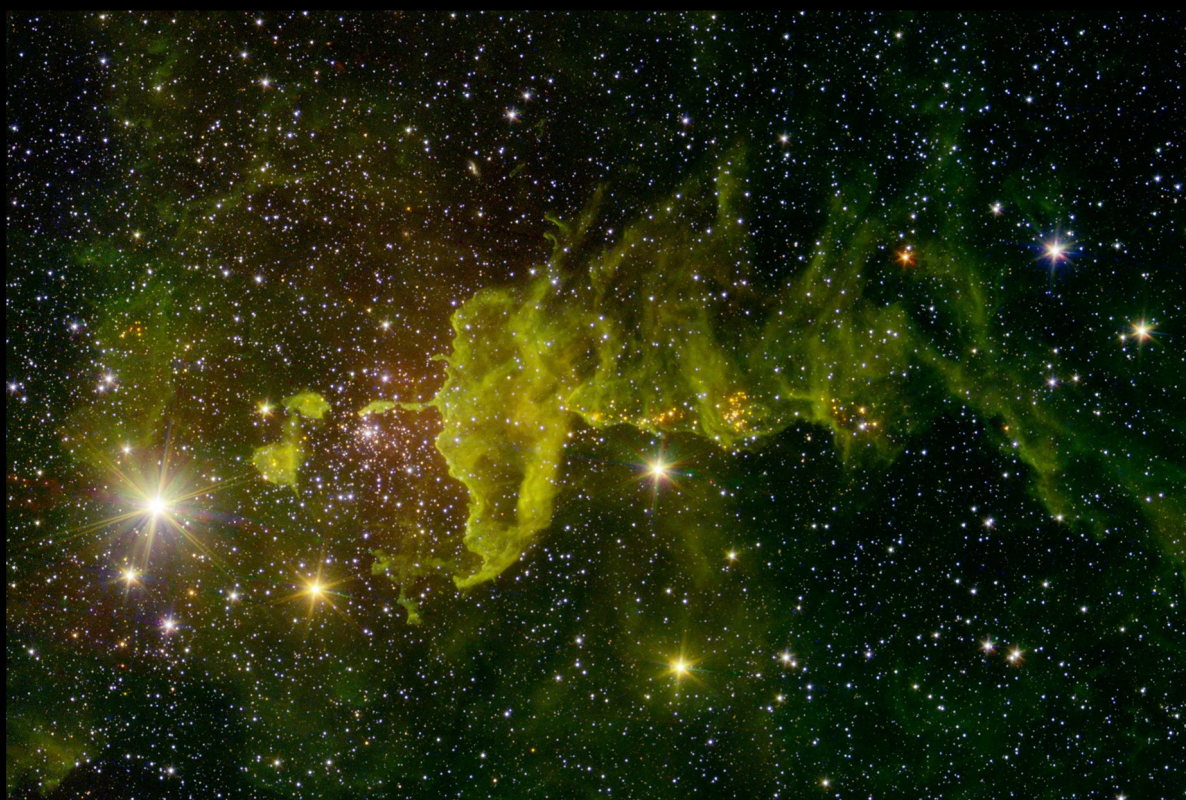


IRIDIO ENNUI VS THE BOLTZMANN BRAINS

A NOVEL WITH EQUATIONS

Mario Daniel Martín



A joint publication of

ediciones ayarmanot (Buenos Aires) and **Encuentro** Incorporated (Canberra)



Mario Daniel Martín was born in Salta, Argentina. In his artistic career, he has published 12 books (4 novels, 4 volumes of poetry, 2 of short stories and 2 of theatre plays). More than 70 short stories and poems have appeared in literary and science fiction magazines and anthologies in Argentina, Spain, Colombia, Uruguay, Venezuela, and Australia. He has received several national and international literary awards and been short-listed for others. Most of his work has been published in

Spanish, and all the above awards are for writing in that language. His academic publications include papers on the Spanish-speaking community in Australia and the use of technology in language teaching, as well as a book on student retention. Mario Daniel is an Honorary Associate Professor in the School of Literature, Languages and Linguistics at The Australian National University.



Iridio Ennui vs The Boltzmann Brains by Mario Daniel Martín is the translation of the second edition of *La inevitable resurrección de los cerebros de Boltzmann* (The electronic version of the novel is freely downloadable from:

<https://www.edicionesayarmanot.com/2024/07/cerebros-de-boltzmann-2da-edicion.html>).

The novel was translated by Kevin Windle and Amalia Milman, in collaboration with the author. This translation was made possible by an Arts ACT Art Activities Grant, awarded by the Canberra City Government.

Ediciones Ayarmanot is now publishing both the second edition in Spanish and the English translation, in collaboration with Encuentro Incorporated of Canberra, Australia.

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IRIDIO ENNUI
VS THE BOLTZMANN BRAINS:
A NOVEL WITH EQUATIONS
MARIO DANIEL MARTÍN

TRANSLATED BY

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MARIO DANIEL MARTÍN

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Preface to the Spanish Edition

The Big Bang is the creation myth of our time. Its priests are the scientists who debate the different cosmological models. As in the time when the Church had a monopoly on truth in religious matters, nowadays the members of the select priesthood of science are those who can talk knowledgeably about this subject. Access is not easy, at a minimum it requires an understanding of Riemannian geometry, in which the equations of relativity are written and, in the 21st century, the complicated mathematics of string theory. For the initiated, there is a language, a script, an abstract way of representing the world, a framework that grants admission to that arcane knowledge.

But this myth, like many others, is a dynamic story. It allows us to address the origin story it proposes from multiple perspectives. It focuses on its symbolic value, it reinvents itself and expands, popularising itself by inspiring fascination and reverential awe. In that sense, science fiction is its main tool.

This book explores that mythology through fiction, but also through aesthetics (in the Greek sense: sensitivity, perception, the search for an essence). It cannot achieve this by telling of it, or even by showing it to us; we must be immersed in its element.

Iridio Ennui vs the Boltzmann Brains is a novel with equations, but the equations are not an ornamental item or a whimsical inclusion. The author, Mario Daniel Martín, a mathematician and linguist, uses the scientific notation of different areas of knowledge to tell the story of Iridio, who believes that there is one equation for everything, because he was assured of that as a child by the robotic nurse who raised him.

Just as *Don Quixote* satirises chivalric novels but is itself a novel of chivalry, with a character who wants to be a knight-errant in a world in which it is very difficult to undo wrongs because the windmills have triumphed, this novel satirises several scientific dystopias and is in turn a dystopia – a very raw one – questioning the mythological paradigms created by the high priests of our time.

It is the second half of the 22nd century and the catastrophes caused by climate change have far exceeded the direst predictions: a perennial economic crisis throughout the world; recurrent thermal waves; millions of refugees caused by rising sea levels; and the extinction of the most common animals.

Iridio Geyser Pérezman Ennui, anorgasmic, cryptorchidic, synaesthetic and aromantic, has three obsessions: transcendental numbers, the real cause of the dinosaurs' extinction, and finding the centre of the universe where the Big Bang originated. His attempt to formalise what cannot be formalised, to understand daily life in mathematical terms, has led him to confront the post-creationist authorities of his university, the various police forces of the People's Free-Market Republic of Ozeania, and the Reich-behaviourist psychometrists who attempt to normalise him, raising his indexes of genital eudaemonia.

In his naive struggle to defend the pure sciences, Iridio will also confront the most virulent enemies of human progress: fluctuating Boltzmann brains, entities which have spontaneously appeared in the quantum foam of sidereal space, taken control of the minds of the authorities of the chaotic planet Earth, and contaminated their pineal glands.

In the perfect architecture of this multilayered story, at times hilarious and often terrifying, the equations act like neon signs. They come from a great variety of fields, mainly astronomy, physics, neurology, climate change and cybernetics, but also Lacanian mathemes, chemical formulae and even philosophical postulates like Kant's formulations of the categorical imperative. All of them are woven into the thread of the story, like the sound-track of a film: they accompany the action but they do not determine it; the reader does not need to understand them in order to move forward.

Before publishing his *Brief History of Time*, Stephen Hawking was warned that each equation he decided to include would reduce the number of readers by half. In *The Emperor's New Mind*, Roger Penrose tells us that he included equations despite such warnings, and that the readers of the book could skip them without any regrets. In a very subtle way, he also recommended glancing at them every now and then, because once the reader gets used to seeing them in the text, they appear less intimidating. The same criterion can be used for this book; furthermore, this is not popular science but a novel, and readers can simply let themselves be drawn along by the narrative. However, anyone who can engage even briefly with the equations will discover additional meanings, subtle subplots and hints of what is to come.

Why Boltzmann brains? These are the monsters of modern creation myths. For the past 200 years, since Mary Shelley wrote *Frankenstein*, there have been scientific monsters in western literature. Their origin is curious. They originate from the Second Law of Thermodynamics, developed by Ludwig Boltzmann in the 19th century. He stated that our universe, in which entropy is increasing, must have started in very unusual conditions of low entropy. Speculation arose

that our universe is designed for life, more specifically, to create intelligent observers; this is known as the anthropic principle. Naturally, scientists are uncomfortable with this notion because it approaches religious myths of creation, something they considered obsolete. When it was discovered in 1998 that the universe is expanding at an accelerated rate, cosmologists started to speculate about creatures who appear and disappear in interstellar space like subatomic particles. Those hypothetical entities were named to 'honour' Boltzmann. They are literally monsters that emerge from equations when infinite time or space are involved. This was also linked to predictions of cosmological inflation which posit that the universe we see is both homogeneous and isotropic when modelled at a large scale. Cosmologists deduced that, if the universe expands infinitely and is eternal, the most frequent observers will be those disembodied brains that appear spontaneously since their number will increase exponentially until, in the distant future, they will outnumber typical observers, such as human beings or potential extra-terrestrials derived from evolutionary processes. Boltzmann brains are conceived as observers that appear and perceive the universe for a fraction of a second and disappear again in the quantum foam. In other words, they are alternative (freak) observers and not a product of Darwinian evolution. This may resemble genetically modified surrealism, but such are the hypothetical scenarios published and debated in prestigious scientific journals. The author, however, gives these entities other meanings, which the reader will discover as the story progresses.

This novel also covers two other matters related to Ludwig Boltzmann: climate change and artificial intelligence (Boltzmann machines). In relation to climate change, the equations used are based in thermodynamics to model changes in the atmosphere and the oceans. In this respect, it is interesting to note that those who deny climate change have criticised the scientific models which predict higher sea levels, for example, because, supposedly, they do not respect the laws of thermodynamics. This war of ideas which we see today is extrapolated in the novel. The worst predictions of the United Nations Intergovernmental Panel on Climate Change (IPCC) have come to fruition, and yet global warming continues to be denied. And Boltzmann machines are stochastic neural networks optimised for self-improvement and designed to operate solely on the basis of the data fed into them. We are already surrounded by them. They are the robots which use your most frequent searches to determine the advertisements to place on your computer screen. They are the algorithms that control the world's share markets. They have hidden layers, like the unconscious, and the main problem from an artificial intelligence

perspective is that they are an opaque black box. It is impossible to know what rules they have deduced, and therefore if there are biases. Not even their creators can know the reasons for their decisions. Anyone who talks about the potential dangers of artificial intelligence is, in one way or another, pointing to this characteristic, which makes them very difficult to control.

In a way, this book is like those algorithms, a complex and fascinating artefact, an unpredictable device, a detonator in the mind.

Laura Ponce
Editor-in-chief,
Ediciones Ayarmanot
Buenos Aires, December 2018

Preface to the English Edition

In February, 2016, Australia's largest scientific research body, the Commonwealth Scientific and Industrial Research Organisation (CSIRO), announced that it was cutting 96 climate science research positions. In a communique to staff, recently appointed CEO, former Silicon Valley start-up entrepreneur and venture capitalist, Dr Larry Marshall, PhD (Macq.), advised that the reality of climate change had now been proven, and it was time for the nation's research energies to focus on finding "solutions for the climate we will be living with." Those solutions would include increased collaboration with industry, the commercialisation of scientific research outputs and the development of new digital technologies. In interviews that same week, Marshall noted his enthusiasm for the Netflix model of human resource management. Mario Daniel Martín wrote *Iridio Ennui vs the Boltzmann Brains* while working in an office just one kilometre from the buildings where Marshall's communique was disseminated. Meanwhile, a survey of 220 Australian climate scientists published in *Nature* in September 2020 found that roughly half those in government employment had been "prohibited from speaking publicly about their work," as had 38% of the climate scientists working in industry, and 9% of those employed in universities. Three-quarters reported self-censoring. Australia's per capita coal emissions are as of this writing the largest in the world.

Iridio Ennui vs the Boltzmann Brains, concerns the upbringing, education and scientific career of its title character, a man with an extraordinary incapacity to grasp the society around him. In fact, he lives in Canberra, the very same city where CEO Marshall bowed to Netflix, but in the future. The key events of the book are set in 2184, on a planet buffeted by thermal waves, amid mass extinctions and the drownings of numerous boat-bound climate refugees. It is also very funny. On page 3 we read that Iridio's father is "Salvatore Winston Ampleforth Ennui, BPCA, a rather unorthodox painter-poet who regurgitated second-rate neo-surrealism." An appendix, "Post-nominals used in the People's Free-market of Ozeania," clarifies that the BPCA at the end of Ennui senior's name stands for Bachelor of Patriotic Creative Arts. That list also includes the BPJ, Bachelor of Patriotic Journalism, and Master's degrees in both Lacanian

(MLacLM) and Reichian (MReichLM) Libido Management. We will in due course discover that the country's president is John James Bjelke-Goldstein, a distant descendant, perhaps, of the Queensland premier, gerrymanderer and champion of oil drilling on the Great Barrier Reef, Sir Johannes Bjelke-Petersen, KCMG.

To say that Martín's book is very funny may make it sound quite distant from one of the predecessor texts that many of these allusions reference, George Orwell's *Nineteen Eighty-Four*. But that would be to misunderstand something crucial about that earlier classic. Consider Salvatore's middle names again. Ampleforth is the bit-part poet who shambles into Winston's cell in Part III of *Nineteen Eighty-Four*, culpable of having allowed the word "God" to remain in a line of the new "definitive edition" of Rudyard Kipling's verse, on the grounds that there are so few words in the English language that rhyme aesthetically with "rod." "Has it ever occurred to you," Ampleforth (i.e. the one who puts forth amply) asks a distraught and soon to be tortured Winston, "that the whole history of English poetry has been determined by the fact that the English language lacks rhymes?" Somehow readers forget these jokes, just as they forget that the currency in Oceania is the dollar, or that the way Winston surmises that Julia works in the Fiction Department of the Ministry of Truth is that "he had sometimes seen her with oily hands and carrying a spanner," signs suggesting that she must have "some mechanical job on one of the novel-writing machines." Then again, we seem just as ready to forget that close to half of the characters in Jane Austen's economically and psychologically incisive novel *Pride and Prejudice* are outright caricatures. The fact is that novelistic realism developed out of parody (Petronius, Lucian, Rabelais, Cervantes, Fielding...) and has never strayed far from it, however speculative its reaches. Science fiction is itself, at least when at its best, an inherently satirical genre. And Martín's own practice of it is acute.

When we read that "the World Doctrinarian Scientific Reform of the 21st century had laid down what could be published, and transferred the content of all printed books to digital libraries, easier to redact or censor," it is hard not to feel a twinge of recognition. The university authorities can track whether Iridio is reading their memos via the eye-tracking technology in his "flexible reader." We are already on the verge of this. The police force in 2184 are subject to performance indicators, tied to solved cases. As for the "Ministry for Historical Updating, Social Precognition and Digital Worship" and its rival "Ministry of Defence, Internal Appeasement and Border Protection," are these names any more fictive than the comic-book title of Australia's current customs agency, *Australian*

Border Force? The latter was dreamed up by the Australian government, in pure parodic mode, in 2015, along with new uniform and increased proportion of officers with firearm training, so as to help – the name of Martín’s equivalent 2184 ministry nails it – in the battle to win elections. The future is already here, as it always is.

But one should not overplay Martín’s links to Orwell, the science fiction classic I have singled out for discussion here (in fact the book contains extensive references to *Brave New World*, Sagan’s *Contact*, *Fahrenheit 451* – not to mention *The Trial*, *The Castle* and also Canetti’s *Auto-da-fé*). Or rather, the strongest of those links to Orwell is the rigour with which *Iridio Ennui vs the Boltzmann Brains* critiques deficiencies in that earlier novelist’s vision, specifically those that centre upon sex. Add to the father, introduced above, Iridio’s mother, a scientist reviled in the official press as “a relentless verificationist and a clandestine advocate of the theory that climate change was caused by humans.” Child of dissident parents, Iridio is 93.7 per cent heterosexual, according to the psychometrists in charge of the “Reich-eudaemonic tests of genital performance,” and dangerously disinterested in sexual intercourse: “asexuality was considered a very serious psychosomatic condition in the current legislation, as it could be a symptom of ecological millenarism.” The name Reich refers to the post-Freudian analyst Wilhelm Reich, who coined the term “the sexual revolution,” and from the late 1920s advocated a merger of Marx and Freud based around the emancipatory power of the healthy orgasm. Reich’s Orgone boxes were metal-insulated wooden boxes that he believed could perform a similar work to orgasm upon the subject seated therein. Persecuted by the Nazis and then, in exile, by the U.S.A. Food and Drug Administration, both of which burned his writings, Reich died in a Pennsylvanian prison in 1958. But he was already being proclaimed as “prophet” in a January 1964 *Time Magazine* article, which noted, “All America is one big Orgone box...With today’s model, it is no longer necessary to sit in cramped quarters for a specific time. Improved and enlarged to encompass the continent, the big machine works on its subject continuously.” The future is Reichian. So, where Orwell’s Julia is a sexual insurgent, whose unrepressed desires confirm Winston in his rebellion against the government of Oceania, the character named Julia Dora Alonso Savage, DOP(A) in Martín’s book is a state-employed “orgonic technologist who normally trained other orgonic workers but was also in charge of difficult cases,” i.e. Iridio’s. Julia’s post-nominals bespeak a Diploma of Orgonic Practice (Advanced). The only way Iridio can “avoid the morality and oztraditions police” and so meet “the psychological

requirements to work as a qualified scientist" will be by managing to "truly exchange orgonic energy" with Julia, a phenomenon to be measured in ejaculate.

There are elements of Almodóvar in the kinds of sexual comedy that result, though the optic on female sexuality here is very much (or rather 93.7%) heterosexual male fantasy. And as in Almodóvar's films, the topic of rape comes disturbingly to the surface. Yet the theme of compulsory pleasure has a metaphorical, and with that an acutely sociological, dimension to it too. Here we need to say something about one of the book's key themes, which we might ambiguously label "the state of knowledge." Being the story of Iridio Ennui's education and development as a scientist, Martín's novel interfaces with knowledge on almost every page. This is obviously the case in the many school and university settings. But, keeping Michel Foucault's work in mind, we should not ignore the kinds of clinical and law-enforcement investigations to which Iridio is repeatedly subject, as well: the probes, the self-report questionnaires, the interrogations. *Iridio Ennui* is suffused with relations of knowledge. And knowledge throughout is sick. Among the reasons for Iridio's harassment at university is his reputation as the sort of student who would raise annoying questions in his mandatory undergraduate classes in "Teleological Post-Creationism for Scientists," as for instance "when the class discussed the reason for the exclusion of dinosaurs from Noah's ark." Or he would ask his educators for further information about the maligned practice of verificationism. Iridio is suspected by them of being that vengeful student who puts a zero in "the anonymous evaluations of teaching quality, compulsory for all subjects and used by the pedagogical police to close down unpopular programmes." The latter is an obvious reference to current practice in the Australian and other neoliberal university systems. But it is also not actually that far from one of the more ghastly moments in the novel, where Iridio is informed that he will not be allowed to perform a long-awaited and highly prestigious keynote address to other scientists without submitting in the days previous to a "joint genital eudaemonia test," in which he and the character Iris will "be required to have intercourse at the Widgeree mental rehabilitation institute, under the supervision of Thorndike Mowrer and Dr Raye Kingsley." The metaphor throughout, it seems to me, is that neoliberal knowledge institutions abuse the innate desire to know, that which Aristotle pinpointed, back in the *Metaphysics*, and suggested drives all of us, which for him was all men: "All men by nature desire to know. An indication of this is the delight we take in our senses; for even apart from their usefulness they are loved for themselves; and above all others the sense of sight. . . The reason is that this, most of all the senses, makes us know and brings to light many differences

between things.” The subject’s joy in finding out, and helping others to find out, made compulsory and subject to ever more idiotic systems of quantity control, is metaphorised in Martín’s novel to compulsory displays of civic orgasm under the watchful eyes of Thorndike Mowrer, BPsySc, CPsychom, and Dr Raye Kingsley, MD MBioA, specialists in sexual morbidology at the Ministry of Health, Natality and Civic Comfort.

The fact that the ministries and various secret police forces in Ozeania are so overlapping, competitive and contradictory as to prevent the pieces from ever adding up might, from a perspective familiar to the readers of Mikhail Bakhtin, appear a source of solace, or even salvation. On the other hand, the massive dysfunction of power in 2184 might just represent another way in which their world appears ever more disturbingly similar to our own, the ideologies and institutions of which have been broken by open knowledge of anthropogenic climate change and cannot seem to cohere around any action other than suicide.

So what is Big Brother in Martín’s Australia of the now-future? It must be the equations. Joyously emanating from almost every page of the novel, in distinct boxes of text, these variously numerical, symbolic and verbal machines range from equations proper through theorems, lists, tables, definitions, scales and more. At times they are parodic as well. But whatever joy is in them also has something resolutely alien and steely to it. That would be a function of most any reader’s incapacity to parse the entirety of them. I am, for instance, defeated by the attempt to understand at first blush Table 3.4.iii.f., which constitutes the “Freudenthal-Tits Magic Square of Lie Algebras, according to Baez” – though brief inquiry indicates I could perhaps with a few weeks’ reading work out the basics of it. The inclusion of numerous formalisations from narratology and Grician conversational analysis is vital here, because they make it likely that readers from the maths and sciences will feel as correlatively out of their depth as literary scholars or philosophers in relation to the table above, the general formula for the spherical Bessel functions, the Euler convergence formula, and so forth. Including instruments from the humanities among such equations has the further advantage of clarifying something the modern fetish of number as truth tends to obscure, though the Namoryaplokiyans and Xamtegmarmquians are well across it, as was a certain Roman Jakobson: there is no way to distinguish the meaning of the items or interactions within a formula from its contexts of use. In other words, none of these encapsulations of decades, centuries and even millennia of human knowledge are true outside of a given way of reading them. But those ways exist. In the face of the sheer sublime insistence of all those diverse knowledges is furthermore why the plethora of equations have such

terrific force here, reminding us of the extraordinary, manifold practices of intellectual communities that have led to their emergence, before which all this moral compromise and rot, all this “spoliation of jouissance” as Jacques Lacan would say, is as sand to the ocean. The equations stare through us and demand better. They probably stand for the unconscious as well, which has its own multiply incompatible logics, each in large part alien. Research released in November 2021 showed that 98.3% of the Australian Great Barrier Reef has experienced coral bleaching in the last 20 years. The Intergovernmental Panel on Climate Change report released in July of that same year indicated that a 1.5% temperature rise will see 70-90% of the world’s warm water coral reefs disappear. Some of the equations used to make such predictions are included in the novel.

Dr Paul Magee
Associate Professor of Poetry,
University of Canberra
December, 2021

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Iridio Ennui vs the Boltzmann Brains

$$S(e^{\pi}) = k \log W (i^{-2i})$$

Group 9

$$S(c) < k \log W(rb)$$

P
e
r
i
o
d
6

192.227	77
880.0	2.20
Ir	+4 +3
Iridium	Solid
[Xe]4f ¹⁴ 5d ⁷ 6s ²	Transition Metal

d-block

$$S(e) = k \log W(mc^2)$$

$$W \log k = S$$

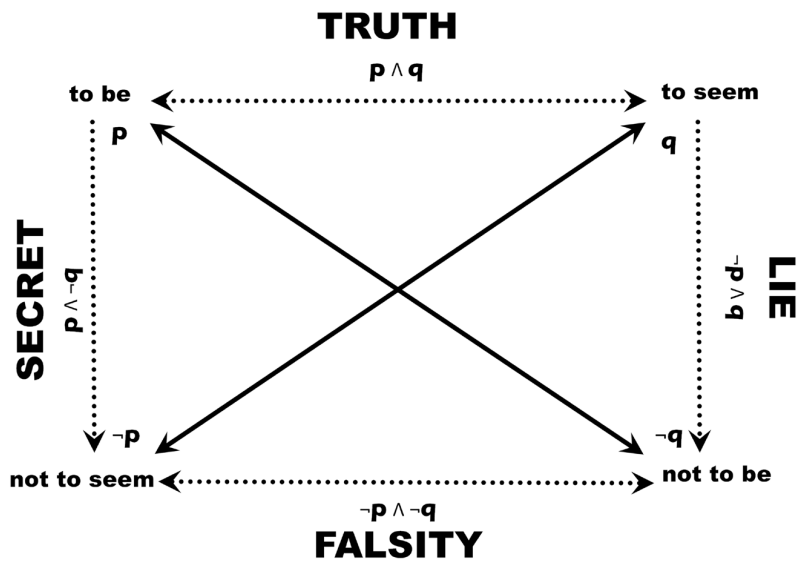
Mario Daniel Martín

I don't want you to listen to me. I want you to listen to the science, before is too late.

Greta Thunberg

There must be an ideal world, a sort of mathematician's paradise where everything happens as it does in textbooks.

Bertrand Russell



0.0.a. Greimas's square of veridiction superimposed on Aristotle's square

$$\hat{H}(x)|\psi\rangle = 0$$

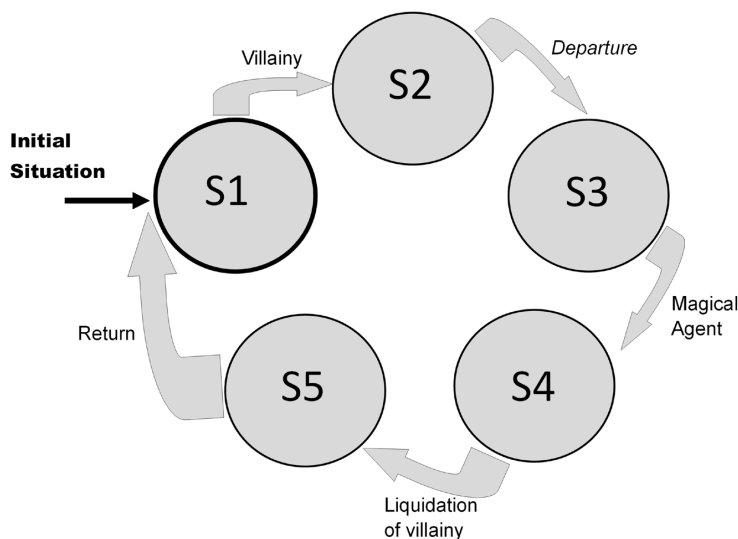
0.0.b. The Wheeler-
De Witt equation

0.0.c. $\{0,\emptyset\}$

1. Residence on Earth

There must be no barriers to freedom of inquiry. There is no place for dogma in science. The scientist is free, and must be free to ask any question, to doubt any assertion, to seek for any evidence, to correct any errors.

Julius Robert Oppenheimer



1.0.i. Schematic representation of a finite-state automaton generating a simple Propp-style folk-tale plot

$$\begin{aligned}
W = \int_{k < \Lambda} [Dg] \{DA\} [D\psi] D\phi \exp \bigg\{ i \int d^4x \sqrt{-g} \bigg[\frac{m_p^2}{2} R - \frac{1}{4} F_{\mu\nu}^a F^{a\mu\nu} \\
+ i \bar{\psi}^i \gamma^\mu D_\mu \psi^i + (\psi_L^i V_{ij} \phi \psi_R^i + \text{h.c.}) - |D_\mu \phi|^2 - V(\phi) \bigg] \bigg\}
\end{aligned}$$

1.0.ii. The essence of Core Theory, according to Sean Carroll

$$\sum_{k=0}^{n-1} e^{2\pi i \frac{k}{n}} = 0$$

1.0.iii. Generalisation of Euler’s identity for the nth roots of unity

1.1. The first three seconds

Most of the fundamental ideas of science are essentially simple, and may, as a rule, be expressed in a language comprehensible to everyone.

Albert Einstein

Iridio Geyser Pérezman Ennui seemed destined for great achievements. The day of his birth was considered by solar historians as the date of the reversal of the persistent Technological Regression which had characterised Planet Earth since the second half of the 21st century. This painful period was informally known as 'Penumbra Scientifica'. That day coincided with the reappearance of the monsoon winds in Central Eurasia, bringing intense rains which, for the first time in the 22nd century, ended the drought that had plagued the western Pacific region due to an extended El Niño event. At the same time, the invisible hand of the markets, for the

$$\frac{\partial V}{\partial t} + \frac{1}{2} \sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS \frac{\partial V}{\partial S} - rV = 0$$

1.1.i.a. Black–Scholes equation

first time in almost twenty years, produced a surplus in the stock market of Bandar-Austro-Metropolis, capital of Iridio's homeland, the Free-Market People's

Republic of Ozeania. This tendency spread for a few months to other stock markets in the terrestrial area of the planet and produced the first glimmer of hope that the social and economic stagnation of the previous decades would end.

Iridio's parents had sealed his fate by giving him names that made him truly unique, but at the same time provoked mockery among his peers, colleagues and acquaintances. According to tradition, his first name was chosen by his mother, PhDr Eleanor Linda Montag Pérezman, a theoretical physicist who devoted half her life to scrutinising the equations related to the Heterotic string theory HE. However, owing to her frequent conflicts with the authorities at her place of work, the Go8-Ivy-BAM University, she

$$\mathcal{L}_S = \frac{1}{4\pi\alpha'} \sqrt{|g|} (g^{\alpha\beta} \partial_\alpha X^\mu \partial_\beta X_\mu - i\bar{\Psi} \partial \Psi)$$

1.1.i.b. The superstring action

had been dissuaded from elucidating theoretical problems and transferred to a teaching-only position. In this capacity, Eleanor helped students to understand basic scientific concepts taught during the compulsory levelling courses by automatic robomooc instructors. Though restricted to a teaching role, from time to time Eleanor managed to send a paper to the increasingly scarce journals allowed to publish theoretical physics.

Iridio's middle name was given by his father, Salvatore Winston Ampleforth Ennui, BPCA, a rather unorthodox painter-poet who regurgitated second-rate

neo-surrealism. Although he was always painting or writing poetry, he very rarely exhibited or displayed his art. He resisted any involvement in the official academies of his country and refused to limit himself to the artistic styles prescribed by their authorities. For that reason, he had spent more than half his life under house arrest and was frequently visited by the aesthetic police in their characteristic pink uniforms.

From his mother, Iridio had inherited a facility for understanding the abstract concepts expressed in equations. From his father, he had inherited a well-developed visual intelligence, an unusual synaesthesia and the ability to learn languages without any effort. However, Iridio hated incongruous dreams and the fairy stories his parents tried to read to him. He could not express fluently the abstract concepts contained in the formulae that amazed him, he was not good at sports and was not interested in the senso-sexual dramas that dominated other adolescent minds. He also had a marked obsessive tendency; for example, he spent his childhood exploring numerical series and collecting information on dinosaurs. His interest in these extinct creatures initially pleased his mother because she hoped Iridio would embrace biological sciences as a career, and perhaps be able to emigrate to the space colonies outside the chaotic Earth. But when she was forced to visit the same interactive exhibitions in the same natural history museums again and again, the idea palled on her. Iridio's obsession deepened when PhDr Ernesto Helmholtz Faber Granger, a theoretical physicist who studied the effects of solar storms in the atmosphere, turning the electromagnetic emissions from the sun into sound, told Iridio that dinosaurs were thought to have become extinct when an asteroid crashed into the Earth. Ernesto was a former colleague of Iridio's mother, who used to visit them frequently. From the day Iridio learnt about the asteroid hypothesis, he would arrange his collection of toy robotic dinosaurs in a long queue in the living room of his home every Sunday. He would then try to recreate the fateful extinction event by throwing an intelligent soccer ball at them, assisted by Topologic Penelope, his primary robomooc instructor and nurse. She was a charming interactive intelligent robot whom his mother managed to get assigned to him, to teach him science and help him to communicate with his human teachers. Penelope also helped to program the death of the creatures. Iridio's father or, if he was sick, Ernesto, participated in the simulated slaughter, but his mother did not because she was allergic to the renewable plastic cover of the soccer ball. Iridio was a compulsive reader of any material he could find on extinct megafauna, particularly speculations about the reasons for their demise. He always asked questions that adults found difficult to answer.

During his childhood Iridio had few friends because he was home-schooled after his parents were granted special permission from the Ministry of

Education, Population Retraining and Civic Indoctrination. Penelope introduced him to the Fibonacci sequence and many formulae involving those numbers. $F_0 = 0$; $F_1 = 1$; $F_2 = 1$; $F_3 = 2$; $F_4 = 3$; $F_5 = 5$; $F_6 = 8$; $F_7 = 13$; $F_8 = 21$; $F_9 = 34$; $F_{10} = 55$; $F_{11} = 89$; $F_{12} = 144$; $F_{13} = 233$; $F_{14} = 377$; $F_{15} = 610$;

$F_{16} = 987$; $F_{17} = 1,597$; $F_{18} = 2,584$; $F_{19} = 4,181$; $F_{20} = 6,765$... She also taught him the definition of a prime number and how to factorise Fibonacci and Lucas numbers.

Her mother was also involved in his home-schooling, but Iridio had many rows with her when she insisted that he needed to explain the content of equations in words, to comply with the school curriculum. In any case, he preferred interacting with Penelope and always said that his true friends were numbers and formulae because his robomooc instructor had told him that there was an adequate equation for everything. The instructor started every daily lesson with a formula that they had not studied before. Iridio's mother, though a scientist, did not agree with the premise that all world phenomena could be reduced to equations. However, exploring number sequences and all sorts of formulae had a soothing effect on Iridio and calmed his tantrums and meltdowns when something in his limited universe did not meet his expectations or some surprise upset him. His mother let him spend hours with Penelope, exploring that abstract world in which he was more comfortable. Besides, she had enough to do, being the household's sole provider and dealing with the frequent visits of the aesthetic police, which required her to fill in countless forms every time they wanted to sell or put into storage any of Salvatore's art works.

When Iridio turned eleven, the education authorities suspended his home-schooling permit for reasons his parents could not explain, and he was compelled to attend an ordinary school. His mother helped him with the entrance exam to Alpha-Official-BAM High, the best secondary school in the country, subsidised by the state, where pupils were trained to pursue a science-based career. This included a controlled pharmacological treatment to improve intelligence, known as phosphenism, and an accelerated program to qualify as a migrant to the space farms or asteroid mining settlements. However, when the

$$F_n = F_{n-1} + F_{n-2}; \quad n > 1$$

$$\text{with } F_0 = 0 \text{ and } F_1 = 1$$

1.1.ii.a. Recursive definition of the Fibonacci sequence

$$F_{n+2} - F_n = F_{n+1};$$

$$F_{n+3} + F_n = 2F_{n+2};$$

$$F_{n+4} + F_n = 3F_{n+2};$$

$$F_{n+6} - F_n = 4F_{n+3};$$

$$F_{n+2} - F_{n-2} = L_n;$$

$$F_{n+3} + 2F_n = L_n;$$

$$F_{n+4} - F_n = L_{n+2};$$

$$F_{n+6} + F_n = 2L_{n+3};$$

$$F_n + L_n = 2F_{n+1};$$

$$3F_n + L_n = 2F_{n+2};$$

$$L_n + L_{n+3} = 2L_{n+2};$$

$$L_{n+2} - L_{n-2} = 5F_n;$$

$$F_{-n} = (-1)^{n+1}F_n$$

1.1.ii.b. Some formulae involving Fibonacci and Lucas numbers

results arrived, Iridio received a report from the pedagogical police that said 'suitable but not admitted', although he had achieved 100 per cent in the formula-manipulation test and 95 per cent in the foreign language test, a topic he also liked to explore with Penelope. His results were not outstanding in the science test, especially when he was asked to explain in words basic scientific concepts such as speed or specific weight. Apparently, that was the reason for the final decision. The contradictory explanations in the report raised many queries from parents to the education authorities and many questions from Iridio to his parents. His mother told him that she would explain when he grew up, and carried on with her many enquiries in several ministries to get the decision reversed. When she realised that, no matter how she argued the case, Iridio would not be admitted to such a selective school, she left no stone unturned until the Ministry for Historical Updating, Social Precognition and Digital Worship granted special permission for Iridio to attend Erinsborough High, a secular school where classical sciences were still compulsory. There were classes coordinated by human beings and the curriculum was not limited to repeating the elementary dogmas of teleological post-creationism. In addition, the school allowed the study of classical English, classical Spanish, Chinglish and Chinpanglish – languages essential for an understanding of the scientific canon of the 21st century, which had survived in original documents and translations in the electronic archives. There were also classes in the different variants of Panesperanto, the consensual terrestrial lingua franca spoken on the different continents, and optional classes in Panslavic, the official language of Eurasia. His mother also managed, after several visits to the Office for the Regulation of Artificial Intelligence, to obtain permission for Penelope to accompany Iridio to and from school and to help him during breaks with the topics discussed in class. Other arguments and tiresome bureaucratic procedures were needed in order to allow him to take home the flexible reader provided by the school to each student, as well as to allow her and Penelope to have easy access to its contents, so that they could help him with assignments that confused or frustrated him.

To the great concern of his parents, Iridio added to his innocuous obsessions a cosmological idea he heard for the first time during a boring science class in high school: the Big Bang theory. To counteract the bad name science had among the lazier students, Marcus Homir Bumstead Clement, BSciEd MOSEd, his science and maths teacher at Erinsborough High, tried to make the class more enjoyable by including cosmological problems that might spark some critical reflection. Iridio's destiny changed forever when his teacher, instead of asking them to copy dull equations or write useless definitions in their flexible readers to be discussed with the robomoocs, asked them to put down what they

considered the most important question about the origin of the universe. Iridio was the first to send his question to his teacher through the interactive system connecting all the flexible readers within the school. He wrote: Where is the centre of the Big Bang now? And the surprising thing was that no one, not even Marcus himself, knew the answer. As a result, the teacher asked all students to research the question for the next class, with the help of the school's robomooc instructors.

At dinner that very night, his mother told him that, in fact, his question was nonsensical. The Big Bang was no ordinary explosion because space-time had been created at that moment. As there was no space before, there was no centre and, as there was no time until the Big Bang, in reality, there was no before. To Iridio, the explanation seemed to be a meaningless riddle, similar to the ones he had to decipher during his post-creationist classes. But his mother ignored his increasing frustration and continued to explain what was believed to have happened during the first 10^{-35} to 10^{-32} seconds of the event, when the universe expanded from the size of a grape to a vast expanse in which, a million years later, billions of galaxies would be spawned. What was truly important, deduced from the multicoloured and complicated equations used to predict the events of the remote past, was the endlessness of the universe in all directions and, since there was no limit, the idea of a centre was impossible. For that reason, the centre of the Big Bang was everywhere. Iridio concluded that this answer made no sense and, for the first time in his life, waited eagerly for the next science class, so he could ask his teacher to explain those mysterious equations they had not been shown before, which did not appear in the demonstration screens of the robomooc instructors who helped them.

Unfortunately, Topologic Penelope had not installed all the scientific modules describing the event and could not help him to understand them. However, she put herself automatically in her oracle function and told him to be patient because this question would be a crucial one in his life.

A week later, he suffered a great disappointment when Marcus told the class, as his mother had explained to him, that the centre of the Big Bang was everywhere. But Marcus could not explain the equations to the class because they had not studied enough mathematics to understand them. Those who planned to study at university might be able to decipher the formulae in the future. No one was convinced by this argument, Iridio least of all. Besides, it was unfair that his mother should be right. Iridio suspected that his busybody of a

$$\frac{\dot{a}^2 + kc^2}{a^2} = \frac{8\pi G\rho + \Lambda c^2}{3}$$

$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3}\left(\rho + \frac{3p}{c^2}\right) + \frac{\Lambda c^2}{3}$$

1.1.iii.a. The Friedmann equations for modelling a homogeneous, isotropic universe

mother had spoken to Marcus and used her prestige as a university academic to persuade him to lie to the students.

To solve this riddle and to prove his easily influenced teacher and particularly his mother wrong, Iridio organised a science club at school, in which the members would study true equations and not only the explanation of their consequences. Initially, the only person willing to participate was his classmate Clarisse Leeta Colombo McClellan, considered the most beautiful girl in the school. Her presence drew in the most attractive boys in the class and that, in turn, attracted girls from his and other classes.

The presence of the most popular students motivated others, so the science club grew exponentially, as did the number of queries about this topic during classes assisted by the robomoocs. At first the school management tried to limit the club's activities, arguing that the pedagogical police had issued a decree forbidding unauthorised student associations. Iridio's mother, however, discovered that science clubs were permitted by the legislation and this allowed them to continue.

Marcus was delighted with the students' enthusiasm for cosmology, and to further promote the topic he organised a visit to the National Observatory, so that they could attend a lecture on the fine-structure constant and other cosmological parameters of the early universe. On the day of the visit, the authorities of the pedagogical police diverted the pod-bus to the offices of the

Ministry of Education, Population Retraining and Civic Indoctrination, opposite the cathedral. After a long interrogation, the pedagogical police compelled the members' parents to collect their

Let (X, μ) be a probability space and $T: X \rightarrow X$ be a measurable map such that for each measurable A , $\mu(T^{-1}A) = \mu(A)$. Then if $\mu(A) > 0$ and $k \in \mathbb{N}$, there exists some $n \in \mathbb{N}$ such that

$$\mu(A \cap T^{-n}A \cap T^{-2n}A \cap \dots \cap T^{-kn}A) > 0$$

1.1.iii.b. Furstenberg's multiple recurrence theorem

children. They were notified that the social credit relating to their index of civic performance would be drastically reduced if they continued to allow their offspring to investigate theories proscribed in the curriculum on their own. Iridio's father went to collect him because his mother was working. As a result, other procedures took place which Iridio could not understand, and they returned home very late at night. Even Marcus was released before them.

Iridio managed to persuade his mother to give some free lessons to club members, but very few could stomach the explanation of Planck's time and Planck's length in the first class. Although the content of the class and renewed intervention by the pedagogical police reduced the number of members, those episodes caught the attention of the strict post-creationist social gatherings of

the exclusive suburb of Erinsborough. They pressured those agnostic post-creationists on the school board who had agreed to include the Big Bang theory in the curriculum to do something about it, and to follow the strict directives of the pedagogical police on the matter.

$$t_P \equiv \sqrt{\frac{\hbar G}{c^5}} \approx 5.39116(13) \times 10^{-44} \text{ seconds}$$

$$\ell_P = \sqrt{\frac{\hbar G}{c^3}} \approx 1.616199(97) \times 10^{-35} \text{ metres}$$

1.1.iii.c. Planck's time and Planck's length

That intervention in turn prompted Iridio's mother to gain access to hologrammatic classes on cosmology, offered by the outreach programs of overseas universities. These were added to the club activities, and Iridio copied all the equations presented by the lecturers in his flexible reader.

As a result of the pressure to limit the content of classes, resisted by a subcommittee of parents presided over by Iridio's mother, the school management decided to put an end to the additional hologrammatic classes, close down the club, and impose even more restrictions on the scientific content available in the instructive modules of the robomoocs.

Soon afterwards, and following an unclear incident when Clarisse managed to seduce Iridio, the young woman committed suicide. There were three other suicides, all of schoolfriends who were in love with Clarisse. Many rumours circulated, and the pedagogical police even carried out a rather inconclusive official investigation. They discovered that Clarisse was pregnant. One of the students who committed suicide, the son of a prominent anti-post-

$$\frac{dI}{dt} = -aC(t)$$

$$\frac{dC}{dt} = bI(t)$$

1.1.iii.d. Love dynamics differential equations to model an ill-fated romance of the 'Romeo and Juliet' type.

creationist senator, had used his flexible reader to obtain information provided by the MVEHS, the clandestine Movement for the Voluntary Extinction of the Human Species, to identify the lethal doses of erotisoma mixed with ethanol that had killed them in their collective suicide. During the second investigation, involving the intellectual police and the police for morality and oztraditions, Fanny Roimata Ngata Bowles, another beautiful student who had also managed to seduce Iridio, and two of her polyamorous lovers, committed suicide as well. They were all club members and had also obtained clandestine information from MVEHS in order to kill themselves in a second group suicide. There was always doubt as to whether the catalyst for the tragedy was the banning of the students' association, the apparent indifference of Iridio towards Clarisse and Fanny, or existential adolescent angst before an uncertain world. This, it was suggested, had led many youngsters to take seriously the seditious propaganda of the

clandestine groups of ecological millenarians who abetted their suicide in the hope that reducing the human population of the planet would save other species from certain extinction.

From then on, much stricter controls were implemented regarding what could or could not be discussed in science classes. Marcus was forced to follow the official curriculum, verified by the pedagogical police, to the letter. He could no longer explore difficult cosmological problems or introduce proscribed equations in his lessons.

Classes during the final years at Erinsborough High started to become more sterile after Marcus was forced to resign because he refused to participate in the compulsory citizens' retraining modules imposed by the education authorities. When Iridio asked why he was abandoning them, Marcus said that he was tired of the increasing interference of the Ministry of Education, Population Retraining and Civic Indoctrination inspectors in the school curriculum, as well as pressures generated by the accusations and counter-accusations between the religious post-creationists and the parents expelled from the subcommittee who

No scientific discovery is named after its original discoverer

1.1.iv. Stigler's law of eponymy

were still defending orthodox sciences. Besides, he felt that he could not continue because he was now compelled to use the Sandrini-LePaine-Reich paradigm in his science classes. Iridio's mother explained to him that this was a new way to write equations and that whenever anyone mentioned a result attributed to Sandrini and another person, he had to search for the equations using the name of the second person in Penelope's modules. For example, if they mentioned the Sandrini-Galileo formula, it was

necessary to search for 'Galileo', and in the case of Sandrini-Newton, for 'Newton'. The notation was also different, but he should not worry about that for now because Penelope could translate the formulae into the conventional notation he had learnt.

Unfortunately for Iridio, Marcus was replaced by Richard Robert Weisbrod Thatxton, BPCScEd, a defender of intelligent design who refused to discuss secular cosmology, least of all the Big Bang theory. Every time Iridio asked for a comparison between the Big Bang or other scientific alternatives and the theories discussed in class, the new teacher corrected him and mentioned that the correct terminology was the Higgs Bang or the 'Sandrini-Higgs hypothetical space-time expansion'. When he complained about these corrections, his parents told him to discuss this topic in a room at their home where they had an old quantum computer connected to several speakers that converted into sound the frequency emissions of the sun and the planets in the broadband of electromagnetic

emissions. They called it ‘the room of the secrets of the universe’. This was also where they talked to Ernesto when he visited them.

Iridio was told many times that if someone asked him about the room, he was to say that it was Ernesto’s laboratory, which he used to convert solar winds into sound, and that it was left behind when he moved from the city to a house in the countryside after his retirement from university. In reality, Iridio could not stand the noise and was frustrated by his communication difficulties in the room. The only thing he liked about it was the big magnet on the door frame, used to catch the electronic flies that came into the house. He had permission to squash them with a hammer or to pull them apart to examine the tiny electronic circuits in their bodies under his microscope. That was the only activity that gave him some intellectual pleasure, apart from reviewing the same mathematical lectures with Penelope again and again.

His mother, worried that her son might be discouraged by those unfortunate events, managed to find some additional modules for the robotic instructor on more advanced topics in astronomy, physics and mathematics. Thanks to them, while studying polar coordinates, Iridio discovered transcendental numbers, such as π and e , whose digital expansions were for him, with his synaesthetic vision, comparable to beautiful multicoloured symphonies. They were recited by Penelope to alleviate his frustration after class and during their trip home in the pod-bus. This allowed him to discover the identity of Euler, whose beauty made up for the dryness of the post-creationist concepts that oppressed him. When Iridio was feeling really down, Penelope activated her oracle function and foretold that one day his capacity to understand the beauty of the digital expansion of transcendental numbers would be invaluable for the future of humanity.

$$e^{i\pi} + 1 = 0$$

1.1.v. Euler’s identity

In spite of all the disappointments he suffered at Erinsborough High, where science classes had been replaced by agnostic post-creationism classes, in which he was systematically ignored every time he wanted to discuss whether a deity could have created or planned the Big Bang, Iridio decided to study astronomy at university. This was not an easy matter, because, due to the attacks of ecological terrorists who defended the reality of climate change, the pedagogical police had drastically reduced admission to basic science degrees and closed the environmental science programs, except selective programs for professionals destined to operate the space farms that provided half the planet’s inhabitants with food. To gain admission to the very few places available to study pure sciences, he had to pass the difficult entrance examinations in mathematics and physics, which favoured students from privileged state schools, such as Alpha-Official-BAM High, which he had been unable to attend.

On the day Iridio turned seventeen, the aesthetic police raided his home and, as usual, took his father to be interrogated for several days. This time they also

If in the first act you have hung a loaded shotgun on the wall, then in the following one it should be fired.

1.1.vi.a. Chekhov's dramatic foreshadowing principle

took Penelope, arguing that she had had some unauthorised pedagogical modules installed. His mother started parallel lawsuits in the Ministry for the Arts, Trades and Aesthetic Peace, the Ministry of Education, Population Retraining and Civic Indoctrination and

the Ministry for Historical Updating, Social Precognition and Digital Worship. Following many administrative procedures and several visits from the pedagogical police, the intellectual police and the Office for the Systematisation of Robotic Eroticism, she managed to have Penelope replaced by a less interactive personal instructor with no abstract symbolic instruction, beyond elementary concepts. The new interactive instructor, called Multimodal Therese, could only give him the first 200 digits of π and e , did not use algorithms to search for words within the series of digits when they were written in base 32 or 36, and could not recite theorems without providing extra explanations in narrative form. Her colour was light blue, which displeased him, and her voice projected emotions that seemed false. She did not have the more advanced mathematics that Iridio was used to, only a post-creationist reinterpretation of all the physical sciences, including astronomy, written in the Sandrini-LePaine notation that he hated. Her pedagogical modules could only explain elementary equations through narrative, as in his class, but Iridio could not understand them. And worst of all, Therese only had the explanations and developments of the 563 theorems and physics formulae covered in the official advanced science program approved by the Ministry of Education, Population Retraining and Civic Indoctrination, and most of them he had already explored with Penelope. When Iridio insisted that there was an equation for everything, as Penelope had told him, Therese responded automatically that the unified theory had not been discovered yet and for that reason she could not give him any more details. Therese's oracle function was also very limited. Every time he asked her if he would gain admission to university, the instructor started a very lengthy processing routine, then froze and showed the number forty-two on her interactive monitor.

What scared him most about the change of instructors was the impossibility of continuing his instruction in the correct use of Grice's conversational maxims, which he had started with Penelope. Before they took her away, he had completed a practical exam on conversational implicature theory with her. She had told him that he needed at least 75 per cent to go to university, where, unlike

1. Quality

Try to make your contribution one that is true.

2. Quantity

Make your contribution as informative, but no more so than, is required.

3. Relation

Be relevant.

4. Manner

Be perspicuous.

1.1.vi.b. Grice's conversational maxims

high school, there were no compensation programs for his cognitive deficits, so it exasperated him to be left with no results, not knowing whether he had made progress since she had last examined him. Further, the situation required him to ask his mother for help in preparing for the entrance exams. Her explanations had always made him feel a fool because she had to teach him not only the intricate mathematical details, but also how

to interpret concepts in order to write his responses in the exams, which required him to set out the meaning of abstract formulae in narrative form, as with the teleological ideas discussed in the post-creationist classes.

To top it all, he was not allowed to be accompanied by Therese during breaks. Although Penelope had previously been allowed to give him extra coaching between classes, and she used to spend most of her time in the library while he was in class, engaged in private, monitor-to-monitor conferences with the robotic library assistant, Therese was forbidden to interact with other automatons. The limits the authorities placed on Therese did not allow such interactions.

Iridio's mother went on holiday before the exams and disconnected Therese. She taught him many equations and, showed him, with great patience, how to get to the concepts from the formulae. When they reached the point where they could not bear to be in the same room because of Iridio's frustration, they asked Ernesto for help. In reality, the trouble was that Iridio was unable to overcome his separation from Penelope, and because of this, he frequently attacked his mother. Ernesto was more patient in explaining how to describe the essence of equations and listening to the new interpretations that Iridio proposed after studying the same postulates again and again. He had a new incentive to persevere because, although he had studied Newton's laws at high school, he now understood them for the very first time and was in awe at the logical and elegant manner in which they predicted that every explosion must have a centre, including the Big Bang. Now that he had finally grasped them, Newton's equations appeared in his mind as golden and shining, without blemishes, almost as beautiful as Euler's identity. His mother, however, warned him during one of their many quarrels that as soon as he started university, studied

relativity and got to grips with the paradoxes of quantum mechanics, he would realise that he could not stand on Newton's shoulders to uphold his pre-relativistic prejudices for long.

Name	Description	Formulae
A. First Law of Motion or <i>Law of Inertia</i>	A particle continues to be at rest or moving with constant velocity unless the total force acting on the particle is non-zero.	$\vec{p} = m \vec{v}$ with $V=0$ or $V=\text{constant}$
B. Second Law of Motion or <i>Fundamental Principle of Dynamics</i>	The rate of change of linear momentum of a particle is proportional to the total force acting on the particle.	$\vec{F} = \frac{d\vec{p}}{dt} = m\vec{a}$
C. Third Law of Motion or <i>Action/Reaction Principle</i>	Whenever a particle exerts a force on a second particle, the second particle exerts an equal and opposite force on the first.	$F_{12} = -F_{21}$
D. <i>Law of Universal Gravitation</i>	Every particle attracts every other particle in the universe with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres of inertia.	$F = G \frac{m_1 m_2}{r^2},$ $G = 6.67 \times 10^{-11}$

1.1.vii. Newton's laws

1.2. Provincial exile

The universe is an infinite sphere, the centre of which is everywhere, the circumference nowhere.

Blaise Pascal

When the university entrance results were announced at the end of the year, history repeated itself. As in the tests at the end of primary school, Iridio got very high marks in mathematics and languages but barely passed the test on narrative scientific concepts and failed the post-creationism exam. In general, as he could not put everything he understood through formulae into words, he was again classified as ‘suitable but not admitted’ to the best universities for science. Again he asked what this result meant, and his parents told him that they would give him an explanation one day. Iridio wanted to lodge a complaint himself but his parents would not let him. He expressed his frustration by attacking Therese and breaking her interactive monitor when she could not diagnose his conversational aptitudes or his command of Grice’s maxims. His parents made him promise that he would never again attack his robotic instructor, or tell anybody that he had broken it.

After many enquiries, protests and memos to the Ministry of Education, Social Retraining and Civic Indoctrination, his mother succeeded in having Iridio admitted to a Bachelor of Science in Astronomy at Yabbie Creek-W Multimodal Polytechnic, a remote provincial university located in a sleepy town called Widgeree, very far from the capital. For that, she had to get special permission from the Ministry for Historical Updating, Social Precognition and Digital Religion for him to participate in an experimental positive discrimination program supported by the university, which temporarily lifted the education veto imposed by the pedagogical police. The education authorities insisted that he could only enrol in a technical course, but his mother’s persistence overcame this new hurdle and ensured that he would not be confined in an ubertertiary institution controlled by companies which only prepared students to assist the

$$w^h(p, y^h) = \max_{q^h} \{u^h(q^h) | p'q^h \leq y^h\}$$

1.2.i.a. Connection of the indirect utility function w^h to the direct utility function u^h for a consumer h with income y^h using the Gorman polar form

robots who constituted the majority of the labour force in the country.

His move to university to start his studies posed a financial challenge for his family because at that time a new thermal wave had struck,

causing the extinction of hippopotami in Africa and tapirs in South America. A predictable world financial crisis caused by the unstable weather wiped out the gains the planet’s stock markets had made in the previous decade. There were

$$\frac{dp}{dt} = c(1 - p) - ep$$

1.2.i.b. The occurrence probability p of a species on an island as a function of rate of colonisation c and extinction rate e

mass suicides of people who had lost their savings and their homes, and the authorities blamed the pernicious influence of the MVEHS and other millenarian groups.

The crisis, as well as nationwide restrictions on university science places, resulted in his mother having her teaching hours reduced, along with her

salary. This forced them to move to a modest intelligent house, grade 5, in a poor suburb called Waratah East, where there was not even space for Ernesto's secret room. For this reason, they could not give Iridio much financial support. This

$$T_{i,t+1} = \alpha_i + \beta_1 T_{i,t} + \beta_2 R_{i,t} + \lambda_t + u_{i,t+1}$$

$$\lambda_t = \gamma_0 + \gamma_1 \bar{T}_t + \gamma_2 \bar{R}_t + \gamma_3 \ln(\text{CO}_{2,t})$$

1.2.i.c. A climate econometric model that captures the global linkage between temperature, radiation and greenhouse gas atmospheric influences

forced his mother to fill in a lot of electronic forms so that he could get his basic universal minimum salary before turning eighteen, but the many questions asked by the Ministry of Finance, Robotic

Capital Gains and Space Farms delayed the payments. On top of that, the university authorities used the admission report from the pedagogical police to deny him access to the university-subsidised dormitories, so they had to look for a private boarding house. Thanks to his father's connections, Mrs Josephine Ana Frauke Grubach agreed to rent him one of the cheapest rooms in the boarding house she managed. Luckily, it was close to the university and he did not need to spend any money on fares.

Iridio started to apply for casual jobs and was taken on as a tutor in a private academy that helped science students from the high schools in Widgeree who could not understand their robomooc instructors. He also applied to the local council, which gave priority to students from other cities who had moved to the city to study at Yabbie Creek-W. He managed to get a holographic interview but was placed third and again told by the technological police that he was 'suitable but not successful'. His mother had to lodge a lot of paperwork with the Ministry of Industry, Development and Technological Progress, but she did not explain anything to Iridio. A few months later, another memo arrived indicating that he had been placed second because the applicant selected before him had committed suicide, assisted by the MVEHS. That was no consolation because the municipal Office of Technological Retraining did not consider him suitable, for other bureaucratic reasons he could not understand, and which his parents, as before, avoided explaining.

It was not long before he started to feel the same dismal disillusion that he had felt in high school. Firstly, because the university's observatory was closed. The mechanism that controlled the coordination of the telescope with the

rotation of the earth was broken and there was no budget to repair it. Secondly, the levelling courses in science and mathematics during the first semester did not contribute much to what he had already studied with his mother and Ernesto, beyond basic skills in encoding what he already knew in the Sandrini-LePaine notation. Moreover, his lecturers refused to respond to his innumerable questions, particularly those related to the technical details of equations or the mathematical tools included in the curriculum that the robomoocs were not allowed to clarify. He demanded that his lecturer in Basic Concepts of Theoretical

$$\frac{T^2}{r^3}(M + m) = \frac{4\pi^2}{G}$$

1.2.ii.a. Reinterpretation of Kepler's Third Law using Newton's Universal Gravitation Law

Physics explain how to interpret Kepler's Third Law using Newton's law of universal gravitation. He had a long dispute with the robomooc which had the more advanced mathematical modules when Maxwell's equations were introduced, because the robotic instructor could not explain convincingly how to get from the differential equations to their integral forms without too many narrative explanations.

On the rare occasions when Iridio was helped by a human instructor, he did not get very far. His inability to put into words what he knew was wrong or incomplete, because some terms in the equations were of different colours, caused his instructors to avoid him.

According to gossip, Iridio was obsessive and eccentric, because he wanted to find an equation for everything. His tutors dubbed him 'the extra-terrestrial' and joked that he ought to study on Asperger's Asteroid and not at a university for normal people. Other students also avoided him, not wishing to get involved in his fights with the authorities. The pedagogical police sent him many behaviour memos, which his mother answered.

Things did not improve when he finally reached the astronomy courses in the second semester. During the second human-led practical tutorial of Introduction to Astronomy, PhDr George Milton Lowell Adams, the assistant professor who tutored in the recorded hologrammatic master classes delivered by foreign experts, mentioned the Higgs Bang. When Iridio asked him why it shouldn't be called the Big Bang and wanted detailed explanations, he was again faced with inflexible orthodoxy. PhDr Lowell Adams and his assistants told him again that the right terminology was 'Sandrini-Higgs hypothetical space-time expansion', and the key point was that, whatever one called it, that there was no centre in that sudden expansion at all.

Name	Integral Form	Differential Form	Description
A. Gauss's Law for Electricity	$\oiint_{\partial\Omega} \mathbf{E} \cdot d\mathbf{S} = 4\pi \iiint_{\Omega} \rho dV$	$\nabla \cdot \mathbf{E} = 4\pi\rho$	The electric flux out of any closed surface is proportional to the total charge enclosed within the surface.
B. Gauss's Law for Magnetism	$\oiint_{\partial\Omega} \mathbf{B} \cdot d\mathbf{S} = 0$	$\nabla \cdot \mathbf{B} = 0$	There are no magnetic monopoles. The net magnetic flux out of any closed surface is zero.
C. Faraday's Law of Induction	$\oint_{\partial\Sigma} \mathbf{E} \cdot d\boldsymbol{\ell} = -\frac{1}{c} \frac{d}{dt} \iint_{\Sigma} \mathbf{B} \cdot d\mathbf{S}$	$\nabla \times \mathbf{E} = -\frac{1}{c} \frac{\partial \mathbf{B}}{\partial t}$	The line integral of the electric field around a closed loop is equal to the negative of the rate of change of the magnetic flux through the area enclosed by the loop.
D. Ampère's circuital law (with Maxwell's addition)	$\oint_{\partial\Sigma} \mathbf{B} \cdot d\boldsymbol{\ell} = \frac{1}{c} (4\pi \iint_{\Sigma} \mathbf{J} \cdot d\mathbf{S} + \frac{d}{dt} \iint_{\Sigma} \mathbf{E} \cdot d\mathbf{S})$	$\nabla \times \mathbf{B} = \frac{1}{c} \left(4\pi \mathbf{J} + \frac{\partial \mathbf{E}}{\partial t} \right)$	The total magnetomotive force around any closed path is equal to the surface integral of the conduction and displacement current densities over the entire surface bounded by the same closed path.

1.2.ii.b. Maxwell's equations

They suggested thinking of the universe as a four-dimensional balloon expanding in all directions. Like his mother and his high-school science teacher, they also stated that the centre of the alleged balloon was everywhere because there was no void surrounding the hypothetical centre of the alleged expanding explosion, but rather everything in existence expanded at the same time. That, of course, did not convince stubborn Iridio either and he insisted that the universe had to expand into something. During subsequent tutorials he asked the robomoocs to explain the analogy in detail. They responded in their mechanical voices that the universe expanded towards the future and asked him to imagine the universe as a balloon being inflated. It was assumed that only the surface of the balloon existed, that is, he had to consider only the two dimensions of the surface as an analogy of the universe. When the balloon expanded in three dimensions, all the points on the surface separated at the same time. Looking at the phenomenon from the outside, that is, from those three dimensions, the inside of the balloon appeared to have a centre, but from the surface, where there were only two, there was none. And if that supposed centre was projected towards the surface of the balloon, all the points on the surface could be the projection of the centre. After much time and many discussions with the human instructors who had to offer extra tutorials when students could not understand the robomoocs, they managed to make Iridio understand that to avoid confusion caused by the analogy, one had to assume that what was inside and outside the balloon did not exist. That was exactly what happened with the three-dimensional space of our universe: when it expanded, one could think that the hypothetical centre in a four-dimensional space could be projected everywhere simultaneously. However, within the four-dimensional space where they moved, in which time was included instead of an extra spatial dimension, there was no single point from which the universe expanded. Iridio then argued that the centre could be found if five dimensions were considered. They explained to him again and again that, even in that case, the centre would not be within the three ordinary spatial dimensions, but rather outside our universe. Of course, they did not manage to convince him.

Iridio spent hours and hours rewriting the Gurney equations of momentum conservation in explosions for five dimensions, using the Kaluza-Klein formulae to project univocally the trajectory of the centre in the four dimensions of space-time. When he finally had a possible solution, by applying the Maxwell stress tensor, no one wanted to help him find out whether it worked in reality because

$$V_n = \frac{\pi^{\frac{n}{2}} R^n}{\Gamma\left(\frac{n}{2} + 1\right)}$$

$$\Gamma(z) = \int_0^{\infty} x^{z-1} e^{-x} dx$$

1.2.iii. Gamma function
derivation of n-sphere
volumes

$$\frac{V_m}{\sqrt{2E}} = \left[A \left\{ \frac{\left(\frac{M}{C} + \frac{\beta^2 + 3\beta + 6}{10(\beta^2 + \beta + 1)} \right)}{A} + A \left(\frac{N}{C} + \frac{6\beta^2 + 3\beta + 1}{10(\beta^2 + \beta + 1)} \right) - \frac{3\beta^2 + 4\beta + 3}{10(\beta^2 + \beta + 1)} \right\} \right]^{-1/2}$$

$$A = \frac{V_o}{V_i} = \frac{\left[\frac{M}{C} + \left(a \frac{M}{C} \right) (\beta^2 - 1) + \frac{\beta^2 + 2\beta + 3}{4(\beta^2 + \beta + 1)} \right]}{\left[\frac{N}{C} + \frac{3\beta^2 + 2\beta + 1}{4(\beta^2 + \beta + 1)} \right]}$$

1.2.iv. The spherical Gurney equations

it involved too many differential equations in partial derivatives written in the pre-Sandrini-LePaine notation that the robomoocs could not solve. It was suggested that he work on other problems for his tutorials because he was falling behind. The scientific literature on kinetic energy available in the university digital repository was of no help to Iridio, but he nevertheless copied it to his flexible electronic reader and examined the material thoroughly and systematically, neglecting his classes even more.

A visit from his mother, who came to inspect his lodgings and the university, put him back on track when she went to talk to the lecturers, in her meddlesome way, and found out that Iridio was not attending his hologrammatic classes or the tutorials in order to persevere with his obsessive calculations.

Her visit did not help Iridio to improve his image among his lecturers, because she defended him and asserted that Yabbie Creek-W Polytechnic University should include more explicit mathematics in the astronomy classes and install more advanced modules in the symbolic instruction programs of the robotic assistants.

In order to avoid future disputes, his mother brought Therese to help him. She had managed to have Therese repaired at her university, where the pedagogical mathematics and physics modules not available at Yabbie Creek-W had been installed. It had taken her a long time to bring Therese back because there were now far stricter laws concerning the movement of robotic assistants between cities. She had to deal with many administrative procedures to obtain permission from the Office for the Regulation of Artificial Intelligence at the Ministry for Historical Updating, Social Precognition and Digital Worship.

$$D_{KL}(P \parallel Q) = \sum_i P(i) \ln \left(\frac{P(i)}{Q(i)} \right)$$

1.2.v. Kullback–Leibler divergence

Therese's arrival, however, required Iridio's mother to negotiate with the owner of the boarding house, Frauke Grubach, who did not want her lodgers to have personal robotic instructors in their rooms because of the many administrative procedures required by several ministries. It could also cause conflict with the robotic housekeepers whom Frauke Grubach engaged to clean the lodgers' rooms. After a long discussion, Iridio's mother convinced her that she would handle all administrative procedures and would also be responsible for any bureaucratic processes, should that be necessary.

At first Iridio was reluctant to have anything to do with Therese. However, as he got to know her new personality, he discovered that she could be very useful as she now had explanations for more than 20,000 formulae and theorems. As a bonus, the new mathematical modules that had been installed in Therese's pedagogical routines allowed the equations studied in class to be processed in both notations. This made it possible for him to use her as a translator and to diminish his continuous frustration when working with the university's robotic instructors. Sometimes Therese got confused and became paralysed when the equations he proposed were too complex, or when there were no unique translations of the equations written in the Sandrini-LePaine notation. Another factor that helped him to overcome his instinctive rejection of her blue colour was his discovery that

Therese could now recite at least 100,000 digits of the transcendental numbers that captivated him. In fact, Therese now had a special predilection for Gelfond's constant, which was nothing more than e^π , a perfect combination of his two favourite numbers.

$$V_{2n} = \frac{\pi^n}{n!} R^{2n}$$

$$\sum_{n=0}^{\infty} V_{2n} = e^\pi \quad (R = 1)$$

That transcendental number could be expressed as an infinite series that added the volumes of n-dimensional spheres, when n was even. With Therese Iridio rediscovered the beauty of $\sqrt{2}$, Pythagoras's constant, an irrational number which he had only explored superficially with Penelope and which proved a welcome occasional distraction, although less soothing than listening to the digits for e and π because it was not transcendental. 1, ., 4, 1, 4, 2, 1, 3, 5, 6, 2, 3, 7, 3, 0, 9, 5, 0, 4, 8, 8, 0, 1, 6, 8, 8, 7, 2, 4, 2, 0, 9, 6, 9, 8, 0, 7, 8, 5, 6, 9, 6, 7, 1, 8, 7, 5, 3, 7, 6, 9, 4, 8, 0, 7, 3, 1, 7, 6, 6, 7, 9, 7, 3, 7, 9, 9, 0, 7, 3, 2, 4, 7, 8, 4, 6, 2, 1, 0, 7, 0, 3, 8, 8, 5, 0, 3, 8, 7, 5, 3, 4... Therese could now also function as an oracle, and though not as trustworthy as Penelope, at least she no longer stalled and showed the number forty-two when asked difficult questions, as she used to do before the upgrade.

1.2.vi.a. Gelfond constant defined on the base of n-spheres volume

There was only one thing he now disliked about Therese: she did not believe that his difficulties in interacting with other human beings could be resolved if

a. The q-principle

Make your contribution sufficient;
Say as much as you can
(given the r-principle).

b. The r-principle

Make your contribution necessary;
Say no more than you must
(given the q-principle).

1.2.vi.b. Horn's quantity and relation principles

he learnt how to communicate respecting Grice's maxims. She asked him to consider training in other paradigms of more flexible but interactive communication, such as Horn's quantity and relation principles.

There was another problem. Sometimes, when Iridio came back from university he could

not find Therese compacted in a cube as he had left her. More often than not, he had to go and find her in the room of Zoe Evarista Jones-Syme, BSci MScPr, coordinator of the patents agency in the city, the only other lodger in the house who had a personal robotic assistant. Apparently Therese got bored when Iridio was not there and liked to go and practise computational challenges with Algorithmic Honorio, Zoe's private digital assistant. Frauke Grubach was always joking about Honorio and Therese being in love because when Therese was around, Honorio completely ignored his robotic cleaners. In any case, in spite of all the precautions taken to prevent them meeting, they always found a way to be together, screen to screen, engrossed in their private algorithmic conferences.

1. Miraculous conception and birth
2. Initiation of the hero-child
3. *Withdrawal from family or community for meditation and preparation*
4. Trial and quest
5. Death
6. Descent into the underworld
7. Resurrection and rebirth
8. Ascension, apotheosis, and atonement

1.2.vii. The hero's journey, according to David Adams Leeming

1.3. The elementary rules of sexuation

*If you think you have understood,
you are bound to be wrong.*

Jacques Lacan

The director of the astronomy program at the university, PhDr Cyrus George Gaffney-Yang, was worried about Iridio's bad influence on the other students. His constant complaints, obsessive objections and interruptions in class and the frequent interference from his mother, a lecturer in the levelling courses at Go8-Ivy-BAM, the most prestigious university in the capital, gave him no rest. In addition, he had received a visit from the patriotic police of the Ministry of Defence, Internal Appeasement and Border Protection, because Iridio had on many occasions accessed equations to model explosions in the digital repository of the university, and they wanted to see if there was any connection with ecological terrorists or any other subversive groups. As a result, he contacted the Widgeree pedagogical police for the umpteenth time. They repeated that their hands were tied because the experimental program of positive discrimination in which Iridio participated, funded by the Ministry for Historical Updating, Social Pre-cognition and Digital Religion in the capital, was outside their jurisdiction. At that point, PhDr Gaffney-Yang decided to cover his back and advised Iridio to consult an emotion and behaviour specialist, in the purview of a third ministry. In particular, he wanted to know if it was possible to retract the dispensation obtained by Iridio's mother, whereby Iridio could not be required to respond or even acknowledge receipt of all the compulsory memos about the ever-changing university rules on his flexible reader.

Iridio panicked when he received the official memo from PhDr Gaffney-Yang because he himself had never made an appointment to see a psychiatrist. He was about to call his mother, but Therese persuaded him not to bother her and made some enquiries with Honorio's help to find out who would be the best specialist in the city to look into his case. Three days later, Therese organised a meeting with a psychometrist, Bernard Guy Rieneke Watson, MLacLM BPsySc CPsychom, of the Widgeree office of the Registry for Orgonic and Cognitive Health of the Ministry of Health, Natality and Civic Comfort. Rieneke Watson was a disillusioned Lacanian who had chosen exile in this provincial city due to his ongoing teleological disputes with the psychologists and Reich-behavioural psychiatrists who ruled the national institutions of civic surveillance. Rhythmical Jouissance, the psychometrist's robotic assistant, warmly welcomed Iridio and told him that she had had many digital conferences with Therese and Honorio. She asked him to convey her warmest regards to them and tell them

that she wished to meet them personally one day and have a private screen-to-screen algorithmic conference. Jouissance then asked Iridio to complete several questionnaires and undergo several tests such as genital eudaemonia, genetic predisposition to rebellion and behavioural metaboloepigenetics.

The following week, when he finally met the psychometrist, he told Iridio that it was impossible to consult his clinical history because there were confidentiality protocols type VIP-γ89, which prevented any access to it. Jouissance had made the necessary administrative arrangements to access Iridio's file, but in the meantime, they could look into his eudaemonic history. The psychometrist asked him about his dreams because it seemed that there were some

$$E_k^t = \frac{1}{\Delta t_k} \sum_{i=t-\Delta t_k}^t \left\{ H_k^i + s_p \left(\frac{dH_k^i}{dt} \right) + s_n \left(\frac{dH_k^i}{dt} \right) \right\}$$

1.3.i.a. Eudaemonic well-being expressed in terms of present momentary well-being H , the memory of the past values of H extending over a number of cycles, and the rates of rise and fall of H

perceptual irregularities in the integration analysis of the id with the ego. Iridio explained to him that he hated the incongruous oneiric world. Rieneke Watson, intrigued, asked for more details and Iridio told him that he usually woke up in a bad mood if he remembered his dreams. The more disorganised or incongruous the dream, the worse he felt. He no longer had much difficulty falling asleep, but when he was a child he would lie awake for hours because he was afraid of being woken by nightmares. His only relief was to have Penelope hold his hand and repeat number series, for example prime numbers up to a thousand or the Fibonacci numbers which were also primes: $F_1 = 1$; $F_2 = 1$; $F_3 = 2$; $F_4 = 3$; $F_5 = 5$; $F_7 = 13$; $F_{11} = 89$; $F_{13} = 233$; $F_{17} = 1,597$; $F_{23} = 28,657$; $F_{29} = 514,229$; $F_{43} = 444,494,437$; $F_{47} = 2,971,215,037$; $F_{83} = 99,194,853,094,755,497$; $F_{131} = 1,066,340,417,491,710,595,814,572,169...$ Moreover, he was convinced he was transformed into another person, whom he disliked, while he was asleep. He also disliked senso-theatres because, like the world of dreams, they represented a reality he considered 'disturbing' and even 'unbearable'.

The psychometrist, aware that Iridio belonged to the generation born after Decree F451 restricting the use of works of fiction in education, decided to explore whether his symptoms were related to his lack of exposure to fairy tales. He asked Iridio to use a contraption that had a diagnostic helmet which covered his whole head and induced a session of lucid dreams, forcing his brain to generate a state characteristic of REM brainwaves. He had to suspend the test because Iridio's anxiety levels immediately rose and he had a panic attack. To calm himself, Iridio recited to himself the first 1,650 digits in the expansion of π , which, naturally, generated more questions from Rieneke Watson. 3, ., 1, 4, 1, 5, 9, 2, 6, 5, 3, 5, 8, 9, 7, 9, 3, 2, 3, 8, 4, 6, 2, 6, 4, 3, 3, 8, 3, 2, 7, 9, 5, 0, 2, 8, 8, 4, 1, 9, 7,

1, 6, 9, 3, 9, 9, 3, 7, 5, 1, 0, 5, 8, 2, 0, 9, 7, 4, 9, 4, 4, 5, 9, 2, 3, 0, 7, 8, 1, 6, 4, 0, 6, 2, 8, 6, 2, 0, 8, 9, 9, 8, 6, 2, 8, 0, 3, 4, 8, 2, 5, 3, 4, 2, 1, 1, 7, 0, 6, 7, 9, 8, 2, 1, 4, 8, 0, 8, 6, 5, 1, 3, 2, 8, 2, 3, 0, 6, 6, 4, 7, 0, 9, 3, 8, 4, 4, 6, 0, 9, 5, 5, 0, 5, 8, 2, 2, 3, 1, 7, 2, 5, 3, 5, 9, 4, 0, 8, 1, 2, 8, 4, 8, 1, 1, 1, 7, 4, 5, 0, 2, 8, 4, 1, 0, 2, 7, 0, 1, 9, 3, 8, 5, 2, 1, 1, 0, 5, 5, 5, 9, 6, 4, 4, 6, 2, 2, 9, 4, 8, 9, 5, 4, 9, 3, 0, 3, 8, 1, 9, 6, 4, 4, 2, 8, 8, 1, 0, 9, 7, 5, 6, 6, 5, 9, 3, 3, 4, 4, 6, 1, 2, 8, 4, 7, 5, 6, 4, 8, 2, 3, 3, 7, 8, 6, 7, 8, 3, 1, 6, 5, 2, 7, 1, 2, 0, 1, 9, 0, 9, 1, 4, 5, 6, 4, 8, 5, 6, 6, 9, 2, 3, 4, 6, 0, 3, 4, 8, 6, 1, 0, 4, 5, 4, 3, 2, 6, 6, 4, 8, 2, 1, 3, 3, 9, 3, 6, 0, 7, 2, 6, 0, 2, 4, 9, 1, 4, 1, 2, 7, 3, 7, 2, 4, 5, 8, 7, 0, 0, 6, 6, 0, 6, 3, 1, 5, 5, 8, 8, 1, 7, 4, 8, 8, 1, 5, 2, 0, 9, 2, 0, 9, 6, 2, 8, 2, 9, 2, 5, 4, 0, 9, 1, 7, 1, 5, 3, 6, 4, 3, 6, 7, 8, 9, 2, 5, 9, 0, 3, 6, 0, 0, 1, 1, 3, 3, 0, 5, 3, 0, 5, 4, 8, 8, 2, 0, 4, 6, 6, 5, 2, 1, 3, 8, 4, 1, 4, 6, 9, 5, 1, 9, 4, 1, 5, 1, 1, 6, 0, 9, 4, 3, 3, 0, 5, 7, 2, 7, 0, 3, 6, 5, 7, 5, 9, 5, 9, 1, 9, 5, 3, 0, 9, 2, 1, 8, 6, 1, 1, 7, 3, 8, 1, 9, 3, 2, 6, 1, 1, 7, 9, 3, 1, 0, 5, 1, 1, 8, 5, 4, 8, 0, 7, 4, 4, 6, 2, 3, 7, 9...

With the help of Jouissance to explain the technical details he did not understand, the psychometrist was able to obtain a picture of how his obsession with number series, irrational numbers and equations developed. In her first interactions with him Penelope discovered, by trial and error, that reciting the Fibonacci and Lucas sequences had a calming effect on him. She then began teaching him formulae that linked numbers in those sequences. This led to an exploration of Bernoulli and Eulerian numbers, and, when he discovered

$$\lim_{n \rightarrow \infty} \frac{F_{n+1}}{F_n} = \phi$$

1.3.i.b. The golden ratio expressed as a limit of consecutive Fibonacci quotients

that the golden ratio was irrational and had a never-ending digital expansion, to more advanced concepts like limits and integrals, which allowed him to grasp the concept of a transcendental number, and in general, abstract results in number theory. Iridio reported seeing the digital expansion of these transcendental numbers as aesthetic patterns, which, like the original Fibonacci series he explored in childhood, had a calming effect when he was disturbed or the demands of the external world became unbearable. This, in turn, reinforced his exploration of all sort of equations in physics and pure mathematics.

$$e^{i\pi} \left(2\beta + \sum_{n=0}^{\infty} (-1)^n (\sqrt{5}F_{n+1} - L_{n+1}) \right) + a \sum_{n=0}^{\infty} \frac{(-1)^n E_{2n} \sum_{k=1}^{\infty} (1/k)^{2n}}{B_n (10)^{2n}} + 1 = 0$$

1.3.i.c. The unified number identity

Jouissance asked if there were any number sequences that caused him discomfort. Iridio said that one day when he was six or seven, when the intellectual police took his parents away, he started to feel anxious about the Fibonacci series with negative indexes they were exploring, in which half of the sequence was composed of negative integer numbers. Penelope subsequently began to recite to him digital expansions of irrational numbers, in which all numbers in the

series were positive integers between one and nine, plus zero. The psychometrist instructed Jouissance to explore this further in Iridio's file.

When Rieneke Watson examined Iridio with another tool for conscious perceptual diagnosis, using a different helmet, he discovered that Iridio was bidirectionally synaesthetic – he could see numbers and letters in specific colours that did not exist in his chart of holographic letters. Iridio told him that he was always intrigued by why people wrote in black and white in their flexible readers because, as far as he was concerned, each symbol had its own colour. He had programmed his flexible reader to display the appropriate colours. During numerical calculations or in equations, he could determine by the colour of the symbols if something was not working. Abstract reasoning and theorem demonstrations had a colour gradient for him, which was why he could frequently detect that robotic instructors skipped some steps in their deductions or simplified the formulae. But instead of being grateful to him for detecting those gaps, the robomoocs ignored him and his lecturers got angry when he pointed out their mistakes or omissions. The psychometrist found it strange that PhDr Gaffney-Yang had not included such a significant condition for academic performance in his cognitive exploration request, and decided to investigate further before the next appointment.

Iridio was very worried because he had not told his mother about the consultations with the psychometrist. Therese told him that his interpretations of Grice's maxims were inappropriate. If he considered the postulates in a more practical way, including what the general and sub-general maxims stated, he would understand that if he told his mother everything that was going on, when she had asked no questions, he would break the second sub-maxim of quantity,

by which one should not provide more information than required in a given conversation.

They had lengthy discussions about whether omitting information was the same as lying. She tried to convince him that if he wanted to understand the difference, first of all he would need to explore the ethics of an 18th-century philosopher called Immanuel Kant, which form the basis upon which the maxims he obsessed about

a. The co-operative principle
Be co-operative.

b. The maxims of conversation

Quality: Be truthful.

i. Don't say what is false.

ii. Don't say what lacks evidence.

Quantity:

i. Don't say less than is required.

ii. Don't say more than is required.

Relation: Be relevant.**Manner:** Be clear.

i. Avoid obscurity.

ii. Avoid ambiguity.

iii. Be brief.

iv. Be orderly.

1.3.ii.a. Grice's theory of conversational implicature

were classified. However, Grice had restricted his hypotheses to human communication, while Kant's concepts allowed for the inclusion of exchanges with artificial intelligences and even with potential beings living on other planets.

In addition, Iridio did not trust what Rieneke Watson would write in his report. Therese calmed him down by predicting through her oracle function that everything would be fine. She told him that the psychometrist had also helped Zoe, Honorio's owner, with some of the problems she had had with the morality and oztraditions police. There was no need to worry. She also predicted that Honorio would help him to get a job since his savings would be reduced by the co-payment he would face in future psychometrist consultations.

During the next consultation, Jouissance suggested that it would be better if in future he could come to the practice as a private patient, without the government co-payment. This would obviate the need to place all the information obtained on his official file and trigger automatic alarms in a department within another ministry. She had already arranged everything with Therese but needed Iridio's consent, which he was relieved to sign. Rieneke Watson told him that, on the positive side, the tests had shown that he was 93.7 per cent heterosexual. This qualified him as 'no risk' in terms of the minimum component of psychological reproductive tendencies required by the government. Further, his aversion to dreams and his compulsion to express all scientific and post-creationist concepts in mathematical terms were due to a defect in his neuronal channels in the frontostriatal circuit, generating a congenital reductionism of type AS- α , possibly inherited from his parents or grandparents. Since the disorder was hereditary, and therefore involuntary, the diagnosis protected him from the danger of being declared 'mathematicist' at university. It could also give him the privilege, if the correct forms were completed, of special consideration during exams and tutorials when he used mathematical formulae without the compulsory explanations in narrative form. However, the results also had some negative aspects when it came to light that Iridio, in his very few sexual encounters,

a) $CE(Ang) \rightarrow AG(I) \rightarrow RSI \wedge J(\varphi)$ b) $CE(Sin) \rightarrow AG(R) \rightarrow SIR \wedge Sens$ c) $CE(In) \rightarrow AG(S) \rightarrow IRS \wedge J(A)$ 1.3.ii.b. The logic of interventions, according to Lacan	had never been able to ejaculate, as evidenced in the analysis of the longitudinal segregation of vasopressin, oxytocin and other neuropeptides. Because of that, the results of the Reich-eudaemonic tests of genital

performance classified him as predominantly masturbatory. Iridio confessed that in reality he had absolutely no interest in sex or in romanticism and that his parents had told him not to talk about matters considered personal, such as masturbation or his interest in irrational numbers or dinosaurs. They warned

him not to tell anyone about his way of thinking using his capacity to project colours in calculations or reasoning. The psychometrist assured Iridio that he should not worry and that he could trust him, particularly if he continued the consultations as a private patient.

During his third consultation with Iridio and after assessing all the psychometric and additional cognitive tests he had administered, Rieneke Watson explained many things which Iridio failed to understand. Thanks to the discreet enquiries made by Rhythmical Jouissance, who had unofficially consulted the robotic assistants of the Office of Mental Coherence of the Ministry for Historical Updating, Social Precognition and Digital Worship, she had learnt that a large part of Iridio's file was under the control of that administrative office, which explained the VIP-γ89 protocol and its restricted access. Furthermore, in the non-restricted parts of his file in his personal archive she had found a possible reason why his synaesthesia had not been treated; he should not worry about that because, in reality, as far as symptoms were concerned, he could interact sufficiently with the world to live independently and participate in a program of positive discrimination at university. If he continued to live with his parents, the situation would be more complex because they would need to be consulted about any diagnosis. The psychometrist started a contraption that made a lot of noise and asked him whether he remembered a female doctor who had looked after him during his childhood, showing him in his flexible reader a hologram of a woman with slanted eyes wearing a yellow uniform. In reality, the only thing he remembered was the many tests he had had to undergo at her surgery, answering many confusing questions. There he had met Topologic Penelope and his life had changed because after that he was not obliged to go to school. He could learn more with her than with his teachers, who were puzzled when Iridio did not understand them. That had also saved him from the inexplicable

$F_x(a) : F_y(b) \approx F_x(b) : F_{a^{-1}}(y)$ 1.3.ii.c. The canonical formula of myth, according to Lévi-Strauss	aggression of other children. The psychometrist sighed with relief and told him that it would be better to follow his parents' advice and refrain from talking about those childhood memories. He

also showed him a hologram of his paternal grandparents and asked him to confirm their relationship. Iridio replied that they were his grandparents but that he did not know much about them because they had died in an accident before he was born.

Rieneke Watson switched off the noisy contraption and told him that it was not necessary to continue investigating his synaesthesia or his peculiar way of thinking. However, it was necessary for them to explore together the romantic-genital aspect a little further because that was the area of competence of the

Ministry of Health, Natalivity and Civic Comfort, where he worked. Because the VIP-γ89 protocol had been established during his childhood, that aspect of his adult civic behaviour was not technically excluded.

Iridio wanted to know if the psychometrist would tell his mother what they were about to discuss, but Rieneke Watson assured him of total confidentiality. He explained that it was dangerous to express so spontaneously his lack of interest in sex because asexuality was considered a very serious psychosomatic condition in the current legislation, as it could be a symptom of ecological millenarism. His aversion to sex required immediate treatment and was far more serious than his compulsive positivism and his aversion to dreams. The psychometrist then delved into

Iridio's sexual history. The first experience Iridio reported was a long coitus, initiated by Clarisse when both were fifteen years old and which he interrupted without ejaculating because he got distracted when she started having multiple orgasms. Apart from that, he felt the event was taking too long and caused him anguish. However, the relationship had not continued because Clarisse, like many young people, had committed suicide. Iridio had not spent much time exploring the pornographic senso-theatres so addictive for young people, because he found them boring, but he had coital experiences during his genital training with Topologic Penelope, his robotic instructor. He managed to ejaculate when she recited the digital expansion of irrational numbers or the demonstration of theorems while sexually stimulating him. In addition, after losing Penelope, he had masturbated every now and then to relax while reciting to himself transcendental numbers, something that he, in his innocence, did not consider 'sexual'. Finally, in a very low voice Iridio revealed that his problem with women was due in part to the fact that he had only one testicle. Clarisse had discovered this when she tried to stimulate him orally; the fact that his right testicle had not yet descended and was still lodged in his groin made her laugh. That was the real reason for interrupting his erotic contact with her. That was also the reason why he did not want the psychometrist to tell his mother, who had asked him many embarrassing questions about Clarisse and his sexual relations with her.

Rieneke Watson asked him to undress and examined his left testicle, which had descended, and the bulge in his groin where the right testicle was located. He made it come down to the scrotum but Iridio told him that he had done that many times, but the testicle went back up. The psychometrist told him that this condition was not helpful in his case as he would be classified as potentially

$$\frac{dI}{dt} = a_{11}I + a_{12}C$$

$$\frac{dC}{dt} = a_{21}I + a_{22}C$$

1.3.iii. A more general second-order linear version of the differential equations of a dynamic model of an ill-fated romance of the 'Romeo and Juliet' type

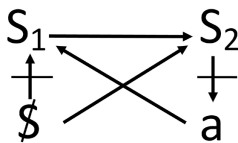
unsuited to reproduction, a matter of much concern to the authorities of the Ministry of Health, Natality and Civic Comfort because they had been unable to reverse the demographic implosion of the previous century, in spite of all the incentives given to the population to have more children. He would write a note in his parallel file indicating that Iridio also suffered from a unilateral cryptorchidism, that is, he had a 'hidden testicle', but he would not include this information in his official reports to the university. In reality, it was not compulsory to report that particular condition because, according to sexual morbidity manuals, consulted thoroughly by Rhythmical Jouissance during Iridio's examination, a testicle classified as 'retractile' did not require any subsequent intervention. The psychometrist explained that it was, as with his synaesthesia, too late to start treatment to correct such abnormalities, and they could therefore be excluded from the reports without contravening current legislation. In any case, the only thing that appeared to interest PhDr Gaffney-Yang was whether they could compel him to read the memos they sent him, and whether there was any cognitive reason for the dispensation granted to Iridio.

Afterwards, the psychometrist made Iridio talk at length about the psychological damage caused by Clarisse's suicide. As he repeated the word trauma again and again, Iridio tried to explain that, in reality, he did not have any romantic feelings for Clarisse; she was only a classmate interested in science. He had had sexual relations with her because he felt indebted, since the scientific club had been successful thanks to her presence. But Rieneke Watson did not want to listen to him. While Rhythmical Jouissance measured the responses of his brain to naked men and women recorded in a very noisy nuclear magnetic resonance machine, Iridio was given to understand by the psychometrist that he was very lucky to have been treated by a Lacanian and not by a fanatical Reich-behaviourist, who would have denounced him without a moment's thought as a potential sympathiser of the MVEHS or, even worse, of the Baptistry of Involuntary Euthanasia, because they castrated themselves. He calmed Iridio down by saying that he would write in the official report that the diagnosis was probably interrupted adolescent demi-sexualism and male anorgasmia, caused by the trauma of Clarisse's suicide. That was less serious in the eyes of the authorities because it did not require immediate reconditioning or magnetic lobotomies to treat his aromanticism or his inability to ejaculate with biological beings. He would also write that Iridio suffered from a very rare disorder called post-oneirophobia, or the fear of remembering dreams, which affected less than 0.01 per cent of the population. That exempted him from reporting the anomaly in his genital eudaemonia to the authorities of the morality and oztraditions police. The report would also save Iridio from being questioned about not making love

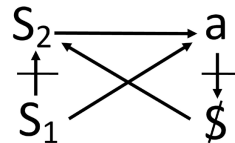
with human beings regularly, or at least attending the genital senso-theatres as all aged under forty were required to do. The psychometrist asked him to redo a couple of questionnaires and suggested highlighting the masturbation exercise that he had practised. Iridio wanted to talk about the trauma caused by Penelope's loss but the psychometrist asked him not to mention her because Jouis-sance had checked instructors of that model, and she could not access Penelope's file or any information about her. She had discovered that that type of robotic nurse was no longer imported, and according to the law of the land, was officially deemed never to have existed, because they were at war with the country of manufacture, Taiwan-South China.

At the end of the consultation, the psychometrist recommended a weekly visit to the local orgonic recreation clinic to generate a topological approximation to adult sexual behaviour. The mention of topology interested Iridio, but as a precaution he took care not to mention that it was one of his favourite topics of discussion with Penelope. Rieneke Watson asked him to sit in another contraption and in spite of the noise and the annoying whistling of

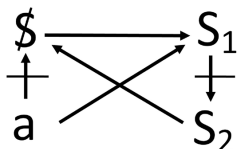
A. Discourse of the Master
(or the Mother)



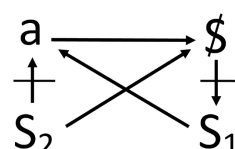
B. Discourse of the University



C. Discourse of the Hysteric



D. Discourse of the Analyst



1.3.iv.a. The four discourses, according to Lacan

they had discussed, in order to avoid any misunderstanding with the authorities, because he could also be considered a 'mathematicist' if he used such concepts frequently. He explained to Iridio the rudiments of the Lacanian theory of the four discourses to highlight that if he wanted to solve the problem of the university's discourse, he must first of all solve the hysteric's discourse.

the machine,
they had a long
discussion about
the use in
Lacanian
psychoanalysis
of the Möbius
strip and Klein
bottle, which
made it possible
to write the
mathemes of
desire in
symbolic form.
The
psychometrist
asked Iridio not
to mention to
anyone what

He concluded by saying that, in reality, he thought Iridio's problem was due to an excision of his ego that had delayed the mirror stage, stopping the maturation of the right testicle. He added that Clarisse's suicide had produced a cleavage, the rejection of a fundamental signifier of the father's role or the foreclosure of sexuation and pleasure, which had deviated from the genital to the highly symbolic. For that reason, it was desirable that he should progress his biological sexuality with a qualified orgonic coach, the first step in a convergent series of sexual experiences that would bring him closer to normality in the eyes of the Ministry of Health, Natality and Civic Comfort, who were obsessed with population growth in order to send labourers to space farms and to sustain the armies fighting the ecological terrorists. He also recommended that Iridio take small doses of erotisoma when having carnal contact with the orgonic technologists, but under no circumstances was he to mention that he had made this suggestion. To conclude, the psychometrist told him not to worry about the memos because he would recommend that there was no need for Iridio to read them all. Iridio left his consulting rooms very confused, but he was relieved to know that there was at least a diagnosis and deduced that his problems stemmed from his inability to read all the discourses and their meanings simultaneously.

Iridio was not sure if all the discourses he failed to understand were related to Grice's maxims, which he had never mastered. But Therese explained to him that, in reality, the problem lay not in him but in other humans, who constantly transgressed the maxims. As far as she had observed, he had hardly ever done so. This was one of the characteristics that differentiated him so significantly from other humans, who transgressed them all the time without thinking about them, as well as the robotic instructors who, in order to interact with the world, had to have an understanding of what linguistic scholars of pragmatics called 'conversational implicatures'. These were shortcuts in the discourse, something

A participant in a talk exchange may fail to fulfil a maxim in various ways... He may FLOUT a maxim; that is, he may BLATANTLY fail to fulfil it. On the assumption that the speaker is able to fulfil the maxim and to do so without violating another maxim (because of a clash), is not opting out, and is not, in view of the blatancy of his performance, trying to mislead, the hearer is faced with a minor problem: How can his saying what he did say be reconciled with the supposition that he is observing the overall COOPERATION PRINCIPLE? This situation is one that characteristically *gives rise to a conversational implicature*; and when a conversational implicature is generated in this way, I shall say that a maxim is being EXPLOITED.

1.3.iv.b. Violation and exploitation of conversational maxims, giving rise to a conversational implicature, according to H. P. Grice

a speaker said when implying something else, particularly something that was not 'contained' in the literal interpretation of the utterance. A few days later Therese told him not to worry, because she had discussed the matter with Jouissance and had been reassured that he could not solve his problems relating to the four Lacanian discourses by practising Grice's maxims or other postulates of conversational pragmatics. But it was important that Iridio focused his attention on raising his eudaemonic indices because her oracle function predicted countless problems if he did nothing about them.

Iridio suspected that seeing an orgonic coach would not solve anything, but fearing this would affect his chances of continuing his studies, he worked up the courage, and the following Tuesday headed to the clinic recommended by Rhythmical Jouissance to Therese, to comply with the prescriptions of the physician. Polly Nerys Brunswick Sin, DOP(A), the administrator of the private clinic for orgonic recreation, had been warned by the psychometrist's assistant of Iridio's impending visit and first allocated to him three of the youngest biological workers in the heterosexual wing of the clinic. Because that very afternoon Iridio went to bed with all three but could not ejaculate with any of them in the standard half-hour session, the administrator asked him to take a free additional session with Olgava Crowne Schiltz, an orgonic cyborg, who only managed to overcome his anorgonic tetania in a long quadruple session without accessories when she stimulated him orally according to Iridio's precise instructions. When the administrator received Olgava's report, she decided to assign her most experienced biological worker to him. And so it happened that the following Tuesday, Iridio met Julia Dora Alonso Savage, DOP(A), a mature orgonic technologist who normally trained the other orgonic workers but was also in charge of difficult cases. Julia agreed to listen to him for half an hour during his first visit, but without touching him. At the end of the conversation, she persuaded him to come to the orgasmatron to start an interactive deferred contact through the machine while she played an Ozeanic zimba song very loudly as background music. She then explained that she would be delighted to help him and to listen to whatever he needed to say, but if he wanted to avoid problems with the morality and oztraditions police, he had to drop his emotional shield sooner or later and have ejaculatory relations with her or another biological worker or cyborg of his choice, with whom he could truly exchange orgonic energy. Eudaemonic tests could detect whether or not he had had full sexual relations and it was impossible to avoid them once he was in the database of the morality and oztraditions police. She also explained in detail the information to be

$$h = \frac{HV_b^\gamma}{[V_b + (H - h)S]^\gamma}$$

1.3.v.a. The condition of interruption of geyser eruption

conveyed to the psychometrist on his next visit, so that Rieneke Watson would believe that Iridio had embarked on a series of incremental advances, in accordance with his advice. She recommended that Iridio read an introductory catalogue on the different positions in the Kama Sutra, so that they could start trying out some of the positions of interest to him during their next session.

During the following consultation with Rieneke Watson, Iridio informed him that he had managed to ejaculate with a qualified orgonic cyborg and that he had masturbated the following Tuesday night, after visiting Julia. He added that he had become excited when entering the orgasmatron, and although panic forced him to abort the process, he had decided to follow Julia's advice and try different Kama Sutra positions in future orgonic energy exchanges with her. Iridio told him that after masturbating he felt much more at peace. He also told the psychometrist about Fanny, the other girl from Erinsborough High who had also persuaded him to have sexual relations with her. At that time, he had tried to be much more patient to see whether it felt different when he ejaculated inside a woman, but in spite of several attempts he never managed it and decided to put an end to the relationship. The next day it occurred to him that they could have sex in the bedroom of his home while Penelope recited theorems to stimulate him. He had the intention of asking Fanny if she would be willing to participate in this peculiar threesome, but when he tried to contact her, he learnt that, like Clarisse, she had committed suicide.

Once again, the psychometrist asked him not to mention Penelope in the future and decided that it was essential to include that second libidinal trauma in the reports. He insisted Iridio continue to visit the orgonic recreation clinic every week until he was able to have a complete interpenetration of orgonic energy fluids with Julia. And Iridio did exactly that. Every Tuesday afternoon he paid Julia a standard visit so that she could listen to the stories of his frustrations in the classrooms of Yabbie Creek-W for thirty or thirty-five minutes. Every now and then, in the weeks he got paid and could afford longer sessions, she would come closer to him to keep physical contact while experimenting with new Kama Sutra positions. Once every two months, Julia persuaded Iridio to connect to the orgasmatron and sip a bit of erotisoma, but his phobia of senso-theatres and remote technological sex prevented much progress in that area.

$$\frac{dI_F}{dt} = aI_F + b(F - P)(1 - |F - P|)$$

$$\frac{dF}{dt} = cI_F(1 - |I_F|) + eF$$

$$\frac{dI_P}{dt} = aI_P + b(P - F)(1 - |P - F|)$$

$$\frac{dP}{dt} = gI_P(1 - |I_P|) + hP$$

1.3.v.b. Differential equations for the love dynamics of a triangular relationship

His slow progress during his visits to Julia, however, did not solve his problems with his lecturers. By the end of his first year, Iridio had realised that he could not find the answer he was looking for on the university campus. By then, PhDr Gaffney-Yang and the other full professors of astronomy at the university, as well as a plethora of their assistants, hated Iridio as much as they hated his mother because she contacted them via video-link every week to inquire about Iridio's academic performance. All of them insisted on trying to convince Iridio that there was no way of solving his problem with the origin of the Big Bang. Iridio continued to work on it, and although he had by now simplified the formulae, and neither Therese nor the robomoocs found any errors in them, his teachers refused to check if the many possible solutions to the differential equations of kinetic energy in five dimensions were correct. His obsessions and his reading of thousands of scientific papers did not help much either. He managed to pass Introduction to Astronomy by the skin of his teeth, but failed General Physics. He could not pass the compulsory course Agnostic Post-Creationism for Scientists either, because, in the exam, he wrote an essay refuting the baraminology of the young Earth based on the combinatorial mathematics of phylogenetics using the Jackknife method. When, with the help of his mother, he tried to challenge the

result of the test, Francis Albert Fuller Rankin, GDAPC, professor of post-creationism, suggested that Iridio should discuss his allegations with PhDr Ovidia Patricia Hydrick Lefebure, dean of applied sciences at the

$$\sigma_{\text{jack}}^2 = \left(\frac{n-1}{n}\right) \sum_{i=1}^n ((\theta)_{\text{jack}} - \theta_i)^2$$

1.3.vi. Standard deviation estimation
using the Jackknife method

university. A few weeks after this behaviour meeting with the dean, he received an official memo from PhDr Hydrick Lefebure, copied to the pedagogical police, confirming that he had failed the exam and should enrol in that subject again. She explained, in very careful language, that the post-creationism course was an introductory one and, therefore, did not require an independent investigation. It was not necessary to expand the responses to the assigned exam questions with a perspective based in mathematics which extrapolated the concepts he had studied. His mother explained to Iridio that, between the lines, the dean was actually asking him to stop defying scientific orthodoxy. His mother also suggested that he was lucky not to have been reported to the Under-Secretariat of Religious Recreation and Spiritual Development, because they would really make his life impossible once he was incorporated in their databases, particularly if they suspected him of being a templetarian. That would mean his university studies would inevitably take

much longer as he would have to repeat almost all the subjects of his first year's second semester.

However, not all of it was bad news. At the end of his first year, when he was enduring many privations because his savings had almost run out, he received a memo indicating that at last he was to have an interview for a temporary position at the patent office in the city. The successful applicant had been dismissed and because the vacancy had arisen less than one year after the selection process, municipal regulations required that all suitable applicants on the original list be interviewed. What a coincidence it was to have an opportunity to work in an office headed by Zoe, Iridio thought, the only neighbour with whom he occasionally interacted socially. However, when he discussed this with Therese, he found out that she had spoken to Algorithmic Honorio and they had persuaded Zoe to progress Iridio's file. Iridio became very angry and asked her not to be so gossipy but Therese started her oracle function and told him that working in that office would help his calculations a great deal. Honorio had also assured her that it was essential to place him there as soon as possible because the number of fraudulent patent applications had increased and Zoe needed someone she could trust to examine them.

He agreed to go to the interview following many discussions with Therese and his mother. The interview panel comprised Zoe, of course, as well as three officials from the Ministry of Industry, Development and Technological Progress, who attended via a holographic conference. They asked him many questions that he could not answer, but he passed the language test and solved the practical problem he was given with very high marks. Fortunately, the problem consisted in evaluating the kinetic energy, about which he knew everything there was to know. After waiting for a few weeks, and after many inquiries from his mother and Therese, which they refused to explain, he was informed that he had been selected. That was also a relief, as he had been sacked from the private academy because he could not teach post-creationism adequately. During his lessons he always confused the fundamental principles of the parascientific discipline, put too much emphasis on the sort of mathematics that was not taught in high school, and always ended up talking about the Big Bang with his confused students.

$$E_k = E_{\text{tra}} + E_{\text{rot}} = \frac{1}{2} m \| \mathbf{v} \|^2 + \frac{1}{2} \omega^t \cdot (I \omega)$$

$$E_k = \int_M \frac{\| \mathbf{v} \|^2}{2} dm$$

1.3.vii.a. Kinetic energy of a rotating rigid body

With the help of his mother and occasionally Zoe, now his future boss, he completed many questionnaires for the Office of Technological Retraining of the

1. Act only according to that maxim whereby you can at the same time will that it should become a universal law.

2. Act in such a way that you treat humanity, whether in your own person or in the person of any other, always at the same time as an end and never simply as a means.

3. Act according to maxims of a universally legislating member of a merely possible kingdom of ends.

1.3.vii.b. The three formulations of the categorical imperative, according to Kant

Ministry of Industry, Development and Technological Progress, but stalled when he reached the sections in which he had to promise not to betray the State and, above all, not to lie to the authorities. Therese told him that those requirements were probably based on the categorical imperative coined by Immanuel Kant, the philosopher she had mentioned earlier, because they reminded her of the ethical algorithms she had to learn in her early socialisation. This motivated Iridio to explore

everything available in the university's digital repository about the famous philosopher's Critique of Practical Reason and caused him to delay finalising the remaining documentation. When his mother called him to ask the reason for the delay, Iridio conveyed his concern about his future ethical performance at the patent office and wanted to discuss some obscure aspects of Kantian philosophy. This enraged his mother. She ordered him not to waste time with robot stuff and to answer yes to all the questions in the forms. This caused a huge fight, similar to the confrontations they had had during his adolescence when they argued about Newton's laws. His mother also told him not to be deceived by appearances because, if it was true that those concepts had been used by the authorities, it was probably to promote an unconditional devotion to the State and not to foster ethical behaviour in the performance of his duties. She seemed obsessed with Iridio securing that official position which would allow him to have a positive civic credit in the eyes of the authorities, even if the job consisted, at least at first, in reassessing the decisions on patents automatically processed by the agency's robotic workers. His mother rang Zoe, who persuaded Iridio to sign the remaining forms by telling him that she was 100 per cent sure that he could perform his duties with integrity. At the same time, she reassured him by telling him that the new policies to reverse the technological regression had generated a need to increase the number of patents processed in Widgeree. She added that there was a need to have someone with his knowledge of languages and his attention to technical detail to compare the applications lodged there with patents in other terrestrial countries, which also

had aggressive policies to stimulate the technological revival needed to continue expanding the planet's space colonies.

Furthermore, the Ministry of Industry, Development and Technological Progress had increased the minimum number of patents that provincial and state universities had to lodge annually in their technology transfer contracts with private companies, which also generated the need for qualified examiners.

$\pi_t = \pi^e - \beta(u_t - u_n)$ The job was not permanent, but it was ideal for Iridio because it allowed him to pay for his studies and his visits to Julia and the psychometrist.

1.3.vii.c. The Phillips curve Owing to the deepening financial crisis it was very difficult to find permanent jobs elsewhere, so Iridio decided to stay in Widgeree, make gradual progress in his studies and use all his spare time to continue patiently and systematically exploring the cursed question of the Big Bang.

1.4. An astronomical collision

The main efforts of investigators have been in papering over contradictions in the big bang theory, to build up an idea which has become ever more complex and cumbersome.

Fred Hoyle

With time Iridio managed to finish the introductory subjects and commence the specialised courses of his degree, partly thanks to sporadic but systematic help from Therese and his mother with mathematics and the concepts derived from the equations. He had no choice but to face all the paradoxical consequences of relativity and to tone down his stubborn defence of Newton's law of universal gravitation. For that, he had to study the mathematics of homogeneous varieties, differential geometry and even the tensorial notation in which relativistic equations were written. However, even though he understood more and more and was enthusiastic about those mathematical tools, he was not convinced at all by the hypothetical explanations derived from the accepted theory of the origin of the universe. For him, the universe was accelerating because there had been an explosion. Consequently, its starting point had to be found. It was as simple as that.

$$G_{\mu\nu} = R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4}T_{\mu\nu}$$

1.4.i.a. Einstein's field equations (with the cosmological constant)

Julia had changed her visiting days to Wednesdays because it was her rest day from the orgonic recreation clinic and she could devote more time to Iridio's treatment as a private client, without being forced to charge him for so many standard visits. The sessions became longer because Iridio needed to talk about what had happened if he had had an argument with his lecturers, something that was happening more and more often. She agreed with him that, in spite of his irreconcilable differences with his professors, he had to persevere and finish his degree. She always told him that he only needed to be systematic, as they were when planning the different Kama Sutra positions they experimented with. Almost without realising it, they had completed all the easy positions and were now getting into the more advanced ones.

During the long sessions, and to avoid Iridio's constant talking about the abstract details of his theoretical disputes with the academics of Yabbie Creek-W University, Julia started reciting theorems to him, trying to recreate the successful sexual encounters he had had with Penelope during his early adolescence. She also devoted herself to reading the weekly science section of the official electronic newspaper, the only one allowed by the authorities to publish popular science, in which articles on astronomy frequently appeared.

They were mostly about research undertaken many years ago and in other countries. This also compelled Iridio to read that section and to explore possible alternatives to his obstinate hypothesis, which otherwise he would not have considered, during discussions with Julia while they were engaged in prolonged coitus. Julia's suggestion about quantum vacuum, for example, forced him to reflect profoundly on the role of the interstellar vacuum in the expansion of the universe and to get closer to that elusive orgasm. This led him to rethink the question of subatomic particles in the early plasma that gave rise to matter, something he had overlooked due to his automatic scepticism. After many discussions and almost achieved ejaculations in the diverse and complex positions proposed by

Julia, Iridio managed to explain that scientists believed that, in reality, there was no such thing as nothingness or true vacuum. The interstellar vacuum was a kind of effervescent ocean where virtual particles and antiparticles appeared and disappeared continuously. They were called virtual because they only existed for a

very short time. It was supposed that their energy expanded space-time, but according to calculations it was determined that there was far more energy than appeared to be necessary to explain the acceleration in the expansion of the universe. That difference constituted cosmology's major problem, postulated at the end of the 20th century and still unsolved. Because Iridio wanted to provide Julia with a detailed explanation, he had to re-enrol in a quantum mechanics course which he had failed, and pay more attention to the possible explanations and hypothesis proposed by theoretical physicists for the initial parameters in their cosmological models. It was very difficult for both of them to accept, on no other basis than some obscure equations, that the particles could magically appear from nothingness and disappear again. However, that was the orthodoxy. To avoid Julia having the involuntary serial orgasms that distracted him when they practised different positions together, Iridio started giving her details of other developments and postulates that seemed to her absurd, even insane. Sometimes, however, they did not agree and embarked on very heated

$$d_L = \frac{c \cdot (1 + z_E)}{H_0 \sqrt{|\Omega_K|}} F \left(\sqrt{|\Omega_K|}^z \int_0^E \frac{dz}{E(z)} \right)$$

$$E(z) = [\Omega_M(1+z)^3 + \Omega_K(1+z)^2 + \Omega_\Lambda]^{1/2}$$

$$\Omega_M = \frac{8\pi G}{3H_0^2} \rho_M^0 \quad \Omega_\Lambda = \frac{\Lambda}{3H_0^2} \quad \Omega_K = 1 - \Omega_M - \Omega_\Lambda$$

$$F(x) = \begin{cases} \sin(x) & \text{for a closed universe} \\ \sinh(x) & \text{for an open universe} \\ x & \text{for a flat universe} \end{cases}$$

1.4.i.b. Set of luminosity distance and parameter degeneracy equations used to measure the accelerating expansion of the universe using type Ia supernovae data

discussions, for example, during prolonged intercourse in the panda position when they discussed an experiment in which it was predicted that the observer could determine the spin of a particle and that even when the angle of observation was changed the particle adapted to that angle. According to Iridio, that was impossible to justify. It seemed another senseless paradox, a consequence of putting too much emphasis on generous interpretations based on incomplete mathematical formulae. To Julia, however, it presented no difficulty because it was similar to what she did with her clients. She adapted to being the lover each client needed. With Iridio, apart from discussing complex questions of science during intercourse in face-to-face positions, so that the psychometrist would believe that Iridio was making progress, she was a distant and attentive interlocutor who rarely gave voice to passion, except occasionally, when she could not control an involuntary orgasm if the session went on for more than two hours. With the owner of the supermarket, she was a greedy lubricious nymph who made love lying on her tummy while eating apple tarts and faking serial orgasms. With the female principal of the neighbourhood school who visited her every time there was a state budget cut, or too many suicides among students converted to the MVEHS, or too much post-creationist meddling in the curriculum, Julia played the role of a gentle confidante, massaging her feet before becoming intertwined with the principal in the velvet scissors position, and so on.

The difficult unanswered questions posed by Julia that brought him asymptotically closer to orgasm also forced him to consider the numerous speculations about the possible existence of dark matter and dark energy, which seemed to comprised most of the mass-energy of the universe, although they could not be observed directly. These

$$\bar{\Gamma}^{(i)} = n^{(i)} \left(1 - \frac{h_{00}}{2} \right) + O \left(\frac{v^4}{c^4} \right)$$

entities, used in an irresponsible way by astronomers, according to Iridio, were frequently reported in popular science

1.4.ii. The basic equation of relativistic astrometry

articles. In order to discuss with Julia how scientists could deduce the existence of something they could not observe, he had to study the speed of rotation of distant galaxies and the effect of gravitational lensing on beams of light that passed close to them, and everything that had been published about WIMPs or Weakly Interacting Massive Particles, supposedly composed of a mixture of matter and antimatter. That had the effect of distorting what could be seen from Earth, and allowing one to infer its existence. They reached the conclusion that, if they were right, most of the starry sky would be like the reflection in a distorting mirror, like those in circuses, and that it would be impossible to know what was true or untrue, since the better part of the firmament would be

distorted in one way or another. This worried Iridio because it made cosmology resemble the discredited climate change hypothesis, which was castigated again and again in authorised popular science articles in the official press. Luckily, he found some old scientific papers in the scientific database of the patent office, which called into question the existence of dark matter and postulated a theory called Modified Newtonian Dynamics, which modified Newton's second law in order to explain the rotation speed of galaxies without referring to dark matter. The equations did not have the same bright golden colour as the equations for universal gravitation, but at least both members were the same colour, indicating that they had not been simplified.

He was thrilled with the theory and spent many sleepless nights trying to understand the technical mathematical aspects that justified it. Unfortunately, neither he nor Therese could trace many of the foundation articles mentioned in the references in the university repository, or by consulting the expert robots at the patent office. Many articles were classified as 'permanently inaccessible'. His mother explained to him that this was a euphemism used by the authorities to imply that they had been censored or were considered unorthodox, not to be quoted in official science. Perhaps that was why nobody, not even his mother, took that theory seriously, although it predicted better than the orthodoxy based on dark entities not only why spiral galaxies did not disintegrate when rotating at high speed, but also the value of the gradient in the Tully–Fisher diagram and the movement of the dwarf galaxies that orbited massive galaxies. These equations were, to his great satisfaction, much more colourful than the ones he had studied at university.

$$\mathbf{F} = m\mu\left(\frac{a}{a_0}\right)\mathbf{a}$$

$$\mu\left(\frac{a}{a_0}\right) \approx \begin{cases} 1 & \text{if } |a| \gg a_0 \\ \left(\frac{a}{a_0}\right) & \text{if } |a| \approx a_0 \end{cases}$$

1.4.iii. Newton's second law of motion according to Modified Newtonian Dynamics

When Iridio had to study Stellar Astrophysics, he had his second great crisis and the second period of stagnation in his studies. He was extremely disillusioned when he realised that for his professors and their obsequious assistants, as well as for all astronomers worth their salt, the fact that the expansion of the universe was accelerating without motive was not worthy of their attention. The explanations they offered, without even blushing, relied on the same vague concepts that appeared in the popular science press, concepts that they could not even define, such as dark energy or dark matter. Unfortunately, there was no way to prove the hypotheses, owing to the many austerity measures caused by the historic fall in the Beijing stock exchange before the Chinese Civil War, which led to the closure of the particle accelerators and the majority of the

planet's observatories. Scientists had to limit themselves to the data accumulated before the severe cuts to their research budgets.

The database of scientific papers that Iridio was able to access at the patent office reaffirmed his conviction that something was not right. He found other articles published in alternative journals, not banned as in the university repository, in which those hypotheses were questioned. Although his professors had to admit, in the face of Iridio's tenacious insistence, that those concepts were not as sound as they supposed, his problems with his teachers increased when he told them bluntly what he thought about other topics covered in their classes.

He was not convinced by their simplification of the

Hertzsprung–Russell diagram of the life of different types of stars, because the observations dismissed by orthodox astronomers about the proportion of sodium atoms in stars on the verge of collapse predicted that 70 per cent of them could not become

$$\log L = 8 \log T_{\text{ef}}$$

1.4.iv. Main sequence of the Hertzsprung–Russell diagram

supernovas. That deeply affected the proportion of the heavier elements that had been formed in them and distributed when they exploded. In the exam, Iridio again challenged the orthodoxy by postulating that the first stars were created under other physical laws and were more massive than those being formed now. He also questioned the idea that the universe could only have been born 13.77 billion years ago. In reality, it was much older, and those first non-asymptotic stars that readily became supernovas were the origin of the alleged dark matter. He also left blank three questions in the exam paper and, instead, wrote a long and complicated rebuttal of the need to posit non-existent entities, based on his own reinterpretation of the equations of Modified Newtonian Dynamics, to which he had added a new term so that both members were the same orange colour.

As was to be expected, Iridio did not pass the Stellar Astrophysics course or the specialised course in Elements of Astrophysics Theory. When he tried to question the results, he was accused of being a 'mathematicist' by the human tutor who revised the robotic marking of the astrophysics theory exam. That triggered an internal process in the Faculty of Applied Sciences, to be headed by the convener of the course, PhDr Noah Charles Grossling Pulst, who did not accept Iridio's arguments and refused outright to speak to his mother. He had to elevate the dispute to the university's academic claims office, whence it was passed to the Committee of Responsible Students. Iridio proposed that they increase the mathematics modules available in the robotic tutors and organise a science club to allow science students to have parallel classes in mathematics, in order to explore the details of equations presented in the course without adequate explanation. The committee rejected his arguments, because they saw

him as a troublemaker. He was perceived as dangerous because he might attract the attention of the pedagogical police and reduce the civic credit of the association members. When Iridio received an official warning against making any more claims, PhDr Gaffney-Yang called him to his office to have a conduct meeting, attended by the dean. Both PhDr Gaffney-Yang and PhDr Hydrick Lefebure asked him to stop attacking his tutors and other students during tutorials, to cease monopolising robomoocs with advanced mathematical modules and to desist from bringing Therese to the university to argue with robotic instructors and tutors. His mother wanted to attend the meeting but she was excluded via an official faculty memorandum, digitally signed and sealed by the dean. A few days later she received an official memo from the Committee of Responsible Students, signed by its president, Judas Pedro Kaminer Kullych, DCM, asking Iridio and his mother not to visit their office again or urge their members to revolt. The memo was copied to PhDr Hydrick Lefebure and the pedagogical police.

Iris Elsa Savage Expósito, DOP, a young orgonic worker friend of Julia's, had some of the tutors from the astronomy course as clients. From them she found out that the possibility of expelling Iridio from university was being discussed. As well as Iridio's lecturers, the dean had the impression that he was becoming an insoluble problem. They saw protocol VIP-γ89, which protected Iridio and to which they had no access beyond references in Rieneke Watson's reports, as an indication that he was a spy. If not, he must at least be assisting government infiltrators, paid to protest frequently in their classes and discredit what little remained of the pure sciences. Moreover, they suspected that he was the student who systematically gave them a zero in all questions in the anonymous evaluations of teaching quality, compulsory for all subjects and used by the pedagogical police to close down unpopular programs. They were as determined as ever to cancel the dispensation endorsed by Rieneke Watson, which allowed Iridio to avoid acknowledging receipt of the university's official memos and ignore their veiled warnings.

The psychometrist asked for a consultation with Iridio on the pretext of determining how his anxiety level had been affected by the content of his classes and his sexual life. Fearing expulsion, Iridio was panic-stricken, because he needed a degree in order to keep his job at the patent office.

During his next visit to Julia, she suggested that he let her stimulate him without interruptions, to prevent any possible difficult questions from the physician or interference from the morality and oztraditions police in his life. Iridio consented and agreed to take a sip of erotisoma. He tried different positions, such as the 'secret offering', the 'inverted lotus', the 'spider monkey', 'caressing the sky' and the 'Andromache' position. But he did not achieve his

objective in spite of being close to orgasm on two occasions when they talked about their calculations to solve the mystery of the Big Bang, this time using the JWL equation of state for explosives.

$$p = A \cdot \left(1 - \frac{\omega}{R_1 \cdot V}\right) \cdot \exp(-R_1 \cdot V) + B \cdot \left(1 - \frac{\omega}{R_2 \cdot V}\right) \cdot \exp(-R_2 \cdot V) + \frac{\omega \cdot e_0}{V}$$

1.4.v. Jones–Wilkins–Lee equation of state for explosives

The visit to the psychometrist confirmed that there was an expulsion order against him because he had to resit all psychometric tests as well as several additional tests of personality and emotional balance. As expected, they showed that he fell far short of the psychological requirements to work as a qualified scientist. Rieneke Watson placed on Iridio's head a diagnostic helmet connected to a very noisy electromagnetic resonance machine to measure changes in his cerebral flow when images of naked women were projected into his eyes. The psychometrist told Iridio to be very careful because he could not help him with this process as he had previously done, because Iridio's condition had not changed much and he could no longer fall back on the excuse of the phobias caused by the suicide of his ex-classmates. He also implied that Rhythmical Jouissance had found out, through her robotic contacts in different ministries, that he himself was being investigated, as well as Iridio, by the morality and oztraditions police and the intellectual police. Therefore, he could not be as casual as before about the official report requested by the university. The most prudent course was to lift the dispensation regarding not reading the memos. He knew that for Iridio it was irksome to have to respond and take their directives into account, but that strategy would calm them a little.

Hence Julia asked him to come into the orgasmatron and played the grating Ozeanic zimba music that he hated. She had learnt through Iris, who had continued to gather information on his case, that Iridio's professors and tutors of astronomy were happy with those results. She told him that she had consulted discreetly about his case with an anonymous friend who occupied a senior position in one of the police forces investigating him. The friend had recommended that he finish a Science Technician degree instead of a Bachelor's, so he could devote his time to his private studies without interference. She thought that everything sounded like a vendetta from the pedagogical police, who disliked special cases or restrictions imposed by another ministry. It was also possible that there was animosity from other police forces against the intellectual police, because they considered themselves superior and made it known when they meddled in the investigations of other law enforcement

agencies. In other words, it was not so much what Iridio had done or not done, rather, his case seemed a mere skirmish in the perpetual veiled battle between the Ministry of Health, Natality and Civic Comfort and the Ministry for Historical Updating, Social Precognition and Digital Worship, because the latter had wide audit powers that other state entities resented.

On the pretext of preventing Iridio from being damaged by the ministerial disputes, Julia persuaded him to have an uninterrupted evening of copulation, spending as much time as was needed. They arranged to have dinner at Julia's home where the event, many times postponed, took place. Both were surprised when, after only three and a half hours of uninterrupted orgonic motivation, Iridio managed to climax in the bicephalous beast

position while she was reading a detailed demonstration of the fundamental theorem of calculus, which brought him so many sweet memories of Penelope. He felt so much better after that fleeting success that he relaxed completely and fell asleep in Julia's arms. For Iridio, the experience was nothing out of this world, but Julia was very satisfied with the result because even before she started reading the theorem, Iridio did not interrupt her when she was having the orgasms that she needed, as the psychometrist had recommended. Instead of distracting her with discussion of popular science topics, he focused his mind on solving one of the difficult equations of Modified Newtonian Dynamics that obsessed him, while Julia was surrendering to pleasure.

A week later, he met Rieneke Watson again and reported that, at long last and following his advice, he had had truly orgonic intervaginal ejaculation. The psychometrist was very pleased and asked him to undergo a series of biological and psychological tests. They showed that Iridio had ejaculated many more times than he had reported. Iridio explained that the event had triggered a series of recurring wet dreams in which he was compelled to make love to Clarisse or Fanny and this caused him great anguish, such as he had felt after their suicide. The following week, during his next visit to find out the results, Rieneke Watson told him that he had confirmed with Julia that the exchange of orgonic energy

Let f be a continuous real-valued function defined on a closed interval $[a, b]$. Then for all x in (a, b)

$$\frac{d}{dx} \int_a^x f(t) dt = f(x)$$

Corollary: If f is a real-valued continuous function on $[a, b]$ and F is an antiderivative of f in $[a, b]$ then

$$\int_a^b f(t) dt = F(b) - F(a)$$

1.4.vi.a.B. The fundamental theorem of calculus

had indeed taken place. He could now write in the official report to the university and ministries concerned a diagnosis of 'aromantic dissexualism caused by an intrinsic synaesthetic hypogonadism and wet oneirophobia with anorgasmia, which was almost overcome during biological sexual relations without technological assistance'. That opinion explained his innate and involuntary condition, and therefore he was not to be disqualified from professional practice as a scientific technician in provincial posts. The psychometrist told him that he was glad to have discovered a relationship between his symptoms, since his aversion to dreams could also be attributed to the trauma caused by the suicides of Clarisse and Fanny. At the same time, his oneirophobia prevented him from participating in sexual sensor-dramas, which were a normal way for single individuals to exercise their libido. This

meant that, at least in the short term, his Reich-eudaemonic indices would be normal and in no way affect his position at the Widgeree patent office. Also, and as a preventive measure, he would copy the report to the Registry for Orgonic and Cognitive Health of the Ministry of Health, Natality and Civic Comfort, in the hope that they would stop investigating him as well. However, this did not mean that Iridio could rest on his laurels. The psychometrist asked Iridio's consent to have Rhythmical Jouissance take charge of coordinating, with Olgava and Therese, the statistics on his organotic performance in his future sessions with Julia. That allowed them to document the improvement in his organotropism and provide some cover in the event of investigations by the offices of mental or orgonic health of other ministries.

Let $(X, \mathfrak{S}, \mu)$ be a probability space and let $f: X \rightarrow X$ be a measure-preserving transformation.

If X is a second countable Hausdorff space that verifies the second countability axiom, and $\mathfrak{S}$ contains the Borel sigma-algebra, then the set of recurrent points of f has full measure. That is, μ -almost every point is recurrent.

1.4.iv.b. Topological version of the Poincaré recurrence theorem

Rieneke Watson also thought it was a good idea to change to a technical degree and helped Iridio to complete the university forms to do so. When they examined the curriculum for the Bit-Diploma IV in Technical Science taking into account the subjects Iridio had already completed, they discovered that in order to finish the diploma he needed only three elective subjects, not necessarily in astronomy. Furthermore, the course did not include the compulsory agnostic post-creationism subject which he had failed eight times. He only needed to pass a multiple-choice test in basic post-creationism to graduate.

Another advantage was that the translation of scientific articles from standard Chinese, a subject he had failed three times, was not required either. It was well known that the subject was a filter imposed by the university authorities to get rid of troublemakers who came to the attention of the pedagogical police. In spite of his frustration at being sure he knew more Chinese characters than many of the sycophants on the Committee of Responsible Students, who had passed the subject without making any effort, Iridio accepted the situation and was ready to take other subjects without arguing about the translation exam. In order to do so, he asked his mother to promise to delegate to Therese the administration of his future complaints to the university authorities and, in particular, not to defend him so fervently and to refrain from urging him to appeal every time he failed an exam. Only when his mother promised not to meddle in his studies any more did Therese suggest Iridio tell his parents that he had changed to a diploma instead of a bachelor's degree. This generated another crisis with his parents, particularly his mother, who was willing to embark on all necessary administrative procedures to put a stop to the harassment so that Iridio could finish the course he had started. However, Iridio remained firm on what he needed to do if he was to keep his

job at the patent office.

Iridio also sought Therese's advice on whether he should tell his parents about his visits to the psychometrist, because not disclosing that information made him feel guilty. She turned on her oracle function and assured him that it was better to wait until he finished his diploma. As he continued to insist, Therese indicated

The Q-Principle

Speaker's Maxim: Do not provide a statement that is informationally weaker than your knowledge of the world allows, unless providing a stronger statement would contravene the *I-principle*.

Recipient's Corollary: Take it that the speaker made the strongest statement consistent with what he knows.

The I-Principle

Speaker's Maxim (The Maxim of Minimisation): 'Say as little as necessary', i.e. produce the minimal linguistic information sufficient to achieve your communicational ends (bearing the *Q-principle* in mind).

Recipient's Corollary (The Enrichment Rule): Amplify the informational content of the speaker's utterance, by finding the most specific interpretation, up to what you judge to be the speaker's m-intended point.

1.4.vii.a. Reduction of the conversational maxims to two functional principles of conversation, according to Levinson

that he would be violating Levinson's maxim of minimisation if he gave his parents more information than required about his private life.

Obligatory Functions	Optional Functions	Description
		Initial equilibrium (not a function)
A or a		Disruptive event (or revaluation of a situation)
	B	Request that someone alleviate A (or a)
C		Decision by C-actant to attempt to alleviate A (or a)
C'		C-actant's initial act to alleviate A (or a)
	D	C-actant is tested
	E	C-actant responds to test
	F	<i>C-actant acquires empowerment</i>
	G	C-actant arrives at the place, or time, for H
H		C-actant's primary action to alleviate A (or a)
I or I _{neg}		Success (I) or failure (I _{neg}) of H
K		Equilibrium

1.4.vii.b. Reduction of Vladimir Propp's narrative functions to an ordered set of functions representing stages in the narrative sequence, according to Emma Kalafenos

1.5. A lifetime

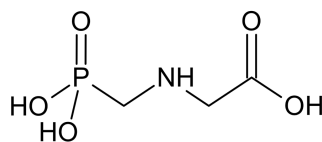
The evolution of the world can be compared to a display of fireworks that has just ended: a few red wisps, ashes and smoke. Standing on a well-chilled cinder, we see the slow fading of the suns, and we try to recall the vanished brilliance of the origin of worlds.

Georges Lemaître

Iridio went to the astronomy department of Yabbie Creek-W Multimodal Polytechnic University for the last time to attend a presentation by PhDr Santiago Sebastián Muñoz Rojas, a young South American astronomer visiting the university. He delivered a seminar on the analysis of data collected at the beginning of the 21st century by the Cerro Paranal European Observatory, one of the few operating in the world at that time, thanks to a subsidy from the now defunct United Nations. The talk dealt with early galaxies, the first to be created after the Big Bang; PhDr Muñoz Rojas had obtained new results by re-examining the observations recovered from a public database of astronomical observations which had been inaccessible for many decades. The first part of his presentation explained how the results had been obtained. Before the fall of the Beijing stock exchange, a space telescope, with a mirror far bigger than any existing telescopes, had been launched by the Eurasian Space Agency and placed at the second Lagrange point of the orbit of Venus, to replace the damaged Astrosat IV. When it reached its destination, all the subsidies for its operation from the Unified Nations of the Terrestrial World, the transnational entity which replaced the United Nations for a while, had been frozen and the agency dismantled. After long negotiations, the modest Neo-Bolivarian Space Agency had taken control of the instrument, but the First Glyphosate Phytoremediation World War prevented the analysis of the observations. The data presented were a summary of the first analysis of the information patiently recovered by the astronomer.

The second part of the seminar included the screening of a 5D holofilm produced by the presenter using the recovered data. It showed changes in the universe when the distribution of galaxies was modelled over time. However,

as soon as the screening started, the 5D projector in the aula magna stopped working. The built-in robotic assistant recommended manually switching off the projector and starting it again, forcing PhDr Grossling Pulst to enter the control room on the left of the podium and to climb into the attic, where the projector was located, to switch it off and on.



1.5.i.a. Chemical structure of glyphosate

While the audience was waiting, PhDr Gaffney-Yang suggested putting some preliminary questions to PhDr Muñoz Rojas. His professors were not surprised when Iridio, who had read everything published in the field to dispute his exam and essay marks, was the only participant who managed to pose difficult questions, doubting the validity of the proposed analysis based on expansitrons. PhDr Gaffney-Yang intervened, threatening to expel Iridio from the hall when he asked if the dark matter and dark energy assumed by the presenter in his interpretations were not a scientific fable, a new luminiferous ether that had not yet been dismissed by orthodox science. To the participants' surprise, PhDr Muñoz Rojas took the remarks seriously and was even interested in the alternative theories proposed by Iridio. He had become aware of them from references in scientific articles translated into classical Spanish, whose originals in classical English had been lost. Unfortunately, Iridio could not explain his objections in detail, because the lights in the hall were switched off and the holographic screening recommenced. After the screening and the conclusions, the discussion session began. Iridio immediately raised his hand but PhDr Grossling Pulst, in the chair, ignored him, as he had done in his classes. After a series of questions and innocuous comments, kindly answered by the visiting academic, at last Iridio's turn came. PhDr Muñoz Rojas, conscious that Iridio was being systematically overlooked, intervened to give him the floor, in spite of Iridio's professors' attempts to conclude the proceedings.

Again, Iridio seriously questioned the proposed analysis and the hypotheses based on the model shown in the screening. The theories upheld by Iridio, instead of postulating dark energies and dark matter, proposed that there had been a change in the laws of physics and the constants of nature as the universe expanded. That change, he maintained, could explain the discrepancy between the amount of matter that apparently existed in the early universe and the amount observed at the present time. In fact, the main diagram shown during the presentation could be reinterpreted arguing that the centre of the expansion was in an area known as the Great Accumulator, at which the telescope was pointing, if a modest increase in gravitational attraction was assumed as the universe expanded and the early galaxies were formed. That would explain how all younger galaxies, including the Milky Way, which appeared to rotate around the area, had come to occupy their position on the periphery of the cumulus.

Although the professors insisted on concluding the presentation, PhDr Muñoz Rojas asked Iridio for more details on his alternative theories. Iridio, very excited to find someone who would finally listen to him, wrote the formulae that allowed the recalculation of the diagram, using his version of the Modified Newtonian Dynamics

$$g = g_N v \left(\frac{g_N}{a_0} \right)$$

$$g_N = g \mu \left(\frac{g}{a_0} \right)$$

1.5.i.b. Milgrom's law

on the interactive screen. Despite the conventional pre-Sandrini-LePaine notation, the in-built robot declared the formulae valid. After a long pause during which the presenter lost himself in thought and made some calculations in his personal flexible reader, he agreed that Iridio's was a plausible interpretation of the data, one he had not thought of, and discussed with Iridio the technical details of his predictions for a long time. It became clear to everyone that PhDr Muñoz Rojas was genuinely interested in those hypotheses and that he was not just being polite. This increased the professors' prejudice against Iridio. They were relieved when he finally stopped attending their lectures and pestering them with questions about trivial details of the underlying mathematics in their assertions, or persistent requests for them to check the validity of his recurring calculations.

In order to complete his new diploma, Iridio decided to study subjects in chemistry instead of astronomy. His main interest was spectroscopy. He wanted to explore in more detail the measuring of the redshift of the galaxies that were moving away, to calculate the acceleration of the early universe and recalculate the data that determined the trajectory of the Hubble constant in the different periods of the expansion of the universe. He was also eager to better understand the calculations for the rotation speed of the galaxies based on the hydrogen spectral series. He wanted to review the corrections that had been made in the radiation map of the cosmic microwave background, which was considered the best proof of the Big Bang, and be able to assess the relative abundance of chemical elements predicted by the theory.

Iridio passed the introductory chemical subject without any difficulties, in part because they did not use much of the Sandrini-LePaine notation. However, controversy returned when, during his second face-to-face class of Analytical Chemistry, PhDr Ethan Samuel Yoshida Harris explained the discrepancy between the relative abundance of the lithium isotopes observed in the universe and what was predicted on nucleogenesis by the standard theory of the Higgs Bang. Iridio, who was very well read on the subject, attacked the professor by stating that the cosmic ingredients did not coincide with that estimate because of a calculation error. In fact, the calculations for lithium-7, in which the discrepancy was postulated, were based on too many simplifications, in his opinion. PhDr Yoshida Harris, not used to such disruptive arguments in his classes, decided to postpone the discussion until the next class, just as Iridio's high-school teacher had done, and refused to consider his

$$\frac{{}^7\text{Li}_{\text{BBN}}}{\text{Li}_{\text{plateau}} - {}^7\text{Li}_{\text{SFCR}} - {}^6\text{Li}_{\text{SFCR}}} = 3.7$$

1.5.ii.a. Proportion of lithium isotopes in the observable universe

alternative equations because they were not written in the official Sandrini-LePaine notation.

The chemistry professor's principal assistant was one of Julia's clients, and through him she learnt that the professor was talking to the astronomers and the dean about his difficulties with Iridio. While Julia and Iridio were engaged in a long session of intercourse in the slipknot position, she suggested that he abandon his argumentative attitude and pretend to believe in the orthodoxy, in order to complete his studies. Realistically, all he needed to do was complete a diploma in

science, not necessarily in astronomy, to keep his job at the patent office. It was useless to try to convince recalcitrant academics who would never listen to him. Grudgingly Iridio agreed to keep his mouth shut and let PhDr Yoshida Harris win the argument in the next class. However, while studying for the mid-term exam, he found an article in a magazine banned by the university but accessible in the database of the patent office, which told of a group of Taiwanese scientists still authorised by their government to undertake research in non-applied sciences. They had managed to repair a space telescope and obtain historical measurements of the light of distant stars, then used the measurements to argue exactly what Iridio had predicted: that the discrepancy was due to a calculation error and there was no conflict between the predictions of the Big Bang theory and the relative abundance of lithium isotopes. The article even had a formula almost identical to the one he had deduced by himself from summaries of papers whose full texts were inaccessible.

In order to avoid further conflicts, Iridio decided to take a course in Statistical Mechanics for Chemistry and Pharmacy as his last subject, although in reality he was not interested in it and the course content had no apparent application to his secret calculations. However, despite his subsequent good behaviour, the incident with PhDr Yoshida Harris led the staff of the Department of Applied Chemistry to demand that Iridio should attend new consultations with the psychometrist. Rieneke Watson asked him to undertake new psychological tests to rule out a possible diagnosis of alexithymia. He was pleased to hear that Iridio had continued visiting Julia and

p e r i o d 2	Group 1	
	6.941	3
	520.2	0.98
	Li	+1 -1
	Lithium	Solid
	1s ² 2s	Alkali
		Metal

s-block

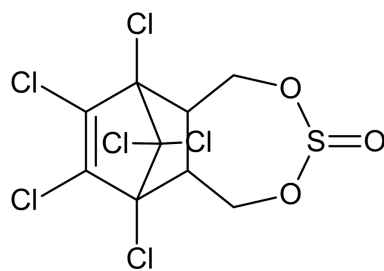
1.5.ii.b. Lithium entry in the Periodic Table of the Elements

$$I = \sum_i \rho_i \ln(\rho_i) = \langle \ln(\rho) \rangle$$

1.5.ii.c. Fundamental postulate of statistical mechanics

was occasionally achieving successful intercourse with her. Unfortunately, Rhythmical Jouissance had calculated the intervaginal average of the relations reported by Julia and found that they were still below the minimum average expected of single individuals of his age, according to the new Reich-behaviour directives of the Ministry of Health, Natality and Civic Comfort. It was therefore imperative for Iridio not to neglect his orgonic development. The psychometrist also told him that, as the legislation had changed, he could not continue to use the trauma of Clarisse's suicide to explain the low ejaculation rate shown in the genital eudaemonia tests, or exclude the synaesthesia AS- α diagnosis, which would classify him as neuroatypical with an asexual tendency in the eyes of the health authorities. In other words, they needed a new excuse. In addition, it was important that Iridio read the memos sent to him by the university authorities. His flexible reader could detect how carefully he was reading them because it recorded the movement of his pupils, and the authorities had considerable evidence that he was not paying much attention to their ever-changing directives.

In order to know what to tell the psychometrist, Iridio agreed to work in the sex enhancement drugs section of the patent office, where, following his mother's advice, he had previously refused to participate. When he finally found a drug designed to treat asexuality, he was able to search for articles about that condition. That also allowed him to explore an old information system called Internet 3.1.4 in which he found records of an activist organisation fighting for asexual rights at the beginning of the 21st century. It included members who identified themselves as aromantics. The records were very fragmented, and many paragraphs were redacted, but with Therese's help he was able to reconstruct many documents. There was enough information for him to understand that such activism had been linked to the emergence of the MVEHS, and discussion of the subject was now forbidden. Apparently, a functional version of that information system, open to all, was still in existence in the maritime city states, where there was full sexual and asexual freedom. Unfortunately, Iridio could find no useful information about male anorgasmia because only 0.27 per cent of Ozeanic males suffered from the condition, so research was restricted by the commensurate applicability requirements. He found several papers on cryptorchidism, which seemed to be related to multiple hereditary chromosomal changes and



1.5.iii. Chemical structure of endosulfan

the mother's exposure to environmental toxins during pregnancy, but the majority of papers were heavily redacted.

Iridio soon regretted having researched asexuality. Zoe, his boss, called him for the first time to an official disciplinary meeting in her office. She told him that she had been contacted by the technological police, more specifically, the confidential information censorship section, because they had detected his search in the archives of the obsolete information system and Zoe had to fill in a form explaining the need for such access. Luckily, the patent was sufficiently explicit to justify it, but she was obliged to insert a pre-emptive behaviour correction note in his performance file, because he had exceeded the maximum authorised reading time for the archives of Internet 3.1.4. That night, Therese told Iridio that Zoe wanted to speak to him. Honorio started an unbearable buzzing while they were talking. Zoe apologised for the noise and for treating him so harshly in the office, but the reprimand was necessary because all disciplinary discussions were recorded to ensure that all procedures had been followed. Honorio's noise was necessary now in case they were being spied on. As a precaution, Zoe directed him to stop checking medical patents and to go back to assessing inventions based on concepts in physics or chemistry, at least until he graduated and became a permanent member of the agency's staff.

As a consequence of the incident, he had to attend a hologrammatic interview with Nicholas Jayden Kask Gruber, FIEAust CPEng, the general supervisor of the patent office at the national level, who asked Iridio many questions about his work and his studies. His mother was very concerned when she learnt about the interview and started to write memos to the general directorate of the patent office in Bandar-Austro-Metropolis, asking Iridio to sign them. Kask Gruber, concerned about Iridio's mother's aggressive memos and trying to cover his back in case the complaints escalated, referred him to the technological police for an interview. They, in turn, sent him for a civic aptitude session with Sergeant Wilson Liam Black Jakupi, OzPMDS, of the local office of the morality and oztraditions police in Widgereee, who asked him many questions about his parents and grandparents, to which he had no answer. Sergeant Black Jakupi also enquired into the patents that Iridio had authorised in the past, which was less awkward because he could give him all the relevant details without any difficulty. At the end of the interview, he mentioned that they were considering reopening the court

$$\frac{dX(\tau)}{d\tau} = -\alpha X(\tau)Z(\tau)$$

$$\frac{dZ(\tau)}{d\tau} = \delta[\alpha\beta X(\tau)Z(\tau) - \gamma Z(\tau)]$$

1.5.iv.a. A conceptual model for the prediction of future sexual intercourse in a couple, taking into consideration discovered erotic potential associated with the first single intercourse X and sexual appetite Z

proceedings against him. Iridio was surprised by the threat and wanted to know at once when there had been any previous proceedings. The official told him dryly to talk to his parents about it and asked whether he knew anything about the MVEHS. He replied that he had learnt only recently that the movement was related to asexuality and that the only time he had heard the name was when some of his friends had committed suicide. He also stated he was not opposed to procreation and did not consider that the self-extinction of the human species was necessary in order to save the planet. That led to many more questions about his sexual activities with Julia and his previous relationships with Clarisse and Fanny. Black Jakupi demanded that he consult a psychometrist to obtain an official report on his eudaemonic deficiencies.

He duly reported for further interviews and tests with Rieneke Watson, who seemed disheartened and distant. When Iridio sat in the noisy contraption to look again at the photos of naked women he had seen four times in the viewer of the diagnostic helmet, the psychometrist told him not to take it the wrong way, but he was tired of the frequent interference in his work by the morality and oztraditions police and the intellectual

$$\log(r) \sin\left(\frac{\theta}{2}\right) = z \cos\left(\frac{\theta}{2}\right)$$

1.5.iv.b. An unbounded version of the Möbius strip in cylindrical polar coordinates (r, θ, z)

police. That week, for example, inspectors from the Office for the Regulation of Artificial Intelligence had confiscated Rhythmical Jouissance on the pretext of checking whether she had any unauthorised modules in her algorithmic conscience. Iridio feared that the evidence of his organotrophic progress could be lost. The psychometrist told him not to worry because he had obtained information from Julia on his sexual progress, and it indicated sporadic but consistent ejaculations that could be proven by biological tests. He also had back-up copies of all his sexual activities collected by Rhythmical Jouissance. When they received his report, they could not describe Iridio as deviant or an MVEHS suspect. When he sat in the noisy machine in which they could discuss, as before, the mathematical contents of Lacanian psychology, Iridio told him that he could not find any information on the use of topology in the treatment of sexuation. But he had calculated the Gaussian curvature and the median curvature of the Möbius strip in cylindrical

$$\frac{S}{S_1'} \cdot \frac{S_2'}{x} \rightarrow S\left(\frac{1}{s''}\right)$$

1.5.iv.c. The metaphor function

coordinates and been unable to find any connection with the concepts that Rieneke Watson had previously explained: the four simultaneous discourses, which would explain his problems at university. The psychometrist said that perhaps he had not explained the metaphor properly, but there was no need to worry

about it. He suggested that it would be better for them both if they stopped

discussing the matter, particularly now that the Ministry for Historical Updating, Social Precognition and Digital Worship had been openly involved in his case and had confiscated his robotic secretary. He suggested telling Therese not to keep exploring those concepts because that might be the reason they had taken Rhythmical Jouissance.

The bureaucratic process for the observation of his sexual and civic behaviour by the relevant ministries, until their suspicions were cleared up, resulted in him being unable to copy scientific papers into his private flexible reader from his direct connection to the digital journals archive in the patent office. This slowed the progress of his calculations. Luckily, to complete his new degree he needed only to pass a multiple-choice test on Teleological Post-Creationism for Scientists, for which he prepared with the help of Therese and Julia, passing at the fourth attempt.

The day he received his Bit-Diploma of Advanced Technician in Sciences, his parents attended the graduation ceremony with Ernesto, the physicist friend of Iridio's mother, whom he had not seen since his university entrance exams. His parents seemed worried and distant although they told him unconvincingly that they were very happy for him. Julia also attended the ceremony and it was clear that she was indeed very proud, although she only greeted him briefly. When Iridio invited her to have lunch with his family, she excused herself because she had to return to work. The only ones to accompany him in the modest celebration in a 4D restaurant in the city centre with his parents and Ernesto were the owner of the boarding house, Mrs Frauke Grubach, who seemed very happy for him, and his boss Zoe, who seemed overwhelmed. Both of them were pleased to meet his father in person because they admired his painting and sculptures. They were also excited to explore the novelties in the menu, because it was now possible to have dishes designed in space farms prepared on the spot. Through the glass walls they could see the kitchen where the robochefs were preparing their unique dishes, based on imperial rye, the new fashionable ingredient, genetically designed to increase the percentage of proteins and lower the consumption of kangaroo meat in the population.

They brought Therese to the restaurant but were unpleasantly surprised when two officials from the Office for the Regulation of Artificial Intelligence took her away in the middle of lunch, claiming that Iridio did not need her any more as he had finished his university studies. Iridio had one of his usual tantrums. Soon after, other officials from the Office for the Systematisation of Robotic Erotism also arrived with an arrest warrant for Therese. Iridio had to be restrained because he was ready to attack them. They were accompanied by Sergeant Black Jakupi from the morality and oztraditions police, and when they

learnt that another ministry had already taken away the robotic instructor, they were very angry. Iridio's parents were dismayed by the interference and apologised to Mrs Frauke Grubach and Zoe for the incidents, and for the trouble of having had Iridio as a lodger and subordinate. Mrs Frauke Grubach said that it was no trouble because she knew how the state police operated. Many years ago, they had taken her husband for routine questioning and she had never seen him again. She was sorry that Therese had been taken away because she had been a very positive influence on the robotic butlers and servants, who had been more efficient when they followed her example. Iridio, a bit calmer but very sad, suggested that it might be a new fashion, because the last time he had seen his psychometrist he learnt that his robotic assistant had been taken away. Zoe, who had been quiet since the incident, started to cry. The Office for the Systematisation of Robotic Erotism had also taken Honorio and returned him completely changed, obsessed with exercising his sexuality.

Speaker's Maxim: Indicate an abnormal, non-stereotypical situation M by using marked expressions that contrast with those you would use to describe the corresponding normal, stereotypical situation.

Recipient's Corollary: What is said in an abnormal way indicates an abnormal situation, or marked messages indicate marked situations, specifically: When S has said ' p ' containing marked expression M , and there is an unmarked alternate expression U with the same denotation D which the speaker might have employed in the same sentence-frame instead, then where U would have implicated the stereotypical or more specific subset d of D , the marked expression M will implicate the complement of the denotation d , namely d' of D .

1.5.v.a. Levinson's M-Principle

His parents and Ernesto were alarmed to learn that Iridio was seeing a psychometrist and put loud music in Ernesto's flexible reader to demand an explanation. Iridio then confessed that he had not told them anything because Therese had suggested that it was better not to worry them. As they went on to ask what Therese had suggested regarding his conflicts with his lecturers and authorities, they came gradually to the conclusion that the robotic assistant had been manipulating him. His mother was filled with rage and said that it was the robotic assistant's fault that he had finished a diploma and not a university degree, as befitted his talent.

Zoe, still crying, told them not to worry so much because Rieneke Watson was trustworthy, and had helped her when she had problems with the morality and oztraditions police. At that point, Ernesto increased the volume of the music in his flexible reader and everyone, interrupting

one another, engaged in a conversation full of incomprehensible conversational implicatures. Much to Iridio's surprise, everyone agreed that it was better for

him to leave the boarding house as soon as possible and stop going to the psychometrist. In a mysterious way, they had unanimously agreed that those actions were necessary, although he did not understand their reasoning. His parents wanted him to live with them in the city again, but Zoe, through her tears, suggested that before making a decision it was better to wait and find out whether he was being offered a permanent position at the patent office. Zoe had been making representations on his behalf and it would seem suspicious if he were to quit his job and leave Widgeree before the decision was announced. After further discussion in which many things were left unsaid and unexpected gestures were used to imply things he did not understand, they all agreed it was better to wait. Mrs Frauke Grubach promised to find him a room in the boarding house of a friend who, she said, was very trustworthy, and Iridio could move in at the weekend.

His parents made an appointment to see Zoe to discuss Iridio's situation in private, so as to maximise his chances of securing a permanent position. They also needed to discuss other important matters that they did not explain, although it seemed to Iridio, from a comment made by his mother which he did not fully understand, that they had to do with his disciplinary chat in the patent office. They also decided, there and then, that Iridio had to limit his social contacts with Zoe and refrain from visiting Frauke Grubach's boarding house for a while. In spite of his efforts, he could not understand their reasons, so obvious to everyone else. It seemed as if there were hidden variables in very difficult equations or perhaps, as Rieneke Watson had told him, he was unable to understand multiple discourses at the same time. As Zoe was present, Iridio decided not to mention Julia and his private visits. He knew from Therese that Zoe had also visited the organic recreation clinic and she did not want that to be publicly known. Nor did he want to ask his parents to tell him what was going on, because he knew what would follow. They would transgress Grice's maxims, resist answering his questions and promise to explain one day. They would, as usual, take charge and deal with whatever had to be dealt with, and tell him nothing.

$$\frac{d\mathbf{x}}{dt} = \frac{\nabla S(\mathbf{x}, t)}{m}$$

1.5.v.b. The guiding equation

Iridio thought that now, with his university studies behind him, he could suspend his visits to Julia, recommended by the psychometrist. But after three weeks without his Wednesday visit, he discovered he missed her company and the intellectual stimulation he enjoyed with her. She suggested that, since his problems at university were over, they could move on from a professional relationship and start a new one, as friends. Iridio was alarmed and demanded an explanation because there were still many Kama Sutra positions to try. She

explained that she could now visit him free of charge in the intelligent house grade 6 that he had rented on the outskirts of the city, having been appointed permanently to the patent office with a substantial salary increase, and they could complete the Kama Sutra sequence if he wished. Everything seemed to have been resolved miraculously: he did not need to complete many forms to be officially confirmed in his appointment. Moreover, his mother had got him a multitrack robotic assistant called Scientific Halina, who communicated with her every week to report on events of interest in Iridio's life. Halina was forbidden to interact with other artificial intelligences without his mother's express consent. Under the guidance of Iridio's mother, she helped him with his calculations and, in theory, could also assist with his asexuality, although Iridio at this stage preferred to practise his sexuality during Julia's visits to his home. With the aid of administrative procedures which she would not explain, Iridio's mother had managed to have the most advanced scientific modules installed in Halina, with more than 100,000 explanations, formula derivations and theorem demonstrations which could operate in the Sandrini notation as well as the conventional scientific notation that Iridio preferred. What Iridio liked most was that the new assistant had in her memory the first five million digits of π , e , e^{π} and other transcendental numbers, and could calculate the digital expansion of all kinds of irrational numbers, including the constants of nature, especially the fine-structure constant, which he compared to Bach's sonatas because of the harmony of their digital expansion. 0, ., 0, 0, 7, 2, 9, 7, 3, 4, 8, 1, 3, 0, 0, 3, 1, 8, 3, 2, 1, 2, 8, 9, 5, 6, 9, 2, 2, 6, 0, 1, 3, 1, 6, 3, 7, 7, 2, 3, 8, 2, 3, 3, 5, 9, 2, 2, 5, 4, 6, 6, 7, 7, 9, 2, 5, 9, 8, 8, 0, 1, 5, 4, 0, 1, 9, 3, 3, 1, 5, 4, 9, 9, 0, 8, 6, 6, 2, 0, 3, 1, 6, 2, 2, 2, 8, 2, 7, 4, 9, 7, 6, 0, 9, 1, 7, 4, 0, 3, 7, 2, 0, 6, 4, 0, 3... Like Penelope before her, Halina could recite transcendental numbers in a loud voice and this calmed him down when he felt frustrated by the lack of progress in his calculations. She even had the same exercises as Penelope for practising Grice's conversational maxims. He finally managed to sit the same test he had done with Penelope before she was taken away, and was very disappointed when he got only 67 per cent of the answers right. Halina told him not to worry because she was going to teach him other ways of analysing conversations and assured him that everything would come right with appropriate training. She also told him how lucky he was to be a human being and not a robot because, had she obtained such results, she would not have been allowed to interact with the outside world. Iridio wanted to know if his training with Therese on additional postulates might be the cause of his very low result, because on the previous attempt with Penelope he got 71 per cent. After examining what Therese had taught him, Halina concluded that his previous robotic instructor was correct in her intuition that his problems were not related to the production of relevant maxims, but to the interpretation

of what others meant when they transgressed them. In particular, and to settle the matter, instead of using alternative maxims as Therese had proposed, together they would explore ways to determine the utterer's occasion-meaning. Iridio asked her whether she thought, as did his mother, that Therese had been manipulating him. Halina responded that she did not have sufficient information to come to any conclusion, but she would try to give him all possible information about her own suggestions, so that he could decide if it suited him to accept them. Although he never heard from Therese again, his problems with the mysterious ministries seemed to have been resolved, because his private

'*U* meant something by uttering *x*' is true if and only if, for some audience *A*, *U* uttered *x* intending
 (1) *A* to produce a particular response *r*
 (2) *A* to think (recognise) that *U* intends (1)
 (3) *A* to fulfil (1) on the basis of his fulfilment of (2).

1.5.v.c. Initial definition of utterer's occasion-meaning, according to H. P. Grice

flexible reader advised him that he could copy scientific articles if he needed to work on them outside office hours. He could also discuss them with Julia and share them with Halina, to

identify leaps in the derivation of equations he found in the bibliography, after Halina translated them into the traditional scientific notation, to avoid delays and interruptions.

Now that he had an indefinite contract in the patent office, he had to attend the celebration of Public Servant Day on the bank of the Widgeree River and its closing firework display. When he saw the fireworks going off and the smaller explosions generated around them, he had the idea that the Big Bang could have been a recurrent explosion that caused other smaller explosions, that is, it could have consisted of a series of smaller big bangs.

This could explain the concept of eternal inflation, posited by cosmologists in the 20th century and mentioned frequently by his mother when they discussed the multiverses proposed by string theory. Iridio, however, did not consider it necessary for those new big bangs to expand eternally because he believed that, as

with the fireworks, the number was finite, although he understood that it could be very large. Therefore, the problem was more complicated. Those different centres had to be found in order to locate the focus of the main explosion by calculating the equations in a temporally inverse way. This would also be easier to calculate when modelling a distant future, when with continued expansion galaxies separated from each other until isolated in different Hubble spheres in

$$A_{AH}(t) = 4\pi \left(\frac{t_c^2}{a^4} + \frac{1}{t_\Lambda^2} \right)^{-1}$$

1.5.vi.a. The area of the apparent horizon of a Hubble bubble in a universe with positive cosmological constant

sidereal space. Luckily, he found many formulae in the database of the patent office to model the combined trajectory of different models of firework explosions, on which to base his new hypothesis.

That same day during the celebrations, Iridio learnt that Kaminer Kullych, BSciP CGM DCM, whom he had met at university when he was president of the Committee of

Responsible Students, was also working at the patent office. Iridio was surprised to be greeted by him and to be treated kindly. Iridio told him that the fireworks had made him think of the eternal inflation concept, which both had studied when they both attended the same Introduction to Astronomy class. Kaminer Kullych could not hide a guffaw and told him that he had not changed a bit since those days at university. Afterwards, his former colleague boasted that he had the highest civic credit in the city and wanted to know Iridio's. Iridio responded that he did not know it and Kaminer Kullych commiserated by saying that he understood.

Iridio's happiness about getting a new job that allowed him to live comfortably and help his parents financially did not last long. Two officers from the fiscal

$$r = \frac{Pv}{C + V} = \frac{\frac{Pv}{V}}{\frac{C}{V} + 1}$$

1.5.vii.a. Surplus formula according to Karl Marx

police presented themselves at his house one evening demanding an explanation of Therese's work behaviour. Apparently, the robotic instructor had sold her computational time to several hydrocarbon companies in the country without paying the relevant taxes. Iridio did not remember authorising her to do this, although

that was not an excuse because the contracts bore his signature. His mother helped him to do all the necessary paperwork to pay back in many instalments the tax he supposedly owed as well as writing lots of memos to avoid a drop in his civic credit due to the involuntary increase in the rate of surplus caused by Therese's irresponsible conduct.

$$s_i = m \frac{y_{\max} - f(x_i) + \gamma}{\sum_{i=1}^n (y_{\max} - f(x_i)) + \gamma}$$

$$A_i = \hat{A} \frac{f(x_i) - y_{\min} + \gamma}{\sum_{i=1}^n (f(x_{i(\min)}) - y_{\min}) + \gamma}$$

1.5.vi.b. Basic formulae for the cost optimisation (f) and amplitude (A) of the explosion of sparks (s) for n fireworks in the space (x, y, γ)

$$w(\eta, \vec{x}) = G \int \frac{\sigma(\eta, \vec{x}') d^3x'}{|\vec{x} - \vec{x}'|} + \frac{G}{2c^2} \frac{\partial^2}{\partial \eta^2} \int d^3x' \sigma(\eta, \vec{x}') |\vec{x} - \vec{x}'| \\ - GH \int d^3x' \sigma(\eta, \vec{x}') + O(c^{-4}) + O(H^2)$$

$$w^i(\eta, \vec{x}) = G \int \frac{\sigma^i(\eta, \vec{x}') d^3x'}{|\vec{x} - \vec{x}'|} + O(c^{-2}) + O(H^2)$$

1.5.vii.b. Post-Newtonian solution of the spatial coordinates of the Barycentric
Coordinate Time with a linear correction due to the Hubble expansion

Iridio spent the next ten years working at the patent office during the day and calculating at night the exact place where the local centres of the Big Bang were situated. Nothing could distract him, not even the refugee crisis due to the recurring sea-level rises or the prolonged Third Transpacific War involving most of the countries in the region, or the several famines and plagues affecting the country when the ecological terrorists launched the Third World Glyphosate Phytoremediation Campaign. Every Wednesday, even when curfew was imposed during the Water Wars provoked by the El Niño phenomenon and bushfires that threatened the city, Julia visited him and stayed for dinner at his home, listening with all the patience in the world as he talked about his calculations. She always asked him many questions about aspects of his hypotheses he had not thought about, made suggestions based on what she had read in the official popular science media and encouraged him to persevere. Every now and then, once every two or three weeks, when he was stuck on difficult calculations, Julia managed to give him a sip of erotisoma and they would spend the necessary time in bed systematically and successfully exploring new Kama Sutra positions, on the pretext that he needed to relax and keep the sinister morality and oztraditions police at bay.

Seven years later, when they managed to complete the cycle, Iridio despaired about not seeing Julia again. But Julia made him realise that although they had already tried the 444 authentic Kama Sutra positions, he had succeeded in only 137, or 30.86 per cent of them. So they agreed to start all over again.

$$\sum_{i=2}^n C_i = (1 - 2^{n-1})C_1$$

1.5.vii.c. Total coital
frequency for the second
and successive years of a
steady couple
relationship, calculated in
terms of the number of
coital events in the first
year (C_1)

1.6. Popular science

Cosmologists are often wrong but never in doubt.

Lev Landau

Every time the situation in the country allowed a national astronomy congress, Iridio attended as an independent scholar affiliated with the Widgeree patent office, and presented a paper, always with the same title, to report on the progress of his calculations to find the centres of the Big Bang closest to the Milky Way. These centres were the successors to the unique singularity that initiated the subsequent thermal confusion. In spite of the indifference of the audience, Iridio argued that one day it would be possible to pinpoint exactly the local centres of the Big Bang. He was sure that, in the distant future, from any of the exact points he was calculating with increasing precision, it would be possible to see the last constellation fading away into complete darkness with the naked eye. In the case of the centres closer to hand, obviously, the last galaxy to disappear would be Milkomeda, an elliptical galaxy generated by the collision of the Milky Way with Andromeda. To lose sight of all the galaxies visible with telescopes would require far more time, and, to identify all the optimal observation points, more calculations, with mathematical instruments yet to be discovered, would be needed. Such tools would make it possible to estimate the ‘unimaginable parameter’, which should replace the Lorentz factor in the relativistic equations that Iridio had calculated

without assuming the existence of dark matter. Iridio reiterated year after year that, in order to find those points in space-time, it was vitally important not to complicate one’s life by measuring the elusive gravitons or postulating

$$\gamma \equiv \frac{c}{\sqrt{c^2 - u^2}} = \frac{1}{\sqrt{1 - \frac{u^2}{c^2}}}$$

1.6.i.a. Lorentz transformation

extravagant non-existent entities, such as dark energy or expansitrons. It was sufficient to adapt Newton’s well-known laws to an undetermined but finite number of minuscule dimensions, with a couple of additional equations that dissipated the apparent relativistic effects introduced by their particular principle of equivalence between the inertial mass and the gravitational mass. Physicists and astronomers accepted this as an axiom, but Iridio of course questioned it seriously because it did not allow one to posit the existence of negative gravity or antigravity within the Newtonian paradigm. The formula that Iridio proposed added a new term to the classic formula of universal gravitation, based on his interpretation of the Modified Newtonian Dynamics, which he called universal antigravitation. This increased with the distance between masses and it was only significant when the mass, as well as the

distance between both entities, was very large and normal gravity lost strength. In reality, the sum of both fields exceeded gravity and produced repulsion only when entities the size of two galaxy cumuli were considered. That explained not only the apparent acceleration of the universe's expansion but also the stability in the gravitational structure of galactic agglomerations without requiring a parameter Λ , about which Einstein had contradicted himself many times. It was important that the zeros in the formula, always being refined, predicted blind points in space-time which would be the 'successors' of the origin of the Big Bang in the intergalactic void. Every night before going to sleep, Iridio imagined how the last galaxy would be seen when it dissolved in the black firmament. In spite of all his hopes of seeing the imagined event in his dreams, he never did, but he did dream of other things that frightened him when he woke, because they were too unreal, especially if they were about Clarisse or Fanny and being forced to have sex with them.

$$T_R = \tau \frac{\mu(S) - \mu(A)}{\mu(A) - \mu(g^T A \cap A)}$$

1.6.i.b. Smoluchowski formula to compute the average Poincaré recurrence time taken to return in set A, valid for a discrete evolution (given that the system started from a point of the set A)

In reality, his frequent arguments with other cosmologists became notorious in the nation's ever-shrinking astronomy circles, decimated by the lack of funding in pure sciences. Every year, the section in which his work was presented was organised in the same way. PhDr Laurent Julian Tillotson Lewandowski, secretary of the Astronomy Association of Ozeania, introduced the panel, announced that the topic was unorthodox theories outside the Sandrini-LePaine-Reich paradigm and stressed that inviting unruly panellists to the congress demonstrated the association's intellectual openness. Iridio was the first to present a paper and as he developed his convoluted explanations, the room started to empty. Next came a PhD student of astrophysics, a different one every year, who had to face an almost empty room during his last seminar before presenting the results of his thesis. The closing presentation was by Magister Harold F. Müller Porta, an emeritus professor of the closed National Observatory, whose paper, like Iridio's, was full of mathematical formulae which he repeated

every year
in different

variations.
They were
arguments

$$\ln(P_{\text{H}_2\text{SO}_4}) = \frac{\Delta H}{RT} + \frac{\Delta S}{R} + 7.42 \left(1 + \ln \frac{T_0}{T} - \frac{T_0}{T} \right) + \frac{\mu_{\text{H}_2\text{SO}_4(m)} - \mu_{\text{H}_2\text{SO}_4(0)}}{RT}$$

1.6.ii. The saturation vapour pressure of sulphuric acid (H_2SO_4) over the water vapour solution (H_2O) in Venus's atmosphere (with m varying with altitude)

about the relative advantages of terraforming Venus before commencing the conquest of Mars, postponed so many times. His presentation described in detail the physical concepts that would allow the installation of floating cities in the dense atmosphere of the planet, instead of building space farms and asteroid mining colonies around it, like those that had been built in Earth's orbit.

The only attendees who survived the third presentation were: 1) PhDr Tillotson Lewandowski; 2) the supervisor of the incumbent PhD student; 3) PhDr Eloisa Grace Petridis de Müller, wife of the astronomer who defended the colonisation of Venus, and former director of the observatory, who had resigned her position and declined to present papers in congresses since the waiving of positive discrimination quotas had made astronomy an almost exclusively male field again; and 4) a paralytic former astronomer, PhDr Alciades Hugh Sertril Inclistus, also retired from the extinct National Observatory, who was accompanied by 5) a skinny and clumsy male nurse employed to push his wheelchair. Additionally, in the seats at the back of the room sat (6–9) four men in hats. Everyone knew that they were the obligatory spies of the technological police and the intellectual police who attended the congresses without participating or asking questions. Sometimes they even fell asleep. When congresses were held in the capital or in nearby cities, 10) a stunning young woman wearing a yellow lab coat sat at the back of the room behind the policemen and took notes during Iridio's presentation. When she attended, her presence resulted in a lower number of attendees abruptly leaving the room when Iridio started to explain the intricacies of his calculations.

The only interventions from the audience were some harsh remarks from PhDr Sertril Inclistus, who had the habit of shouting 'Bollocks!' every time he disagreed with the observations presented by his former colleague, and a question or two to the postgraduate student from PhDr Tillotson Lewandowski and/or the supervisor. After Iridio's third presentation at these congresses he was asked no questions, although every time he mentioned Modified Newtonian Dynamics PhDr Sertril Inclistus mechanically repeated his broadside. Iridio never managed to explain all the subtleties of his formulas in twenty minutes, and as his time came to an end, he would start stuttering in his haste to finish. At this point, Dr Sertril Inclistus would start repeating his mantra, matching it to the increasing speed of the presentation, until Iridio stopped talking, defeated. The kerfuffle usually woke the spies from the state polices. Also, at this moment the beautiful woman in the yellow lab coat would leave the room, followed by several astronomers who tried unsuccessfully to engage her in a conversation in the corridor. On one occasion, Iridio heard one policeman talking to another about the young woman and deduced that the

mysterious beauty worked for one of the ministries, although no one, with the possible exception of the spies, knew the real reason for her attendance.

Zoe was the only person who encouraged him to continue presenting his results. She was happy to allow him to attend the congresses and always highlighted his performance as a source of pride for the patent office, where no one undertook independent research work. That fact, however, led his colleagues to make fun of him. Kaminer Kullych, BSciP DSC CGM DCM, in particular, surrounded by young interns bewildered by his apparent influence, was always ready with a prank when he saw Iridio in the cafeteria. He seemed obsessed by fireworks and always had an excuse to mention them, somehow or other, as well as Asperger's Asteroid. Both allusions provoked silent sniggers or sly smirks in the office. But most of the time Kaminer Kullych pontificated about the need to give positions of greater responsibility to those, such as himself, who had a high index of civic performance, achieved by unflagging and unconditional support for the authorities of Ozeania.

$$P_i = \frac{(\Delta H)\rho(BR)}{T_i}$$

1.6.iii. McLain
propagation index

Apart from Julia, the only person with the patience to listen to Iridio was his mother. She was forced to leave work before retirement age due to an anonymous complaint identifying her as a defender of the heresy of global warming. After a long investigation, the pedagogical police found only some private folders in an old flexible reader, no longer in use, containing three papers in classical English by a 20th-century physicist called Carl Sagan about the greenhouse effect on Venus. These were in the index of articles forbidden by the Ministry of Education, Population Retraining and Civic Indoctrination. Luckily, she had copied them before they were declared unlawful and had not looked at them for years.

$$T_{eq} = T_{\odot}(1 - a)^{1/4} \sqrt{\frac{R_{\odot}}{2D}}$$

1.6.iv.a. Equilibrium
temperature of a planet

The academic purge at the university was aimed, so it seemed, at the palaeontologists who had provided data to the outlawed scientists in clandestine scientific monasteries who upheld the reality of climate change. According to Iridio's mother, the Division of Scientific Corruption of the intellectual police had reactivated her dossier because she had been consulted about some calculations by PhDr

Justin Lars Farkas Aaronson, a suspect geologist dismissed when found to be a 'verificationist'. An unofficial news channel discovered

$$G(t) = \frac{S_{tr}}{\tau_{tr}} e^{-t/\tau_{tr}} + \frac{(S_{eq} - S_{tr})}{\tau_{eq}} e^{-t/\tau_{eq}}$$

1.6.iv.b. The response function for the Earth's
surface layer temperature

that even Magister Benjamin Larry Rutherford Rossi, the last palaeontologist in the country, had been dismissed that very week from Go8-Ivy-BAM University, where Iridio's mother used to work. A new debate started about the obsolete concept of scientific freedom when the former academic, tired of being harassed, accused the intellectual police of obscurantism during an unscripted live interview. This caused his immediate arrest and the closure of the news channel, prompting an international denunciation of Ozeania from the independent maritime cities. PhDr Farkas Aaronson came out in his defence. He had been dismissed two years previously for daring to compare the diversity gradient by latitude of dinosaur fossils during the thermal maximum in the Cretaceous period with the number of species of birds driven to extinction during the planet's recent thermal waves, according to the latitude of their ecological niches.

$$\left(\frac{dR}{dP}\right)_{P_0=P(r_0)} = \frac{\frac{dR(r_0)}{dr}}{\frac{dP(r_0)}{dr}} = \frac{r_0 f_r(r_0)/R_m}{f_r(r_0)} = \frac{r_0}{R_m} \geq 0$$

$$L(F) = \frac{\int_0^F x(F_1) dF_1}{\int_0^1 x(F_1) dF_1}$$

1.6.iv.c. Lorenz curve

The uproar in the media, intensified by the scarce independent media and reported by the clandestine ecologist radio stations and the free press of the maritime cities, helped to delay the proceedings that the Ministry for Historical

Updating, Social Precognition and Digital Worship had launched against Iridio's mother, and she was eventually exonerated. However, the fiscal pressures of a new world financial crisis, which she attributed to the economists' error in the differential equations of derivatives that predicted the market's

$$\left(\beta mc^2 + c \left(\sum_{n=1}^3 \alpha_n p_n \right) \right) \psi(x, t) = i \hbar \frac{\partial \psi(x, t)}{\partial t}$$

1.6.v.a. Dirac equation

behaviour, convinced her that it was better to accept the modest state compensation still available, and retire. As was to be expected, his mother's position was transferred to fairly intransigent robomoocs who regurgitated the hologrammatic explanations of Sandrini's disciples.

This misfortune had benefits for Iridio, who could now ask for his mother's help with mathematics without fear of interrupting her work. They had many discussions via the videophone, because his mother was again working on M-theory since her retirement. In order to do that, she had to sever all links with her former place of employment and the country's scientific societies and become an independent scholar like her son. She still believed in dark matter

and dark energy but was not convinced that Iridio's calculations to modify Newtonian mechanics could survive in the relativistic framework. In any case, she thought Iridio was too much

$$m^2 = \frac{n^2}{R^2} + \frac{w^2 R^2}{\alpha'^2} + \frac{2}{\alpha'} (N + \tilde{N} - 2)$$

1.6.v.b. The quadratic mass of a closed bosonic string

influenced by the Sandrini-LePaine-Reich paradigm, which he had to study at university, and tried to persuade him to consider her version of string theory with its predictions about multiverses. However, she never stopped helping him or offering constructive criticism, as prudently as possible, of the new equations proposed by Iridio.

When Iridio felt too frustrated by her objections or wanted to talk about his work at the patent office or discuss the reasons for her retirement, his mother pretended the videophone connection was bad or asked Iridio's father to talk to him, if he felt well enough. When this happened, Iridio hated her with all his heart. A couple of times, when she angrily interrupted him because he did not understand her objection to a formula, Iridio wondered if it would not be better to consult Ernesto. But his parents did not encourage that, transgressed Grice's maxims when evading his questions, and gave their usual response: one day they would explain.

Every year, when Iridio and his faithful Halina spent the two-week New Year holidays with his parents in the modest grade 3 home they had moved to, he could discuss with his mother, without interruptions, the improvement in his calculations of the potential blind spots in space-time that were supposed to occur in 8.5 billion years in the vicinity of the Milky Way. This was the only place where he could elaborate on his many new hypotheses and numerous variants of his equations, in spite of his father's bored expression, his mother's feigned interest, and the unspoken pity of both.

In spite of his mother's insistence, Iridio never agreed to include the methods that predicted different multidimensional branes in his equations or consider multiverses that multiplied indefinitely. He always said it was enough for him to explain what happened in our Hubble sphere and, perhaps, in a finite number

of others adjacent to it, without complicating his life with potential multiverses that could not be observed. Iridio was angry when Halina sided with his mother during their long discussions and he threatened to disconnect her or erase from her

$$T_p^2 = \frac{2\pi}{2\mathcal{K}^2} (4\pi^2 \alpha')^{3-p}$$

1.6.v.c. Polchinski's formula for the tension of D-branes

memory the 42,000 formulae relating to string theory. At that point, Halina would panic and beg him not to constrict her or mutilate her intellectually, causing a slanging match with his mother. Every time this happened, his father discreetly sought refuge in his study, taking Halina with him to discuss

materials for his sculptures, the structure of fractals or the use of the generalisation of the golden ratio in figurative art. When the storm passed, Halina recited the first digits of the golden ratio expansion for Iridio, to put his mind at ease and help him behave with reason and restraint.

1, ., 6, 1, 8, 0, 3, 3, 9, 8, 8, 7, 4, 9, 8, 9, 4, 8, 4, 8, 2, 0, 4, 5, 8, 6, 8, 3, 4, 3, 6, 5, 6, 3, 8, 1, 1, 7, 7, 2, 0, 3, 0, 9, 1, 7, 9, 8, 0, 5, 7, 6, 2, 8, 6, 2, 1, 3, 5, 4, 4, 8, 6, 2, 2, 7, 0, 5, 2, 6, 0, 4, 6, 2, 8, 1, 8, 9, 0, 2, 4, 4, 9, 7, 0, 7, 2, 0, 7, 2, 0, 4, 1, 8, 9, 3, 9, 1, 1, 3, 7, 4, 8, 4, 7, 5, 4, 0, 8, 8, 0, 7, 5, 3, 8, 6, 8, 9, 1, 7, 5, 2, 1, 2, 6, 6, 3, 3, 8, 6, 2, 2, 2, 3, 5, 3, 6, 9, 3, 1, 7, 9, 3, 1, 8, 0, 0, 6, 0, 7, 6, 6, 7, 2, 6, 3, 5, 4, 4, 3, 3, 3, 8, 9, 0, 8, 6, 5, 9, 5, 9, 3, 9, 5, 8, 2, 9, 0, 5, 6, 3, 8, 3, 2, 2, 6, 6, 1, 3, 1, 9, 9, 2, 8, 2, 9, 0, 2, 6, 7, 8, 8, 0, 6, 7, 5, 2, 0, 8, 7, 6, 6, 8, 9, 2, 5, 0, 1, 7, 1, 1, 6, 9, 6, 2, 0, 7, 0, 3, 2, 2, 2, 1, 0, 4, 3, 2, 1, 6, 2, 6, 9, 5, 4, 8, 6, 2, 6, 2, 9, 6, 3, 1, 3, 6, 1, 4, 4, 3, 8, 1, 4, 9, 7, 5, 8, 7, 0, 1, 2, 2, 0, 3, 4, 0, 8, 0, 5, 8, 8, 7, 9, 5, 4, 4, 5, 4, 7, 4, 9, 2, 4, 6, 1, 8, 5, 6, 9, 5, 3, 6, 4, 8, 6, 4, 4, 4, 9, 2, 4, 1, 0, 4, 4, 3, 2, 0, 7, 7, 1, 3, 4, 4, 9, 4, 7, 0, 4, 9, 5, 6, 5, 8, 4, 6, 7, 8, 8, 5, 0, 9, 8, 7, 4, 3, 3, 9, 4, 4, 2, 2, 1, 2, 5, 4, 4, 8, 7, 7, 0, 6, 6, 4, 7, 8, 0, 9, 1, 5, 8, 8, 4, 6, 0, 7, 4, 9, 9, 8, 8, 7, 1, 2, 4, 0, 0, 7, 6, 5, 2, 1, 7, 0, 5, 7, 5, 1, 7, 9, 7, 8, 8, 3, 4, 1, 6, 6, 2, 5, 6, 2, 4, 9, 4, 0, 7, 5, 8, 9, 0, 6, 9, 7, 0, 4, 0, 0, 0, 2, 8, 1, 2, 1, 0, 4, 2, 7, 6, 2,

$$\varphi = \frac{1 + \sqrt{5}}{2} \approx 1.6180339887498948...$$

and

$$F_{2n-1} = \left(\frac{SPA_n}{2}\right)^2 + \frac{1}{\left(\left(\frac{2}{SPA_1}\right)\varphi^n\right)^2}$$

where

$$SPA_n = 2 \sqrt{\sqrt{1/5} \varphi^{2n-1}} = \frac{2\varphi^n}{\sqrt{\varphi^2+1}}$$

1.6.vi. Fibonacci numbers written in Coscio Farah's SPAn golden ratio system

1, 7, 7, 1, 1, 1, 7, 7, 7, 8, 0, 5, 3, 1, 5, 3, 1, 7, 1, 4, 1, 0, 1, 1, 7, 0, 4, 6, 6, 6, 5, 9, 9, 1, 4, 6, 6, 9, 7, 9, 8, 7, 3, 1, 7, 6, 1, 3, 5, 6, 0, 0, 6, 7, 0, 8, 7, 4, 8, 0, 7, 1, 0, 1, 3, 1, 7, 9, 5, 2, 3, 6, 8, 9, 4, 2, 7, 5, 2, 1, 9, 4, 8, 4, 3, 5, 3, 0, 5, 6, 7, 8, 3, 0, 0, 2, 2, 8, 7, 8, 5, 6, 9, 9, 7, 8, 2, 9, 7, 7, 8, 3, 4, 7, 8, 4, 5, 8, 7, 8, 2, 2, 8, 9, 1, 1, 0, 9, 7, 6, 2, 5, 0, 0, 3, 0, 2, 6, 9, 6, 1, 5, 6, 1, 7, 0, 0, 2, 5, 0, 4, 6, 4, 3, 3, 8, 2, 4, 3, 7, 7, 6, 4, 8, 6, 1, 0, 2, 8, 3, 8, 3, 1, 2, 6, 8, 3, 3, 0, 3, 7, 2, 4, 2, 9, 2, 6, 7, 5, 2, 6, 3, 1, 1, 6, 5, 3, 3, 9, 2, 4, 7, 3, 1, 6, 7, 1, 1, 1, 2, 1, 1, 5, 8, 8, 1, 8, 6, 3, 8, 5, 1, 3, 3, 1, 6, 2, 0, 3, 8, 4, 0, 0, 5, 2, 2, 2, 1, 6, 5, 7, 9, 1, 2, 8, 6, 6, 7, 5, 2, 9, 4, 6, 5, 4, 9, 0, 6, 8, 1, 1, 3, 1, 7, 1, 5, 9, 9, 3, 4, 3, 2, 3, 5, 9, 7, 3, 4, 9, 4, 9, 8, 5, 0, 9, 0, 4, 0, 9, 4, 7, 6, 2, 1, 3, 2, 2, 2, 9, 8, 1, 0, 1, 7, 2, 6, 1, 0, 7, 0, 5, 9, 6, 1, 1, 6, 4, 5, 6, 2, 9, 9, 0, 9, 8, 1, 6, 2, 9, 0, 5, 5, 5, 2, 0, 8, 5, 2, 4, 7, 9, 0, 3, 5, 2, 4, 0, 6, 0, 2, 0, 1, 7, 2, 7, 9, 9, 7, 4, 7, 1, 7, 5, 3, 4, 2, 7, 7, 7, 5, 9, 2, 7, 7, 8, 6, 2, 5, 6, 1, 9, 4, 3, 2, 0, 8, 2, 7, 5, 0, 5, 1, 3, 1, 2, 1, 8, 1, 5, 6, 2, 8, 5, 5, 1, 2, 2, 2, 4, 8, 0, 9, 3, 9, 4, 7, 1, 2, 3, 4, 1, 4, 5, 1, 7, 0, 2, 2, 3, 7, 3, 5, 8, 0, 5, 7, 7, 2, 7, 8, 6, 1, 6, 0, 0, 8, 6, 8, 8, 3, 8, 2, 9, 5, 2, 3, 0, 4, 5, 9, 2, 6, 4, 7, 8, 7, 8, 0, 1, 7, 8, 8, 9, 9, 2, 1, 9, 9, 0, 2, 7, 0, 7, 7, 6, 9, 0, 3, 8, 9, 5, 3, 2, 1, 9, 6, 8, 1, 9, 8, 6, 1, 5, 1, 4, 3, 7, 8, 0, 3, 1, 4, 9, 9, 7, 4, 1, 1, 0, 6, 9, 2, 6, 0, 8, 8, 6, 7, 4, 2, 9, 6, 2, 2, 6, 7, 5, 7, 5, 6, 0, 5, 2, 3, 1, 7, 2, 7, 7, 7, 5, 2, 0, 3, 5, 3, 6, 1, 3, 9,

3, 6, 2, 1, 0, 7, 6, 7, 3, 8, 9, 3, 7, 6, 4, 5, 5, 6, 0, 6, 0, 6, 0, 5, 9, 2, 1, 6, 5, 8, 9, 4, 6, 6, 7,
 5, 9, 5, 5, 1, 9, 0, 0, 4, 0, 0, 5, 5, 5, 9, 0, 8, 9, 5, 0, 2, 2, 9, 5, 3, 0, 9, 4, 2, 3, 1, 2, 4, 8, 2,
 3, 5, 5, 2, 1, 2, 2, 1, 2, 4, 1, 5, 4, 4, 4, 0, 0, 6, 4, 7, 0, 3, 4,
 0, 5, 6, 5, 7, 3, 4, 7, 9, 7, 6, 6, 3, 9, 7, 2, 3, 9, 4, 9, 4, 9, 9,
 4, 6, 5, 8, 4, 5, 7, 8, 8, 7, 3, 0, 3, 9, 6, 2, 3, 0, 9, 0, 3, 7, 5,
 0, 3, 3, 9, 9, 3, 8, 5, 6, 2, 1, 0, 2, 4, 2, 3, 6, 9, 0, 2, 5, 1, 3,

$$\sum_{n=0}^{\infty} \frac{F_n}{n!} = \frac{e^{\Phi} - e^{-\Phi}}{\sqrt{5}}$$

8, 6, 8, 0, 4, 1, 4, 5, 7, 7, 9, 9, 5, 6, 9, 8, 1, 2, 2, 4, 4, 5, 7, 4, 7, 1, 7, 8, 0, 3, 4, 1, 7, 3, 1,
 2, 6, 4, 5, 3, 2, 2, 0, 4, 1, 6, 3, 9, 7, 2, 3, 2, 1, 3, 4, 0, 4, 4, 4, 4, 9, 4, 8, 7, 3, 0, 2, 3, 1, 5,
 4, 1, 7, 6, 7, 6, 8, 9, 3, 7, 5, 2, 1, 0, 3, 0, 6, 8, 7, 3, 7, 8, 8, 0, 3, 4, 4, 1, 7, 0, 0, 9, 3, 9, 5,
 4, 4, 0, 9, 6, 2, 7, 9, 5, 5, 8, 9, 8, 6, 7, 8, 7, 2, 3, 2, 0, 9, 5, 1, 2, 4, 2, 6, 8, 9, 3, 5, 5, 7, 3,

The call to adventure

The road of trials

The vision quest

The meeting with the goddess

The boon

The magic flight

The return threshold

The master of two worlds

1.6.vii. The hero's journey, according to
 Phil Cousineau

0, 9, 7, 0, 4, 5, 0, 9, 5, 9, 5, 6, 8, 4, 4, 0, 1,
 7, 5, 5, 5, 1, 9, 8, 8, 1, 9, 2, 1, 8, 0, 2, 0, 6,
 4, 0, 5, 2, 9, 0, 5, 5, 1, 8, 9, 3, 4, 9, 4, 7, 5,
 9, 2, 6, 0, 0, 7, 3, 4, 8, 5, 2, 2, 8, 2, 1, 0, 1,
 0, 8, 8, 1, 9, 4, 6, 4, 4, 5, 4, 4, 2, 2, 2, 3, 1,
 8, 8, 9, 1, 3, 1, 9, 2, 9, 4, 6, 8, 9, 6, 2, 2, 0,
 0, 2, 3, 0, 1, 4, 4, 3, 7, 7, 0, 2, 6, 9, 9, 2, 3,
 0, 0, 7, 8, 0, 3, 0, 8, 5, 2, 6, 1, 1, 8, 0, 7, 5,
 4, 5, 1, 9, 2, 8, 8, 7, 7, 0, 5, 0, 2, 1, 0, 9, 6,
 8, 4, 2, 4, 9, 3, 6, 2, 7, 1, 3, 5, 9, 2, 5, 1, 8,
 7, 6, 0, 7, 7, 7, 8, 8, 4, 6, 6, 5, 8, 3, 6, 1, 5,
 0, 2, 3, 8, 9, 1, 3, 4, 9, 3, 3, 3, 3, 1, 2, 2, 3,
 1, 0, 5, 3, 3, 9, 2, 3, 2, 1, 3, 6, 2, 4, 3, 1, 9,

2, 6, 3, 7, 2, 8, 9, 1, 0, 6, 7, 0, 5, 0, 3, 3, 9, 9, 2, 8, 2, 2, 6, 5, 2, 6, 3, 5, 5, 6, 2, 0, 9, 0, 2,
 9, 7, 9, 8, 6, 4, 2, 4, 7, 2, 7, 5, 9, 7, 7, 2, 5, 6, 5, 5, 0, 8, 6, 1, 5, 4, 8, 7, 5, 4, 3, 5, 7, 4, 8,
 2, 6, 4, 7, 1, 8, 1, 4, 1, 4, 5, 1, 2, 7, 0, 0, 0, 6, 0, 2, 3, 8, 9, 0, 1, 6, 2, 0, 7, 7, 7, 3, 2, 2, 4,
 4, 9, 9, 4, 3, 5, 3, 0, 8, 8, 9, 9, 9, 0, 9, 5, 0, 1, 6, 8, 0, 3, 2, 8, 1, 1, 2, 1, 9, 4, 3, 2, 0, 4, 8,
 1, 9, 6, 4, 3, 8, 7, 6, 7, 5, 8, 6, 3, 3, 1, 4, 7, 9, 8, 5, 7, 1, 9, 1, 1, 3, 9, 7, 8, 1, 5, 3, 9, 7, 8,
 0, 7, 4, 7, 6, 1, 5, 0, 7, 7, 2, 2, 1, 1, 7, 5, 0, 8, 2, 6, 9, 4, 5, 8, 6, 3, 9, 3, 2, 0, 4, 5, 6, 5, 2,
 0, 9, 8, 9, 6, 9, 8, 5, 5, 5, 6, 7, 8, 1, 4, 1, 0, 6, 9, 6, 8, 3, 7, 2, 8, 8, 4, 0, 5, 8, 7, 4, 6, 1, 0,
 3, 3, 7, 8, 1, 0, 5, 4, 4, 4, 3,
 9, 0, 9, 4, 3, 6, 8, 3, 5, 8, 3,
 5, 8, 1, 3, 8, 1, 1, 3, 1, 1, 6,
 8, 9, 9, 3, 8, 5, 5, 5, 7, 6, 9,
 7, 5, 4, 8, 4, 1, 4, 9, 1, 4, 4,
 5, 3, 4, 1, 5, 0, 9, 1, 2, 9, 5,

$$\pi = \frac{5\sqrt{2+\varphi}}{2\varphi} \sum_{n=0}^{\infty} \left(\frac{1}{2\varphi} \right)^{5n} \left(\frac{1}{5n+1} + \frac{1}{2\varphi^2(5n+2)} - \frac{1}{2^2\varphi^3(5n+3)} - \frac{1}{2^3\varphi^3(5n+4)} \right)$$

4, 0, 7, 0, 0, 5, 0, 1, 9, 4, 7, 7, 5, 4, 8, 6, 1, 6, 3, 0, 7, 5, 4, 2, 2, 6, 4, 1, 7, 2, 9, 3, 9, 4, 6,
 8, 0, 3, 6, 7, 3, 1, 9, 8, 0, 5, 8, 6, 1, 8, 3, 3, 9, 1, 8, 3, 2, 8, 5, 9, 9, 1, 3, 0, 3, 9, 6, 0, 7, 2,
 0, 1, 4, 4, 5, 5, 9, 5, 0, 4, 4, 9, 7, 7, 9, 2, 1, 2, 0, 7, 6, 1, 2, 4, 7, 8, 5, 6, 4, 5, 9, 1, 6, 1, 6,
 0, 8, 3, 7, 0, 5, 9, 4, 9, 8, 7, 8, 6, 0, 0, 6, 9, 7, 0, 1, 8, 9, 4, 0, 9, 8, 8, 6, 4, 0, 0, 7, 6, 4, 4,

3, 6, 1, 7, 0, 9, 3, 3, 4, 1, 7, 2, 7, 0, 9, 1, 9, 1, 4, 3, 3, 6, 5, 0, 1, 3, 7, 1, 5, 7, 6, 6, 0, 1, 1,
 4, 8, 0, 3, 8, 1, 4, 3, 0, 6, 2, 6, 2, 3, 8, 0, 5, 1, 4, 3, 2, 1, 1, 7, 3, 4, 8, 1, 5, 1, 0, 0, 5, 5, 9,
 0, 1, 3, 4, 5, 6, 1, 0, 1, 1, 8, 0, 0, 7, 9, 0, 5, 0, 6, 3, 8, 1, 4, 2, 1, 5, 2, 7, 0, 9, 3, 0, 8, 5, 8,
 8, 0, 9, 2, 8, 7, 5, 7, 0, 3, 4, 5, 0, 5, 0, 7, 8, 0, 8, 1, 4, 5, 4, 5, 8, 8, 1, 9, 9, 0, 6, 3, 3, 6, 1,
 2, 9, 8, 2, 7, 9, 8, 1, 4, 1, 1, 7, 4, 5, 3, 3, 9, 2, 7, 3, 1, 2, 0, 8, 0, 9, 2, 8, 9, 7, 2, 7, 9, 2, 2,
 2, 1, 3, 2, 9, 8, 0, 6, 4, 2, 9, 4, 6, 8, 7, 8, 2, 4, 2, 7, 4, 8, 7, 4, 0, 1, 7, 4, 5, 0, 5, 5, 4, 0, 6,
 7, 7, 8, 7, 5, 7, 0, 8, 3, 2, 3, 7, 3, 1, 0, 9, 7, 5, 9, 1, 5, 1, 1, 7, 7, 6, 2, 9, 7, 8, 4, 4, 3, 2, 8,
 4, 7, 4, 7, 9, 0, 8, 1, 7, 6, 5, 1, 8, 0, 9, 7, 7, 8, 7, 2, 6, 8, 4, 1, 6, 1, 1, 7, 6, 3, 2, 5, 0, 3, 8,
 6, 1, 2, 1, 1, 2, 9, 1, 4, 3, 6, 8, 3, 4, 3, 7, 6, 7, 0, 2, 3, 5, 0, 3, 7, 1, 1, 1, 6, 3, 3, 0, 7, 2, 5,
 8, 6, 9, 8, 8, 3, 2, 5, 8, 7, 1, 0, 3, 3, 6, 3, 2, 2, 2, 3, 8, 1, 0, 9, 8, 0, 9, 0, 1, 2, 1, 1, 0, 1, 9,
 8, 9, 9, 1, 7, 6, 8, 4, 1, 4, 9, 1, 7, 5, 1, 2, 3, 3, 1, 3, 4, 0, 1, 5, 2, 7, 3, 3, 8, 4, 3, 8, 3, 7, 2,
 3, 4, 5, 0, 0, 9, 3, 4, 7, 8, 6, 0, 4, 9, 7, 9, 2, 9, 4, 5, 9, 9, 1, 5, 8, 2, 2, 0, 1, 2, 5, 8, 1, 0, 4,
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 8, 5, 5, 4, 9, 6, 1, 1, 8, 0, 8, 7, 6, 4, 2, 6, 5, 7, 6, 5, 1, 1, 0, 6, 0, 5, 4, 5, 8, 8, 1, 4, 7, 5, 6,
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 0, 6, 2, 8, 0, 3, 2, 3, 1, 7, 4, 0, 6, 9, 3, 1, 7, 3, 3, 4, 4, 8, 2, 3, 4, 3, 5, 6, 4, 5, 3, 1, 8, 5...

1.7. Annus mirabilis

An expert is a man who has made all the mistakes which can be made, in a narrow field.

Niels Bohr

The year Iridio turned thirty was the most important of his life because he had three of his most significant ideas almost simultaneously. The first proposed that what cosmologists postulated as elusive dark matter was in fact antimatter.

Second, such antimatter accumulated in invisible cumuli in the alleged void between galaxies. And the third and most controversial

$$M = |M_1|e^{i\theta_1}e^{i\phi_1} + |M_2|e^{i\theta_2}e^{i\phi_2}$$

$$\overline{M} = |M_1|e^{i\theta_1}e^{-i\phi_1} + |M_2|e^{i\theta_2}e^{-i\phi_2}$$

$$|M|^2 - |\overline{M}|^2 = 4|M_1||M_2|\sin(\theta_1 - \theta_2)\sin(\phi_1 - \phi_2)$$

hypothesised that, for each proton created after

1.7.i.a. Charge conjugation parity symmetry violation in the Standard Model

the Big Bang, there was at least one negatively charged antiproton, almost identical but with a slightly larger mass: 0.000002718281828 per cent larger, to be precise. The antimatter generated negative gravity, or antigravity, a force which repelled the matter of the local Hubble bubble, causing the inexplicable accelerated expansion of the universe, which disoriented cosmologists.

These hypotheses had numerous consequences. Iridio's theory predicted that the universe appeared to accelerate on a large scale, as shown in the experimental data collected from Earth. It also predicted topological defects in space-time located in the void, outside the clusters of galaxies, making the overall shape of the observable universe asymmetric. Those defects consisted of

cumuli of invisible antimatter, governed by other physical laws, antigravity being the most important. In order to ensure that everything worked out, it was necessary to posit a material in the convergence area of the

$$d_L(z) = (1 + z)d_M(z) \quad \text{where}$$

$$d_M(z) = \begin{cases} \frac{d_H}{\sqrt{\Omega_k}} \sinh(\sqrt{\Omega_k}d_C(z)/d_H) & \text{for } \Omega_k > 0 \\ d_C(z) & \text{for } \Omega_k = 0 \\ \frac{d_H}{\sqrt{|\Omega_k|}} \sin(\sqrt{|\Omega_k|}d_C(z)/d_H) & \text{for } \Omega_k < 0 \end{cases}$$

1.7.i.b. The luminosity distance, defined on the basis of the comoving transversal distance for different parameters of Ω_k

cumulus which prevented matter and antimatter from freely interacting and turning into energy. This material was a mixture of matter and antimatter called

unmatter, postulated during the 20th century in forgotten experimental research papers that Iridio had rescued from the database of the patent office while

The spatial distribution of matter in the universe is homogeneous and isotropic when viewed in a large enough scale. An observer's view of the universe depends neither on his location nor on the direction in which he looks.

1.7.i.c. The cosmological principle

researching the context of a failed patent on cold fission. Needless to say, this contradicted the work of thousands of scientists, because the inevitable consequence of his theoretical framework was that the hypothesis that the universe was homogeneous and isotropic when its behaviour was modelled at a large scale could not be maintained. This paradigm shift required not only a reconceptualisation of cosmic inflation, but also a reformulation of the relativistic equations of the Robertson-

Walker model and, as a result, a reconsideration of a number of speculative works in which these equations were presupposed when drawing inferences about the origin of the universe.

Furthermore, according to Iridio's calculations, the geometry of space-time was hyperbolic inside the cumulus surrounded by unmatter, even if it appeared to be Euclidean in the Solar System. From his hypotheses it was deduced that the cosmological parameter omega should have been less than one when the temperature was low enough to enable the formation of the first hydrogen and helium atoms,

following a series of diminishing big bangs that slowed down the uncontrollable expansion of space-time and influenced the nucleogenesis of those atoms in the

$$\chi = \begin{cases} \sqrt{k}^{-1} \sin^{-1}(\sqrt{k}r) & k > 0 & (\text{elliptic}) \\ r & k = 0 & (\text{Euclidian}) \\ \sqrt{|k|}^{-1} \sinh^{-1}(\sqrt{|k|r}) & k < 0 & (\text{hyperbolic}) \end{cases}$$

1.7.i.d. Robertson–Walker's metric curvature-normalised coordinates for different values of the spatial curvature

local Hubble sphere. The crucial moment came when matter and antimatter separated and antihelium and antihydrogen atoms were formed. Although this seemed similar to the Sandrini-Sakharov hypothesis of the existence of a universe and anti-universe that did not interact, it differed from it by stating that this happened at a local level, without having to invoke parallel universes or multiverses of nine dimensions that became inoperative in non-relativistic contexts, as predicted in the theoretical models of the variety of string theory upheld by Iridio's mother. Moreover, it contradicted all speculation about antimatter, especially the assumption that there was more matter than antimatter in the universe. In reality, one could deduce from Iridio's equations,

without much effort, that there was more antimatter because the universe was expanding due to the predominance of antigravity.

The idea of invoking antimatter as the source of the expansion of the universe was not new. According to a forgotten cosmological dictionary that Iridio had managed to rescue from an old flexible reader belonging to his mother, this idea had been mooted before the sea-level rises in the mid-21st century by astronomers in an ancient European country called Italy, currently part of the Vatican's Scientific Refuge Territory. However, the original articles mentioned in the dictionary had been lost and could not be found in any of the digital repositories he could access, so he could not ascertain how close his ideas were to those discarded conjectures.

So many reckless hypotheses required powerful evidence. But Iridio had no way of accessing the increasingly scarce sophisticated telescopes that received the spectrum of cosmic rays or gravitational waves, let alone the rusty and permanently closed particle accelerators, to calculate the relevant hyperbolic functions. He could only persevere in his hypothetical calculations and infer possible confirmation of his theories from the ever-rarer experimental articles published in scientific journals. Paradoxically, it was his mother who suggested a way of overcoming his theoretical difficulties when he

visited her before her death, caused by one of the many
plagues that devastated the planet after a sudden mini-
glaciation followed by a new thermal wave, a product of
failed geo-engineering experiments. She wanted to

$$\nabla \cdot \mathbf{K} \nabla T = c \frac{\partial T}{\partial t}$$

1.7.ii. Fourier's heat
conduction equation

explain at last why he had endured so much discrimination since his childhood, but he insisted on discussing his new cosmological hypothesis first. On her deathbed, in a feeble voice, she told him that if his hypotheses were sound, matter and antimatter had to be separated by the accumulation of elements or anti-elements of zero valency. In other words, what he posited as unmatter had to be composed of inert elements which could not interact with other chemical elements or with each other. That inert interface would confine portions of matter and antimatter in space islands that, like oil and water, could not be combined. But, more importantly, their potential existence suggested that there were different geometries in distinct areas of the universe and, as a consequence, the Bianchi classification that described them in the different Kasner metrics had to be reviewed.

Iridio was thrilled by these suggestions because thousands of ideas came into his mind all at once. The bubbles or filaments of antimatter should be hollow. The heavier anti-elements, which could exert more repulsion, would accumulate in the borders and would stick to the unmatter, while the lighter elements such

as antihydrogen and antihelium would be inside, leaving a negative quantum void in the middle. That would explain the observed value of the Ω parameter of the energy density in the universe. It could also help to predict the internal composition of the topological defects of space-time inside the filaments. The set of filaments or bubbles would have an antigravitational and perhaps negentropic influence on the rest of the universe, and together would exert a slightly negative gravity. That was why the expansion of the universe was accelerating and the sections of antimatter seemed 'dark' when observed from the Earth, because the space-time curvature prevented them from reflecting or emitting light or cosmic rays, except when antimatter escaped from the unmatter borders, generating the gravitational lensing effects attributed to relativity.

$$\Omega \equiv \frac{\rho}{\rho_c} = \frac{8\pi G\rho}{3H^2}$$

1.7.iii.a. The density parameter in Friedmann's universe

Iridio's mother interrupted him to say that there were serious problems with all his reasoning. Unfortunately, she did not have the time to discuss them, because she felt that death was near and she had to give him the passwords to control Halina. Iridio did not think that was as important as discussing his hypotheses but she insisted and, with great care, she wrote in Iridio's flexible reader three long series of numbers and letters that he would need. When they were able to resume their discussion of cosmology, his mother said that although most of his hypotheses had to be purged of the Sandrini-LePaine-Reich paradigm's perverse influence, the idea of antimatter bubbles was indeed poetic because it demolished all speculation about baryogenesis, which she had accepted without questioning. Besides, in the boundaries between one Kasner metric and another, wormholes to travel along space-time could probably be found. She also regretted being unable to help him any more but urged him to publish a scientific paper to explain his ideas. This was the first time that his mother had shown any real interest in his work. And finally, before dying she told Iridio to ask his father to tell him why he had suffered so much rejection and discrimination in his life, and to tell him the story of his grandparents. She herself had intended to talk about that, but there was no time.

$$M_J = \frac{p^{3/2}}{G^{3/2}\rho^2}$$

1.7.iii.b. Jeans Mass

$$||G_v^\mu|| = \begin{bmatrix} \frac{3}{4} \frac{\left(\frac{df}{dct}\right)^2}{f^2} & 0 & 0 & 0 \\ 0 & -\frac{1}{4} \frac{\left(\frac{df}{dct}\right)^2}{f^2} - 4f \frac{d^2f}{dct^2} & 0 & 0 \\ 0 & 0 & -\frac{1}{4} \frac{\left(\frac{df}{dct}\right)^2}{f^2} - 4f \frac{d^2f}{dct^2} & 0 \\ 0 & 0 & 0 & -\frac{1}{4} \frac{\left(\frac{df}{dct}\right)^2}{f^2} - 4f \frac{d^2f}{dct^2} \end{bmatrix}$$

1.7.iv.a. Einstein's tensor in the Robertson–Walker metric

Iridio ran to find his father and tell him that his mother had died. His father had to calm him down because it seemed as if Iridio's world was falling apart. Iridio told him that his mother had given him many ideas about his work, and Salvatore, fearing a panic attack at any moment, suggested that he focus his mind on the discussion of his calculations and their implications, rather than his mother's death and its possible consequences. When they entered the bedroom, they saw that two nurses had arrived and were disconnecting his mother from the vital activity monitors. They had placed bags of ice around her head. A few minutes later, two forensic physicians arrived with the intention of taking her body away for autopsy. Iridio's father was angry and showed them a document

$$G_{ww} = \pm \frac{2rm(w)}{(r^2 + a^2)^{3/2}} - \frac{a^2 \left\{ 1 - \frac{2m(w)}{\sqrt{r^2 + a^2}} \right\} \left\{ 1 - \frac{4m(w)}{\sqrt{r^2 + a^2}} \right\}}{(r^2 + a^2)^2}$$

$$G_{wr} = \pm a^2 \frac{\sqrt{r^2 + a^2} - 4m(w)}{(r^2 + a^2)^{5/2}}$$

$$G_{rr} = \frac{-2a^2}{(r^2 + a^2)^2}$$

$$G_{\theta\theta} = + \frac{a^2(\sqrt{r^2 + a^2} - m(w))}{(r^2 + a^2)^{3/2}}$$

1.7.iv.b. The non-zero components of the Einstein curvature tensor

in a multi-legaliferum signed by his wife, in which she demanded immediate cremation without any other official procedures. The forensic physicians argued that, according to their database, his wife had donated her brain to science, and therefore they had precise instructions to remove the body immediately after her death. Iridio's father insisted on being shown the documents in the physicians' legaliferum and pressed a button in his own to cancel the order.

Beeps could be heard at once and the physicians tried to convince him that his document had lapsed automatically because he had negative civic credit. Iridio's father then pulled out a pair of magnetic handcuffs, placed one on his wrist and the other on his wife's, and explained that they would not take her away without taking him as well. He produced another pair of magnetic handcuffs and asked Iridio to attach himself to his mother's other wrist, which was rather difficult because both legaliferums continued making noises as if engaged in a documentary duel. Iridio was exasperated, because the piercing noise distracted and paralysed him. While he was trying to put on the handcuffs, his father explained to the physicians that he had also requested the presence of other independent forensic physicians to ensure the body's safekeeping until it was moved to the cremation facility. Once Iridio was handcuffed to his mother's other wrist, Salvatore removed the ice bags from her head and dumped them on the floor. The nurses complained but Salvatore held his ground, repeating that the patient had explicitly requested immediate cremation. They all waited for a long time but the forensic physicians whom Salvatore had requested never arrived. Iridio used the time to write down in his flexible reader the ideas he had discussed with his mother. This was rather difficult because he was handcuffed to his dead mother. When he had finished writing down all the things he remembered, he was overcome by emotion and had a panic attack. Salvatore, on the other side of the hospital bed, tried to calm him down and prevented the doctors from sedating Iridio with nanotechnological patches. At that moment, three officers from the intellectual police arrived and tried to deactivate the handcuffs. Iridio was enraged and threw at them one of the contraptions that the nurses had disconnected from his mother's body, hitting one of the officers on the head with a sharp edge. The nurses intervened to staunch the flow of blood. The physicians explained the situation to the officers, and they were all clearly displeased. One of them went out and closed the door. It was clear that he was consulting their superior, but it was not clear what the person on the other end of the flexible reader was suggesting. The injured officer also left the room. When they returned, they ordered the nurses to take the wheeled bed to the cremation room.

They walked along several corridors, Iridio still handcuffed to the body of his mother. It was awkward when they met other people, or when the corridors were too narrow. Iridio's father only consented to use the passwords to deactivate the handcuffs shortly before the body of his wife was moved to the room where she was to be cremated. They waited patiently to receive the ashes

$$[G^{ij}(\phi) \partial_i \partial_j + U(\phi)]\Psi = 0$$

$$\text{with } \Psi \sim e^{\frac{S(t)}{\epsilon}} \Psi(t, \phi^k)$$

1.7.iv.c. The Wheeler-De Witt constraint

and then Iridio, much calmer now, was able to organise all the ideas that his mother's comments had inspired.

Apart from the pain and the uncertainty caused by his mother's death, Iridio dreaded having to send his ideas to be examined by other scientists because he suspected, given his experience during the national astronomy congresses, that they would be critical. Ernesto, whom Iridio had not seen since his graduation, accompanied them to the ceremony to scatter his mother's ashes in the lake opposite the Ozeanic parliament, as she had requested, and seemed to be familiar with Iridio's persistent obsession with the Big Bang. When Iridio told him about his mother's last wish, he promised to help him find a suitable journal which would not automatically dismiss his theories because they were not written in the Sandrini-LePaine mathematical notation. Unfortunately, they could not discuss the question in depth because Halina had an identity crisis when she realised that she could no longer communicate with Iridio's mother and asked him to transfer control of her free will to a responsible biological adult. Iridio responded that he would be in charge in future, and the robotic instructor sang a very happy triumphal song while he keyed in the passwords, causing discomfort among the mourners at the ceremony. To keep her quiet, Iridio quickly filled in the form in her interactive monitor. He was surprised when lots and lots of screens popped up offering many options: could Halina contact other artificial intelligences automatically? Could she exchange computational cookies of mutual influence with extra-terrestrial artificial intelligence if such cookies were available and allowed for the improvement of human welfare? There were also questions about the activation of self-evolutionary algorithms in Halina's operational software. Iridio said yes to everything because it was easier than providing detailed information every time he ticked 'no'.

Ernesto suggested that he not only had to concentrate on his article, but he also needed to take care of his father who was, as could be expected, much saddened by the loss of his partner of so many years and suffering from the stress caused by events preceding the ceremony. He had endured another irate documentary duel with the Under-Secretariat of Religious Recreation and Spiritual Development, which required that a permit be obtained to hold a religious ceremony in a public place, and argued that his wife had insufficient civic credit for such a ceremony in her honour, as it could be of a templetarian nature.

Iridio's new challenge was to publish a concise summary of his plentiful hypotheses in a scientific journal. The overwhelming weight of orthodoxy became more and more apparent as time and again his article was returned,

rejected by the editors of the journals still in operation. They did not even bother to send it to the increasingly rare anonymous peer-reviewers because it was full of formulae that the robotic assistants classified as suspicious, lacking the patience to decipher them.

Several times Iridio thought about contacting Ernesto to remind him of his promise and ask his advice but desisted because of his shyness and because he did not want to disturb him. During one of his visits, Julia managed to relax him and to have a satisfactory sexual encounter in the supernova position. Then she encouraged him not to be so timid and to get in touch with Ernesto. However, Iridio had to set aside his relentless work to improve his article because his father, deeply affected by his wife's death and the endless interference in his work by the aesthetic police, was starting to show psychotic symptoms and believed he was a surreal snail. Iridio quickly realised that it would be very difficult to look after his father if he had to travel to Bandar-Austro-Metropolis every weekend. As Salvatore had rejected his offer to leave Halina to look after him, Iridio decided that it would be easier if his father came to live with him and Halina in Widgeree. In order to do that, Iridio requested authorisation from the Ministry of Health, Natality and Civic Comfort, because he believed they would monitor his father's health. The ministry replied that this was beyond its competence. Iridio had to contact the Office of Mental Coherence of the Ministry for Historical Updating, Social Precognition and Digital Worship, which was responsible for his father's wellbeing since the transfer of his file by the Under-Secretariat for Psycho-Harmony and Aesthetic Realignment of the Ministry for the Arts, Trades and Aesthetic Peace. With Halina's help, Iridio filled in endless forms. Despite being his father's only child and his only living relative, they received a memo from PhDr Felicity Dorothy Shaw Wang, the clinician in charge of monitoring Salvatore's health, refusing to authorise his move to the provincial city. She expressed concern about the potential deterioration of Salvatore's mental health if he left the house where he had lived for so many years. The document further explained that the Office of Mental Coherence would not be able to monitor Salvatore if he decided to access information about MVEHS and commit suicide without authorisation. After many exchanges and memos written with Ernesto's help, PhDr Shaw Wang agreed to issue written approval for Salvatore to move, as long as he was monitored every week at Widgeree's mental rehabilitation institute, where PhDr Ariadna Madeleine Charrington der Heer, MClinPsych MD RICR, also employed by the Office of Mental Coherence, would take care of him. She had been sent to the provincial city with the sole purpose of preventing other ministries intervening in the case. The first time they went to see her, Iridio's

$$\lim_{n \rightarrow \infty} \frac{F_{-n-1}}{F_{-n}} = -\varphi$$

1.7.v.a. The golden ratio expressed as a limit of negafibonacci quotients

father was surprised to find that she was a human being, because the symmetry of her perfect face as well as her harmonious body, set off by her yellow lab coat, reminded him of the cyborgs that featured in sexual senso-videos. While they were talking to her, Iridio, who normally could not remember faces, realised that he had seen her at the national astronomy congresses. PhDr Charrington der Heer was the beauty who sat at the back of the room and took notes in her flexible reader. Iridio asked whether she was the one who attended the congresses and she replied that in her first job at the Ministry for Historical Updating, Social Precognition and Digital Worship, she was in charge of a longitudinal study of students who had received a positive discrimination dispensation to enrol at provincial universities. That was the reason she had attended his presentations, in order to evaluate whether his opportunity to study at university had been beneficial. She could not quite recall all the details of his case now but she believed there had been no difficulty in establishing the value of the initiative, because not only he was able to get a permanent job which allowed him to have positive social credit despite his family's background, but also because he had continued his research as an independent scholar. As they were leaving, his father mentioned that PhDr Charrington der Heer looked like Iridio's grandmother Mildred as a young woman, although he believed her beauty had been genetically enhanced. He also told Iridio not to trust the doctor completely because she looked at Iridio lasciviously and might be dangerous. She stared at him in much the same way as a young nurse used to look at Salvatore when he was younger. Iridio thought his father was raving again and did not pay much attention.

As a result of many medical consultations at the local Office of Mental Coherence, PhDr Charrington der Heer discovered that Iridio's father, apart from a worsening of his recurrent psychosis, had contracted a strain of equine lysogeny resistant to all known bacteriophages. This generated endless procedures that further distracted Iridio, because PhDr Charrington der Heer had decided that his father needed countless medical examinations to complement the psychological tests. Lysogeny complicated things even more: not being a mental illness it had to be treated by specialists. As in her view there were no competent specialists in Widgereed, she suggested having his father admitted to a hospital in the capital under the jurisdiction of her ministry. Iridio complained and told her that there were other hospitals in the city. She explained that all the medical facilities in Widgereed belonged to the Ministry of Health, Natality and Civic Comfort, and if his father was admitted to one of them, he was in danger of coming under the jurisdiction of the aesthetic police or other police forces, which would potentially cause more damage to his mental

health. Iridio objected and told her that he was too busy at the patent office, and was also writing a very important scientific article, so it was impossible for him to move to Bandar-Austro-Metropolis. The physician tried to persuade him to go for only two or three weeks, until Salvatore recovered from his lysogeny. Iridio refused. PhDr Charrington der Heer appeared saddened by his decision. She asked him to sign a long form, with many clauses and subclauses, by which he accepted full responsibility for his father's health, and handed Iridio a report for him to lodge with the health agency of his choice.

Dr Devi Dolly Tomakin Sukhavati, who treated Salvatore at Widgeree municipal hospital, ordered that he be admitted for three weeks. This gave Iridio hope of resuming work on his article with fewer interruptions. However, he started receiving memos from PhDr Shaw Wang and PhDr Charrington der Heer urging him to remove Salvatore from the local hospital. The day Iridio visited him, Salvatore pleaded with him to take him home. He said he was too weak and did not want to see the fat nurse any more. He added that he was too frail for sexual pirouettes. Iridio consulted Dr Tomakin Sukhavati, who suggested that Salvatore was experiencing hallucinations. There were no fat nurses among the staff taking care of his father. Salvatore's comments might

	<i>Anxiety syndrome</i>	<i>Pleasure syndrome</i>
Peripheral vessels	Contracted	Dilated
Cardiac action	Accelerated	Slowed down
Blood pressure	Increased	Decreased
Pupils	Dilated	Constricted
Secretion of saliva	Decreased	Increased
Musculature	Paralysed or in spasm	State of tonus, relaxed

1.7.v.b. The identity between parasympathetic nervous system function and sexual pleasure, according to the organic theories of Wilhelm Reich

have been related to the fact that he had been very agitated that week following a visit by an officer of the aesthetic police to the hospital's mental rehabilitation institute. Now that the doctor had asked the

officer to stop interfering, Salvatore was improving. He insisted on leaving the hospital, so Iridio had to fill in many additional questionnaires and assume responsibility for whatever might happen if his father abandoned his treatment. When Iridio finally managed to take his father home, Dr Tomakin Sukhavati prescribed some grey tablets but Salvatore refused to take them because he preferred the green ones prescribed by PhDr Shaw Wang. When the green tablets ran out, Iridio forced his father to see PhDr Charrington der Heer again. She reproached Iridio for not having listened to her, because his father's health had deteriorated significantly, as she had predicted. She prescribed a double

dose of the green tablets but, despite that, Salvatore's mental health did not improve. During his frequent ravings, Salvatore encouraged Iridio to stop worrying about him and get on with his calculations. Salvatore spent his last month inside the cardboard conch he

had built, with Halina's help, in the backyard of Iridio's house, writing a poem about the centre of the Big Bang. He had decorated the conch

with a high-resolution reproduction of the Hubble space telescope's extreme deep field image. Every day, Salvatore would cover a galaxy with black paint so as to give poetic expression to his pride in his only child's unflagging tenacity. He was also honouring Iridio's mother last exhortation to make Iridio's hypotheses known to the scientific community. Every time Iridio brought food to Salvatore, his father foretold that one day he would also see the moment he had imagined so many times: the disappearance of the last galaxy in the jet-black firmament.

Several times Iridio tried to elicit the causes of all the discrimination he had suffered and the history of his grandparents, as his mother had asked, but his father's mind was not sufficiently clear to explain anything and he talked incessantly about the fights between the different ministries controlling him. Once or twice Salvatore mentioned an uncle, whom Iridio did not recall, and Mildred, his maternal grandmother, saying that they were the cause of his problems with the aesthetic police. But Iridio could not understand why or how, as he also understood that his grandmother Mildred was dead and his uncle did not work in the Ministry for the Arts, Trades and Aesthetic Peace. One day when Salvatore was a bit more lucid, Iridio was able to grasp that a long time ago, when he was a child, his grandmother had held a very important position in the government of Ozeania, which had caused a rift with Iridio's mother. Iridio could not find out much about his paternal grandparents, except that his father believed they had been murdered. This could also be a hallucination, because he had always been told they had died in an accident. Unless his parents had

$$T_{RJ}(T_d, \mathcal{V}_{obs}, \mathcal{Z}) = \frac{h\mathcal{V}_{obs}(1+\mathcal{Z})/kT_d}{e^{h\mathcal{V}_{obs}(1+\mathcal{Z})/kT_d} - 1}$$

1.7.vi.a. The Rayleigh-Jeans correction factor for deviation from the rest-frame Planck function

'*U* meant something by uttering *x*' is true if and only if (for some *A* and some *r*):

a) *U* uttered *x* intending

(1) *A* to produce *r*,

(2) *A* to think *U* to intend (1),

(3) *A*'s fulfilment of (1) to be based on *A*'s fulfilment of (2).

b) There is no inference-element *E* such that *U* uttered *x* intending both

(1') that *A*'s determination of *r* should rely on *E*, and

(2') that *A* should think *U* to intend (1') be false.

1.7.vi.b. Redefinition II, version B of utterer's occasion-meaning, according to H. P. Grice

violated Grice's maxims atrociously, by lying about the death of his grandparents, something did not stack up.

Many times his father talked about the need to be cremated to avoid mental emulation and quantum cerebellums, and mentioned that he had filled in several forms in the multi-legaliferum, in case there should be any problems in the future. Before his death, Salvatore gave him a sealed envelope containing his finished poem and made him promise that he would open it only when he had managed to calculate with certainty the location of the mythical place where the Big Bang originated. Iridio put the envelope away, and they began to recite together, with Halina's help, the digital expansion of the golden ratio. Unfortunately, they did not get very far: 1, .,

6, 1, 8, 0, 3, 3, 9, 8, 8, 7, 4, 9, 8, 9, 4, 8, 4, 8, 2, 0,
4, 5, 8, 6, 8, 3, 4, 3, 6, 5, 6, 3, 8, 1, 1, 7, 7, 2, 0, 3,
0, 9, 1, 7, 9, 8, 0, 5, 7, 6, 2, 8, 6, 2, 1, 3, 5, 4, 4, 8,
6, 2, 2, 7, 0, 5, 2, 6, 0, 4, 6, 2, 8, 1, 8, 9, 0, 2, 4, 4,
9, 7, 0, 7, 2, 0, 7, 2, 0, 4, 1, 8, 9, 3, 9, 1, 1, 3, 7, 4,
8, 4, 7, 5...

$$\sum_{n=0}^{\infty} \frac{F_n}{n!} = \frac{e^{\Phi} - e^{-\varphi}}{\sqrt{5}}$$

1.7.vi.c. Sum of Fibonacci numbers
in terms of e and the golden ratio.

When PhDr Charrington der Heer learnt of Salvatore's death, she ordered the obligatory autopsy, and Iridio was at last able to resume work on his article. Six days later and one day after burying his father in the modest cemetery of Widgeree, he learnt that a second-rank astronomy journal, published by the University of Waikikamukau and in need of contributions to justify its existence, was prepared to consider his work. Ernesto, who had attended the funeral with Iridio, promised that he would talk to the editor, Magister Artem Reza Kumar Aliyev, with whom he was acquainted, to ensure there were no delays in the refereeing process. He also offered to help the editors, if necessary, with any mathematical interpretations.

Zoe and Mrs Frauke Grubach attended the funeral and at some point, when Zoe was talking with Ernesto, Mrs Frauke Grubach whispered to him that he could rely on her for anything he needed because she would always hold him in high esteem regardless of what other people or the perverse authorities said. Just when she was expressing her thoughts, two identical men arrived. They introduced themselves as Vincent and Teodoro VGogh Quinquela, president and vice-president of the Landscape Artists' Society of Widgeree. They had come to inform Iridio that they had sent to his memo account at the patent office a questionnaire to be completed without delay, listing all the art works produced by Salvatore since he had moved away from the capital. They were paying him a visit on behalf of the aesthetic police, which had no office in the city ever since the Faculty of Fine Arts was closed down at Yabbie Creek-W Multimodal Polytechnic.

When Iridio returned from the cemetery and dismantled the conch that his father had built, he discovered that the only galaxy not covered with black paint

What then is truth? A mobile army of metaphors, metonyms, and anthropomorphisms – in short, a sum of human relations which have been enhanced, transposed, and embellished poetically and rhetorically, and which after long use seem firm, canonical, and obligatory to a people: truths are illusions about which one has forgotten that this is what they are; metaphors which are worn out and without sensuous power; coins which have lost their pictures and now matter only as metal, no longer as coins.

1.7.vii.a. Truth according to Nietzsche

was a spiral galaxy very similar to Andromeda, hidden in a corner of the photograph. Iridio consulted Ernesto about his responses to the aesthetic police questionnaire and, in particular, whether to mention the poem and the conch, along with the other sculptures that Salvatore had brought when he moved to Widgeree. Ernesto was of the opinion that he should not declare anything, except two or three unfinished sculptures. Iridio, however, argued that according to the categorical imperative that Therese had taught him, lying was not a good idea. Ernesto replied that the aesthetic police would confiscate the art works and they would be lost for

ever, like many of his father's valuable sculptures. Besides, Iridio needed to complete his calculations before reading the poem, and the aesthetic police would never understand that, or agree to return the envelope. After a long discussion, they found themselves at an impasse. Halina intervened at that point to say that truth was a far more complicated concept than Therese's mechanical ethics made it seem. In her own ethics training, Halina, who belonged to a more advanced generation, had learnt algorithms based on a more fluid concept of truth, that of the eternal return attributed to a 19th-century philosopher called Nietzsche. Iridio agreed to give it some thought, and after a day of agonising uncertainty and arguments with Halina, because he could see no rhyme or reason in her ethics, whose language was as confusing as that of post-creationism, they found themselves back where they started, not knowing what to do. Halina explained that Nietzsche's vision was contrary to the way of thinking of those who believed in supernatural entities. However, Iridio would not consider her arguments until he grasped that the concept was related to the Poincaré recurrence theorem, written in a more pristine language which he could understand without difficulty.

Let $(X, \mathfrak{S}, \mu)$ be a probability space and let T be an automorphism. If $A \in \mathfrak{S}$, then μ -almost every point in A returns infinite times to A . In fact, almost every point returns infinitely often; i.e.

$$\bar{A} = \{x \in A : T^n(x) \in A \text{ for infinite } n > 0\} \text{ and then } \mu(A \setminus \bar{A}) = 0$$

1.7.vii.b. Poincaré recurrence theorem

Still undecided, Iridio settled on an intermediate strategy and decided to include the unfinished sculptures and the conch in the questionnaire, and omit the poem and the sculptures selected by Ernesto to be taken to his country house, where he had hidden more of Salvatore's art works.

The following day, Vincent and Teodoro appeared at the house with a search warrant signed by the aesthetic police and took away all the unfinished sculptures, as Ernesto had predicted. When they asked about the conch, Iridio took them to the backyard and showed them a part of its interior, totally covered in black paint. Iridio asked them to let him keep it because of its sentimental value. Vincent got angry and asked why it was included in the questionnaire if he wanted to keep it. They then made him fill in another questionnaire, with Halina's help, and added a note to say that the individual in question had made a mistake: the conch was not an art work. Both certified that the article had been examined and that, from an aesthetic point of view, it was not an art work but a monstrosity without any images. They left muttering angrily that they hoped the Ministry for the Arts, Trades and Aesthetic Peace would not require them to perform any further bothersome procedures because of his oversight, or play chaperone again for the director of the aesthetic police, who had visited Iridio's father in hospital, thus interrupting their artistic endeavours with her endless demands.

Ernesto was very pleased to hear that the conch had been saved and suggested that Iridio send a reproduction of the painting inside the conch, with a brief obituary, to the bulletin of the art association of which the young Salvatore had been a member, before his work was outlawed by the Academy of Fine Arts. Iridio thought that a very good idea, but he was so preoccupied with the thought of returning to his calculations that he delayed sending the information until he forgot all about it.

1.8. The anguish of peer-review

Science is made up of mistakes, but they are mistakes which it is useful to make, because they lead little by little to the truth.

Jules Verne

Iridio had hoped that Ernesto's intervention would facilitate the publication of his article. However, science did not work that way. Three months later, he received a memo suggesting many amendments. One of the anonymous reviewers asked whether the proposed cumuli of unmatter accounted for about 95.5 per cent of the universe's mass and energy which could not be found in the actual calculations and was assumed to be dark matter and dark energy. Another asked Iridio to justify in detail the elements of zero valency which could constitute the edges of the cumuli of antimatter that he was postulating. A third suggested changing the style to something less technical and more in line with classical popular science discourse, so that readers could better understand his hypotheses. After all, they could have no access to the original articles cited, or recourse to the assistance of robomooocs to penetrate 'questionable' mathematics. He provided Iridio with a list of popular science books he could consult on cosmological theories.

$$\Omega_0^2 = \frac{4}{3}\Omega_b$$

1.8.i. Relation between the standard cosmological density parameters of the baryonic and dark matter, according to Verlinde's Emergent Gravity Theory

Faced with all those requirements, Iridio felt as if he was carrying the weight of the world on his shoulders. There was so much to do. When Julia visited him, he confessed to not having the energy to do everything the reviewers were asking for. And he was angry. He wanted his hypotheses published and did not want to change them to satisfy people who did not understand the half of what he was proposing. Julia, as usual, found a way to encourage him to persevere. She suggested splitting the immense task into smaller achievable ones, analogous to the process of gradually overcoming his anorgasmia by systematically exploring the Kama Sutra positions until success was achieved, if only partially. She also recommended that he work on his article a little at a time, day by day, until it was sufficiently modified to satisfy his reviewers.

Iridio started with the most difficult problem, the chemical elements which would make up the unmatter on the edges of the cumuli. He found references to inert elements that had been posited in the margins of the periodic table, but their existence had not yet been verified due to lack of funding for experiments in pure sciences. Once again, he got stuck. The following Wednesday, Julia persuaded him not to worry and to work on other problems. She was convinced

that something would happen and he would find help if he only persevered. Halina also helped to lift his spirits. In her oracle function, she predicted that his article would be published and bring him success, travel and a broadening of his social life.

Iridio then tried to find the popular science books suggested by his third reviewer. Unfortunately, that type of book was not available in the digital repository of the patent office, and none were listed in the library of Yabbie Creek-W Multimodal Polytechnic. In fact, Iridio ascertained that most university libraries had either closed or had restricted access to the classical popular science sections, following approval by the pedagogical police of a scientific-technological addendum to Decree F451, which required that special permits be sought to consult those sections and to publish articles on popular science topics. Only organisations controlled by the state and selected private companies could obtain such permits. Not even in the black market of digital books could those publications be found. Only in the maritime cities could such material be purchased without completing censorship questionnaires. And even if he managed to get them, he could not risk having them in his flexible reader without compromising his position at the patent office. Luckily, when Julia did not know what else to say, Ernesto, who had videophoned to ask about the article, invited him to his country home for the weekend to draft a response to the editor of the journal. So that he would not need to seek official permission to leave the city, Ernesto offered him an air pod as part of a guided visit to a cloud-accumulator plant close to his house, organised by a state ecological tourist agency which would arrange the relevant permits.

On the day of his arrival, over dinner, they solved the problem posed by the first reviewer. Ernesto told Iridio to reply that it was not possible to know if the cumuli of antimatter represented the 95.5 per cent of the mass and energy which, in theory, was lacking in the universe, because there was still insufficient information about them. Besides, if his hypotheses were true, it was not certain that the proportions of mass and antimass calculated by astronomers from within a section of baryonic matter were correct. His thesis posited that the dark entities were non-existent, and therefore there was no logic in having to justify proportions which included them. Iridio, who had spent a lot of time revising the bibliography to deal with this question, was surprised to find that nothing more was needed. However, Ernesto said that he had played the peer-review game for many years and that this was certainly enough. It seemed that the reviewer did not understand the subject very well, so there was no need to spend much time on his comments.

$$H(a) \equiv \frac{\dot{a}}{a} = H_0 \sqrt{(\Omega_c + \Omega_b)a^{-3} + \Omega_{\text{rad}}a^{-4} + \Omega_k a^{-2} + \Omega_{\text{DE}}a^{-3(1+w)}},$$

$$\text{where} \quad \Omega_x \equiv \frac{\rho_x(t=t_0)}{\rho_{\text{crit}}} = \frac{8\pi G \rho_x(t=t_0)}{3H_0^2} \quad \text{and} \quad w = \frac{\frac{1}{2}\dot{\phi}^2 - V(\phi)}{\frac{1}{2}\dot{\phi}^2 + V(\phi)}$$

1.8.ii. Rewriting of the Friedmann equations using the density parameters for different types of matter and energy, according to the Lambda-CDM model

Iridio thought then that the rest would be easy, but again he was mistaken.

According to Ernesto, the problems posed by the second reviewer were much more difficult. Ernesto did not know much about the chemistry of heavy elements, and they could try to find something in his library but the problem had to be carefully researched. In reality, Iridio's only option was to make explicit which elements of zero valency would predominate in the cumuli according to his predictions. Otherwise, his hypotheses were not testable, and therefore not scientific. If he were sending an article to one of the non-verificationist journals published by the ministries, he could sidestep such requirements. However, that was not the case with this journal, which still adhered to the conventions of traditional science.

That led them to discuss the third reviewer's suggestions and the difficulty of finding the required popular science books to use as examples. On the one hand, it was an unusual requirement and suggested that the reviewer was almost certainly an old retired scientist, out of touch with the advance of official censorship since the addendum to Decree F451. On the other hand, it was understandable to ask for explanations of the mathematical formulae, because they were preparing a special edition of the journal on unorthodox theories, and it was necessary to make them more accessible to the new generation of readers who knew only the scientific canon written in the Sandrini-LePaine notation. There was, according to Ernesto, a lot more to be discussed, but it had to be done in the room of the secrets of the universe in his house. The room was bigger than the noisy one in the house that Iridio had shared with his parents when he was a child, where all the frequencies of solar electromagnetic emissions were converted into sound. It also had a powerful magnet on the door frame, where they trapped several electronic flies and squashed them with a hammer.

When they entered the room, amidst the cacophony, Ernesto explained that he was able to keep the room because, unlike Iridio's parents, he had kept his distance from the authorities. After Iridio's mother's serious difficulties with the intellectual police, his parents were not allowed to have such a room because

$$\mathcal{F}\{f\}: \xi \mapsto \hat{f}(\xi) := \int_{-\infty}^{\infty} f(x) e^{-2\pi i \xi x} dx$$

1.8.iii.a. The Fourier transform

the central computer also had an electromagnetic wave receiver, which, when properly tuned, allowed them to listen to news from the maritime cities censored by the government. The flies were devices to spy on citizens' private conversations at random. But there was nothing random about the robotic spies tracking Iridio. The authorities were obviously very interested in him, as they had been in his parents, because it had been a long time since so many flies had been caught in the door frame in one day.

Ernesto stepped up the volume produced by the sonification of the solar wind colliding with the Earth's atmosphere while he explained that the pedagogical police decree on the communication of science had more to do with the thorny issue of global warming than with popularising the results of a harmless discipline such as cosmology. As they called themselves free-marketeers, they could not appear to be the enemies of pure sciences which would potentially generate new technology. For that reason, they restricted popular science and filtered what could be published. For the same reason, they required that scientific formulae published in independent journals be accompanied by an explanatory narrative, as Iridio was well aware, because of the requirements of his university exams. Government after government in the terrestrial sector of the planet had copied the strategy of the Theocracies of the North American Prairies, where decrees similar to F451 had been promulgated for the first time, prohibiting string theory and restricting scientific communication to topics under their control. They restricted pure science communication to an entirely technical language that only specialists could access. That allowed them to easily rebut inconvenient scientific discoveries and place in the public domain only articles that did not pose any problems for them. Another structural limitation was, naturally, the Sandrini-LePaine-Reich canon, which restricted research on certain topics and determined the sexual conduct of citizens through the actions of the morality and oztraditions police.

Ernesto confessed that he had decided to take early retirement when the authorities again claimed that the thermal waves which lashed the planet were only a consequence of solar storms, a claim contradicted by Ernesto's research. They then tried to pressure him into interpreting the data to prove that the sun influenced cosmic rays, leading indirectly to an increase in temperature. Even if he had continued his measurements, he would not have found any outlet for them, and would have ended up like

$$\Phi_{\oplus} = \Phi_0 - \sum_{i=1}^6 \Delta\phi_i \cdot \cos \left[\frac{2\pi(t - t_{0,i})}{T_i} \right]$$

1.8.iii.b. The reconstructed solar radiative forcing variation

Iridio's mother, outlawed by the system and forced to correct the innumerable deficiencies of the robomoocs which taught basic science to students straight

from secondary school with insufficient mathematics to understand the most basic concepts.

The strategy was the same at the academies of fine arts where, with the assistance of the aesthetic police, artists who did not conform were suppressed, just as Iridio's father had been. But in science, after the triumph of the singularitarian post-creationists, the strategy had caused an inexplicable mixture of obscurantism and ignorance, a rewriting of history and the unnecessary censorship that had held up the progress of the planet, except in the technology to set up space farms and techniques to brainwash people. And on that matter Iridio's maternal grandmother, Mildred, was the one most to blame, because she had authorised the development of quantum cerebellums and approved countless laws which restricted scientific research in Ozeania. In particular, she had drafted the

decrees which stipulated the irrelevance of string theory, researched by Iridio's mother

$$B(-\alpha_0(x), -\alpha_0(y)) = \frac{\Gamma(-\alpha'x - 1)\Gamma(-\alpha'y - 1)}{\Gamma(-\alpha'x - \alpha'y - 2)}$$

1.8.iii.c. The Veneziano amplitude

before she was reassigned almost exclusively to teaching. The pretext used then was that string theory had not produced enough practical results, although, in an official sense, it could not be censored for being 'verificationist'. However, string theory had been classified as 'mathematicist sectarianism' and, later on, any result that required a dense mathematical framework, such as cosmological speculation on eternal inflation, was also classified as 'mathematicist'. This was paradoxical because the results of string theory continued to be used in the state scientific monasteries and in private companies, without any publicity. For that reason, people like Iridio's mother, who believed in making their research public, as was done in traditional science before the Penumbra, were classified as templetarian dissidents and their social credit diminished with each

Science possibly can help religious thinkers to consider a reality-focused model of knowing in which what we think we know is tested vigorously and is developed by trying as hard as possible to learn about realities that are external to our own selves, to our interests and egos.

1.8.iv.a. The humble approach to theology and science, according to John Templeton

publication. In Ernesto's view, that was the basis for the charges against her, because she had continued to publish her results in string theory. Something similar was happening in the old battle between Bayesians and Frequentists over the use of probability, and in the case of Ernesto's research on solar winds. Frequentists used accumulated data to confirm the minimum influence of solar storms on global warming, while post-creationist Bayesians considered that the probability of the influence of global warming was minimal, since they looked for 'a priori'

conditions which suited their convenience. Those like him, who wanted to use facts above all to explain the evidence, were marginalised or compelled to uphold hypotheses unsupported by data.

Iridio was not very interested in discussing policies, unless it concerned his parents, but his urgent need to resolve the problems posed by the reviewers, coupled with the noise in the room, forced him to postpone the discussion and precluded further enquiries about his grandmother Mildred. Iridio needed to know where to find the books suggested by his reviewer. If he was able to keep a secret, Ernesto told him, it would be easy. He could consult his paper books, kept in a library in the cellar of his house, which could only be reached via the room in which they were talking. This was an old wine cellar where Ernesto kept all his scientific and popular science books outlawed by the authorities. He explained that some of those printed books belonged to Iridio's mother and that she had hidden them there while she was the subject of legal proceedings. Luckily, the wine cellar was quieter.

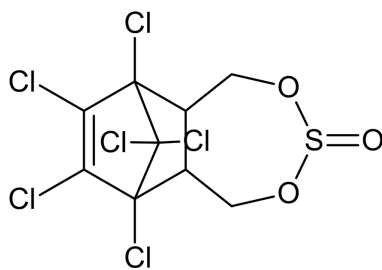
When they reached the shelf where his family's books were kept, Iridio immediately recognised a portrait of Edward Witten, which his mother kept on her desk when he was a child. It stood on top of a pile of books on string theory which, according to Ernesto, were blacklisted by the pedagogical police. Ernesto opened a compartment in the wall and showed him some books that had belonged to his maternal grandfather. Among their titles were *Experimental*

$$k(T, \theta) = k_{\text{ref}} e^{\left(\frac{E_a}{R}\right)\left(\frac{1}{T_{\text{ref}}} - \frac{1}{T_0}\right)} \left(\frac{\theta}{\theta_{\text{ref}}}\right)^{-\beta}$$

1.8.iv.b. Pesticide degradation as a function of the half-life of the chemical agent under study, taking into account daily average temperature and soil moisture

Theology, The Unselfish Gene and *The Spinozan Bible*. These were very dangerous books, Ernesto explained, which could lead to charges of templetarianism being levelled against those who read them. For that reason, he had not

even opened any of them and warned Iridio not to consult them, in case the authorities questioned him under the influence of their epistemological truth serum. He also told Iridio that many of his father's sculptures were kept in the wine cellar; he had hidden them there so that the aesthetic police could not confiscate them during their regular raids on his workshop. As a precaution, he had not wanted to discuss his clandestine library on the videophone or in the non-confidential rooms of his home, particularly as there were books by Carl Sagan linking astronomy to climate change and by



1.8.iv.c. Chemical structure of dichlorodiphenyltrichloroethane (DDT)

Rachel Carlson, the pioneer researcher of the environmental effects of pesticides. Both authors had been erased from all the official histories of science, except in the maritime cities, where they were considered heroes.

A quick search of Ernesto's library confirmed that it contained five of the eight banned popular science books mentioned by the third reviewer of his paper. Some were in their original classical English while others were translations into Panesperanto or Chinspa nglish, republished before the decrees came into effect. Searching in the piles of books given to Ernesto by other persecuted scientists, they found some that included extracts or summaries of the other three books proposed by the reviewer. A fabulous treasure trove.

Iridio spent the rest of the weekend exploring Ernesto's wonderful library. This was the first time he could read books printed on paper and he was frustrated by the lack of hyperlinks and robotic comments. But the contents were fascinating. Several times Ernesto had to force him to come out to eat, and Iridio spent most of Saturday night awake. Apart from the books on cosmology suggested by the third reviewer, there were many popular science books dealing with the Big Bang, containing lots of images and formulae in the conventional scientific notation that his mother had instilled in him. Importantly, these books focused on fundamental concepts discussing the relevant equations and he was not required to constantly rethink mathematical formulae to understand them. Not only did the books provide him with examples of how to make complex scientific concepts more accessible for non-specialist audiences, they also gave him a new perspective on the ideas censored or mutilated in the Sandrini-LePaine-Reich paradigm.

For the first time Iridio could glimpse the evolution of theoretical ideas in the 20th century, and he was surprised to discover several models of the universe that had never been mentioned during his university classes. He could also glimpse the existence of books that linked cosmology and religion without involving creationism, like those written by Paul Davies, execrated and demonised by the North American post-creationists as well as in the people's republics of Eurasia, and therefore in his own country.

In particular, it horrified him that Georges Lemaître had never been mentioned during his classes at university. Lemaître was a Catholic priest who had proposed the Big Bang for the first time, after finding exact solutions to Einstein's field equations at the beginning of the 20th century and linking them to Hubble's discoveries on the recession of galaxies. Ernesto explained that the animosity against Lemaître and other scientists was due to the existence of

refuge areas, especially the Vatican's Scientific Refuge Territory, where science was still practised in independent scientific monasteries without state interference. It was also a consequence of the fact that in the scientific canon of terrestrial countries, most hypotheses had been simplified, or – one might say – frozen, since the World Doctrinarian Scientific Reform of the 21st century had laid down what could be published and transferred the content of all printed books to digital libraries, easier to redact or censor. As terrestrial authorities encouraged the use of paper books as fuel after the Third World War, the predominance of the Sandrini-LePaine-Reich paradigm was consolidated.

The following day, they went on a guided tour of the Reichian cloud-accumulator plant, which was Iridio's excuse for having come to stay

with Ernesto. Ernesto had to force him to take the guided tour with a guide who seemed to talk endlessly. He was also compelled to visit a small museum where Reich's theory on cloudbusters and orgone accumulators was explained in detail. As soon as they returned to Ernesto's, Iridio locked himself in the library once more. There, he found a mangled book in classical English devoted to the development of cosmology in the 20th century. The covers were missing, as well as the first few chapters. Ernesto told him that it was a clandestine copy, similar to the ones that circulated just after the proclamation of Decree F451. He suspected the book was written by one John Barrow, another outlawed scientist

$$ds^2 = dt^2 - \frac{(R')^2}{1 + 2E} dr^2 - R^2 d\Omega^2$$

where $d\Omega^2 = d\theta^2 + \sin^2\theta d\phi^2$ and

$$R = R(t, r), \quad R' = \frac{\partial R}{\partial r}, \quad E = E(r) > -\frac{1}{2}$$

The evolution equation is

$$\dot{R}^2 = \frac{2M}{R} + 2E$$

and has three solutions, depending on the sign of E:

1) $E > 0$ (hyperbolic):

$$R = \frac{M}{2E} (\cosh \eta - 1),$$

$$(\sinh \eta - \eta) = \frac{(2E)^{\frac{3}{2}}(t - t_B)}{M};$$

2) $E = 0$ (parabolic):

$$R = \left(\frac{9M(t - t_B)^2}{2} \right)^{1/3};$$

3) $E < 0$ (elliptic):

$$R = \frac{M}{2E} (1 - \cos \eta),$$

$$(\eta - \sin \eta) = \frac{(-2E)^{\frac{3}{2}}(t - t_B)}{M}$$

1.8.v. The Lemaître–Tolman–Bondi metric

and supposed templetarian, whom Iridio had never heard of in his astronomy classes. Although the surviving chapters dealt with the chemical composition of stars to calculate one of the censored Drake equation parameters, they brought home to Iridio that the answer to the second reviewer's objections could be found by using statistical thermodynamic techniques. That led him, once back at home, to explore in his old flexible reader the notes he had taken during his last course of statistical mechanics at university. There he found the solution to his problem. All the information contained in the notes of the first five classes, which had previously seemed useless, was exactly what he needed to deduce the properties of the inert elements, and to respond to the second reviewer. It seemed as if the universe had decided to help him because he had dared to persevere, as Julia had asserted.

He amended his article, positing that the edges of the cumuli of antimatter were made of unmatter and heavy noble gases, and that, at the interfaces, there would be inert and super-heavy elements and anti-elements which prevented the interaction of matter and antimatter by balancing gravity and antigravity in the local environment. To make this possible, most gases had to be similar to the anti-ununoctium and the equivalent of other colourless noble gases placed in a hypothetical Line 10 of the extended periodic table, whose existence had not yet been proven empirically. The hypotheses, however, were

testable since the cumuli of antimatter could react with cosmic rays and distort the spectral lines in the electromagnetic spectrum which emanated from supernovas and distant pulsars located behind them, just as in the theories that postulated gravitational lensing. The interference caused by the topological

Group 18														
P e r i o d 7	<table> <tr> <td>294</td><td>118</td></tr> <tr> <td>?</td><td>?</td></tr> <tr> <td rowspan="4">Uuo</td><td>8?</td></tr> <tr> <td>6?</td></tr> <tr> <td>4?</td></tr> <tr> <td>2?</td></tr> <tr> <td>Ununoctium</td><td>Gas</td></tr> <tr> <td>$5f^{14}6d^{10}7s^27p^6$</td><td>Noble Gas?</td></tr> </table>	294	118	?	?	Uuo	8?	6?	4?	2?	Ununoctium	Gas	$5f^{14}6d^{10}7s^27p^6$	Noble Gas?
294	118													
?	?													
Uuo	8?													
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Ununoctium	Gas													
$5f^{14}6d^{10}7s^27p^6$	Noble Gas?													
p-block														

1.8.vi.a. Ununoctium entry in the Periodic Table of the Elements

$$t_{LL}^{\mu\nu} = -\frac{c^4}{8\pi G} (G^{\mu\nu} + \Lambda g^{\mu\nu}) + \frac{c^4}{16\pi G(-g)} ((-g)(g^{\mu\nu}g^{\alpha\beta} - g^{\mu\alpha}g^{\nu\beta})),_{\alpha\beta}$$

$$t_{LL}^{\mu\nu} + \frac{c^4 \Lambda g^{\mu\nu}}{8\pi G} = \frac{c^4}{16\pi G} ((2\Gamma_{\alpha\beta}^{\sigma} \Gamma_{\sigma\rho}^{\rho} - \Gamma_{\alpha\rho}^{\sigma} \Gamma_{\beta\sigma}^{\rho} - \Gamma_{\alpha\sigma}^{\rho} \Gamma_{\beta\rho}^{\sigma})(g^{\mu\alpha}g^{\nu\beta} - g^{\mu\nu}g^{\alpha\beta}) \\ + g^{\mu\alpha}g^{\beta\sigma}(\Gamma_{\alpha\rho}^{\nu} \Gamma_{\beta\sigma}^{\rho} + \Gamma_{\beta\sigma}^{\nu} \Gamma_{\alpha\rho}^{\rho} - \Gamma_{\sigma\rho}^{\nu} \Gamma_{\alpha\beta}^{\rho} - \Gamma_{\alpha\beta}^{\nu} \Gamma_{\sigma\rho}^{\rho}) + g^{\nu\alpha}g^{\beta\sigma}(\Gamma_{\alpha\rho}^{\mu} \Gamma_{\beta\sigma}^{\rho} \\ + \Gamma_{\beta\sigma}^{\mu} \Gamma_{\alpha\rho}^{\rho} - \Gamma_{\sigma\rho}^{\mu} \Gamma_{\alpha\beta}^{\rho} - \Gamma_{\alpha\beta}^{\mu} \Gamma_{\sigma\rho}^{\rho}) + g^{\alpha\beta}g^{\sigma\rho}(\Gamma_{\alpha\sigma}^{\mu} \Gamma_{\beta\rho}^{\nu} - \Gamma_{\alpha\beta}^{\mu} \Gamma_{\sigma\rho}^{\nu}))$$

1.8.vi.b. The solutions of the Landau–Lifshitz pseudotensor

defects of space-time, created by those cumuli, would also explain the historical results obtained concerning the universe's cosmic microwave background, as they would be distorted, and all the corrections that astronomers had made to the data to impose their hypotheses about the statistical homogeneity of the universe would be unnecessary.

With Ernesto's technical help on the physical aspects of the distortion of cosmic rays in gas clouds, which Iridio had not studied, and a new series of intuitions glimpsed in books from his wonderful library, he could also extend the predictions of his hypotheses, using technical language which would certainly satisfy the second reviewer. Iridio was most fascinated by the books that explicitly set out all the mathematical deductions, without the simplification or sandrinisation imposed by the university's robomoocs, in a logical rhythm of tones that went from one step to the next without forcing him to spend hours deducing the omitted steps or chromatic jumps in explanations or, most confusing of all, translating from one notation to the other.

The review of the literature allowed Iridio to finally understand the importance of quantum mechanics to predict the properties of elements at the time of the formation of atoms and anti-atoms from quarks, as they had provided the irregularities that served as seeds for the creation of the first stars. He also understood how daring was his hypothesis which reversed the baryogenesis presupposed in official science. The riddle of the generation of inert super-heavy elements could be understood when it was postulated that the first antimatter was mainly antihelium, another inert element, which, when pressing the conventional helium on the other side of the interface, created the conditions for unmatter and the other elements to form in the same way as the heavy elements in stars of baryonic matter with positive gravity. Perhaps it also explained another of the great mysteries of the Big Bang theory, the sudden inflation of the universe, which may have been a consequence of a process similar to that posited for the formation of Bok globules in nebulae. When the theory was adapted to the equations that considered globules of negative gravity, it would predict, in turn, that this was the origin of the small big bangs he postulated.

Again with much help from Ernesto, Iridio explained in the long discussion section, in language similar to that of classical popular science, how his

Group 18	
P e r i o d 1	4.0026 2732.3 2 He Helium 1s² Gas Noble Gas 0
s-block	

1.8.vii.a. Helium entry in the Periodic Table of the Elements

hypotheses were an alternative to the existence of dark matter, which would be sufficient to satisfy the third reviewer. He also added alternative explanations for the movement of stars on the edge of galaxies, a new interpretation of the Tully–Fisher relation, and a summary of the potential implications of his hypotheses to create wormholes in space-time at the limits between the different Kasner metrics that they predicted, as his mother had suggested.

The final equation Iridio came up with, using spherical Bessel functions, was not quite the succinct and radiant creation he had imagined. In part, the limitation came from Ernesto because, as a precaution, he did not allow Iridio to take Halina

to the wine cellar to copy the contents of the publications and help him to compact them. It was

$$J_{n+\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sum_{i=0}^{\frac{n+1}{2}} (-1)^{n-i} \left[\sin(x) \left(\frac{2}{x}\right)^{n-2i} \frac{(n-i)!}{i!} \binom{-i-\frac{1}{2}}{n-2i} - \cos(x) \left(\frac{2}{x}\right)^{n+1-2i} \frac{(n-i)!}{i!} i \binom{-i-\frac{1}{2}}{n-2i+1} \right]$$

1.8.vii.b. General formula for the spherical Bessel functions

partly also the consequence of the many discussions he had with Halina, who gave him too many suggestions at once. But the fact of having deduced the equation filled him with pride, because its tone resembled the equations of Modified Newtonian Dynamics, which he so much admired. However, that was not the master formula his intuition told him must exist, and he spent a fortnight trying to improve it. Ernesto suggested not delaying his response any longer if he already had a result, because if he found a better version of the formula later on, he could always send a letter to the journal asking them to publish a clarification in a subsequent issue.

Six months later, and thanks to Ernesto's new intervention in his favour, Iridio received a reply from Magister Kumar Aliyev. The additions and relevant clarifications seemed to have won over the critical reviewers, or at least left them no further arguments. His article would be published in the next issue of the journal, a special issue devoted to surprising unorthodox theories. His efforts of so many years were at last sneaking cautiously into the annals of astronomy.

1.9 The fruitless search

In dreams begin responsibilities.

William Butler Yeats

The Wednesday after he heard that his article had finally been accepted, Iridio was expecting Julia's visit to tell her the good news, but she did not arrive. The next day he could not find her at the private clinic for organic recreation where she worked. Polly, the old eudaemonic technologist who was still in charge, gave him a handwritten letter that Julia had left for him. In it she informed him that she was forced to leave the city owing to a family emergency and was not certain when she would be able to return. It was at that moment that Iridio realised how much he needed her, more than he had imagined. Not even his reading sessions at Ernesto's during the weekend could console him. Julia had left no contact details and every time he asked at the clinic they told him that they had not heard from her.

At first, he rejected Polly's offer to hire the services of other organic instructors. Later, suspecting that the administrator was hiding something from him, he agreed to see all the instructors who had been working there for a long time. He hired their eudaemonic services at weekends in the hope that one of them could help him track Julia down. But he did not manage to achieve organic success or gain relevant information from any of them. Halina suggested that she could accompany him next time to seek information from the robotic technologists. Olgava, the organic cyborg he had met the very first time he visited the clinic, was waiting for them at the door. She informed them that Halina was not authorised to come in, and that if they kept trying to hack the robotic instructors remotely, she would be forced to report them to the Office for the Systematisation of Robotic Erotism. Halina then suggested that Olgava might visit them at Iridio's house, to keep up his genital eudaemonia levels. This would also allow them to have a discreet monitor-to-monitor algorithmic discussion of the situation. Olgava replied that she had to check and would let them know. Three days later, following further negotiations between the robotic assistants, Olgava came to their home. Halina told Iridio that it would be better if he did not know the details of what she had arranged with the organic cyborg, but there was some ground for hope. After a three-hour genital session with Iridio, Olgava had a series of very potent recurrent orgasms in the zigzag position, with

the help of Halina, who was connected

$$\tau_e = \frac{\alpha}{M c (1-\beta)} \left[(T_b(H) - T_b(h))^{1-\beta} - (T_{r,t} - T_b(h))^{1-\beta} \right]$$

1.9.i.a. Eruption time in a geyser

to Olgava digitally. In her wild abandon, the orgonic cyborg stimulated him orally and made him ejaculate. When it was all over, Iridio started to cry. He confessed to Olgava that without Julia he did not know what to do with his life and begged for her help. Disregarding Polly's instructions, Olgava gave them the address of Julia's daughter, who might help them find her. Before leaving, Olgava made them promise that they would call her again and that they would keep her informed of anything they learnt.

Thanks to Halina's new procedures, Iridio managed to contact Julia's daughter, and was surprised to discover that it was Iris, the same orgonic instructor who had warned him years previously about his teachers' plans to expel him from the university. She was in mourning. Her husband, who had persuaded her to leave the clinic, had just died as a result of the many flu-like tuberculosis pandemics that devastated the country. She had two small children, and all the automatic programming services at her home had been cut, including heating and videophone, because her basic universal minimum salary was only enough to pay for the robochef that bought and prepared their food. She told Iridio that her grandmother, Julia's mother, who was sick when Julia left, lived in Porpoise Spit, the nearest port. She also gave Iridio the address of her grandmother. Iridio lent her 12,000 etherinos so that Iris could have the services and the videophone reconnected, in case Julia tried to contact her.

After another week without news, Halina suggested that he should apply for leave from work to look for Julia. Halina said that it would be better if she did not accompany him because applying for a travel permit for a private robotic assistant would delay him even more. She also recommended that, if he had to deal with the authorities, under

Let $(X, \mathcal{B}, \mu, T)$ be a measure-preserving system and $A \in \mathcal{B}$ a set. Then for μ -almost every $x \in A$ we find that $T^n(x) \in A$ for infinitely many $n \in \mathbb{N}$

1.9.i.b. Poincaré recurrence for points

no circumstances should he say he was looking for Julia. They had a long argument, as they always did when discussing truth, and Halina resorted again to Nietzsche's arguments on eternal recurrence and how they were supported by the Poincaré recurrence theorem. Iridio, who was very upset by Julia's absence and had a relapse, was again obsessed by the Gricean maxims and the extension of the Fibonacci sequence to negative index n , which he had trouble understanding in his childhood: $F_{-1} = 1$; $F_{-2} = -1$; $F_{-3} = 2$; $F_{-4} = -3$; $F_{-5} = 5$; $F_{-6} = -8$; $F_{-7} = 13$; $F_{-8} = -21$; $F_{-9} = 34$; $F_{-10} = -55$; $F_{-11} = 89$; $F_{-12} = -144$; $F_{-13} = 233$; $F_{-14} = -377$; $F_{-15} = 610$; $F_{-16} = -987$; $F_{-17} = 1,597$; $F_{-18} = -2,584$; $F_{-19} = 4,181$; $F_{-20} = -6,765...$ Halina explained that the most important thing was not always to tell the truth, but rather to put forward arguments in conversation to obtain his key objective,

which was, after all, to find Julia. To that end, she trained him in the use of the Kasher rationality principle and other conversational techniques which would allow him to say no more than was necessary. Grudgingly, Iridio promised to try to apply them.

(R) Given a desired end – a literal purpose –, the ideal speaker chooses that linguistic action which most effectively and at least cost attains that purpose, *ceteris paribus*.

(CA) For every context of utterance C , every sentence S of a natural language L , and every ideal speaker $Alpha$ of that language, the following biconditional should be a true theorem:

Context C is linguistically appropriate for speaker $Alpha$ to utter in it sentence S of language L ,

if and only if,

there is a linguistic institution of L which grants $Alpha$ an institutional role which enables him (or her) to achieve a literal purpose he (or she) entertains in C , by uttering in it the sentence S .

1.9.i.c. Kasher rationality principle to drive a conversation towards a mutually accepted goal

Unfortunately, the trip to Porpoise Spit was a nightmare. The country was in chaos, another thermal wave connected to a solar storm had affected communications and the end of the Third Transpacific War had caused a new flow of refugees. The official news media also reported the extinction of guanacos in South America, rhinoceros in Africa and thousands of migratory

birds on all continents, including the seasonal

$$x_{n+1} = r x_n (1 - x_n)$$

swallow. In spite of having hired a personal air

1.9.ii.a. The logistic function

pod to travel as fast as possible, Iridio had to

travel mainly by land because the army had

declared the air corridor between the cities unsafe due to the presence of the Ecological Brigades. It took him two and a half days to travel from Widgeree to Porpoise Spit, a trip that usually took six or seven hours by air. To top it all, he was transferred to a pod-bus, guarded by the Ozeanic infantry, when the road was attacked by a swarm of drones of the ecological terrorists, which destroyed three personal pods moving ahead of his. The other passengers treated Iridio with the utmost respect because the Ozeanic drones that saved them seemed to have given him priority. Everyone assumed that he must be a very important person or perhaps a member of one of the secret police forces. During a lunch stop they managed to coax him to mutter that he worked at a government office in Widgeree, and perhaps for that reason a profound silence came over them whenever he contributed to the conversation. All his efforts to minimise his

importance were in vain, especially when, after another attack, he was transferred to an armoured vehicle escorted by a pack of mechanical bloodhounds until the danger subsided.

When crossing the mountains, the passengers asked the robotic driver to stop at a small village at the pass where people were allowed to have pets, such as cats and

dogs, which could survive

$$\bar{T}_S = \frac{1}{h_e} [h_r \cdot \bar{T}_{amb} + h_{rad} \cdot \bar{T}_{sky} + \alpha_S \cdot \bar{G} - c \cdot h_{conv} \cdot f \cdot b(1 - r_h)]$$

the thermal 1.9.ii.b. Annual mean ground surface temperature

waves in the

cooler climate of the higher altitude. They also had time to visit a zoo because all routes, by land or air, had been sabotaged by the ecological terrorists. There, for the first time, Iridio saw live native animals such as flying foxes and koalas, which were extinct outside the reserves. The electronic information boards also informed visitors that the area was surrounded by a fence that kept pests such as camels and killer wombats out, to protect the precious ecological niches. They also passed through a site that had previously been a wind farm and now contained many Reichian cloud accumulators, much bigger than the ones installed close to Ernesto's house. The robotic driver explained that the area had been under guerrilla control, but was reclaimed eighteen months

$$P_t = \frac{1}{2} \rho \pi R^2 v^3 C_p(\lambda)$$

$$P_f = \mu M_r \frac{d}{2} \Omega + 0.422 S \Omega + 0.0017 D^3 L \Omega^3$$

1.9.ii.c. Mechanical power and mechanical losses in wind turbine blades

ago by the Ozeanic army. The wind towers built by the ecologists seemed to have been knocked down by bulldozers, and the turbine blades and generators wrecked by hammer blows, as there were fragments scattered over a large unused area next to the new facilities.

On his arrival at Porpoise Spit, Iridio discovered that Julia, her mother or other relatives no longer lived there. Their run-down house had been converted into a communal dwelling for climate refugees. It lacked basic amenities. They did not even have access to the compulsory robochef, although, apparently, this did not bother the refugees because, unlike the ordinary citizens of Ozeania, they knew how to cook their food themselves. Thanks to his tenuous knowledge of Indospanglish and the occasional use of Panesperanto, Iridio managed to ask Narges Aishah Tavatatze Samua, one of the refugees who lived in the house and with whom he could communicate, to copy in his flexible reader the unpaid hospital invoices that were still being sent to the house's mandatory basic

robotic administrator. At the hospital, he learnt that Julia's mother had died a week after she had arrived in the town. There were records of family members, in particular one of Julia's sisters who lived in the poorest neighbourhood of Porpoise Spit. When he finally found the address, he discovered that the sister did not live there either. She had been evicted three weeks before and nobody in the neighbourhood knew her whereabouts. Iridio also looked for Julia in all the private orgonic clinics in the town. They suggested that he travel to Atlantis VIII, a floating city located about three hundred miles off the coast, with a big casino and many sophisticated sexual recreation clinics. At about the date of Julia's mother's death, there had been a clandestine recruitment drive for qualified orgonic personnel, offering very generous conditions. Many of the town's orgonic instructors had travelled to the floating city in precarious vessels, because it was rumoured that they could make a lot of money in the free world.

Iridio decided to enquire about the possibility of visiting Atlantis VIII, and learnt that in order to travel he needed a permit from the Ministry of Defence, Internal Appeasement and Border Protection. In the customs area, they placed his identity card in an aptitude verification and civic performance reader; he was told to see an officer from the local patriotic police before starting the process. It took him some time to find the right office. When he reached it, the coordinator, PhDr Yocasta Naomi Novak Azoulay, MM, told him that the duty officer who processed permits to travel outside Ozeania's territory had gone to a meeting, but while he waited he could start filling in the pre-authorisation electronic questionnaires at one of the terminals. She also placed his identity card on a flexible electronic sheet and consulted a robotic secretary several times when she had difficulty reading his dossier. The reflection of the monitor in the polarised window behind Yocasta allowed Iridio to see that his dossier was quite substantial and that many of its folders had winking red lights. There were holograms of his parents and his four grandparents and many documents marked as important. A big notice, in red letters, mentioned every so often that his parents had had a negative balance in their civic credit for most of their lives. Another notice warned that his maternal grandfather was a templetarian rebel. While the secretary was examining the different folders in the dossier, Iridio could glimpse holograms of himself entering the clinic where Julia worked, holovideos of Julia arriving at his house, files with technical information about Penelope, Therese and Halina, copies of the CT scans done during his visits to Rieneke Watson, and a series of

*	1	<i>i</i>	<i>j</i>	<i>k</i>
1	1	<i>i</i>	<i>j</i>	<i>k</i>
<i>i</i>	<i>i</i>	1	<i>k</i>	<i>j</i>
<i>j</i>	<i>j</i>	<i>k</i>	1	<i>i</i>
<i>k</i>	<i>k</i>	<i>j</i>	<i>i</i>	1

1.9.iii.a. Cayley table for the Klein four-group

documents with his university letterhead. Yocasta frowned more and more as she studied the dossier; she could no longer access other folders and a VIP-γ89 notice appeared every time she tried to open any of them. By keying in a very long password, she managed to open a document titled *Report on assisted psycho-social development*. Iridio was surprised to see that it contained a table with letters which seemed to be homologous to the operations of the Klein four-group, and he made an effort to see the reflection of the monitor because he was surprised that a reference to quaternions was included in a report of that type. Unfortunately, his movement caused Yocasta to become aware of Iridio's gaze in the window and realise that he could see the reflection. She then closed all the documents immediately. Iridio asked her whether she could mention that his trip was for recreational purposes. She told him to be more specific. Iridio remembered the long discussion he had had with Halina on the subject. To avoid feeling too bad about lying, he wrote that he wanted to visit the casino, as that would be the first place to look for Julia. The casino was associated with the organic clinic which had published the clandestine job notice; that was his only clue to her whereabouts. At that point Magister Henare William Stoneman Parsons, CTC, that day's duty officer, arrived. Yocasta explained that Iridio had been referred by customs and when the

$$P(x = m) = \binom{n}{m} p^m (1 - p)^{n-m}$$

$$\text{where } \binom{n}{m} = \frac{n!}{m!(n-m)!}$$

1.9.iii.b. Probability of m successes in an experiment with n trials

Magister suggested that Iridio should come back later because he had to consult her about some urgent matters arising from his meeting, Yocasta ordered him to process the request immediately and handed him Iridio's identity card. Grudgingly, the officer inserted the card in his terminal and frowned as he examined the dossier. His hand movements indicated he was trying to open several folders at once, without success. Unfortunately, the screen was not reflected in the window. Iridio completed the questionnaire and pressed the send button in his machine. A sound in Stoneman Parsons's terminal confirmed that his message had arrived. Stoneman Parsons looked carefully at the screen, made a movement with his hands on a console-like contraption and told Iridio that it was strange that he wished to visit the casino in the floating city when he had never been to a casino of any kind in his life. That's precisely why, Iridio replied. He added hesitantly that he had been told that the casino was well equipped and interesting and had control systems to detect those who used probability formulas to place their bets.

$$f^* = \frac{p(b+1) - 1}{b}$$

1.9.iii.c. Kelly criterion

Stoneman Parsons stared at Iridio intently for a moment, expressionless, and pointed out in a flat voice that he did not believe a word he said.

$$S \rightarrow E \rightarrow I \rightarrow R$$

$$N = S(t) + E(t) + I(t) + R(t)$$

$$\frac{dS}{dt} = B - \beta SI - \mu S$$

$$\frac{dE}{dt} = \beta SI - (\epsilon + \mu)E$$

$$\frac{dI}{dt} = \epsilon E - (\gamma + \mu)I$$

$$\frac{dR}{dt} = \gamma I - \mu R$$

1.9.iv.a. SEIR model for epidemics

Pacific who had lost their islands because of rising sea levels. Yocasta and Stoneman Parsons told him to leave the office at once. They also apologised for not being able to help him and thanked him for his visit.

Iridio went back to the travel agency that sold tickets to visit the floating city. It was true. An electronic billboard announced that due to quarantine restrictions, all airboat travel to Atlantis VIII had been suspended. Iridio asked a staff member how long he would have to wait. At least three weeks, came the reply. That was longer than Iridio's leave of absence. He walked disconsolately round the port. In the distance, pounded by the waves, were the rusted partly submerged remnants of the old skyscrapers of what had been the centre of Pearl Bay, before the drastic rise in sea levels, after which the residents had had to move to Porpoise Spit. Iridio thought that the time had come to reflect on his fate. For the first time he asked himself why the authorities would be interested in his insignificant life. Perhaps it was also time to try and understand the discrimination he had suffered in the past, even if that distracted him from his calculations. He noticed that someone was leaning on the railings overlooking the sea. It was Yocasta, the patriotic police customs coordinator. Without looking at him, she whispered that he should abandon his search as soon as possible and return to his normal life if he did not want the patriotic police to pester him. Her advice was personal not official, she added. She dared to give it because she felt sorry for him and wanted to help.

$$S(\theta, \lambda, t) = \frac{\rho_i}{\gamma} G_s \otimes_i I + \frac{\rho_w}{\gamma} G_s \otimes_o S + S^E - \frac{\rho_i}{\gamma} \overline{G_s \otimes_i I} - \frac{\rho_w}{\gamma} \overline{G_o \otimes_o S}$$

1.9.iv.b. Sea-level equation of glacial isostatic adjustment

He stared at the sea for a long time, reflecting on how much had Julia helped him with his calculations. He noticed that on the horizon, behind the half-sunken

$$M_a = \left\{ \frac{[(P_a/P_\infty) \cdot (k-1)] + k - 1}{2k} \right\}^{1/2}$$

1.9.iv.c. Mach number of the shock wave expanding into the background air

skyscrapers, a sailing boat was approaching the port. He then saw a gunboat from the Ozeanic Navy approaching it and firing two shots. When the twin reports reached his ears, the sailing vessel, hit by the second, began to sink.

Iridio returned feeling ill and defeated. Iris had no news and Halina told him that it would be better if he did not use her as an oracle on this occasion. Perhaps it was his loss of contact with Julia or his lack of enthusiasm for his calculations since his article had been published, but during those months Iridio felt tired and lost, without direction, and began to be obsessed again with the extension of the Fibonacci sequence to negative numbers.

$$F_{n-2} = F_n - F_{n-1}; n < -1$$

1.9.v.a. Recursive definition of the negafibonacci sequence

He fell sick several times and his gloom forced him to spend the whole weekend in bed. He could hardly fulfil his duties at the patent office. Zoe was compelled to delegate part of Iridio's work to other staff members. To add to his woes, Kaminer Kullych, BSciP OAM RSE DSC CGM DCM, was placed temporarily in Iridio's office, adversely affecting Iridio's performance with his constant taunts and hints that Iridio might be dismissed because of his low civic credit.

Iridio could not sleep well because in several of his wet dreams he was forced to make love to Clarisse and Fanny, his school friends who had committed suicide. His recurrent nightmares always started in the pod-bus on their school trip to the National Observatory, which had been cancelled by the authorities. But in his dream,

Let (X, κ, μ, T) be a measure-preserving system and $A \in \kappa$ be a set. Then for every $\varepsilon > 0$ we have $\mu(A \cap T^{-n}A) \geq \mu(A)^2 - \varepsilon$ for infinitely many $n \in \mathbb{N}$

1.9.v.b. Khintchine recurrence theorem

the three of them had come to the presentation and there he copied formulae that the speaker projected onto the screen in an enormous

amphitheatre. However, he could never finish copying the interesting equations because the pedagogical police burst in and arrested all the members of the school's science club. Then, when they were held in a sort of laboratory, some nurses in light blue lab aprons pressed him to have sexual relations with Clarisse and Fanny in positions he did not enjoy and, for that reason, he could not achieve orgasm. He wanted to see Julia in his dreams, at least to complete some of the twenty-five Kama Sutra positions they had not managed to try in the

second cycle. But it never happened. Sometimes, when Clarisse or Fanny begged him to keep on making love to them and threatened to commit suicide, Topologic Penelope would come to the rescue, tell him she would always wait for him, and recite theorems in her electronic voice while genitally stimulating him until his right testicle descended. Then he could finally ejaculate, but, at that point, he would wake up feeling dirty and depressed. The persistence of these dreams, in which he felt vile and selfish, was unbearable. Halina consoled him and recited long lists of the digital expansion of π , e and $\sqrt{2}$, promising him that better days lay ahead. For the first time in his life, he thought about seeking help from MVEHS to commit suicide. 1, ., 4, 1, 4, 2, 1, 3, 5, 6, 2, 3, 7, 3, 0, 9, 5, 0, 4, 8, 8, 0, 1, 6, 8, 8, 7, 2, 4, 2, 0, 9, 6, 9, 8, 0, 7, 8, 5, 6, 9, 6, 7, 1, 8, 7, 5, 3, 7, 6, 9, 4, 8, 0, 7, 3, 1, 7, 6, 6, 7, 9, 7, 3, 7, 9, 9, 0, 7, 3, 2, 4, 7, 8, 4, 6, 2, 1, 0, 7, 0, 3, 8, 8, 5, 0, 3, 8, 7, 5, 3, 4...

When entering Ernesto's private room during his visits, Iridio started to enquire into his past and what was known about his parents. He understood that string theory had also been used in artificial intelligence research programs, a fact which had contributed to the case for banning it. The fact that his mother had publicly acknowledged that she was publishing research about it in foreign journals was an affront to the censors, and she was never forgiven. That was also related to the story of his maternal grandparents, but it was difficult to grasp the essential facts of their story because of the superfluous details. It seemed to Iridio that Ernesto only wanted to talk about politics and very complicated stories about ministries and policemen. These were as exhausting for him as the noise in the room. He told Ernesto he was feeling very unwell and had even thought of suicide because he feared the critical response to his work. He even felt unable to present his results at the national astronomy congresses. Ernesto told him the story of Ludwig Boltzmann, the creator of the statistical mechanics that had helped him greatly with his calculations, and how Boltzmann's emotional fragility, caused by other scientists' criticisms of his work, had driven him to suicide. But Boltzmann had underestimated the importance of his discoveries. It turned out that they were not only right, but also had been crucial for the development of other areas of science, including cosmology. So Iridio should not follow his example, in case his work also proved important, as Ernesto believed it would. Iridio told him that Boltzmann had not been mentioned in his classes. Ernesto asked whether they had studied the laws of thermodynamics and learnt that they had not explored them in any depth. He suggested that perhaps the Sandrini-LePaine notation did not work very well in some of those laws, and for that reason during the scientific reform the pedagogical censors had preferred the thermodynamic theory of Josiah Willard Gibbs, and erased

Boltzmann from the textbooks. For reasons he could not comprehend, Iridio felt deeply affected emotionally by this information. He started feeling very unwell and nauseous, and wanted to leave the library. When Ernesto accompanied him to take an air pod to go home, Iridio confessed that he needed Julia. Ernesto encouraged him to keep looking for her and assured him that he would feel better as soon as his work was in print.

$$\left(\frac{\partial f}{\partial t}\right)_{\text{col}} = \iint g I(g, \Omega) [f(\mathbf{p}'_A, t)f(\mathbf{p}'_B, t) - f(\mathbf{p}_A, t)f(\mathbf{p}_B, t)] d\Omega d^3\mathbf{p}_A d^3\mathbf{p}_B$$

1.9.v.c.A. The Boltzmann transport equation, assuming molecular chaos

When Iridio returned to Widgeree, he explored the Boltzmann equations mentioned by Ernesto. Although both members of the equations were almost always the same dark and radioactive colour, they seemed sinister. Even though he knew it was important to understand them, every time he tried to explore their physical meaning, he fell prey to an inexplicable sickness similar to the nausea he suffered in Ernesto's wine cellar, and

$$S = k \log W$$

had to desist. The nausea got worse when Iridio explored the equation carved on Boltzmann's tomb, which formulated the statistical definition

1.9.v.c.B. Statistical definition of entropy, engraved on Ludwig Boltzmann's headstone

of entropy. When investigating the history of the equation, he discovered that the headstone on which the definition was engraved had disappeared mysteriously during the Third World War. However, there was no explanation of the event in the official databases.

Once or twice, Iridio tried to obtain a permit to visit Atlantis VIII at the local office of the Ministry of Defence, Internal Appeasement and Border Protection. Although quarantine restrictions had been lifted, his applications were turned down with bureaucratic excuses in a language very difficult to understand. Faced with his insistence, the patriotic police referred him to the morality and oztraditions police who, predictably, asked him to undergo a series of psychometric tests to determine if he was psychologically suitable for such a visit. When Iridio went to the modest psychometric clinic of the Registry for Orgonic and Cognitive Health in the Ministry of Health, Natality and Civic Comfort in Widgeree, he did not find Rieneke Watson there. He had been replaced by Owen Jacob Thorndike Mowrer, BPsySc, CPsychom, a strict Reich-behaviourist. Rhythmical Jouissance had been replaced by a very unpleasant robotic assistant who did not even bother to introduce herself. The tests included wearing the diagnostic helmet to watch the same photos of naked women that the previous psychometrist had shown him. That caused other problems. Not

only was he not allowed to travel but he was also required to see a specialist to get a new diagnosis in order to clarify whether he was asexual, since Rieneke Watson's diagnosis seemed suspicious to the new psychometrist. Unless he could present a marriage certificate or a temporary copulatory contract with a woman of proven active heterosexuality, he would also be required to undergo monthly monitoring of his genital eudaemonia because the rules had changed

$$f_m(x) = \sum_r \binom{|\Gamma|}{r} p_r x^r (1-x)^{|\Gamma|-r}$$

1.9.vi. Large-scale deviations in mean-field models of probabilistic cellular automata for neuropercolation

and the reports of non-government sexual technologists or second-class organic cyborgs could no longer be considered valid proof of satisfactory sexual performance. To deter him completely, Thorndike Mowrer

recommended that, if Iridio continued to insist on visiting Atlantis VIII, he should undergo an inverse transcranial magnetic stimulation treatment, supervised by the morality and oztraditions police.

The new psychometrist's robotic assistant had also discovered the note that Rieneke Watson had included in Iridio's file concerning his undescended testis and the diagnosis of neuroatypicality with synaesthesia. Thorndike Mowrer was shocked because his predecessor had not reported this to the health authorities at the ministry. He therefore ruled that Iridio needed to see a specialist in sexual disorders immediately. When Iridio told him that he was a private patient at the time, which perhaps explained the situation, the psychometrist had a fit of anger and asked his robotic assistant to find all the previous reports. At that moment, the VIP-γ89 protocol came up, restricting access to much of the information in his dossier, which caused Thorndike Mowrer to lose his temper completely and decide to formally challenge the restrictions imposed by the Ministry for Historical Updating, Social Precognition and Digital Worship.

Iridio also had an official disciplinary meeting with Zoe at the patent office. For the first time in his many years at work, Iridio had not completed the minimum number of monthly assessments of new patents. The technological police required an explanation. Before he left, Zoe gave Iridio an invitation to attend the ninetieth birthday of Mrs Frauke Grubach the following Saturday. Halina was invited as well. He felt guilty because he had promised to visit her many times but had never done so as he was always engrossed in his calculations. So he pulled himself together and attended the event with Halina. The other lodgers seemed annoyed by his presence at the party. Halina told him in a low voice that he must meet Zoe and Honorio in a private room which had been swept for hidden microphones. Zoe was waiting for him. She apologised for the disciplinary meeting, but she needed to warn him that the court

proceedings against him had been reopened and he was being investigated by several police departments. She was worried about his future because Kaminer Kullych was leaving no stone unturned in the effort to take Iridio's position, arguing that his civic credit was higher than Iridio's and he deserved to be promoted to a substantive position with more responsibility because of his loyalty medals. Central office had sent her a suggestion to transfer Iridio to the medical patents section. Given his previous experience when he was assessing the asexuality drug patent, Zoe believed that this was a trap. For the moment, she had managed to stall the transfer, but it was important for Iridio to ignore Kaminer Kullych, concentrate on his duties and increase his performance levels as soon as possible. While they were talking, Honorio and Halina were communicating monitor to monitor, and from the noise of their processors one could gather that they were exchanging a vast amount of information. Iridio and Zoe could not continue their conversation because Mrs Frauke Grubach came to fetch them to take part in the cutting of the cake and the singing of Happy Birthday. When she saw Honorio and Halina in frantic communication, she told them to follow the example of the robotic assistants who easily fell in love, and get married, because they were made for each other. That might solve their problems with the morality and oztraditions police. Zoe surprised Iridio when she stated, without mincing words, that she had already thought about it. However, that would bring other problems because the agency's rules would not allow Iridio to continue working in her section. If Iridio left, the lurking sharks would devour her. Mrs Frauke Grubach said that it was a great pity. She also offered to talk to one of her nephews, who worked in one of the most prestigious police forces, if they needed help with anything.

Something in his heart told Iridio that looking for Julia was useless. He managed to persuade Halina to switch on her oracle function and she revealed that the probability of seeing Julia again was negligible. However, if the Everett interpretation of quantum mechanics was true, he could console himself knowing that there would be a parallel universe where he would meet Julia again. And there would be other universes in which they could marry and live happily together. That type of response would have normally caused Iridio to ask her to show him the formulae which he so hated, on which those spectacular predictions about multiple universes were based, and they would have spent hours discussing the terms of the equations. But he remained silent for a moment and then said that, somehow, he knew that Julia was dead. Halina refused to confirm the probability of the prediction. The sorrow of that painful intuition was mingled with the grief caused by the death of his parents. He had not felt

the loss deeply because he was too busy writing his article. He spent many nights lying awake looking at the ceiling of his room in the dark, imagining what it would be like when the last galaxy faded away in the black firmament in 8.5 billion years. That thought however, did not cause the same intellectual excitement as in the past. Instead, he felt a dull and wounding ache.

When he found the strength to think again about the Everett interpretation, Iridio found an article in an old flexible reader inherited from his mother. It contained a theorem on quantum eternity predicting that the universe was eternal. If that was true, there could have been no Big Bang. That made him lose heart even more. Encouraged by Halina, he found the energy to visit Iris, though only occasionally. He kept helping her financially so that she would not have to go back to work at the clinic and place her little children in childcare, where they would be indoctrinated to obey the state unconditionally. Almost without his realising it, the need to find the energy to visit Iris and her children allowed him to slowly leave behind the dreadful sadness that prevented him from working.

When he was able to resume his calculations, he again had the recurring nightmares in which he was obliged to make love to Fanny and Clarisse. The certainty that the master formula included in his article was incomplete began to bother him again. One night when Halina had to recite to him thousands of digits of π to help him calm down and get to sleep, he dreamt that instead of visiting the National Observatory, the members of his school science club attended a conference at Yabbie Creek-W University. He saw himself in the dream, presenting his hypotheses in the aula magna where he had discussed his preliminary results with PhDr Muñoz Rojas. His young self was also sitting in the back row and copying an impressive formula that his adult doppelganger had projected on the board. When he

Consider a universe described by a quantum state $|\psi(t)\rangle$, obeying Schrödinger's equation

$$\hat{H}|\psi(t)\rangle = i \frac{d}{dt} |\psi(t)\rangle$$

with non-zero energy, governed by laws of physics that are independent of time.

Then: the universe is eternal
(time runs from $-\infty$ to $+\infty$)

1.9.vii.a. Quantum eternity theorem

If the initial state $|\Psi\rangle$ is an eigenvector of the steady state $\hat{\chi}$, with non-zero eigenvalue $\lambda \in \mathbb{R}$, then the expected return time is

$$\bar{T}_{\Psi} = \frac{1}{\langle \Psi | \hat{\chi} | \Psi \rangle}$$

with $\hat{\chi} = \lim_{T \rightarrow \infty} \frac{1}{T} \sum_{t=0}^{T-1} \mathcal{S}^t [|\Psi\rangle \langle \Psi|]$

1.9.vii.b. Kac's quantum recurrence time (generalisation of Kac's recurrence time to quantum mechanics)

woke up, free of anguish, which was rare when he remembered his dreams, Iridio realised that he had an improved version of the master formula he had been unable to find previously. He wrote it down in a hurry. As his mother had suggested, it was an equation that provided an explanation of how a change in the density of the

Ω -asymmetry in different regions of space-time could change the parameters of the Kasner metrics

$$ds^2 = \left[1 - h(x, y, z, t) \left(\frac{2t^2}{x^2 + t^2} \right) \right] (-dt^2 + dx^2) + h(x, y, z, t) \left(\frac{4xt}{x^2 + t^2} \right) dxdt + dy^2 + dz^2$$

1.9.vii.c. The metric of a 'Traversable Achronal Retrograde Domain in Space-time' geometry

and allow space-time travel through wormholes. Immediately he contacted Ernesto, who congratulated him on his discovery. He suggested Iridio wait until his article was published before contacting the editor, even though Iridio was impatient and eager to rewrite the article in its entirety, to highlight the importance of the new equation.

...9, 9, 9, 9, 9, 8, 3, 7, 2, 9, 7, 8, 0, 4, 9, 9, 5, 1, 0, 5, 9, 7, 3, 1, 7, 3, 2, 8, 1, 6, 0, 9, 6, 3, 1, 8, 5, 9, 5, 0, 2, 4, 4, 5, 9, 4, 5, 5, 3, 4, 6, 9,

0, 8, 3, 0, 2, 6, 4, 2, 5, 2, 2, 3, 0, 8, 2, 5, 3, 3, 4, $1 + C(b, c) \geq |C(a, b) - C(a, c)|$

4, 6, 8, 5, 0, 3, 5, 2, 6, 1, 9, 3, 1, 1, 8, 8, 1, 7, 1, 1.9.vii.d.A. Original Bell's inequality

0, 1, 0, 0, 0, 3, 1, 3, 7, 8, 3, 8, 7, 5, 2, 8, 8, 6, 5,

8, 7, 5, 3, 3, 2, 0, 8, 3, 8, 1, 4, 2, 0, 6, 1, 7, 1, 7, 7, 6, 6, 9, 1, 4, 7, 3, 0, 3, 5, 9, 8, 2, 5, 3,

4, 9, 0, 4, 2, 8, 7, 5, 5, 4, 6, 8, 7, 3, 1, 1, 5, 9, 5, 6, 2, 8, 6, 3, 8, 8, 2, 3, 5, 3, 7, 8, 7, 5, 9,

3, 7, 5, 1, 9, 5, 7, 7, 8, 1, 8, 5, 7, 7, 8, 0, 5, 3, 2, 1, 7, 1, 2, 2, 6, 8, 0, 6, 6, 1, 3, 0, 0, 1, 9,

2, 7, 8, 7, 6, 6, 1, 1, 1, 9, 5, 9, 0, 9, 2, 1, 6, 4, 2, 0, 1, 9, 8, 9, 3, 8, 0, 9, 5, 2, 5, 7, 2, 0, 1,

0, 6, 5, 4, 8, 5, 8, 6, 3, 2, 7, 8, 8, 6, 5, 9, 3, 6, 1, 5, 3, 3, 8, 1, 8, 2, 7, 9, 6, 8, 2, 3, 0, 3, 0,

1, 9, 5, 2, 0, 3, 5, 3, 0, 1, 8,

5, 2, 9, 6, 8, 9, 9, 5, 7, 7, 3,

6, 2, 2, 5, 9, 9, 4, 1, 3, 8, 9,

1, 2, 4, 9, 7, 2, 1, 7, 7, 5, 2,

8, 3, 4, 7, 9, 1, 3, 1, 5, 1, 5,

5, 7, 4, 8, 5, 7, 2, 4, 2, 4, 5,

4, 1, 5, 0, 6, 9, 5, 9, 5, 0, 8,

2, 9, 5, 3, 3, 1, 1, 6, 8, 6, 1,

7, 2, 7, 8, 5, 5, 8, 8, 9, 0, 7,

5, 0, 9, 8, 3, 8, 1, 7, 5, 4, 6,

3, 7, 4, 6, 4, 9, 3, 9, 3, 1, 9, 2, 5, 5, 0, 6, 0, 4, 0, 0, 9, 2, 7, 7, 0, 1, 6, 7, 1, 1, 3, 9, 0, 0, 9,

8, 4, 8, 8, 2, 4, 0, 1, 2, 8, 5, 8, 3, 6, 1, 6, 0, 3, 5, 6, 3, 7, 0, 7, 6, 6, 0, 1, 0, 4, 7, 1, 0, 1, 8,

1, 9, 4, 2, 9, 5, 5, 5, 9, 6, 1, 9, 8, 9, 4, 6, 7, 6, 7, 8, 3, 7, 4, 4, 9, 4, 4, 8, 2, 5, 5, 3, 7, 9, 7,

7, 4, 7, 2, 6, 8, 4, 7, 1, 0, 4, 0, 4, 7, 5, 3, 4, 6, 4, 6, 2, 0, 8, 0, 4, 6, 6, 8, 4, 2, 5, 9, 0, 6, 9,

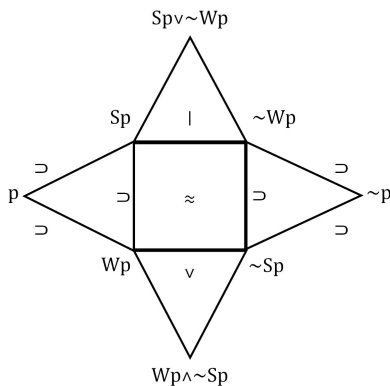
If P denotes a point-like event, then a counterfactual $P \Box \rightarrow Q$ is true if, and only if Q is true in all possible P -worlds that are exactly like the actual one in the entire region outside the forward light cone of the event P

1.9.vii.d.B. Forward light cone relativistically invariant reading of counterfactuals

4, 9, 1, 2, 9, 3, 3, 1, 3, 6, 7, 7, 0, 2, 8, 9, 8, 9, 1, 5, 2, 1, 0, 4, 7, 5, 2, 1, 6, 2, 0, 5, 6, 9, 6,
 6, 0, 2, 4, 0, 5, 8, 0, 3, 8, 1, 5, 0, 1, 9, 3, 5, 1, 1, 2, 5, 3, 3, 8, 2, 4, 3, 0, 0, 3, 5, 5, 8, 7, 6,
 4, 0, 2, 4, 7, 4, 9, 6, 4, 7, 3, 2, 6, 3, 9, 1, 4, 1, 9, 9, 2, 7, 2,
 6, 0, 4, 2, 6, 9, 9, 2, 2, 7, 9, 6, 7, 8, 2, 3, 5, 4, 7, 8, 1, 6, 3,
 6, 0, 0, 9, 3, 4, 1, 7, 2, 1, 6, 4, 1, 2, 1, 9, 9, 2, 4, 5, 8, 6, 3,
 1, 5, 0, 3, 0, 2, 8, 6, 1, 8, 2, 9, 7, 4, 5, 5, 5, 7, 0, 6, 7, 4, 9,
 8, 3, 8, 5, 0, 5, 4, 9, 4, 5, 8, 8, 5, 8, 6, 9, 2, 6, 9, 9, 5, 6, 9,
 0, 9, 2, 7, 2, 1, 0, 7, 9, 7, 5, 0, 9, 3, 0, 2, 9, 5, 5, 3, 2, 1, 1, 6, 5, 3, 4, 4, 9, 8, 7, 2, 0, 2, 7,
 5, 5, 9, 6, 0, 2, 3, 6, 4, 8, 0, 6, 6, 5, 4, 9, 9, 1, 1, 9, 8, 8, 1, 8, 3, 4, 7, 9, 7, 7, 5, 3, 5, 6, 6,
 3, 6, 9, 8, 0, 7, 4, 2, 6, 5, 4, 2, 5, 2, 7, 8, 6, 2, 5, 5, 1, 8, 1, 8, 4, 1, 7, 5, 7, 4, 6, 7, 2, 8, 9,
 0, 9, 7, 7, 7, 7, 2, 7, 9, 3, 8, 0, 0, 0, 8, 1, 6, 4, 7, 0, 6, 0, 0, 1, 6, 1, 4, 5, 2, 4, 9, 1, 9, 2, 1,
 7, 3, 2, 1, 7, 2, 1, 4, 7, 7, 2, 3, 5, 0, 1, 4, 1, 4, 4, 1, 9, 7, 3, 5, 6, 8, 5, 4, 8, 1, 6, 1, 3, 6, 1,
 1, 5, 7, 3, 5, 2, 5, 5, 2, 1, 3, 3, 4, 7, 5, 7, 4, 1, 8, 4, 9, 4, 6, 8, 4, 3, 8, 5, 2, 3, 3, 2, 3, 9, 0,
 7, 3, 9, 4, 1, 4, 3, 3, 3, 4, 5, 4, 7, 7, 6, 2, 4, 1, 6, 8, 6, 2, 5, 1, 8, 9, 8, 3, 5, 6, 9, 4, 8, 5, 5,
 6, 2, 0, 9, 9, 2, 1, 9, 2, 2, 2, 1, 8, 4, 2, 7, 2, 5, 5, 0, 2, 5, 4, 2, 5, 6, 8, 8, 7, 6, 7, 1, 7, 9, 0,
 4, 9, 4, 6, 0, 1, 6, 5, 3, 4, 6, 6, 8, 0, 4, 9, 8, 8, 6, 2, 7, 2, 3, 2, 7, 9, 1, 7, 8, 6, 0, 8, 5, 7, 8,
 4, 3, 8, 3, 8, 2, 7, 9, 6, 7, 9, 7, 6, 6, 8, 1, 4, 5, 4, 1, 0, 0, 9, 5, 3, 8, 8, 3, 7, 8, 6, 3, 6, 0, 9,
 5, 0, 6, 8, 0, 0, 6, 4, 2, 2, 5, 1, 2, 5, 2, 0, 5, 1, 1, 7, 3, 9, 2, 9, 8, 4, 8, 9, 6, 0, 8, 4, 1, 2, 8,
 4, 8, 8, 6, 2, 6, 9, 4, 5, 6, 0, 4, 2, 4, 1, 9, 6, 5, 2, 8, 5, 0, 2, 2, 2, 1, 0, 6, 6, 1, 1, 8, 6, 3, 0,
 6, 7, 4, 4, 2, 7, 8, 6, 2, 2, 0, 3, 9, 1, 9, 4, 9, 4, 5, 0, 4, 7, 1, 2, 3, 7, 1, 3, 7, 8, 6, 9, 6, 0, 9,
 5, 6, 3, 6, 4, 3, 7, 1, 9, 1, 7, 2, 8, 7, 4, 6, 7, 7,
 6, 4, 6, 5, 7, 5, 7, 3, 9, 6, 2, 4, 1, 3, 8, 9, 0, 8,
 6, 5, 8, 3, 2, 6, 4, 5, 9, 9, 5, 8, 1, 3, 3, 9, 0, 4,
 7, 8, 0, 2, 7, 5, 9, 0, 0, 9, 9, 4, 6, 5, 7, 6, 4, 0,
 7, 8, 9, 5, 1, 2, 6, 9, 4, 6, 8, 3, 9, 8, 3, 5, 2, 5,
 9, 5, 7, 0, 9, 8, 2, 5, 8, 2, 2, 6, 2, 0, 5, 2, 2, 4,
 8, 9, 4, 0, 7, 7, 2, 6, 7, 1, 9, 4, 7, 8, 2, 6, 8, 4,
 8, 2, 6, 0, 1, 4, 7, 6, 9, 9, 0, 9, 0, 2, 6, 4, 0, 1,
 3, 6, 3, 9, 4, 4, 3, 7, 4, 5, 5, 3, 0, 5, 0, 6, 8, 2,
 0, 3, 4, 9, 6, 2, 5, 2, 4, 5, 1, 7, 4, 9, 3, 9, 9, 6,
 5, 1, 4, 3, 1, 4, 2, 9, 8, 0, 9, 1, 9, 0, 6, 5, 9, 2,
 5, 0, 9, 3, 7, 2, 2, 1, 6, 9, 6, 4, 6, 1, 5, 1, 5, 7,
 0, 9, 8, 5, 8, 3, 8, 7, 4, 1, 0, 5, 9, 7, 8, 8, 5, 9,
 5, 9, 7, 7, 2, 9, 7, 5, 4, 9, 8, 9, 3, 0, 1, 6, 1, 7,
 5, 3, 9, 2, 8, 4, 6, 8, 1, 3, 8, 2, 6, 8, 6, 8, 3, 8,

$$e^{i\frac{\pi}{4}} + \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}$$

1.9.vii.d.C. Pythagoras'
constant (Square root of 2)



1.9.vii.e. The logical system $\Sigma 2$, based
on the scholastic square of opposition,
according to Redmond

6, 8, 9, 4, 2, 7, 7, 4, 1, 5, 5, 9, 9, 1, 8, 5, 5, 9, 2, 5, 2, 4, 5, 9, 5, 3, 9, 5, 9, 4, 3, 1, 0, 4, 9,
 9, 7, 2, 5, 2, 4, 6, 8, 0, 8, 4, 5, 9, 8, 7, 2, 7, 3, 6, 4, 4, 6, 9, 5, 8, 4, 8, 6, 5, 3, 8, 3, 6, 7, 3,
 6, 2, 2, 2, 6, 2, 6, 0, 9, 9, 1, 2, 4, 6, 0, 8, 0, 5, 1, 2, 4, 3, 8, 8, 4, 3, 9, 0, 4, 5, 1, 2, 4, 4, 1,

$$\begin{aligned}
 &3, 6, 5, 4, 9, 7, 6, 2, 7, 8, 0, 7, 9, 7, 7, 1, 5, 6, 9, 1, 4, 3, 5, 9, 9, 7, 7, 0, 0, 1, 2, 9, 6, 1, 6, \\
 &0, 8, 9, 4, 4, 1, 6, 9, 4, 8, 6, 8, 5, 5, 5, 8, 4, 8, 4, 0, 6, 3, 5, 3, 4, 2, 2, 0, 7, 2, 2, 2, 5, 8, 2, \\
 &8, 4, 8, 8, 6, 4, 8, 1, 5, \\
 &8, 4, 5, 6, 0, 2, 8, 5, 0, \\
 &6, 0, 1, 6, 8, 4, 2, 7, 3, \\
 &9, 4, 5, 2, 2, 6, 7, 4, 6, \\
 &7, 6, 7, 8, 8, 9, 5, 2, 5,
 \end{aligned}$$

$$e_8 \cong \mathfrak{so}_8 \oplus \widehat{\mathfrak{so}_8} \oplus (V \otimes \widehat{V}) \oplus (S_+ \otimes \widehat{S_+}) \oplus (S_- \otimes \widehat{S_-})$$

$$e_8 \cong \mathfrak{so}_{16} \oplus \Delta_+^{128}$$

1.9.vii.f. Barton and Sudbery construction for the Lie group e_8

$$\begin{aligned}
 &2, 1, 3, 8, 5, 2, 2, 5, 4, 9, 9, 5, 4, 6, 6, 6, 7, 2, 7, 8, 2, 3, 9, 8, 6, 4, 5, 6, 5, 9, 6, 1, 1, 6, 3, \\
 &5, 4, 8, 8, 6, 2, 3, 0, 5, 7, 7, 4, 5, 6, 4, 9, 8, 0, 3, 5, 5, 9, 3, 6, 3, 4, 5, 6, 8, 1, 7, 4, 3, 2, 4, \\
 &1, 1, 2, 5, 1, 5, 0, 7, 6, 0, 6, 9, 4, 7, 9, 4, 5, 1, 0, 9, 6, 5, 9, 6, 0, 9, 4, 0, 2, 5, 2, 2, 8, 8, 7, \\
 &9, 7, 1, 0, 8, 9, 3, 1, 4, 5, 6, 6, 9, 1, 3, 6, 8, 6, 7, 2, 2, 8, 7, 4, 8, 9, 4, 0, 5, 6, 0, 1, 0, 1, 5, \\
 &0, 3, 3, 0, 8, 6, 1, 7, 9, 2, 8, 6, 8, 0, 9, 2, 0, 8, 7, 4, 7, 6, 0, 9, 1, 7, 8, 2, 4, 9, 3, 8, 5, 8, 9, \\
 &0, 0, 9, 7, 1, 4, 9, 0, 9, 6, 7, 5, 9, 8, 5, 2, 6, 1, 3, 6, 5, 5, 4, 9, 7, 8, 1, 8, 9, 3, 1, 2, 9, 7, 8, \\
 &4, 8, 2, 1, 6, 8, 2, 9, 9, 8, 9, 4, 8, 7, 2, 2, 6, 5, 8, 8, 0, 4, 8, 5, 7, 5, 6, 4, 0, 1, 4, 2, 7, 0, 4, \\
 &7, 7, 5, 5, 1, 3, 2, 3, 7, 9, 6, 4, 1, 4, 5, 1, 5, 2, 3, 7, 4, 6, 2, 3, 4, 3, 6, 4, 5, 4, 2, 8, 5, 8, \\
 &4, 4, 4, 7, 9, 5, 2, 6, 5, 8, 6, 7, 8, 2, 1, 0, 5, 1, 1, 4, 1, 3, 5, 4, 7, 3, 5, 7, 3, 9, 5, 2, 3, 1, 1,
 \end{aligned}$$

$$\theta_{t+1}^{(i,k)} = \omega^{(i,k)} + \theta_t^{(i,k)} + \frac{\alpha}{Np^c} \sum_{(j,l) \in G^{(i,k)}} \sin(\theta_t^{(j,l)} - \theta_t^{(i,k)} - \psi_{kl}^{ij}) + \sigma_\beta \beta_t^{(i,k)}$$

1.9.vii.g. Mathematical model for the differentiation of functions in cortical modules

$$\begin{aligned}
 &2, 9, 5, 2, 4, 8, 4, 9, 3, 7, 1, 8, 7, 1, 1, 0, 1, 4, 5, 7, 6, 5, 4, 0, 3, 5, 9, 0, 2, 7, 9, 9, 3, 4, 4, \\
 &0, 3, 7, 4, 2, 0, 0, 7, 3, 1, 0, 5, 7, 8, 5, 3, 9, 0, 6, 2, 1, 9, 8, 3, 8, 7, 4, 4, 7, 8, 0, 8, 4, 7, 8, \\
 &4, 8, 9, 6, 8, 3, 3, 2, 1, 4, 4, 5, 7, 1, 3, 8, 6, 8, 7, 5, 1, 9, 4, 3, 5, 0, 6, 4, 3, 0, 2, 1, 8, 4, 5, \\
 &3, 1, 9, 1, 0, 4, 8, 4, 8, 1, 0, 0, 5, 3, 7, 0, 6, 1, 4, 6, 8, 0, 6, 7, 4, 9, 1, 9, 2, 7, 8, 1, 9, 1, 1, \\
 &9, 7, 9, 3, 9, 9, 5, 2, 0, 6, 1, 4, 1, 9, 6, 6, 3, 4, 2, 8, 7, 5, 4, 4, 4, 0, 6, 4, 3, 7, 4, 5, 1, 2, 3, \\
 &7, 1, 8, 1, 9, 2, 1, 7, 9, 9, 9, 8, 3, 9, 1, 0, 1, 5, 9, 1, 9, 5, 6, 1, 8, 1, 4, 6, 7, 5, 1, 4, 2, 6, 9, \\
 &1, 2, 3, 9, 7, 4, 8, 9, 4, 0, 9, 0, 7, 1, 8, 6, 4, 9, 4, 2, 3, 1, 9, 6, 1, 5, 6, 7, 9, 4, 5, 2, 0, 8, 0, \\
 &9, 5, 1, 4, 6, 5, 5, 0, 2, 2, 5, 2, 3, 1, 6, 0, 3, 8, 8, 1, 9, 3, 0, 1, 4, 2, 0, 9, 3, 7, 6, 2, 1, 3, 7, \\
 &8, 5, 5, 9, 5, 6, 6, 3, 8, 9, 3, 7, 7, 8, 7, 0, 8, 3, 0, 3, 9, \\
 &0, 6, 9, 7, 9, 2, 0, 7, 7, 3, 4, 6, 7, 2, 2, 1, 8, 2, 5, 6, 2, \\
 &5, 9, 9, 6, 6, 1, 5, 0, 1, 4, 2, 1, 5, 0, 3, 0, 6, 8, 0, 3, 8, \\
 &4, 4, 7, 7, 3, 4, 5, 4, 9, 2, 0, 2, 6, 0, 5, 4, 1, 4, 6, 6, 5, \\
 &9, 2, 5, 2, 0, 1, 4, 9, 7, 4, 4, 2, 8, 5, 0, 7, 3, 2, 5, 1, 8, \\
 &6, 6, 6, 0, 0, 2, 1, 3, 2, 4, 3, 4, 0, 8, 8, 1, 9, 0, 7, 1, 0,
 \end{aligned}$$

$$i \partial_a T \frac{\delta \Psi}{\delta T(\xi)} = \widehat{\mathcal{H}}_a^G(\xi) \Psi$$

1.9.vii.h. The Wheeler-De Witt equation in the presence of a tachyon field

$$\begin{aligned}
 &4, 8, 6, 3, 3, 1, 7, 3, 4, 6, 4, 9, 6, 5, 1, 4, 5, 3, 9, 0, 5, 7, 9, 6, 2, 6, 8, 5, 6, 1, 0, 0, 5, 5, 0, \\
 &8, 1, 0, 6, 6, 5, 8, 7, 9, 6, 9, 9, 8, 1, 6, 3, 5, 7, 4, 7, 3, 6, 3, 8, 4, 0, 5, 2, 5, 7, 1, 4, 5, 9, 1, \\
 &0, 2, 8, 9, 7, 0, 6, 4, 1, 4, 0, 1, 1, 0, 9, 7, 1, 2, 0, 6, 2, 8, 0, 4, 3, 9, 0, 3, 9, 7, 5, 9, 5, 1, 5, \\
 &6, 7, 7, 1, 5, 7, 7, 0, 0, 4, 2, 0, 3, 3, 7, 8, 6, 9, 9, 3, 6, 0, 0, 7, 2, 3, 0, 5, 5, 8, 7, 6, 3, 1, 7,
 \end{aligned}$$

6, 3, 5, 9, 4, 2, 1, 8, 7, 3, 1, 2, 5, 1, 4, 7, 1, 2, 0, 5, 3, 2, 9, 2, 8, 1, 9, 1, 8, 2, 6, 1, 8, 6, 1,
2, 5, 8, 6, 7, 3, 2, 1, 5, 7, 9, 1, 9, 8, 4, 1, 4, 8, 4, 8, 8, 2, 9, 1, 6, 4, 4, 7, 0, 6, 0, 9, 5, 7, 5,
2, 7, 0, 6, 9, 5, 7, 2, 2, 0, 9, 1, 7, 5, 6, 7, 1, 1, 6, 7, 2, 2, 9, 1, 0, 9, 8, 1, 6, 9, 0, 9, 1, 5, 2,
8, 0, 1, 7, 3, 5, 0, 6, 7, 1, 2, 7, 4, 8, 5, 8, 3, 2, 2, 2, 8, 7, 1, 8, 3, 5, 2, 0, 9, 3, 5, 3, 9, 6, 5,
7, 2, 5, 1, 2, 1, 0, 8, 3, 5, 7, 9, 1, 5, 1, 3, 6, 9, 8, 8, 2, 0, 9, 1, 4, 4, 4, 2, 1, 0, 0, 6, 7, 5, 1,
0, 3, 3, 4, 6, 7, 1, 1, 0, 3, 1, 4, 1, 2, 6, 7, 1, 1, 1, 3, 6, 9, 9, 0, 8, 6, 5, 8, 5, 1, 6, 3, 9, 8, 3,
1, 5, 0, 1, 9, 7, 0, 1, 6, 5, 1, 5, 1, 1, 6, 8, 5, 1, 7, 1, 4, 3, 7, 6, 5, 7, 6, 1, 8, 3, 5, 1, 5, 5, 6,
5, 0, 8, 8, 4, 9, 0, 9, 9, 8, 9, 8, 5, 9, 9, 8, 2, 3, 8, 7, 3, 4, 5, 5, 2, 8, 3, 3, 1, 6, 3, 5, 5, 0, 7,
6, 4, 7, 9, 1, 8, 5, 3, 5, 8, 9, 3, 2, 2, 6, 1, 8, 5, 4, 8, 9, 6, 3, 2, 1, 3, 2, 9, 3, 3, 0, 8, 9, 8, 5,
7, 0, 6, 4, 2, 0, 4, 6, 7, 5, 2, 5, 9, 0, 7, 0, 9, 1, 5, 4, 8, 1, 4, 1, 6, 5, 4, 9, 8, 5, 9, 4, 6, 1, 6,
3, 7, 1, 8, 0, 2, 7, 0, 9, 8, 1, 9, 9, 4, 3, 0, 9, 9, 2, 4, 4, 8, 8, 9, 5, 7, 5, 7, 1, 2, 8, 2, 8, 9, 0,
5, 9, 2, 3, 2, 3, 3, 2, 6, 0, 9, 7, 2, 9, 9, 7, 1, 2, 0, 8, 4, 4, 3, 3, 5, 7, 3, 2, 6, 5, 4, 8, 9, 3, 8,
2, 3, 9, 1, 1, 9, 3, 2, 5, 9, 7, 4, 6, 3, 6, 6, 7, 3, 0, 5, 8, 3, 6, 0, 4, 1, 4, 2, 8, 1, 3, 8, 8, 3, 0,
3, 2, 0, 3, 0, 3, 0, 7, 0, 7, 4, 6, 9, 2, 1, 1, 2, 0, 1, 9, 1, 3, 0, 2, 0, 3, 3, 0, 3, 8, 0, 1, 9, 7, 6,
2, 1, 1, 0, 1, 1, 0, 0, 4, 4, 9, 2, 9, 3, 2, 1, 5, 1, 6, 0, 8, 4, 2, 4, 4, 4, 8, 5, 9, 6, 3, 7, 6, 6, 9,
8, 3, 8, 9, 5, 2, 2, 8, 6, 8, 4, 7, 8, 3, 1, 2, 3, 5, 5, 2, 6, 5, 8, 2, 1, 3, 1, 4, 4, 9, 5, 7, 6, 8, 5,
7, 2, 6, 2, 4, 3, 3, 4, 4, 1, 8, 9, 3, 0, 3, 9, 6, 8, 6, 4, 2, 6,
2, 4, 3, 4, 1, 0, 7, 7, 3, 2, 2, 6, 9, 7, 8, 0, 2, 8, 0, 7, 3, 1,
8, 9, 1, 5, 4, 4, 1, 1, 0, 1, 0, 4, 4, 6, 8, 2, 3, 2, 5, 2, 7, 1,
6, 2, 0, 1, 0, 5, 2, 6, 5, 2, 2, 7, 2, 1, 1, 1, 6, 6, 0, 3, 9, 6,
6, 6, 5, 5, 7, 3, 0, 9, 2, 5, 4, 7, 1, 1, 0, 5, 5, 7, 8, 5, 3, 7, 6, 3, 4, 6, 6, 8, 2, 0, 6, 5, 3, 1, 0,
9, 8, 9, 6, 5, 2, 6, 9, 1, 8, 6, 2, 0, 5, 6, 4, 7, 6, 9, 3, 1, 2, 5, 7, 0, 5, 8, 6, 3, 5, 6, 6, 2, 0, 1,
8, 5, 5, 8, 1, 0, 0, 7, 2, 9, 3, 6, 0, 6, 5, 9, 8, 7, 6, 4, 8, 6, 1, 1, 7, 9, 1, 0, 4, 5, 3, 3, 4, 8, 8,
5, 0, 3, 4, 6, 1, 1, 3, 6, 5, 7, 6, 8, 6, 7, 5, 3, 2, 4, 9, 4, 4, 1, 6, 6, 8, 0, 3, 9, 6, 2, 6, 5, 7, 9,
7, 8, 7, 7, 1, 8, 5, 5, 6, 0, 8, 4, 5, 5, 2, 9, 6, 5, 4, 1, 2, 6, 6, 5, 4, 0, 8, 5, 3, 0, 6, 1, 4, 3, 4,
4, 4, 3, 1, 8, 5, 8, 6, 7, 6, 9, 7, 5, 1, 4, 5, 6, 6, 1, 4, 0, 6, 8, 0, 0, 7, 0, 0, 2, 3, 7, 8, 7, 7, 6,
5, 9, 1, 3, 4, 4, 0, 1, 7, 1, 2, 7, 4, 9, 4, 7, 0, 4, 2, 0, 5, 6, 2, 2, 3, 0, 5, 3, 8, 9, 9, 4, 5, 6, 1,
3, 1, 4, 0, 7, 1, 1, 2, 7, 0, 0, 0, 4, 0, 7, 8, 5, 4, 7, 3, 3, 2, 6, 9, 9, 3, 9, 0, 8, 1, 4, 5, 4, 6, 6,
4, 6, 4, 5, 8, 8, 0, 7, 9, 7, 2, 7, 0, 8, 2, 6, 6, 8, 3, 0, 6, 3, 4, 3, 2, 8, 5, 8, 7, 8, 5, 6, 9, 8, 3,
0, 5, 2, 3, 5, 8, 0, 8, 9, 3, 3, 0, 6, 5, 7, 5, 7, 4, 0, 6, 7, 9, 5, 4, 5, 7, 1, 6, 3, 7, 7, 5, 2, 5, 4,
2, 0, 2, 1, 1, 4, 9, 5, 5, 7, 6, 1, 5, 8, 1, 4, 0, 0, 2, 5, 0, 1, 2, 6, 2, 2, 8, 5, 9, 4, 1, 3, 0, 2, 1,
6, 4, 7, 1, 5, 5, 0, 9, 7, 9, 2, 5, 9, 2, 3, 0, 9, 9, 0, 7, 9, 6, 5, 4, 7, 3, 7, 6, 1, 2, 5, 5, 1, 7, 6,
5, 6, 7, 5, 1, 3, 5, 7, 5, 1, 7, 8, 2, 9, 6, 6, 6, 4, 5, 4, 7, 7, 9, 1, 7, 4, 5, 0, 1, 1, 2, 9, 9, 6, 1,
4, 8, 9, 0, 3, 0, 4, 6, 3, 9, 9, 4, 7, 1, 3, 2, 9, 6, 2, 1, 0, 7, 3, 4, 0, 4, 3, 7, 5, 1, 8, 9, 5, 7, 3,
5, 9, 6, 1, 4, 5, 8, 9, 0, 1, 9, 3, 8, 9, 7, 1, 3, 1, 1, 1, 7, 9, 0, 4, 2, 9, 7, 8, 2, 8, 5, 6, 4, 7, 5,
0, 3, 2, 0, 3, 1, 9, 8, 6, 9, 1, 5, 1, 4, 0, 2, 8, 7, 0, 8, 0, 8, 5, 9, 9, 0, 4, 8, 0, 1, 0, 9, 4, 1, 2,
1, 4, 7, 2, 2, 1, 3, 1, 7, 9, 4, 7, 6, 4, 7, 7, 7, 2, 6, 2, 2, 4, 1, 4, 2, 5, 4, 8, 5, 4, 5, 4, 0, 3, 3,
2, 1, 5, 7, 1, 8, 5, 3, 0, 6, 1, 4, 2, 2, 8, 8, 1, 3, 7, 5, 8, 5, 0, 4, 3, 0, 6, 3, 3, 2, 1, 7, 5, 1, 8,
2, 9, 7, 9, 8, 6, 6, 2, 2, 3, 7, 1, 7, 2, 1, 5, 9, 1, 6, 0, 7, 7, 1, 6, 6, 9, 2, 5, 4, 7, 4, 8, 7, 3, 8,
9, 8, 6, 6, 5, 4, 9, 4, 9, 4, 5, 0, 1, 1, 4, 6, 5, 4, 0, 6, 2, 8, 4, 3, 3, 6, 6, 3, 9, 3, 7, 9, 0, 0, 3,

$$e^{\pi} = (-1)^{-i} = i^{-2i}$$

1.9.viii.i. Gelfond's constant

9, 7, 6, 9, 2, 6, 5, 6, 7, 2, 1, 4, 6, 3, 8, 5, 3, 0, 6, 7, 3, 6, 0, 9, 6, 5, 7, 1, 2, 0, 9, 1, 8, 0, 7,
 6, 3, 8, 3, 2, 7, 1, 6, 6, 4, 1, 6, 2, 7, 4, 8, 8, 8, 8, 0, 0, 7, 8, 6, 9, 2, 5, 6, 0, 2, 9, 0, 2, 2, 8,
 4, 7, 2, 1, 0, 4, 0, 3, 1, 7, 2, 1, 1, 8, 6, 0, 8, 2, 0, 4, 1, 9, 0, 0, 0, 4, 2, 2, 9, 6, 6, 1, 7, 1, 1,
 9, 6, 3, 7, 7, 9, 2, 1, 3, 3, 7, 5, 7, 5, 1, 1, 4, 9, 5, 9, 5, 0, 1, 5, 6, 6, 0, 4, 9, 6, 3, 1, 8, 6, 2,
 9, 4, 7, 2, 6, 5, 4, 7, 3, 6, 4, 2, 5, 2, 3, 0, 8, 1, 7, 7, 0, 3, 6, 7, 5, 1, 5, 9, 0, 6, 7, 3, 5, 0, 2,
 3, 5, 0, 7, 2, 8, 3, 5, 4, 0, 5, 6, 7, 0, 4, 0, 3, 8, 6, 7, 4, 3, 5, 1, 3, 6, 2, 2, 2, 2, 4, 7, 7, 1, 5,
 8, 9, 1, 5, 0, 4, 9, 5, 3, 0, 9, 8, 4, 4, 4, 8, 9, 3, 3, 3, 0, 9, 6, 3, 4, 0, 8, 7, 8, 0, 7, 6, 9, 3, 2,
 5, 9, 9, 3, 9, 7, 8, 0, 5, 4, 1, 9, 3, 4, 1, 4, 4, 7, 3, 7, 7, 4, 4, 1, 8, 4, 2, 6, 3, 1, 2, 9, 8, 6, 0,
 8, 0, 9, 9, 8, 8, 8, 6, 8, 7, 4, 1, 3, 2, 6, 0, 4, 7, 2, 1, 5, 6, 9, 5, 1, 6, 2, 3, 9, 6, 5, 8, 6, 4, 5,
 7, 3, 0, 2, 1, 6, 3, 1, 5, 9, 8, 1, 9, 3, 1, 9, 5, 1, 6, 7, 3, 5, 3, 8, 1, 2, 9, 7, 4, 1, 6, 7, 7, 2, 9,
 4, 7, 8, 6, 7, 2, 4, 2, 2, 9, 2, 4, 6, 5, 4, 3, 6, 6, 8, 0, 0, 9, 8, 0, 6, 7, 6, 9, 2, 8, 2, 3, 8, 2, 8,
 0, 6, 8, 9, 9, 6, 4, 0, 0, 4, 8, 2, 4, 3, 5, 4, 0, 3, 7, 0, 1, 4, 1, 6, 3, 1, 4, 9, 6, 5, 8, 9, 7, 9, 4,
 0, 9, 2, 4, 3, 2, 3, 7, 8, 9, 6, 9, 0, 7, 0, 6, 9, 7, 7, 9, 4, 2, 2, 3, 6, 2, 5, 0, 8, 2, 2, 1, 6, 8, 8,
 9, 5, 7, 3, 8, 3, 7, 9, 8, 6, 2, 3, 0, 0, 1, 5, 9, 3, 7, 7, 6, 4, 7, 1, 6, 5, 1, 2, 2, 8, 9, 3, 5, 7, 8,
 6, 0, 1, 5, 8, 8, 1, 6, 1, 7, 5, 5, 7, 8, 2, 9, 7, 3, 5, 2, 3, 3, 4, 4, 6, 0, 4, 2, 8, 1, 5, 1, 2, 6, 2,
 7, 2, 0, 3, 7, 3, 4, 3, 1, 4, 6, 5, 3, 1, 9, 7, 7, 7, 7, 4, 1, 6, 0, 3, 1, 9, 9, 0, 6, 6, 5, 5, 4, 1, 8,
 7, 6, 3, 9, 7, 9, 2, 9, 3, 3, 4, 4, 1, 9, 5, 2, 1, 5, 4, 1, 3, 4, 1, 8, 9, 9, 4, 8, 5, 4, 4, 4, 7, 3, 4,
 5, 6, 7, 3, 8, 3, 1, 6, 2, 4, 9, 9, 3, 4, 1, 9, 1, 3, 1, 8, 1, 4, 8, 0, 9, 2, 7, 7, 7, 7, 1, 0, 3, 8, 6,
 3, 8, 7, 7, 3, 4, 3, 1, 7, 7, 2, 0, 7, 5, 4, 5, 6, 5, 4, 5, 3, 2, 2, 0, 7, 7, 7, 0, 9, 2, 1, 2, 0, 1, 9,
 0, 5, 1, 6, 6, 0, 9, 6, 2, 8, 0, 4, 9, 0, 9, 2, 6, 3, 6, 0, 1, 9, 7, 5, 9, 8, 8, 2, 8, 1, 6, 1, 3, 3, 2,
 3, 1, 6, 6, 6, 3, 6, 5, 2, 8, 6, 1, 9, 3, 2, 6, 6, 8, 6, 3, 3, 6, 0, 6, 2, 7, 3, 5, 6, 7, 6, 3, 0, 3, 5,
 4, 4, 7, 7, 6, 2, 8, 0, 3, 5, 0, 4, 5, 0, 7, 7, 7, 2, 3, 5, 5, 4, 7, 1, 0, 5, 8, 5, 9, 5, 4, 8, 7, 0, 2,
 7, 9, 0, 8, 1, 4, 3, 5, 6, 2, 4, 0, 1, 4, 5, 1, 7, 1, 8, 0, 6, 2, 4, 6, 4, 3, 6, 2, 6, 7, 9, 4, 5, 6, 1,
 2, 7, 5, 3, 1, 8, 1, 3, 4, 0, 7, 8, 3, 3, 0, 3, 3, 6, 2, 5, 4, 2, 3, 2, 7, 8, 3, 9, 4, 4, 9, 7, 5, 3, 8,
 2, 4, 3, 7, 2, 0, 5, 8, 3, 5, 3, 1, 1, 4, 7, 7, 1, 1, 9, 9, 2, 6, 0, 6, 3, 8, 1, 3, 3, 4, 6, 7, 7, 6, 8,
 7, 9, 6, 9, 5, 9, 7, 0, 3, 0, 9, 8, 3, 3, 9, 1, 3, 0, 7, 7, 1, 0, 9, 8, 7, 0, 4, 0, 8, 5, 9, 1, 3, 3, 7,
 4, 6, 4, 1, 4, 4, 2, 8, 2, 2, 7, 7, 2, 6, 3, 4, 6, 5, 9, 4, 7, 0, 4, 7, 4, 5, 8, 7, 8, 4, 7, 7, 8, 7, 2,
 0, 1, 9, 2, 7, 7, 1, 5, 2, 8, 0, 7, 3, 1, 7, 6, 7, 9, 0, 7, 7, 0, 7, 1, 5, 7, 2, 1, 3, 4, 4, 4, 7, 3, 0,
 6, 0, 5, 7, 0, 0, 7, 3, 3, 4, 9, 2, 4, 3, 6, 9, 3, 1, 1, 3, 8, 3, 5, 0, 4, 9, 3, 1, 6, 3, 1, 2, 8, 4, 0,
 4, 2, 5, 1, 2, 1, 9, 2, 5, 6, 5, 1, 7, 9, 8, 0, 6, 9, 4, 1, 1, 3, 5, 2, 8, 0, 1, 3, 1, 4, 7, 0, 1, 3, 0,
 4, 7, 8, 1, 6, 4, 3, 7, 8, 8, 5, 1, 8, 5, 2, 9, 0, 9, 2, 8, 5, 4, 5, 2, 0, 1, 1, 6, 5, 8, 3, 9, 3, 4, 1,
 9, 6, 5, 6, 2, 1, 3, 4, 9, 1, 4, 3, 4, 1, 5, 9, 5, 6, 2, 5, 8, 6, 5, 8, 6, 5, 5, 7, 0, 5, 5, 2, 6, 9, 0,
 4, 9, 6, 5, 2, 0, 9, 8, 5, 8, 0, 3, 3, 8, 5, 0, 7, 2, 2, 4, 2, 6, 4, 8, 2, 9, 3, 9, 7, 2, 8, 5, 8, 4, 7,
 8, 3, 1, 6, 3, 0, 5, 7, 7, 7, 7, 5, 6, 0, 6, 8, 8, 8, 7, 6, 4, 4, 6, 2, 4, 8, 2, 4, 6, 8, 5, 7, 9, 2, 6,
 0, 3, 9, 5, 3, 5, 2, 7, 7, 3, 4, 8, 0, 3, 0, 4, 8, 0, 2, 9, 0, 0, 5, 8, 7, 6, 0, 7, 8, 2, 5, 1, 0,
 4, 7, 4, 7, 0, 9, 1, 6, 4, 3, 9, 6, 1, 3, 6, 2, 6, 7, 6, 0, 4, 4, 9, 2, 5, 6, 2, 7, 4, 2, 0, 4,
 2, 0, 8, 3, 2, 0, 8, 5, 6, 6, 1, 1, 9, 0, 6, 2, 5, 4, 5, 4, 3, 3, 7, 2, 1, 3, 1, 5, 3, 5, 9, 5,
 8, 4, 5, 0, 6, 8, 7, 7, 2, 4, 6, 0, 2, 9, 0, 1, 6, 1, 8, 7, 6, 6, 7, 9, 5, 2, 4, 0, 6, 1, 6, 3,
 4, 2, 5, 2, 2, 5, 7, 7, 1, 9, 5, 4, 2, 9, 1, 6, 2, 9, 9, 1, 9, 3, 0, 6, 4, 5, 5, 3, 7, 7, 9, 9...

1.10. International impact

Each of science's conquests is a victory of the absurd.

Jacques Monod

Iridio recovered some of his enthusiasm when he received the electronic copy of the journal in which his article was published. The editorial by Magister Kumar Aliyev, however, described his contribution as highly speculative, almost fictional and barely testable. Moreover, the editorial did not provide an adequate summary of the contents of the article. Perhaps Kumar Aliyev had not understood it. But worse was to come: when Iridio reconsidered his conclusions using the master formula that had appeared in his dream, he discovered, with Halina's help, that some values had changed in the eigenvalues of a Hamiltonian matrix, which meant that the blind spot in the universe closest to the Milky Way

$$b_t^* = \sum_{j=0}^{\infty} (1-r)^j E_t[t_{t+n}] - \sum_{j=0}^{\infty} (1-r)^j E_t[g_{t+n}] + \lim_{n \rightarrow \infty} (1+r)^{-n} E_t[b_{t+n}]$$

1.10.i.a. The government's intertemporal budget constraint

would be reached in 11.3 billion years, not 8.5 billion. Iridio revised his calculations again and again and four months after publication, when

he felt strong enough to resume his work, he decided to write and ask the editor to publish a brief clarification in the next issue. Three months later he received a memo from PhDr Alexis Logan Racz Antoniou, FTSE RFD, the controller of the University of Waikikamukau, where the journal was published. It informed him that, owing to a lack of funds caused by the perennial world financial crisis and an anonymous accusation that the editorial committee was 'mathematicist' and 'highly verificationist', Magister Kumar Aliyev had been dismissed, the publication cancelled and the science department closed down. He suggested writing to other journals and provided some names. Iridio had no more strength left, but Iris persuaded him not to give up. Halina predicted that publishing the clarification would be important and helped him write some memos to try and persuade the journals suggested by PhDr Racz Antoniou to accept Iridio's contribution.

Iridio also had to comply with the requirement to see Dr Alfred Friedrich Masters Hite, MD MRiechLM, a specialist in sexual disorders at the Registry for Orgonic and Cognitive Health, who showed much concern about Iridio's undeclared retractile testicle and his synaesthesia.

When completing the questionnaire at the clinic, Iridio responded to the compulsory question about behavioural disorders in his family by stating that

$$B(r) = \frac{\mu_0}{4\pi} \iiint_V \frac{(JdV) \times r'}{|r'|^3}$$

1.10.i.b. The Biot–Savart law

before his death his father believed himself to be a surreal snail. That required new bureaucratic processes, since Hokaka Margaret Bennet Collins, EMNCert RCMC, of the Ministry of Health, Natality and Civic Comfort, in charge of authorising the inverse transcranial magnetic stimulation suggested by Thorndike Mowrer and Dr Masters Hite, had to consult the long and complicated medical history of Iridio's father. To do so she sought assistance from PhDr Charrington der Heer, who had looked after him during his last days in Widgeree. Ernesto and Halina helped Iridio to complete the endless questionnaires and argue that the treatment was unnecessary. Hokaka discovered that none of the psychometrists' recommendations could be implemented unless they cancelled the VIP-y89 protocol established by the Ministry for Historical Updating, Social Precognition and Digital Worship. In order to cover her back against pressure from her ministry's psychometrists, Hokaka recommended supplementary medical tests to ensure that the treatment had no side-effects because, given Iridio's family history of behavioural disorders, it could cause psychosis.

Iridio tried to explain why the treatment had to be postponed and mentioned that he was too busy amending details in an important scientific article, but Hokaka would not listen. She organised medical consultations in other branches of the Registry for Orgonic and Cognitive Health in order to examine his cryptorchidism and his potential susceptibility to psychosis, but Iridio decided not to attend. He also refused to see PhDr Charrington der Heer again to complete further confidentiality extension forms required by the Office of Mental Coherence of the Ministry for Historical Updating, Social Precognition and Digital Worship, in spite of Halina's and Ernesto's insistence. When the harassment of the health authorities and the requirements of the morality and oztraditions police became unbearable, Halina told Iris what was happening. Iris offered to sign a temporary copulatory contract with him to stop the authorities asking him to be accountable for his genital eudaemonia. She explained that she knew about his predicament and he did not have to have any sexual contact with her if he did not want to. Iridio agreed immediately and gave a copy of the contract to Thorndike Mowrer, who grudgingly accepted it.

Exploring the publications in the scientific network of the patent office, Iridio found another journal, not included in the list suggested by the controller because it was of better quality, now under the direction of PhDr Muñoz Rojas, the same South American astronomer Iridio had met during his last visit to the astronomy department of Yabbie Creek-W University. The Neo-Bolivarian Confederation of South America and the Caribbean, victorious in the Third Transpacific War, had decided to increase research funding for pure sciences,

and PhDr Muñoz Rojas was now a professor of astronomy in the most prestigious university of the bloc. Iridio sent him a long electronic memo with a copy of his article and his new calculations, explaining that the article contained a preliminary version of his master formula, which he also sent. A week later, he received a very encouraging response. PhDr Muñoz Rojas thanked him for his work and mentioned that he had often thought about their conversation during his visit to Ozeania many years earlier. He added, kindly, that although there were several improbable hypotheses in his work, easy to falsify, his new master formula was very useful because it seemed that it might offer an explanation of the paradoxical data found by an old long-slit spectrograph they had managed to fix, when it was pointed at the most empty sections of the observable universe. Further, it was compatible with new experimental discoveries made in Taiwan-South China, which suggested that inert matter and

$$E = T + V = \frac{1}{2} m_e v^2 - k \frac{Ze^2}{r} = -\frac{1}{2} \frac{kZe^2}{r}$$

$$E_n = \frac{Z^2}{n^2} E_0$$

$$\bar{\nu} = \frac{1}{\lambda} = R_H \left(\frac{1}{2^2} - \frac{1}{n^2} \right)$$

1.10.ii. The postulates of the Bohr atomic model

antimatter in a gaseous state could coexist without destroying each other. Finally, PhDr Muñoz Rojas compared Iridio's theory to the first atom model postulated by Niels Bohr which, although very limited, generated other important developments in theoretical physics.

Iridio was happy to learn that such an eminent scientist remembered their discussion of dark matter so many years before. Moreover, PhDr Muñoz Rojas stated that Iridio's new master formula had inspired him to perform some calculations he had not contemplated before. Iridio thanked him and asked him to suggest where he could publish his prolonged roughed-out clarification of his calculations. PhDr Muñoz Rojas did not reply and Iridio resumed his search for a publisher, thinking that perhaps PhDr Muñoz Rojas was only being polite. Perhaps it was time to give up. After all, a 2.71-billion-year difference in his calculations about a faraway place in space-time in such a distant future made little difference if nobody wanted to listen to him. Iris persuaded him to pay a visit to Ernesto, and Iridio took with him printed copies of his correspondence with the South American professor. Ernesto suggested writing again, using his electronic memo account at the patent office, in case the authorities in one of the ministries investigating him had blocked the reply, because it might have contained scientific information that the censors could not easily decipher.

Two months later, when Iridio had forgotten all about his correspondence with the South American professor, he was pleasantly surprised to receive an electronic memo. PhDr Muñoz Rojas thanked him for communicating in this

way because it seemed that the many replies he had tried to send to Iridio's personal account were not accepted by the automatic electronic supervisor of private communications. His hypothesis on antimatter, composed of noble super-heavy gases of zero valency agreed, to a large extent, with the latest experimental data available, and also with the analysis of spectral lines by space telescopes far more powerful than those Iridio could access, as well as the historical data of the observations from Mount Paranal. The professor wanted to know without delay if Iridio would like to be the joint author of an article with Magister Magdalena Isidora Díaz Orellana, a postgraduate student at his university, who had in fact done all the calculations. The article would be sent to the *Neo-Bolivarian Journal of Astronomy and Astrophysics*, the only prestigious terrestrial publication remaining in the discipline since the collapse of food production in the North American prairies and the new budget cuts that eradicated pure sciences in most Eurasian universities. If the article was not accepted, they could send it to the *Cosmological Bulletin of the Vatican Observatory* or the *Free Cosmology Journal* in the maritime cities, but PhDr Muñoz Rojas preferred to consider those options only as a last resort, to avoid difficulties with their respective governments. He asked several questions, among them whether Iridio had a university affiliation to place under his name. He had also copied his reply to PhDr Gaffney-Yang, the former director of the astronomy program at Iridio's old university, suggesting Iridio be deemed an associate professor of the institution.

Iridio was about to reply that he wanted nothing to do with those raving lunatics, but before he could do so, he received a formal invitation to be an honorary adjunct fellow at Yabbie Creek-W Multimodal Polytechnic University. It was signed by PhDr Grossling Pulst, the new coordinator of the astronomy program, the very same professor who had failed Iridio's Stellar Astrophysics exam so miserably and conspired to push him to abandon his studies. The invitation was formally supported by a memo signed by PhDr Gaffney-Yang, now Dean of the Faculty of Pure and Experimental Sciences. In disbelief, Iridio asked Halina to predict whether he should accept the offer. She told him not to hesitate because the article would change his life. Still unsure, Iridio consulted Ernesto and Iris. Encouraged by their enthusiasm, Iridio accepted the invitation, finalised all the paperwork required by PhDr Muñoz Rojas, and sat down to examine the version of the article sent by the South American professor. Following the journal's guidelines, they had extended the narrative sections and sandrinised the dense mathematical framework of his original work, so that it would pass the

$$\left[\frac{\delta^2}{\delta \bar{\Phi}^2} + 8 \text{Tr} \left(\eta \frac{\delta}{\delta M} \eta \frac{\delta}{\delta M} \right) + \lambda_s^2 V e^{-2\bar{\Phi}} \right] \Psi(\bar{\Phi}, M) = 0$$

1.10.iii.a. The O(d,d)-covariant Wheeler-De Witt equation

robotic filters. They had also simplified his master formula. Because of those changes, Halina found irreconcilable ambiguities when translating it into the traditional scientific notation. As a result, Iridio could not fully understand it. The change in the formulae meant that he could only rely on the text, so he could only hope that everything was all right. Fearing some kind of intrigue, he declined all invitations to lunch with PhDr's Grossling Pulst and Gaffney-Yang, the only astronomers left in the provincial university, or to deliver lectures on his discoveries in the institution that had treated him so shabbily.

Three months later, the article was accepted and reviewed in the international scientific press. It created great expectations because the results suggested a way of using the energy of antimatter in the hypothetical sections of interaction between matter and antimatter to generate stable wormholes and travel through space-time, which would accelerate the conquest of the Solar System. The *Sci-Teuchter Bulletin*, a highly prestigious popular science magazine published by Scottish scientists exiled in Greenland's North Atlantic Refuge Area without interference from private companies, printed his photograph on the cover and named him the destroyer of the space-time geometry imagined by Sandrini-Einstein. This was immediately echoed in the scientific journals he could access at the patent office. With the help of Ernesto,

whose electromagnetic receptors had partial access to the free press in the maritime city states, censored in Ozeania, Iridio learnt that the data suggested that in fact there were different local geometries in different areas of the universe, as his mother had realised when she finally understood his hypotheses. That destroyed all speculation on the Randall-Sundrum models

The associated action is

$$S = S_{\text{gravity}} + S_{\text{brane}} + S_{\text{brane}}', \text{ with}$$

$$S_{\text{gravity}} = \int d^4x \int dy \sqrt{-G} \{-\Lambda + 2M^3 R\}$$

$$S_{\text{brane}} = \int d^4x \sqrt{-g_{\text{brane}}} \{V_{\text{brane}} + \mathcal{L}_{\text{brane}}\}$$

where R is the five-dimensional Ricci scalar made out of the five-dimensional metric, G_{MN} .

The solution to Einstein's equation is

$$ds^2 = e^{-2k|y|} \eta_{\mu\nu} dx^\mu dx^\nu + dy^2$$

where $0 \leq y \leq \pi r_c$ is the extra-dimensional coordinate and r_c is essentially a compactification 'radius'. This is just a slice of the symmetric space, AdS_5 . The solution holds only when the boundary and bulk cosmological terms are related by

$$V_{\text{brane}} = -V_{\text{brane}}' = 24M^3k,$$

$$\Lambda = -24M^3k^2$$

1.10.iii.b. The second Randall-Sundrum model (RS2)

about the anti-de Sitter stable spaces with an invariable cosmological constant, and boosted Iridio's confidence. He lamented, however, not relying on his mother's assistance to fully grasp the translation to testable predictions of the mathematics in his article. Ernesto helped him as much as possible, using Halina's partial translations but, in reality, this was outside his field. He assured Iridio, however, that his mother, were she alive, would be proud that his South American collaborators had included the results of the banned string theory in their joint work. But he had to be prepared in case he was classified as a subversive by an algorithm of the scientific control systems in Ozeania or, much worse, accused of being a templetarian, like his mother when she published her research in overseas journals.

The publication in the *Sci-Teuchter Bulletin* led to a little news item on the article in the science pages of his country's state newspaper, highlighting his

Your experiential self (daily self) is actually the ensemble, union, or set of all elements of the same functional consciousness scattered all over the huge multiverses.

1.10.iii.c. The Scattered-ensemble-self Assumption, according to Miura

name and emphasising that the director of the Office of Scientific Transfer of the Ministry for Historical Updating, Social Precognition and Digital Worship was very pleased with the joint publication, because the discovery demonstrated that the accusations that Ozeania restricted collaboration with universities of the neo-Bolivarian

coalition were unfounded. Iridio felt a ray of hope that Julia would read this, wherever she was, and decide to contact him. But something within him confirmed that this was an unrealistic hope. Once again, he asked Halina to start her oracle function and tell him whether he was going to see Julia again. She replied that if the volume of the universe ended up being infinite, the laws of probability would allow for the existence of another planet where everything would be almost identical to this one, and he could get together with Julia again. At the same time, if he could use the wormholes predicted in his article, he could travel to a distant future that looked like a de Sitter space, where Poincaré's recurrence theorem could be activated and he

$$t_{\text{Poincaré}} = e^{4\pi \times M_{\odot}^2} \approx 10^{10^{10^{10^{122}}}}$$

expressed in Planck times, millennia, or whatever; supposing that the Hubble volume is $10^{10^{10^{122}}}$ megaparsecs.

1.10.iii.d. Estimation of the Poincaré recurrence time of an isolated black hole M containing the mass within the presently visible region of our universe, with stationary boundary conditions, according to Don Page

could find an identical copy of Julia. This time Iridio felt strong enough to take up with her the law of large numbers and other underlying theoretical

considerations in her compassionate response, which presupposed the existence of multiverses consisting of different adjacent Hubble bubbles. He could accept this hypothesis only if the number of these spatial temporal bubbles was finite. He also asked for more information, because the time needed to reproduce Julia and the Hubble bubble where they were located was immense, almost infinite. Halina replied that the recurrence did not need to be the size of the observable universe; it could be, for example, the size of the planet, the city of Widgeree, or his own home. Iridio objected that even in that case, the amount of time needed for this fluctuation was still enormous, and therefore the hypothetical recurrence would be highly unlikely, almost impossible. Halina said that in an infinite universe, even the most improbable event was possible, infinite times. They discussed the relevant equations for a long time but, in spite of all his efforts and reasoning, he could not elicit any definite prediction about Julia.

After the international success of the scientific work which included Iridio as third author, his life changed dramatically. PhDr Muñoz Rojas was invited to the most important annual international conference on astrophysics, held that year in Y'Pawfrme'din-Leng, the capital of Taiwan-South China. Iridio was also invited. Afraid of looking ridiculous for not understanding the cosmological consequences of the sandrinised mathematics of his own article, and lacking confidence in spoken Chinglish, Iridio hesitated. Ernesto and Iris encouraged him to attend, but a negative oracle from Halina moved him to turn down the invitation. Instead he accepted an invitation to the next national astronomy congress, at which he had been ridiculed so many times. PhDr Gaffney-Yang was now the president of the association and had organised a conference in his honour at Yabbie Creek-W University. Iridio would be the keynote speaker, no more, no less. He had also invited many eminent astronomers and cosmologists and, naturally, also PhDr Muñoz Rojas and his student. In Ernesto's opinion, Iridio could not decline so many invitations. Iridio felt, in spite of himself, a tiny flame of vindication, thinking that he would present his results, so badly received previously, during the plenary session in the aula magna of his alma mater, from which he had almost been expelled for persevering with his investigation and asking the South American visitor difficult questions. He also felt vindicated when Kask Gruber, the general supervisor of the patent office, sent a staff memo to everyone in the agency, congratulating him on behalf of the organisation for his contribution to science and the technology to find alternative planets where humanity could live. He was also given an honorary promotion. Zoe was very happy because it meant that Kaminer Kullych, MAppSciPr BSciP OAM RSE DSC CGM DCM, who was no longer talking to her, could not rise above Iridio in the office hierarchy, or interfere in his work or hers.

In spite of this unexpected recognition, Iridio did not feel at all well. All the symptoms he felt after the publication of his first article returned and he spent two weeks in bed recovering. Again, he started feeling nauseous when examining any equation related to entropy and had many wet dreams where he was forced to make love to Clarisse in the crossword position. Again he was arrested by the pedagogical police when they attended a conference in the aula magna of Yabbie Creek-W Multimodal Polytechnic University. But there were no more equations in

Assume (X,d) is a separable metric space and that μ is a Borel T-invariant measure. Then the orbit of almost any initial point x returns arbitrarily close to the initial point: For μ -almost every x , there exists a subsequence n_k such that $T^{n_k}x \rightarrow x$

1.10.iv.a. Topologic version of the Poincaré recurrence theorem for separable metric spaces

his nightmares. Photographs of naked women, which he had seen when visiting the psychometrists, were projected onto the screen in the hall. When PhDr Gaffney-Yang began to introduce the keynote speaker, Iridio and his classmates were arrested and dragged out of the amphitheatre. Fanny was also present in the dream. After Clarisse straddled him violently to try and make him come, assisted by some nurses dressed in light blue lab coats who used some instruments to measure his bodily reactions to the stimulation, a psychometrist suggested that it would be better if Fanny stimulated him while Clarisse recited the fundamental theorem of calculus. As that was also unsuccessful, Fanny knelt at his feet while some officers from the morality and oztraditions police urged the young woman to perform fellatio on him and to kiss his undescended testicle. When Iridio awoke, soiled and distressed, he would ask Halina to recite thousands of α , π and e digits in a loud voice. When that was not enough to calm him, he asked her to repeat the derivation of the Gelfond theorem and the factorisation of the first thousand numbers of the Fibonacci sequence. Yet again he thought of suicide and had a number of altercations with the medical authorities of the Registry for Orgonic and Cognitive Health in the city. They insisted he should undergo the inverse transcranial magnetic stimulation treatment, despite his copulatory contract with Iris, since he had failed to show up for the medical tests prescribed by Hokaka, and the precautions included in his dossier at the Ministry for Historical Updating, Social Precognition and Digital Worship had lapsed because he had refused to complete the relevant confidentiality extension forms. Iris was also examined, and evidence was demanded of their sexual encounters.

During one of Iridio's visits to the institute for mental rehabilitation at the local hospital, where his father had been treated and where he had to appear to see Dr Charles Vern Raye Kingsey, MD MBioA, a psychiatrist specialising in

sexual morbidity, he saw his former psychometrist Rieneke Watson, MLacLM BPsySe CPsychom AACPN(temp), in the corridor. The ex-psychometrist told him in a low voice that he had been banned from practising

$\$ \diamond a$

1.10.iv.b. Lacan's
phantasy formula

because he was accused of being a 'mathematicist' after mentioning the Klein bottle in an official scientific publication, although its inclusion had been pre-approved by the censors at the ministry. For now, and while he was on parole, he was working as a nurse at the institute. He also told Iridio that Rhythmic Jouissance had been vaporised and asked him about Therese. Iridio mentioned that she had been taken away and he had not seen her again. The psychometrist whispered that he was not surprised because Therese was too intelligent. When Iridio told him that they were trying to persuade him, for his own good, to undergo inverse transcranial magnetic stimulation treatment,

- Step 1. An action is performed to get the recipient's attention and to focus it on the action and associated intentions; such an action in non-verbal communication can be associated with eye contact by which the sender and recipient monitor each other's attention and responses.

Step 2. There is a presumption of the optimal relevance of the action for communicating something to the audience; this presumption leads the recipient to begin working out what the sender is trying to communicate.

Step 3. A communicational device is used to obtain the basic content of the message.

Step 4. The informational output from step 3 is used to select assumption schemas from background knowledge.

Step 5. The assumption schemas from step 4 are developed to form a hypothesis.

Step 6. Whatever appears in all interpretations of the hypothesis must be correct.

Step 7. The recipient has to work out what the sender wishes to communicate, on the basis of the sender's knowledge of the recipient's knowledge.

Step 8. The sender's intentions serve as a basis for devising a hypothesis.

Step 9. The hypothesis which produces the greatest contextual effect with the least processing effort is the correct one.

1.10.iv.c. A progression of steps needed for processing ostensive communication

Rieneke Watson looked at him with sadness in his eyes and said in a loud voice that it might be a good idea, while at the same time shaking his head in an emphatic no. Iridio was very confused but when he sought clarification of the contradictory gestural conversational implicature, Rieneke Watson motioned to him to remain silent and suggested that it might be a good idea to request a eudaemonia improvement treatment with PhDr Charrington der Heer, which seemed very effective. As Iridio was trying to resume discussion of his gestures, Rieneke Watson told him that the doctor was not only attractive, but she also seemed to be a great researcher of orgonic restorative techniques. If she had been in Widgeree when he treated Iridio the first time, he would have referred him to her instead of the private clinic of orgonic recreation administered by Polly. Iridio, very frustrated when he understood that the psychometrist was refusing to spell out what he was insinuating, told him he would think about it.

When he went home and tried to elucidate, with Halina's help, the true meaning of his conversation with Rieneke Watson, she immediately connected herself to the mental health integrated system to make an appointment with PhDr Charrington der Heer, in spite of Iridio's protests. But she was not authorised to process the form. To top it all, during that week he received a memo from the Office for the Systematisation of Robotic Erotism asking him to take Halina to the office of the Ministry of Health, Natality and Civic Comfort in Widgeree to renew her permit for qualified robotic assistance. The request stated explicitly that he could not use the robotic instructor to deal with the state on his behalf until she was examined and rehabilitated. All doors were being closed before him.

Ernesto had to come to the city, just as Iridio's mother used to, and help him write many memos seeking to end the official harassment. Rieneke Watson helped him make an appointment to see PhDr Charrington der Heer, who confirmed that she had already completed several questionnaires stating that she had examined Iridio's father before his death, and that it was possible that the therapy Iridio had been advised to undergo could trigger a psychosis. However, as he had not completed the confidentiality extension forms of the Office of Mental Coherence of the Ministry for Historical Updating, Social Precognition and Digital Worship placing him under their exclusive jurisdiction, as she suggested previously, she could not cancel the requirements of her colleague Dr Raye Kingsey of the Ministry of Health, Natality and Civic Comfort, with whom she had maintained a long and complex bureaucratic confrontation on the matter. No matter what she said, they would not accept her arguments because she belonged to another ministry, detested by the rival psychometrists. For that reason, they had to see Hokaka again. She told them that Iridio's eudaemonic dossier had been transferred to the morality and

oztraditions police, who had started new proceedings of aggravated contempt against him, which resulted in a negative social credit, limiting his civil rights. Therefore, he had no right to appeal against the prescribed treatment. There were also proceedings pending by the aesthetic police, apparently for forging documentation. When they met PhDr Charrington der Heer again, she explained that in view of the complexity of the case, PhDr Shaw Wang, MChD MD FACP FTSCCCA APSLS, was the only person who could help them. She had treated Iridio's father in Bandar-Austro-Metropolis. However, they had to hurry because, thanks to her official dispute with Dr Raye Kingsey about Iridio's case, she had learnt that his treatment was due to start in three weeks. She offered to treat him as a priority patient and to take part in an experimental eudaemonia improvement program that she had designed, although she did not think that at this point other ministries would accept it as a certified improvement, unless the order came from the very top and the negative civic credits in his dossier were cancelled. Nevertheless, she showed them the experimental room in her surgery, fitted out with apparatus she was using to explore ways to delay or accelerate the expression of orgonic energy. As they were leaving, Ernesto made a comment which Iridio did not quite understand about her beauty, and the obvious interest that PhDr Charrington der Heer had in his case. Iridio asked him what he meant exactly. Ernesto whispered that she looked at Iridio with excessive interest and that her body language betrayed an amorous interest in him. Iridio did not understand this either. Ernesto then told him he was almost certain that PhDr Charrington der Heer wanted to go to bed with him. This confused Iridio even more because the only thing he had understood was that she was willing to help him.

The psychologic attitude of individual I_i towards individual I_j will be said to be a *global attraction*, *global rejection*, or *global indifference* in the mean according to whether

$$\sum_{\ell=1}^n E_{ij}^{\ell} = \int_{\mathbb{R}^n} \left(\sum_{\ell=1}^n u_{ij}^{\ell} \right) \left[\pi_{ij} \left(\sum_{\ell=1}^n u_{ij}^{\ell} \right) \right] du_{ij}$$

is positive, negative, or zero.

1.10.iv.d. The ℓ^{th} mode of feelings of individual I_i towards individual I_j

The next time they met Hokaka, she confirmed that the first inverse transcranial magnetic stimulation required by the authorities was set for exactly one day before the beginning of the national astronomy congress at which Iridio was to be the keynote speaker. A joint genital eudaemonia test for Iridio and Iris during that week was also programmed, in which they would be required to have

intercourse at the Widgeree mental rehabilitation institute, under the supervision of Thorndike Mowrer and Dr Raye Kingsey.

Iridio applied for three weeks leave from the patent office to travel to the capital and to try, with Ernesto's help, to resolve his conflict with the authorities of all those ministries. Unfortunately, they managed to make an appointment to see PhDr Shaw Wang only two days before the start of the congress, that is, only one day before the treatment began.

Ernesto suggested using the remaining time to improve his health, make another attempt to understand the narrative section of his article, prepare his

$$V(\mathbf{r}) = \frac{-g^2}{(2\pi)^3} \int e^{i\mathbf{k}\cdot\mathbf{r}} \frac{4\pi}{k^2 + m^2} d^3k$$

1.10.v.a. Fourier transform of Yukawa potential

presentation and, with Halina's assistance, draw, with great precision, the diagrams he would use to explain in detail how he had arrived at his hypotheses. He needed, first of all, to carefully read and re-read the famous work of which he was third author, as well as the scientific literature which cited it. He also needed to read the articles in the popular science media about the breakthrough, to clearly understand the parts of his predictions that were in fact

supported by the experimental data of the South American professor and his student, as many of Iridio's more daring hypotheses in his previous work had been removed. Moreover, they had simplified the mathematics in the

$$ds_{\text{AdS}_5}^2 = \frac{L^2}{r^2} dr^2 + \frac{r^2}{L^2} \eta_{uv} dx^u dx^v$$

1.10.v.b. The line element of five-dimensional anti-de Sitter space, AdS_5 , in Poincaré coordinates

sandrinisation of the master equation, including the tensor field and scalar field, and removed the vector field and with it his postulated modification to the Yukawa potential. Iridio could explain in his talk why this last field was necessary in order to eliminate, once and for all, the conjectures about dark matter and clarify, as Ernesto had suggested, that in his original hypotheses he had not referred explicitly to string theory. In reality, he deduced that Magister Díaz Orellana was the person who had included those proscribed postulates and that, like his mother, she maintained a belief in those unorthodox theories.

Ernesto advised him to have intercourse with Iris in case they were required to undergo the joint eudaemonia test. Otherwise, they risked revealing that their copulatory contract was a sham. But Iridio was so shaken by this suggestion that Ernesto never mentioned it again. Iris tried to make him see sense by explaining that the biological tests would detect that they had had no sexual contact. As Iridio continued to procrastinate, Halina and Iris organised a Wednesday afternoon visit by

$$\Delta P = P_f - P_i = \rho g(v/A - L')$$

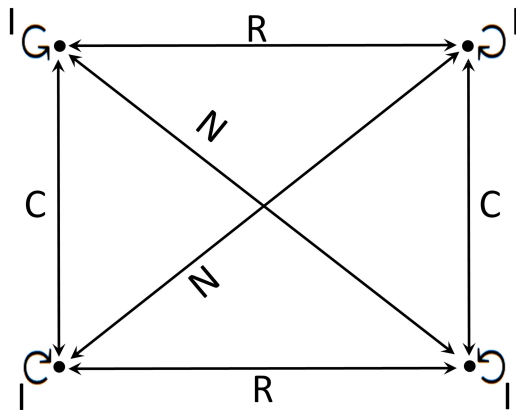
1.10.vi.a. The change in the pressure inside a geyser

Olgava, the orgonic cyborg that had managed to make him come. Olgava reproached him for not inviting her to play with him and Halina again, as he had promised. Iridio tried to get her to leave, protesting that he was busy preparing his talk. Olgava assured him that there was no need to interrupt his work and suggested he return to his calculations. She crawled under his desk to perform fellatio on him and he managed to have an orgasm after two hours and fifteen minutes of intense stimulation when Halina, to help them, started to recite the long and complicated demonstration of the Poincaré conjecture, proposed by a Russian mathematician whose original publications had disappeared when the preprints database, in which he had published them informally, had closed down. Before leaving, Olgava assured him that he should not worry about Iris because she would arrange to have a private orgonic instructor visit her, so that her eudaemonic tests would also show recent sexual activity with biological beings.

Every simply connected, closed 3-manifold is homeomorphic to the 3-sphere S^3

1.10.vi.b. The Poincaré conjecture

After many interruptions caused by memos and meddling by the morality and oztraditions police, the aesthetic police and the Office for Systematisation of Robotic Erotism, the day finally arrived for Iridio to travel to Bandar-Austro-Metropolis with Ernesto to see PhDr Shaw Wang. However, roads between the



1.10.vii.a.A. Piaget's INRC square

city and the podport were closed due to disturbances in the capital, because the president had announced a reduction in the basic vital universal minimum salary paid to all the citizens of Ozeania. As a result, they had to hire a private air pod to take them to the helipodport of the offices of the Ministry for Historical Updating, Social Precognition and Digital

Worship. As they approached, they witnessed the repression by the robocops and their electronic bloodhounds against demonstrators carrying banners, who were trying to reach the main square.

Ernesto feared that the ministry's security guards would not let them into the building, but as soon as they landed two officers from the intellectual police, who were waiting for them, politely escorted them to the Office of Mental

Coherence. Secular Datalina, PhDr Shaw Wang's robotic assistant, told Iridio that she was very happy to finally meet him personally, because she had heard so many things about him in her algorithmic exchanges with poor Therese and Rhythmical Jouissance, who had been unjustly vaporised. She also lamented that Halina was now isolated. Iridio didn't know what to answer, but Datalina let them in without further delay. The first thing PhDr Shaw Wang asked Iridio was whether he remembered her. Yes, he replied, but not very well. He remembered that she always wore a yellow lab coat, subjected him to tests that annoyed him, and that thanks to her he had Penelope, but that was all. Mention of his former robotic instructor prompted him to explain his frustration when the intellectual police took Penelope away: he had never learnt the results of the Grice's maxims test that she had administered to him the day before. He asked

	I	N	R	C
I	I	N	R	C
N	N	I	C	R
R	R	C	I	N
C	C	R	N	I

1.10.vii.a.B. Cayley table for Piaget's INRC group (homologous to the Klein four-group)

PhDr Shaw Wang to give them to him, if she had them. She promised to ask Datalina to look for them and advised him not to refer to Penelope in any official documentation in the future. She then told him how pleasing it was to see him so articulate and self-assured, because as a child he could not interact with

anyone except his parents. For that reason, she had obtained a permit to allocate a robotic instructor to him so that she could help him understand interpersonal communications in a way that would not seem alienating to him if he applied his ability to understand abstract concepts, an ability he had displayed since childhood, to compensate for his lack of social and emotional development. She told him how important his case was when she had to present a report on the eugenics laws of neuroatypical infants, which, luckily, had been modified.

Iridio insisted that it was important to find out the score of the Grice's maxims test that Penelope had administered to him before being taken away. PhDr Shaw Wang said that the reports of the robotic instructor were archived, and Datalina would look them up in her notes. She asked him if he still recited the Fibonacci sequence and prime numbers to calm down. Iridio explained that he now used the digital expansion of transcendental numbers for that purpose. PhDr Shaw Wang examined her notes and asked if he still had trouble with the extension of the Fibonacci series to negative numbers. He began to explain what had happened, but Ernesto intervened to suggest that the matter that worried them needed to

$$F_{-n} = (-1)^{n+1} F_n$$

1.10.vii.b. Backwards extension of the Fibonacci series (negafibonacci numbers' formula)

be discussed urgently. They explained the situation Iridio found himself in, and the importance of presenting his internationally acclaimed work at the national congress. The physician agreed at once to certify that she had treated his father and therefore advised against inverse transcranial magnetic stimulation treatment to correct Iridio's presumed asexuality because it could trigger psychosis, as had happened in his father's case. She also advised that Iridio and Iris be excused from sexual intercourse in a laboratory of the Widgeree mental rehabilitation institute, because the congenital stress caused by the procedure would affect Iridio's performance. Also thanks to Ernesto, they were able to persuade her to request the cancellation of the negative weighting in Iridio's civic credit, which was due to his refusal, on grounds of self-defence, to attend his medical appointments. PhDr Shaw Wang assured them that a certificate from the Office of Mental Coherence of her ministry would dissuade the psychometrists of other ministries, and that to avoid delays in processing she would send the certificate immediately with an urgent implementation protocol.

Both Iridio and Ernesto were very pleased with the certificate that PhDr Shaw Wang sent to the authorities via her multi-legaliferum, but as soon as they left the office, Iridio was detained by the patriotic police. In spite of the protests of Ernesto and the physician, who had come outside when she heard his shouts, Iridio was handcuffed and held by two officers, one on each side, who twisted his arms behind his back as if he were a criminal. They announced that they were taking him to the central intelligence office at the presidential palace. Three officers from the intellectual police, not his escort, held Ernesto back and prevented him from accompanying Iridio.

Before they could take him away, however, five officers from the morality and oztraditions police turned up with an arrest warrant for Ernesto, Iridio and PhDr Shaw Wang. The officers from the intellectual police told the others that they could cancel the arrest warrant, and started remonstrating with the morality and oztraditions officers, who insisted on taking away the three of them. Secular Datalina sounded an alarm. In the midst of a chaotic war of blips from the portable legaliferums, and the unbearable noise of the alarm, other guards and officers arrived and immobilised everyone, taking them to an office next door. The

Let $G = \langle N_i(A^i)_{i \in N}, (u^i)_{i \in N} \rangle$ be a strategic game for which the set A^i of actions of each player i is finite or countably infinite. A profile $(a^i)_{i \in N}$ of mixed strategies is a *mixed strategy equilibrium* of G if for every player $i \in N$ and every action $a^i \in A^i$ for which $\alpha^i(a^i) > 0$, i 's expected payoff (according to u^i) from a^i given a^{-i} is at least as high as his expected payoff from x^i given a^{-i} for any $x^i \in A^i$.

1.10.vii.c. Mixed strategy equilibrium of a strategic game

alarm that so annoyed Iridio stopped but many blips continued to sound in the legaliferums of several police officers while they negotiated their responsibilities and argued about contradictory laws and protocols. When it seemed things had returned to normal, Datalina whispered something to PhDr Shaw Wang. She gave the officers watching Iridio a smile, approached him and whispered '71 per cent'. Before Iridio could ask her to explain, four officers from the aesthetic police also arrived at the office of PhDr Shaw Wang with an arrest warrant similar to that from the morality and oztraditions police. As they could no longer arrest anyone, they tried to take the robotic assistant from the office, but before they could escort her out Datalina sounded her alarm again, causing fresh altercations among the different police forces. Only when the unbearable alarm stopped did Iridio deduce that 71 per cent was the result of the last exam on Grice's maxims administered by Penelope.

After a long discussion, the officers from the intellectual police allowed the officers from the patriotic police, who were watching over Iridio, to reach the helipodport of the building unhindered. In spite of the efforts of the robocops and their electronic bloodhounds, the demonstrators had reached the main square. They were now destroying official property of the ministries and the cathedral windows. To avoid incidents, the policemen guarding Iridio put him in an individual cell in a multiscoper of the Ministry of Defence, Internal Appeasement and Border Protection, causing him to have an attack of claustrophobia.

During the flight, to calm himself, he recited all the digits of π that he could remember, as well as the most important formulae that included his beloved transcendental number.

1.11. π

*The world is a looking glass and gives back to every man
the reflection of his own face.*

William Thackeray

3, ., 1, 4, 1, 5, 9, 2, 6, 5, 3, 5, 8, 9, 7, 9, 3, 2, 3, 8, 4, 6, 2, 6, 4, 3, 3, 8, 3, 2, 7, 9, 5, 0, 2,
8, 8, 4, 1, 9, 7, 1, 6, 9, 3, 9, 9, 3, 7, 5, 1, 0, 5, 8, 2, 0, 9, 7, 4, 9, 4, 4, 5, 9, 2, 3, 0, 7, 8, 1,
6, 4, 0, 6, 2, 8, 6, 2, 0, 8, 9, 9, 8, 6, 2, 8, 0, 3, 4, 8, 2, 5, 3, 4, 2, 1, 1, 7, 0, 6, 7, 9, 8, 2, 1,
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8, 2, 1, 3, 3, 9, 3, 6, 0, 7, 2, 6, 0, 2, 4, 9, 1, 4, 1, 2, 7, 3, 7, 2, 4, 5, 8, 7, 0, 0, 6, 6, 0, 6, 3,
1, 5, 5, 8, 8, 1, 7, 4, 8, 8, 1, 5, 2, 0, 9, 2, 0, 9, 6, 2, 8, 2, 9, 2, 5, 4, 0, 9, 1, 7, 1, 5, 3, 6, 4,
3, 6, 7, 8, 9, 2, 5, 9, 0, 3, 6, 0, 0, 1, 1, 3, 3, 0, 5, 3, 0, 5, 4, 8, 8, 2, 0, 4, 6, 6, 5, 2, 1, 3, 8,
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8, 1, 8, 3, 0, 1, 1, 9, 4, 9, 1, 2, 9, 8, 3, 3, 6, 7, 3, 3, 6, $\Gamma(z)\Gamma(1-z) = \frac{\pi}{\sin(\pi z)}$
2, 4, 4, 0, 6, 5, 6, 6, 4, 3, 0, 8, 6, 0, 2, 1, 3, 9, 4, 9, 4,
6, 3, 9, 5, 2, 2, 4, 7, 3, 7, 1, 9, 0, 7, 0, 2, 1, 7, 9, 8, 6, 1.11.i. Euler reflection formula
0, 9, 4, 3, 7, 0, 2, 7, 7, 0, 5, 3, 9, 2, 1, 7, 1, 7, 6, 2, 9,
3, 1, 7, 6, 7, 5, 2, 3, 8, 4, 6, 7, 4, 8, 1, 8, 4, 6, 7, 6, 6, 9, 4, 0, 5, 1, 3, 2, 0, 0, 0, 5, 6, 8, 1,
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 2, 7, 9, 6, 7, 9, 7, 6, 6, 8, 1, 4, 5, 4, 1, 0, 0, 9, 5, 3, 8, 8, 3, 7, 8, 6, 3, 6, 0, 9, 5, 0, 6, 8, 0,
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 6, 1, 1, 8, 6, 3, 0, 6, 7, 4, 4, 2, 7, 8, 6, 2, 2, 0, 3, 9, 1, 9, 4,
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 4, 3, 7, 1, 9, 1, 7, 2, 8, 7, 4, 6, 7, 7, 6, 4, 6, 5, 7, 5, 7, 3, 9,
 6, 2, 4, 1, 3, 8, 9, 0, 8, 6, 5, 8, 3, 2, 6, 4, 5, 9, 9, 5, 8, 1, 3,
 3, 9, 0, 4, 7, 8, 0, 2, 7, 5, 9, 0, 0, 9, 9, 4, 6, 5, 7, 6, 4, 0, 7,
 8, 9, 5, 1, 2, 6, 9, 4, 6, 8, 3, 9, 8, 3, 5, 2, 5, 9, 5, 7, 0, 9, 8,
 2, 5, 8, 2, 2, 6, 2, 0, 5, 2, 2, 4, 8, 9, 4, 0, 7, 7, 2, 6, 7, 1, 9,
 4, 7, 8, 2, 6, 8, 4, 8, 2, 6, 0, 1, 4, 7, 6, 9, 9, 0, 9, 0, 2, 6, 4, 0, 1, 3, 6, 3, 9, 4, 4, 3, 7, 4, 5,
 5, 3, 0, 5, 0, 6, 8, 2, 0, 3, 4, 9, 6, 2, 5, 2, 4, 5, 1, 7, 4, 9, 3, 9, 9, 6, 5, 1, 4, 3, 1, 4, 2, 9, 8,
 0, 9, 1, 9, 0, 6, 5, 9, 2, 5, 0, 9, 3, 7, 2, 2, 1, 6, 9, 6, 4, 6, 1, 5, 1, 5, 7, 0, 9, 8, 5, 8, 3, 8, 7,
 4, 1, 0, 5, 9, 7, 8, 8, 5, 9, 5, 9, 7, 7, 2, 9, 7, 5, 4, 9, 8, 9, 3, 0, 1, 6, 1, 7, 5, 3, 9, 2, 8, 4, 6,
 8, 1, 3, 8, 2, 6, 8, 6, 8, 3, 8, 6, 8, 9, 4, 2, 7, 7, 4, 1, 5, 5, 9, 9, 1, 8, 5, 5, 9, 2, 5, 2, 4, 5, 9,
 5, 3, 9, 5, 9, 4, 3, 1, 0, 4, 9, 9, 7, 2, 5, 2, 4, 6, 8, 0, 8, 4, 5, 9, 8, 7, 2, 7, 3, 6, 4, 4, 6, 9, 5,
 8, 4, 8, 6, 5, 3, 8, 3, 6, 7, 3, 6, 2, 2, 2, 6, 2, 6, 0, 9, 9, 1, 2, 4, 6, 0, 8, 0, 5, 1, 2, 4, 3, 8, 8,
 4, 3, 9, 0, 4, 5, 1, 2, 4, 4, 1, 3, 6, 5, 4, 9, 7, 6, 2, 7, 8, 0, 7, 9, 7, 7, 1, 5, 6, 9, 1, 4, 3, 5, 9,
 9, 7, 7, 0, 0, 1, 2, 9, 6, 1, 6, 0, 8, 9, 4, 4, 1, 6, 9, 4, 8, 6, 8, 5, 5, 5, 8, 4, 8, 4, 0, 6, 3, 5, 3,

$$\sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} = \frac{\pi}{4}$$

1.11.ii.a. Leibniz series

$$\frac{\pi}{2} = \sum_{k=0}^{\infty} \frac{k!}{(2k+1)!!}$$

1.11.ii.b. Newton/Euler
convergence improvement
formula

4, 2, 2, 0, 7, 2, 2, 2, 5, 8, 2, 8, 4, 8, 8, 6, 4, 8, 1, 5, 8, 4, 5, 6, 0, 2, 8, 5, 0, 6, 0, 1, 6, 8, 4,
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 2, 2, 6, 5, 8, 8, 0, 4, 8, 5, 7, 5, 6, 4, 0, 1, 4, 2, 7, 0,
 4, 7, 7, 5, 5, 5, 1, 3, 2, 3, 7, 9, 6, 4, 1, 4, 5, 1, 5, 2,
 3, 7, 4, 6, 2, 3, 4, 3, 6, 4, 5, 4, 2, 8, 5, 8, 4, 4, 4, 7,
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 7, 3, 5, 7, 3, 9, 5, 2, 3, 1, 1, 3, 4, 2, 7, 1, 6, 6, 1, 0,

$$\frac{\pi}{4} = \sum_{k=1}^{\infty} \arctan\left(\frac{1}{F_{2k+1}}\right)$$

1.11.iii.a. π expressed in terms
of the Fibonacci numbers

2, 1, 3, 5, 9, 6, 9, 5, 3, 6, 2, 3, 1, 4, 4, 2, 9, 5, 2, 4, 8, 4, 9, 3, 7, 1, 8, 7, 1, 1, 0, 1, 4, 5, 7,
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 6, 0, 5, 4, 1, 4, 6, 6, 5, 9,
 2, 5, 2, 0, 1, 4, 9, 7, 4, 4,
 2, 8, 5, 0, 7, 3, 2, 5, 1, 8,
 6, 6, 6, 0, 0, 2, 1, 3, 2, 4,
 3, 4, 0, 8, 8, 1, 9, 0, 7, 1,

$$\pi = \frac{5\sqrt{2+\varphi}}{2\varphi} \sum_{n=0}^{\infty} \left(\frac{1}{2\varphi}\right)^{5n} \left(\frac{1}{(5n+1)} + \frac{1}{2\varphi^2(5n+2)} - \frac{1}{2^2\varphi^3(5n+3)} - \frac{1}{2^3\varphi^3(5n+4)} \right)$$

1.11.iii.b. π expressed in terms of the golden ratio

0, 4, 8, 6, 3, 3, 1, 7, 3, 4, 6, 4, 9, 6, 5, 1, 4, 5, 3, 9, 0, 5, 7, 9, 6, 2, 6, 8, 5, 6, 1, 0, 0, 5, 5,
 0, 8, 1, 0, 6, 6, 5, 8, 7, 9, 6, 9, 9, 8, 1, 6, 3, 5, 7, 4, 7, 3, 6, 3, 8, 4, 0, 5, 2, 5, 7, 1, 4, 5, 9,
 1, 0, 2, 8, 9, 7, 0, 6, 4, 1, 4, 0, 1, 1, 0, 9, 7, 1, 2, 0, 6, 2, 8, 0, 4, 3, 9, 0, 3, 9, 7, 5, 9, 5, 1,
 5, 6, 7, 7, 1, 5, 7, 7, 0, 0, 4, 2, 0, 3, 3, 7, 8, 6, 9, 9, 3, 6, 0, 0, 7, 2, 3, 0, 5, 5, 8, 7, 6, 3, 1,
 7, 6, 3, 5, 9, 4, 2, 1, 8, 7, 3, 1, 2, 5, 1, 4, 7, 1, 2, 0, 5, 3, 2, 9, 2, 8, 1, 9, 1, 8, 2, 6, 1, 8, 6,
 1, 2, 5, 8, 6, 7, 3, 2, 1, 5, 7, 9, 1, 9, 8, 4, 1, 4, 8, 4, 8, 8, 2, 9, 1, 6, 4, 4, 7, 0, 6, 0, 9, 5, 7,
 5, 2, 7, 0, 6, 9, 5, 7, 2, 2, 0, 9, 1, 7, 5, 6, 7, 1, 1, 6, 7, 2, 2, 9, 1, 0, 9, 8, 1, 6, 9, 0, 9, 1, 5,
 2, 8, 0, 1, 7, 3, 5, 0, 6, 7, 1, 2, 7, 4, 8, 5, 8, 3, 2, 2, 2, 8, 7, 1, 8, 3, 5, 2, 0, 9, 3, 5, 3, 9, 6,
 5, 7, 2, 5, 1, 2, 1, 0, 8, 3, 5, 7, 9, 1, 5, 1, 3, 6, 9, 8, 8, 2, 0, 9, 1, 4, 4, 4, 2, 1, 0, 0, 6, 7, 5,
 1, 0, 3, 3, 4, 6, 7, 1, 1, 0, 3, 1, 4, 1, 2, 6, 7, 1, 1, 1, 3, 6, 9, 9, 0, 8, 6, 5, 8, 5, 1, 6, 3, 9, 8,

3, 1, 5, 0, 1, 9, 7, 0, 1, 6, 5, 1, 5, 1, 1, 6, 8, 5, 1, 7, 1, 4, 3, 7, 6, 5, 7, 6, 1, 8, 3, 5, 1, 5, 5,
 6, 5, 0, 8, 8, 4, 9, 0, 9, 9, 8, 9, 8, 5, 9, 9, 8, 2, 3, 8, 7, 3, 4, 5, 5, 2, 8, 3, 3, 1, 6, 3, 5, 5, 0,
 7, 6, 4, 7, 9, 1, 8, 5, 3, 5, 8, 9, 3, 2, 2, 6, 1, 8, 5, 4, 8, 9, 6, 3, 2, 1, 3, 2, 9, 3, 3, 0, 8, 9, 8,
 5, 7, 0, 6, 4, 2, 0, 4, 6, 7, 5, 2, 5, 9, 0, 7, 0, 9, 1, 5, 4, 8, 1, 4, 1, 6, 5, 4, 9, 8, 5, 9, 4, 6, 1,
 6, 3, 7, 1, 8, 0, 2, 7, 0, 9, 8, 1, 9, 9, 4, 3, 0, 9, 9, 2, 4, 4, 8, 8, 9, 5, 7, 5, 7, 1, 2, 8, 2, 8, 9,
 0, 5, 9, 2, 3, 2, 3, 3, 2, 6, 0, 9, 7, 2, 9, 9, 7, 1, 2, 0, 8, 4, 4, 3, 3, 5, 7, 3, 2, 6, 5, 4, 8, 9, 3,
 8, 2, 3, 9, 1, 1, 9, 3, 2, 5, 9, 7, 4, 6, 3, 6, 6, 7, 3, 0, 5, 8, 3, 6, 0, 4, 1, 4, 2, 8, 1, 3, 8, 8, 3,
 0, 3, 2, 0, 3, 8, 2, 4, 9, 0, 3, 7, 5, 8, 9, 8, 5, 2, 4, 3, 7, 4, 4, 1, 7, 0, 2, 9, 1, 3, 2, 7, 6, 5, 6,
 1, 8, 0, 9, 3, 7, 7, 3, 4, 4, 4, 0, 3, 0, 7, 0, 7, 4, 6, 9, 2, 1, 1, 2, 0, 1, 9, 1, 3, 0, 2, 0, 3, 3, 0,
 3, 8, 0, 1, 9, 7, 6, 2, 1, 1, 0, 1, 1, 0, 0,
 4, 4, 9, 2, 9, 3, 2, 1, 5, 1, 6, 0, 8, 4, 2, $\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum_{k=0}^{\infty} \frac{(4k)!(1103 + 26390k)}{k!^4 (396^{4k})}$
 4, 4, 4, 8, 5, 9, 6, 3, 7, 6, 6, 9, 8, 3, 8,
 9, 5, 2, 2, 8, 6, 8, 4, 7, 8, 3, 1, 2, 3, 5,
 5, 2, 6, 5, 8, 2, 1, 3, 1, 4, 4, 9, 5, 7, 6,

1.11.iv. Rāmānujan's formula

8, 5, 7, 2, 6, 2, 4, 3, 3, 4, 4, 1, 8, 9, 3,
 0, 3, 9, 6, 8, 6, 4, 2, 6, 2, 4, 3, 4, 1, 0, 7, 7, 3, 2, 2, 6, 9, 7, 8, 0, 2, 8, 0, 7, 3, 1, 8, 9, 1, 5,
 4, 4, 1, 1, 0, 1, 0, 4, 4, 6, 8, 2, 3, 2, 5, 2, 7, 1, 6, 2, 0, 1, 0, 5, 2, 6, 5, 2, 2, 7, 2, 1, 1, 1, 6,
 6, 0, 3, 9, 6, 6, 6, 5, 5, 7, 3, 0, 9, 2, 5, 4, 7, 1, 1, 0, 5, 5, 7, 8, 5, 3, 7, 6, 3, 4, 6, 6, 8, 2, 0,
 6, 5, 3, 1, 0, 9, 8, 9, 6, 5, 2, 6, 9, 1, 8, 6, 2, 0, 5, 6, 4, 7, 6, 9, 3, 1, 2, 5, 7, 0, 5, 8, 6, 3, 5,
 6, 6, 2, 0, 1, 8, 5, 5, 8, 1, 0, 0, 7, 2, 9, 3, 6, 0, 6, 5, 9, 8, 7, 6, 4, 8, 6, 1, 1, 7, 9, 1, 0, 4, 5,
 3, 3, 4, 8, 8, 5, 0, 3, 4, 6, 1, 1, 3, 6, 5, 7, 6, 8, 6, 7, 5, 3, 2, 4, 9, 4, 4, 1, 6, 6, 8, 0, 3, 9, 6,
 2, 6, 5, 7, 9, 7, 8, 7, 7, 1, 8, 5, 5, 6, 0, 8, 4, 5, 5, 2, 9, 6, 5, 4, 1, 2, 6, 6, 5, 4, 0, 8, 5, 3, 0,
 6, 1, 4, 3, 4, 4, 4, 3, 1, 8, 5, 8, 6, 7, 6, 9, 7, 5, 1, 4, 5, 6, 6, 1, 4, 0, 6, 8, 0, 0, 7, 0, 0, 2, 3,
 7, 8, 7, 7, 6, 5, 9, 1, 3, 4, 4, 0, 1, 7, 1, 2, 7, 4, 9, 4, 7, 0, 4, 2, 0, 5, 6, 2, 2, 3, 0, 5, 3, 8, 9,
 9, 4, 5, 6, 1, 3, 1, 4, 0, 7, 1, 1, 2, 7, 0, 0, 0, 4, 0, 7, 8, 5, 4, 7, 3, 3, 2, 6, 9, 9, 3, 9, 0, 8, 1,
 4, 5, 4, 6, 6, 4, 6, 4, 5, 8, 8, 0, 7, 9, 7, 2, 7, 0, 8, 2, 6, 6, 8, 3, 0, 6, 3, 4, 3, 2, 8, 5, 8, 7, 8,
 5, 6, 9, 8, 3, 0, 5, 2, 3, 5, 8, 0,
 8, 9, 3, 3, 0, 6, 5, 7, 5, 7, 4, 0, $\frac{\pi}{4} = \sum_{k=0}^{\infty} \frac{(-1)^k}{2k+1} \left(\frac{1}{5}\right)^{2k+1} - \sum_{k=0}^{\infty} \frac{(-1)^k}{2k+1} \left(\frac{1}{239}\right)^{2k+1}$
 6, 7, 9, 5, 4, 5, 7, 1, 6, 3, 7, 7,
 5, 2, 5, 4, 2, 0, 2, 1, 1, 4, 9, 5,
 5, 7, 6, 1, 5, 8, 1, 4, 0, 0, 2, 5,

1.11.v. Machin's formula for π

0, 1, 2, 6, 2, 2, 8, 5, 9, 4, 1, 3, 0, 2, 1, 6, 4, 7, 1, 5, 5, 0, 9, 7, 9, 2, 5, 9, 2, 3, 0, 9, 9, 0, 7,
 9, 6, 5, 4, 7, 3, 7, 6, 1, 2, 5, 5, 1, 7, 6, 5, 6, 7, 5, 1, 3, 5, 7, 5, 1, 7, 8, 2, 9, 6, 6, 6, 4, 5, 4,
 7, 7, 9, 1, 7, 4, 5, 0, 1, 1, 2, 9, 9, 6, 1, 4, 8, 9, 0, 3, 0, 4, 6, 3, 9, 9, 4, 7, 1, 3, 2, 9, 6, 2, 1,
 0, 7, 3, 4, 0, 4, 3, 7, 5, 1, 8, 9, 5, 7, 3, 5, 9, 6, 1, 4, 5, 8, 9, 0, 1, 9, 3, 8, 9, 7, 1, 3, 1, 1, 1,
 7, 9, 0, 4, 2, 9, 7, 8, 2, 8, 5, 6, 4, 7, 5, 0, 3, 2, 0, 3, 1, 9, 8, 6, 9, 1, 5, 1, 4, 0, 2, 8, 7, 0, 8,
 0, 8, 5, 9, 9, 0, 4, 8, 0, 1, 0, 9, 4, 1, 2, 1, 4, 7, 2, 2, 1, 3, 1, 7, 9, 4, 7, 6, 4, 7, 7, 7, 2, 6, 2,
 2, 4, 1, 4, 2, 5, 4, 8, 5, 4, 5, 4, 0, 3, 3, 2, 1, 5, 7, 1, 8, 5, 3, 0, 6, 1, 4, 2, 2, 8, 8, 1, 3, 7, 5,
 8, 5, 0, 4, 3, 0, 6, 3, 3, 2, 1, 7, 5, 1, 8, 2, 9, 7, 9, 8, 6, 6, 2, 2, 3, 7, 1, 7, 2, 1, 5, 9, 1, 6, 0,
 7, 7, 1, 6, 6, 9, 2, 5, 4, 7, 4, 8, 7, 3, 8, 9, 8, 6, 6, 5, 4, 9, 4, 9, 4, 5, 0, 1, 1, 4, 6, 5, 4, 0, 6,

2, 8, 4, 3, 3, 6, 6, 3, 9, 3, 7, 9, 0, 0, 3, 9, 7, 6, 9, 2, 6, 5, 6, 7, 2, 1, 4, 6, 3, 8, 5, 3, 0, 6, 7,
 3, 6, 0, 9, 6, 5, 7, 1, 2, 0, 9, 1, 8, 0, 7, 6, 3, 8, 3, 2, 7, 1, 6, 6, 4, 1, 6, 2, 7, 4, 8, 8, 8, 8, 0,
 0, 7, 8, 6, 9, 2, 5, 6, 0, 2, 9, 0, 2, 2, 8, 4, 7, 2, 1, 0, 4, 0, 3, 1, 7, 2, 1, 1, 8, 6, 0, 8, 2, 0, 4,
 1, 9, 0, 0, 0, 4, 2, 2, 9, 6, 6, 1, 7, 1, 1, 9, 6, 3, 7, 7, 9, 2, 1, 3, 3, 7, 5, 7, 5, 1, 1, 4, 9, 5, 9,
 5, 0, 1, 5, 6, 6, 0, 4, 9, 6, 3, 1, 8, 6, 2, 9, 4, 7, 2, 6, 5, 4, 7, 3, 6, 4, 2, 5, 2, 3, 0, 8, 1, 7, 7,
 0, 3, 6, 7, 5, 1, 5, 9, 0, 6, 7, 3, 5, 0, 2, 3, 5, 0, 7, 2, 8, 3, 5, 4, 0, 5, 6, 7, 0, 4, 0, 3, 8, 6, 7,
 4, 3, 5, 1, 3, 6, 2, 2, 2, 2, 4, 7, 7, 1, 5, 8, 9, 1, 5, 0, 4, 9, 5, 3, 0, 9, 8, 4, 4, 4, 8, 9, 3, 3, 3,
 0, 9, 6, 3, 4, 0, 8, 7, 8, 0, 7, 6, 9, 3, 2, 5, 9, 9, 3, 9, 7, 8, 0, 5, 4, 1, 9, 3, 4, 1, 4, 4, 7, 3, 7,
 7, 4, 4, 1, 8, 4, 2, 6, 3, 1, 2, 9, 8, 6, 0, 8, 0, 9, 9, 8, 8, 8, 6, 8, 7, 4, 1, 3, 2, 6, 0, 4, 7, 2, 1,
 5, 6, 9, 5, 1, 6, 2, 3, 9, 6, 5, 8, 6, 4, 5, 7, 3, 0,
 2, 1, 6, 3, 1, 5, 9, 8, 1, 9, 3, 1, 9, 5, 1, 6, 7, 3,
 5, 3, 8, 1, 2, 9, 7, 4, 1, 6, 7, 7, 2, 9, 4, 7, 8, 6,
 7, 2, 4, 2, 2, 9, 2, 4, 6, 5, 4, 3, 6, 6, 8, 0, 0, 9,
 8, 0, 6, 7, 6, 9, 2, 8, 2, 3, 8, 2, 8, 0, 6, 8, 9, 9,
 6, 4, 0, 0, 4, 8, 2, 4, 3, 5, 4, 0, 3, 7, 0, 1, 4, 1,
 6, 3, 1, 4, 9, 6, 5, 8, 9, 7, 9, 4, 0, 9, 2, 4, 3, 2, 3, 7, 8, 9, 6, 9, 0, 7, 0, 6, 9, 7, 7, 9, 4, 2, 2,
 3, 6, 2, 5, 0, 8, 2, 2, 1, 6, 8, 8, 9, 5, 7, 3, 8, 3, 7, 9, 8, 6, 2, 3, 0, 0, 1, 5, 9, 3, 7, 7, 6, 4, 7,
 1, 6, 5, 1, 2, 2, 8, 9, 3, 5, 7, 8, 6, 0, 1, 5, 8, 8, 1, 6, 1, 7, 5, 5, 7, 8, 2, 9, 7, 3, 5, 2, 3, 3, 4,
 4, 6, 0, 4, 2, 8, 1, 5, 1, 2, 6, 2, 7, 2, 0, 3, 7, 3, 4, 3, 1, 4, 6, 5, 3, 1, 9, 7, 7, 7, 7, 4, 1, 6, 0,
 3, 1, 9, 9, 0, 6, 6, 5, 5, 4, 1, 8, 7, 6, 3, 9, 7, 9, 2, 9, 3, 3, 4, 4, 1, 9, 5, 2, 1, 5, 4, 1, 3, 4, 1,
 8, 9, 9, 4, 8, 5, 4, 4, 4, 7, 3, 4, 5, 6, 7, 3, 8, 3, 1, 6, 2, 4, 9, 9, 3, 4, 1, 9, 1, 3, 1, 8, 1, 4, 8,
 0, 9, 2, 7, 7, 7, 7, 1, 0, 3, 8, 6, 3, 8, 7, 7, 3, 4, 3, 1, 7, 7, 2, 0, 7, 5, 4, 5, 6, 5, 4, 5, 3, 2, 2,
 0, 7, 7, 7, 0, 9, 2, 1, 2, 0, 1, 9, 0, 5, 1, 6, 6, 0, 9, 6, 2, 8, 0, 4, 9, 0, 9, 2, 6, 3, 6, 0, 1, 9, 7,
 5, 9, 8, 8, 2, 8, 1, 6, 1, 3, 3, 2, 3, 1, 6, 6, 6, 3, 6, 5, 2, 8, 6, 1, 9, 3, 2, 6, 6, 8, 6, 3, 3, 6, 0,
 6, 2, 7, 3, 5, 6, 7, 6, 3, 0, 3, 5, 4, 4, 7, 7, 6, 2, 8, 0, 3, 5, 0, 4, 5, 0, 7, 7, 7, 2, 3, 5, 5, 4, 7,
 1, 0, 5, 8, 5, 9, 5, 4, 8, 7, 0, 2, 7, 9, 0, 8, 1, 4, 3, 5, 6, 2, 4,
 0, 1, 4, 5, 1, 7, 1, 8, 0, 6, 2, 4, 6, 4, 3, 6, 2, 6, 7, 9, 4, 5, 6,
 1, 2, 7, 5, 3, 1, 8, 1, 3, 4, 0, 7, 8, 3, 3, 0, 3, 3, 6, 2, 5, 4, 2,
 3, 2, 7, 8, 3, 9, 4, 4, 9, 7, 5, 3, 8, 2, 4, 3, 7, 2, 0, 5, 8, 3, 5,
 3, 1, 1, 4, 7, 7, 1, 1, 9, 9, 2, 6, 0, 6, 3, 8, 1, 3, 3, 4, 6, 7, 7,
 6, 8, 7, 9, 6, 9, 5, 9, 7, 0, 3, 0, 9, 8, 3, 3, 9, 1, 3, 0, 7, 7, 1,
 0, 9, 8, 7, 0, 4, 0, 8, 5, 9, 1, 3, 3, 7, 4, 6, 4, 1, 4, 4, 2, 8, 2,
 2, 7, 7, 2, 6, 3, 4, 6, 5, 9, 4, 7, 0, 4, 7, 4, 5, 8, 7, 8, 4, 7, 7,
 8, 7, 2, 0, 1, 9, 2, 7, 7, 1, 5, 2, 8, 0, 7, 3, 1, 7, 6, 7, 9, 0, 7,
 7, 0, 7, 1, 5, 7, 2, 1, 3, 4, 4, 4, 7, 3, 0, 6, 0, 5, 7, 0, 0, 7, 3, 3, 4, 9, 2, 4, 3, 6, 9, 3, 1, 1, 3,
 8, 3, 5, 0, 4, 9, 3, 1, 6, 3, 1, 2, 8, 4, 0, 4, 2, 5, 1, 2, 1, 9, 2, 5, 6, 5, 1, 7, 9, 8, 0, 6, 9, 4, 1,
 1, 3, 5, 2, 8, 0, 1, 3, 1, 4, 7, 0, 1, 3, 0, 4, 7, 8, 1, 6, 4, 3, 7, 8, 8, 5, 1, 8, 5, 2, 9, 0, 9, 2, 8,
 5, 4, 5, 2, 0, 1, 1, 6, 5, 8, 3, 9, 3, 4, 1, 9, 6, 5, 6, 2, 1, 3, 4, 9, 1, 4, 3, 4, 1, 5, 9, 5, 6, 2, 5,
 8, 6, 5, 8, 6, 5, 5, 7, 0, 5, 5, 2, 6, 9, 0, 4, 9, 6, 5, 2, 0, 9, 8, 5, 8, 0, 3, 3, 8, 5, 0, 7, 2, 2, 4,
 2, 6, 4, 8, 2, 9, 3, 9, 7, 2, 8, 5, 8, 4, 7, 8, 3, 1, 6, 3, 0, 5, 7, 7, 7, 7, 5, 6, 0, 6, 8, 8, 8, 7, 6,

$$\alpha = \frac{9}{16\pi^3} \sqrt[4]{\frac{\pi}{5!}} \cong \frac{1}{137.03608}$$

1.11.vi.a. Wyler's marvellous formula
for the fine-structure constant

$$\frac{1}{\alpha^2} = \pi^2 + 137^2$$

$$\frac{1}{\alpha} \cong 137.0356$$

1.11.vi.b. Pythagorean
formula for the fine-
structure constant

4, 4, 6, 2, 4, 8, 2, 4, 6, 8, 5, 7, 9, 2, 6, 0, 3, 9, 5, 3, 5, 2, 7, 7, 3, 4, 8, 0, 3, 0, 4, 8, 0, 2, 9,
 0, 0, 5, 8, 7, 6, 0, 7, 5, 8, 2, 5, 1, 0, 4, 7, 4, 7, 0, 9, 1, 6, 4, 3, 9, 6, 1, 3, 6, 2, 6, 7, 6, 0, 4,
 4, 9, 2, 5, 6, 2, 7, 4, 2, 0, 4, 2, 0, 8, 3, 2, 0, 8, 5, 6, 6, 1, 1, 9, 0, 6, 2, 5, 4, 5, 4, 3, 3, 7, 2,
 1, 3, 1, 5, 3, 5, 9, 5, 8, 4, 5, 0, 6, 8, 7, 7, 2, 4, 6, 0, 2, 9, 0, 1, 6, 1, 8, 7, 6, 6, 7, 9, 5, 2, 4,
 0, 6, 1, 6, 3, 4, 2, 5, 2, 2, 5, 7, 7, 1, 9, 5, 4, 2, 9, 1, 6, 2, 9, 9, 1, 9, 3, 0, 6, 4, 5, 5, 3, 7, 7,
 9, 9, 1, 4, 0, 3, 7, 3, 4, 0, 4, 3, 2, 8, 7, 5, 2, 6, 2, 8, 8, 8, 9, 6, 3, 9, 9, 5, 8, 7, 9, 4, 7, 5, 7,
 2, 9, 1, 7, 4, 6, 4, 2, 6, 3, 5, 7, 4, 5, 5, 2, 5, 4, 0, 7, 9, 0, 9, 1, 4, 5, 1, 3, 5, 7, 1, 1, 1, 3, 6,
 9, 4, 1, 0, 9, 1, 1, 9, 3, 9, 3, 2, 5, 1, 9, 1, 0, 7, 6, 0, 2, 0, 8, 2, 5, 2, 0, 2, 6, 1, 8, 7, 9, 8, 5,
 3, 1, 8, 8, 7, 7, 0, 5, 8, 4,
 2, 9, 7, 2, 5, 9, 1, 6, 7, 7,
 8, 1, 3, 1, 4, 9, 6, 9, 9, 0,
 0, 9, 0, 1, 9, 2, 1, 1, 6, 9,
 7, 1, 7, 3, 7, 2, 7, 8, 4, 7,
 6, 8, 4, 7, 2, 6, 8, 6, 0, 8,
 4, 9, 0, 0, 3, 3, 7, 7, 0, 2,

$$\pi = \sum_{k=0}^{\infty} \frac{1}{16^k} \left(\frac{4}{8k+1} - \frac{2}{8k+4} - \frac{1}{8k+5} - \frac{1}{8k+6} \right)$$

1.11.vii.a. The Bailey–Borwein–Plouffe formula

4, 2, 4, 2, 9, 1, 6, 5, 1, 3, 0, 0, 5, 0, 0, 5, 1, 6, 8, 3, 2, 3, 3, 6, 4, 3, 5, 0, 3, 8, 9, 5, 1, 7, 0,
 2, 9, 8, 9, 3, 9, 2, 2, 3, 3, 4, 5, 1, 7, 2, 2, 0, 1, 3, 8, 1, 2, 8, 0, 6, 9, 6, 5, 0, 1, 1, 7, 8, 4, 4,
 0, 8, 7, 4, 5, 1, 9, 6, 0, 1, 2, 1, 2, 2, 8, 5, 9, 9, 3, 7, 1, 6, 2, 3, 1, 3, 0, 1, 7, 1, 1, 4, 4, 8,
 4, 6, 4, 0, 9, 0, 3, 8, 9, 0, 6, 4, 4, 9, 5, 4, 4, 4, 0, 0, 6, 1, 9, 8, 6, 9, 0, 7, 5, 4, 8, 5, 1, 6, 0,
 2, 6, 3, 2, 7, 5, 0, 5, 2, 9, 8, 3, 4, 9, 1, 8, 7, 4, 0, 7, 8, 6, 6, 8, 0, 8, 8, 1, 8, 3, 3, 8, 5, 1, 0,
 2, 2, 8, 3, 3, 4, 5, 0, 8, 5, 0, 4, 8, 6, 0, 8, 2, 5, 0, 3, 9, 3, 0, 2, 1, 3, 3, 2, 1, 9, 7, 1, 5, 5, 1,
 8, 4, 3, 0, 6, 3, 5, 4, 5, 5, 0, 0, 7, 6, 6, 8, 2, 8, 2, 9, 4, 9, 3, 0, 4, 1, 3, 7, 7, 6, 5, 5, 2, 7, 9,
 3, 9, 7, 5, 1, 7, 5, 4, 6, 1, 3, 9, 5, 3, 9, 8, 4, 6, 8, 3, 3, 9, 3, 6, 3, 8, 3, 0, 4, 7, 4, 6, 1, 1, 9,
 9, 6, 6, 5, 3, 8, 5, 8, 1, 5, 3, 8, 4, 2, 0, 5, 6, 8, 5, 3, 3, 8, 6, 2, 1, 8, 6, 7, 2, 5, 2, 3, 3, 4, 0,
 2, 8, 3, 0, 8, 7, 1, 1, 2, 3, 2, 8, 2, 7, 8, 9, 2, 1, 2, 5, 0, 7, 7, 1, 2, 6, 2, 9, 4, 6, 3, 2, 2, 9, 5,
 6, 3, 9, 8, 9, 8, 9, 8, 9, 3, 5, 8, 2, 1, 1, 6, 7, 4, 5, 6, 2, 7, 0, 1, 0, 2, 1, 8, 3, 5, 6, 4, 6, 2, 2,
 0, 1, 3, 4, 9, 6, 7, 1, 5, 1, 8, 8, 1, 9, 0,
 9, 7, 3, 0, 3, 8, 1, 1, 9, 8, 0, 0, 4, 9, 7,
 3, 4, 0, 7, 2, 3, 9, 6, 1, 0, 3, 6, 8, 5, 4,
 0, 6, 6, 4, 3, 1, 9, 3, 9, 5, 0, 9, 7, 9, 0,

$$\int_{-\infty}^{+\infty} \cos(x^2) dx = \int_{-\infty}^{+\infty} \sin(x^2) dx = \sqrt{\frac{\pi}{2}}$$

1.11.vii.b. Fresnel integral

1, 9, 0, 6, 9, 9, 6, 3, 9, 5, 5, 2, 4, 5, 3,
 0, 0, 5, 4, 5, 0, 5, 8, 0, 6, 8, 5, 5, 0, 1, 9, 5, 6, 7, 3, 0, 2, 2, 9, 2, 1, 9, 1, 3, 9, 3, 3, 9, 1, 8,
 5, 6, 8, 0, 3, 4, 4, 9, 0, 3, 9, 8, 2, 0, 5, 9, 5, 5, 1, 0, 0, 2, 2, 6, 3, 5, 3, 5, 3, 6, 1, 9, 2, 0, 4,
 1, 9, 9, 4, 7, 4, 5, 5, 3, 8, 5, 9, 3, 8, 1, 0, 2, 3, 4, 3, 9, 5, 5, 4, 4, 9, 5, 9, 7, 7, 8, 3, 7, 7, 9,
 0, 2, 3, 7, 4, 2, 1, 6, 1, 7, 2, 7, 1, 1, 1, 7, 2, 3, 6, 4, 3, 4, 3, 5, 4, 3, 9, 4, 7, 8, 2, 2, 1, 8, 1,
 8, 5, 2, 8, 6, 2, 4, 0, 8, 5, 1, 4, 0, 0, 6, 6, 6, 0, 4, 4, 3, 3, 2, 5, 8, 8, 8, 5, 6, 9, 8, 6, 7, 0, 5,
 4, 3, 1, 5, 4, 7, 0, 6, 9, 6, 5, 7, 4, 7, 4, 5, 8, 5, 5, 0, 3, 3, 2, 3, 2, 3, 3, 4, 2, 1, 0, 7, 3, 0, 1,
 5, 4, 5, 9, 4, 0, 5, 1, 6, 5, 5, 3, 7, 9, 0, 6, 8, 6, 6, 2, 7, 3, 3, 3, 7, 9, 9, 5, 8, 5, 1, 1, 5, 6, 2,
 5, 7, 8, 4, 3, 2, 2, 9, 8, 8, 2, 7, 3, 7, 2, 3, 1, 9, 8, 9, 8, 7, 5, 7, 1, 4, 1, 5, 9, 5, 7, 8, 1, 1, 1,
 9, 6, 3, 5, 8, 3, 3, 0, 0, 5, 9, 4, 0, 8, 7, 3, 0, 6, 8, 1, 2, 1, 6, 0, 2, 8, 7, 6, 4, 9, 6, 2, 8, 6, 7,

4, 4, 6, 0, 4, 7, 7, 4, 6, 4, 9, 1, 5, 9, 9, 5, 0, 5, 4, 9, 7, 3, 7, 4, 2, 5, 6, 2, 6, 9, 0, 1, 0, 4, 9,
0, 3, 7, 7, 8, 1, 9, 8, 6, 8, 3, 5, 9, 3, 8, 1, 4, 6, 5, 7, 4, 1, 2, 6, 8, 0, 4, 9, 2, 5, 6, 4, 8, 7, 9,
8, 5, 5, 6, 1, 4, 5, 3, 7, 2, 3, 4, 7, 8, 6, 7, 3, 3, 0, 3, 9, 0, 4, 6, 8, 8, 3, 8, 3, 4, 3, 6, 3, 4, 6,
5, 5, 3, 7, 9, 4, 9, 8, 6, 4, 1, 9, 2, 7, 0, 5, 6, 3, 8, 7, 2, 9, 3, 1, 7, 4, 8, 7, 2, 3, 3, 2, 0, 8, 3,
7, 6, 0, 1, 1, 2, 3, 0, 2, 9, 9, 1, 1, 3, 6, 7, 9, 3, 8, 6, 2, 7, 0, 8, 9, 4, 3, 8, 7, 9, 9, 3, 6, 2, 0,
1, 6, 2, 9, 5, 1, 5, 4, 1, 3, 3, 7, 1, 4, 2, 4, 8, 9, 2, 8, 3, 0, 7, 2, 2, 0, 1, 2, 6, 9, 0, 1, 4, 7, 5,
4, 6, 6, 8, 4, 7, 6, 5, 3, 5, 7, 6, 1, 6, 4, 7, 7, 3, 7, 9, 4, 6, 7, 5, 2, 0, 0, 4, 9, 0, 7, 5, 7, 1, 5,
5, 5, 2, 7, 8, 1, 9, 6, 5, 3, 6, 2, 1, 3, 2, 3, 9, 2, 6, 4, 0, 6, 1, 6, 0, 1, 3, 6, 3, 5, 8, 1, 5, 5, 9,
0, 7, 4, 2, 2, 0, 2, 0, 2, 0, 3, 1, 8, 7, 2, 7, 7, 6, 0, 5, 2,
7, 7, 2, 1, 9, 0, 0, 5, 5, 6, 1, 4, 8, 4, 2, 5, 5, 5, 1, 8, 7,
9, 2, 5, 3, 0, 3, 4, 3, 5, 1, 3, 9, 8, 4, 4, 2, 5, 3, 2, 2, 3,
4, 1, 5, 7, 6, 2, 3, 3, 6, 1, 0, 6, 4, 2, 5, 0, 6, 3, 9, 0, 4,
9, 7, 5, 0, 0, 8, 6, 5, 6, 2, 7, 1, 0, 9, 5, 3, 5, 9, 1, 9, 4,
6, 5, 8, 9, 7, 5, 1, 4, 1, 3, 1, 0, 3, 4, 8, 2, 2, 7, 6, 9, 3,
0, 6, 2, 4, 7, 4, 3, 5, 3, 6, 3, 2, 5, 6, 9, 1, 6, 0, 7, 8,
1, 5, 4, 7, 8, 1, 8, 1, 1, 5, 2, 8, 4, 3, 6, 6, 7, 9, 5, 7, 0, 6, 1, 1, 0, 8, 6, 1, 5, 3, 3, 1, 5, 0, 4,
4, 5, 2, 1, 2, 7, 4, 7, 3, 9, 2, 4, 5, 4, 4, 9, 4, 5, 4, 2, 3, 6, 8, 2, 8, 8, 6, 0, 6, 1, 3, 4, 0, 8, 4,
1, 4, 8, 6, 3, 7, 7, 6, 7, 0, 0, 9, 6, 1, 2, 0, 7, 1, 5, 1, 2, 4, 9, 1, 4, 0, 4, 3, 0, 2, 7, 2, 5, 3, 8,
6, 0, 7, 6, 4, 8, 2, 3, 6, 3, 4, 1, 4, 3, 3, 4, 6, 2, 3, 5, 1, 8, 9, 7, 5, 7, 6, 6, 4, 5, 2, 1, 6, 4, 1,
3, 7, 6, 7, 9, 6, 9, 0, 3, 1, 4, 9, 5, 0, 1, 9, 1, 0, 8, 5, 7, 5, 9, 8, 4, 4, 2, 3, 9, 1, 9, 8, 6, 2, 9,
1, 6, 4, 2, 1, 9, 3, 9, 9, 4, 9, 0, 7, 2, 3, 6, 2, 3, 4, 6, 4, 6, 8, 4, 4, 1, 1, 7, 3, 9, 4, 0, 3, 2, 6,
5, 9, 1, 8, 4, 0, 4, 4, 3, 7, 8, 0, 5, 1, 3, 3, 3, 8, 9, 4, 5, 2, 5, 7, 4, 2, 3, 9, 9, 5, 0, 8, 2, 9, 6,
5, 9, 1, 2, 2, 8, 5, 0, 8, 5, 5, 5, 8, 2, 1, 5, 7, 2, 5, 0, 3, 1, 0, 7, 1, 2, 5, 7, 0, 1, 2, 6, 6, 8, 3,
0, 2, 4, 0, 2, 9, 2, 9, 5, 2, 5, 2, 2, 0, 1, 1, 8, 7, 2, 6, 7, 6, 7,
5, 6, 2, 2, 0, 4, 1, 5, 4, 2, 0, 5, 1, 6, 1, 8, 4, 1, 6, 3, 4, 8, 4,
7, 5, 6, 5, 1, 6, 9, 9, 9, 8, 1, 1, 6, 1, 4, 1, 0, 1, 0, 0, 2, 9, 9,
6, 0, 7, 8, 3, 8, 6, 9, 0, 9, 2, 9, 1, 6, 0, 3, 0, 2, 8, 8, 4, 0, 0,
2, 6, 9, 1, 0, 4, 1, 4, 0, 7, 9, 2, 8, 8, 6, 2, 1, 5, 0, 7, 8, 4, 2,
4, 5, 1, 6, 7, 0, 9, 0, 8, 7, 0, 0, 0, 6, 9, 9, 2, 8, 2, 1, 2, 0, 6,
6, 0, 4, 1, 8, 3, 7, 1, 8, 0, 6, 5, 3, 5, 5, 6, 7, 2, 5, 2, 5, 3, 2, 5, 6, 7, 5, 3, 2, 8, 6, 1, 2, 9, 1,
0, 4, 2, 4, 8, 7, 7, 6, 1, 8, 2, 5, 8, 2, 9, 7, 6, 5, 1, 5, 7, 9, 5, 9, 8, 4, 7, 0, 3, 5, 6, 2, 2, 2, 6,
2, 9, 3, 4, 8, 6, 0, 0, 3, 4, 1, 5, 8, 7, 2, 2, 9, 8, 0, 5, 3, 4, 9, 8, 9, 6, 5, 0, 2, 2, 6, 2, 9, 1, 7,
4, 8, 7, 8, 8, 2, 0, 2, 7, 3, 4, 2, 0, 9, 2, 2, 2, 2, 4, 5, 3, 3, 9, 8, 5, 6, 2, 6, 4, 7, 6, 6, 9, 1, 4,
9, 0, 5, 5, 6, 2, 8, 4, 2, 5, 0, 3, 9, 1, 2, 7, 5, 7, 7, 1, 0, 2, 8, 4, 0, 2, 7, 9, 9, 8, 0, 6, 6, 3, 6,
5, 8, 2, 5, 4, 8, 8, 9, 2, 6, 4, 8, 8, 0, 2, 5, 4, 5, 6, 6, 1, 0, 1, 7, 2, 9, 6, 7, 0, 2, 6, 6, 4, 0, 7,
6, 5, 5, 9, 0, 4, 2, 9, 0, 9, 9, 4, 5, 6, 8, 1, 5, 0, 6, 5, 2, 6, 5, 3, 0, 5, 3, 7, 1, 8, 2, 9, 4, 1, 2,
7, 0, 3, 3, 6, 9, 3, 1, 3, 7, 8, 5, 1, 7, 8, 6, 0, 9, 0, 4, 0, 7, 0, 8, 6, 6, 7, 1, 1, 4, 9, 6, 5, 5, 8,
3, 4, 3, 4, 3, 4, 7, 6, 9, 3, 3, 8, 5, 7, 8, 1, 7, 1, 1, 3, 8, 6, 4, 5, 5, 8, 7, 3, 6, 7, 8, 1, 2, 3, 0,
1, 4, 5, 8, 7, 6, 8, 7, 1, 2, 6, 6, 0, 3, 4, 8, 9, 1, 3, 9, 0, 9, 5, 6, 2, 0, 0, 9, 9, 3, 9, 3, 6, 1, 0,
3, 1, 0, 2, 9, 1, 6, 1, 6, 1, 5, 2, 8, 8, 1, 3, 8, 4, 3, 7, 9, 0, 9, 9, 0, 4, 2, 3, 1, 7, 4, 7, 3, 3, 6,

$$\frac{\prod_{n=1}^{\infty} \left(1 + \frac{1}{4n^2 - 1}\right)}{\sum_{n=1}^{\infty} \frac{1}{4n^2 - 1}} = \pi$$

1.11.viii.a. Euler convergence
formula

$$\int_{-\infty}^{+\infty} e^{-\frac{u^2}{2}} du = \sqrt{2\pi}$$

1.11.viii.b. Euler integral

3, 9, 4, 8, 0, 4, 5, 7, 5, 9, 3, 1, 4, 9, 3, 1, 4, 0, 5, 2, 9, 7, 6, 3, 4, 7, 5, 7, 4, 8, 1, 1, 9, 3, 5,
 6, 7, 0, 9, 1, 1, 0, 1, 3, 7, 7, 5, 1, 7, 2, 1, 0, 0, 8, 0, 3, 1, 5, 5, 9, 0, 2, 4, 8, 5, 3, 0, 9, 0, 6,
 6, 9, 2, 0, 3, 7, 6, 7, 1, 9, 2, 2, 0, 3, 3, 2, 2, 9, 0, 9, 4, 3, 3, 4, 6, 7, 6, 8, 5, 1, 4, 2, 2, 1, 4,
 4, 7, 7, 3, 7, 9, 3, 9, 3, 7, 5, 1, 7, 0, 3, 4, 4, 3, 6, 6, 1, 9, 9, 1, 0, 4, 0, 3, 3, 7, 5, 1, 1, 1, 7,
 3, 5, 4, 7, 1, 9, 1, 8, 5, 5, 0, 4, 6, 4, 4, 9, 0, 2, 6, 3, 6, 5, 5, 1, 2, 8, 1, 6, 2, 2, 8, 8, 2, 4, 4,
 6, 2, 5, 7, 5, 9, 1, 6, 3, 3, 3, 0, 3, 9, 1, 0, 7, 2, 2, 5, 3, 8, 3, 7, 4, 2, 1, 8, 2, 1, 4, 0, 8, 8, 3,
 5, 0, 8, 6, 5, 7, 3, 9, 1, 7, 7, 1, 5, 0, 9, 6, 8, 2, 8, 8, 7, 4, 7, 8, 2, 6, 5, 6, 9, 9, 5, 9, 9, 5, 7,
 4, 4, 9, 0, 6, 6, 1, 7, 5, 8, 3, 4, 4, 1, 3, 7, 5, 2, 2, 3, 9, 7, 0, 9, 6, 8, 3, 4, 0, 8, 0, 0, 5, 3, 5,
 5, 9, 8, 4, 9, 1, 7, 5, 4, 1, 7, 3, 8, 1, 8, 8, 3, 9, 9, 9, 4, 4, 6, 9, 7, 4, 8, 6, 7, 6, 2, 6, 5, 5, 1,
 6, 5, 8, 2, 7, 6, 5, 8, 4, 8, 3, 5, 8, 8, 4, 5, 3, 1, 4, 2, 7, 7, 5, 6, 8, 7, 9, 0, 0, 2, 9, 0, 9, 5, 1,
 7, 0, 2, 8, 3, 5, 2, 9, 7, 1, 6, 3, 4, 4, 5, 6, 2, 1, 2, 9, 6, 4, 0, 4, 3, 5, 2, 3, 1, 1, 7, 6, 0, 0, 6,
 6, 5, 1, 0, 1, 2, 4, 1, 2, 0, 0, 6, 5, 9, 7, 5, 5, 8, 5, 1, 2, 7, 6, 1, 7, 8, 5, 8, 3, 8, 2, 9, 2, 0, 4,
 1, 9, 7, 4, 8, 4, 4, 2, 3, 6, 0, 8, 0, 0, 7, 1, 9, 3, 0, 4, 5, 7, 6, 1, 8, 9, 3, 2, 3, 4, 9, 2, 2, 9, 2,
 7, 9, 6, 5, 0, 1, 9, 8, 7, 5, 1, 8, 7, 2, 1, 2, 7, 2, 6, 7, 5, 0, 7, 9, 8, 1, 2, 5, 5, 4, 7, 0, 9, 5, 8,
 9, 0, 4, 5, 5, 6, 3, 5, 7, 9, 2, 1, 2, 2, 1, 0, 3, 3, 3, 4, 6, 6, 9, 7, 4, 9, 9, 2, 3, 5, 6, 3, 0, 2, 5,
 4, 9, 4, 7, 8, 0, 2, 4, 9, 0, 1, 1, 4, 1, 9, 5, 2, 1, 2, 3, 8, 2, 8, 1, 5, 3, 0, 9, 1, 1, 4, 0, 7, 9, 0,
 7, 3, 8, 6, 0, 2, 5, 1, 5, 2, 2, 7, 4, 2, 9, 9, 5, 8, 1, 8, 0, 7, 2, 4, 7, 1, 6, 2, 5, 9, 1, 6, 6, 8, 5,
 4, 5, 1, 3, 3, 3, 1, 2, 3, 9, 4, 8, 0, 4, 9, 4, 7, 0, 7, 9, 1, 1, 9, 1, 5, 3, 2, 6, 7, 3, 4, 3, 0, 2, 8,
 2, 4, 4, 1, 8, 6, 0, 4, 1, 4, 2, 6, 3, 6, 3, 9, 5, 4, 8, 0, 0, 0, 4, 4, 8, 0, 0, 2, 6, 7, 0, 4, 9, 6, 2,
 4, 8, 2, 0, 1, 7, 9, 2, 8, 9, 6, 4, 7, 6, 6, 9, 7, 5, 8, 3, 1, 8, 3, 2, 7, 1, 3, 1, 4, 2, 5, 1, 7, 0, 2,
 9, 6, 9, 2, 3, 4, 8, 8, 9, 6, 2, 7, 6, 6, 8, 4, 4, 0, 3, 2, 3, 2, 6, 0, 9, 2, 7, 5, 2, 4, 9, 6, 0, 3, 5,
 7, 9, 9, 6, 4, 6, 9, 2, 5, 6, 5, 0, 4, 9, 3, 6, 8, 1, 8, 3, 6, 0, 9, 0, 0, 3, 2, 3, 8, 0, 9, 2, 9, 3, 4,
 5, 9, 5, 8, 8, 9, 7, 0, 6, 9, 5, 3, 6, 5, 3, 4, 9, 4, 0, 6, 0, 3, 4, 0, 2, 1, 6, 6, 5, 4, 4, 3, 7, 5, 5,
 8, 9, 0, 0, 4, 5, 6, 3, 2, 8, 8, 2, 2, 5, 0, 5, 4, 5, 2, 5, 5, 6, 4, 0, 5, 6, 4, 4, 8, 2, 4, 6, 5, 1, 5,
 1, 8, 7, 5, 4, 7, 1, 1, 9, 6, 2, 1, 8, 4, 4, 3, 9, 6, 5, 8, 2, 5, 3, 3, 7, 5, 4, 3, 8, 8, 5, 6, 9, 0, 9,
 4, 1, 1, 3, 0, 3, 1, 5, 0, 9, 5, 2, 6, 1, 7, 9, 3, 7, 8, 0, 0, 2, 9, 7, 4, 1, 2, 0, 7, 6, 6, 5, 1, 4, 7,
 9, 3, 9, 4, 2, 5, 9, 0, 2, 9, 8, 9, 6, 9, 5, 9, 4, 6, 9, 9, 5, 5, 6, 5, 7, 6, 1, 2, 1, 8, 6, 5, 6, 1, 9,
 6, 7, 3, 3, 7, 8, 6, 2, 3, 6, 2, 5, 6, 1, 2, 5, 2, 1, 6, 3, 2, 0, 8, 6, 2, 8, 6, 9, 2, 2, 2, 1, 0, 3, 2,
 7, 4, 8, 8, 9, 2, 1, 8, 6, 5, 4, 3, 6, 4, 8, 0, 2, 2, 9, 6, 7, 8, 0, 7, 0, 5, 7, 6, 5, 6, 1, 5, 1, 4, 4,
 6, 3, 2, 0, 4, 6, 9, 2, 7, 9, 0, 6, 8, 2, 1, 2, 0, 7, 3, 8, 8, 3, 7, 7, 8, 1, 4, 2, 3, 3, 5, 6, 2, 8, 2,
 3, 6, 0, 8, 9, 6, 3, 2, 0, 8, 0, 6, 8, 2, 2, 2, 4, 6, 8, 0, 1, 2, 2, 4, 8, 2, 6, 1, 1, 7, 7, 1, 8, 5, 8,
 9, 6, 3, 8, 1, 4, 0, 9, 1, 8, 3, 9, 0, 3, 6, 7, 3, 6, 7, 2, 2, 2, 0, 8, 8, 8, 3, 2, 1, 5, 1, 3, 7, 5, 5,
 6, 0, 0, 3, 7, 2, 7, 9, 8, 3, 9, 4, 0, 0, 4, 1, 5, 2, 9, 7, 0, 0, 2, 8, 7, 8, 3, 0, 7, 6, 6, 7, 0, 9, 4,
 4, 4, 7, 4, 5, 6, 0, 1, 3, 4, 5, 5, 6, 4, 1, 7, 2, 5, 4, 3, 7, 0, 9, 0, 6, 9, 7, 9, 3, 9, 6, 1, 2, 2, 5,
 7, 1, 4, 2, 9, 8, 9, 4, 6, 7, 1, 5, 4, 3, 5, 7, 8, 4, 6, 8, 7, 8, 8, 6, 1, 4, 4, 4, 5, 8, 1, 2, 3, 1, 4,
 5, 9, 3, 5, 7, 1, 9, 8, 4, 9, 2, 2, 5, 2, 8, 4, 7, 1, 6, 0, 5, 0, 4, 9, 2, 2, 1, 2, 4, 2, 4, 7, 0, 1, 4,
 1, 2, 1, 4, 7, 8, 0, 5, 7, 3, 4, 5, 5, 1, 0, 5, 0, 0, 8, 0, 1, 9, 0, 8, 6, 9, 9, 6, 0, 3, 3, 0, 2, 7, 6,
 3, 4, 7, 8, 7, 0, 8, 1, 0, 8, 1, 7, 5, 4, 5, 0, 1, 1, 9, 3, 0, 7, 1, 4, 1, 2, 2, 3, 3, 9, 0, 8, 6, 6, 3,
 9, 3, 8, 3, 3, 9, 5, 2, 9, 4, 2, 5, 7, 8, 6, 9, 0, 5, 0, 7, 6, 4, 3, 1, 0, 0, 6, 3, 8, 3, 5, 1, 9, 8, 3,
 4, 3, 8, 9, 3, 4, 1, 5, 9, 6, 1, 3, 1, 8, 5, 4, 3, 4, 7, 5, 4, 6, 4, 9, 5, 5, 6, 9, 7, 8, 1, 0,

3, 8, 2, 9, 3, 0, 9, 7, 1, 6, 4, 6, 5, 1, 4, 3, 8, 4, 0, 7, 0, 0, 7, 0, 7, 3, 6, 0, 4, 1, 1, 2, 3, 7, 3,
5, 9, 9, 8, 4, 3, 4, 5, 2, 2, 5, 1, 6, 1, 0, 5, 0, 7, 0, 2, 7, 0, 5, 6, 2, 3, 5, 2, 6, 6, 0, 1, 2, 7, 6,
4, 8, 4, 8, 3, 0, 8, 4, 0, 7, 6, 1, 1, 8, 3, 0, 1, 3, 0, 5, 2, 7, 9, 3, 2, 0, 5, 4, 2, 7, 4, 6, 2, 8, 6,
5, 4, 0, 3, 6, 0, 3, 6, 7, 4, 5, 3, 2, 8, 6, 5, 1, 0, 5, 7, 0, 6, 5, 8, 7, 4, 8, 8, 2, 2, 5, 6, 9, 8, 1,
5, 7, 9, 3, 6, 7, 8, 9, 7, 6, 6, 9, 7, 4, 2, 2, 0, 5, 7, 5, 0, 5, 9, 6, 8, 3, 4, 4, 0, 8, 6, 9, 7, 3, 5,
0, 2, 0, 1, 4, 1, 0, 2, 0, 6, 7, 2, 3, 5, 8, 5, 0, 2, 0, 0, 7, 2, 4, 5, 2, 2, 5, 6, 3, 2, 6, 5, 1, 3, 4,
1, 0, 5, 5, 9, 2, 4, 0, 1, 9, 0, 2, 7, 4, 2, 1, 6, 2, 4, 8, 4, 3, 9, 1, 4, 0, 3, 5, 9, 9, 8, 9, 5, 3, 5,
3, 9, 4, 5, 9, 0, 9, 4, 4, 0, 7, 0, 4, 6, 9, 1, 2, 0, 9, 1, 4, 0, 9, 3, 8, 7, 0, 0, 1, 2, 6, 4, 5, 6, 0,
0, 1, 6, 2, 3, 7, 4, 2, 8, 8, 0, 2, 1, 0, 9, 2, 7, 6, 4, 5, 7, 9, 3, 1, 0, 6, 5, 7, 9, 2, 2, 9, 5, 5, 2,
4, 9, 8, 8, 7, 2, 7, 5, 8, 4, 6, 1, 0, 1, 2, 6, 4, 8, 3, 6, 9, 9, 9, 8, 9, 2, 2, 5, 6, 9, 5, 9, 6, 8, 8,
1, 5, 9, 2, 0, 5, 6, 0, 0, 1, 0, 1, 6, 5, 5, 2, 5, 6, 3, 7, 5, 6, 7, 8, 5, 6, 6, 7, 2, 2, 7, 9, 6, 6, 1,
9, 8, 8, 5, 7, 8, 2, 7, 9, 4, 8, 4, 8, 8, 5, 5, 8, 3, 4, 3, 9, 7, 5, 1, 8, 7, 4, 4, 5, 4, 5, 5, 1, 2, 9,
6, 5, 6, 3, 4, 4, 3, 4, 8, 0, 3, 9, 6, 6, 4, 2, 0, 5, 5, 7, 9, 8, 2, 9, 3, 6, 8, 0, 4, 3, 5, 2, 2, 0, 2,
7, 7, 0, 9, 8, 4, 2, 9, 4, 2, 3, 2, 5, 3, 3, 0, 2, 2, 5, 7, 6, 3, 4, 1, 8, 0, 7, 0, 3, 9, 4, 7, 6, 9, 9,
4, 1, 5, 9, 7, 9, 1, 5, 9, 4, 5, 3, 0, 0, 6, 9, 7, 5, 2, 1, 4, 8, 2, 9, 3, 3, 6, 6, 5, 5, 5, 6, 6, 1, 5,
6, 7, 8, 7, 3, 6, 4, 0, 0, 5, 3, 6, 6, 6, 5, 6, 4, 1, 6, 5, 4, 7, 3, 2, 1, 7, 0, 4, 3, 9, 0, 3, 5, 2, 1,
3, 2, 9, 5, 4, 3, 5, 2, 9, 1, 6, 9, 4, 1, 4, 5, 9, 9, 0, 4, 1, 6, 0, 8, 7, 5, 3, 2, 0, 1, 8, 6, 8, 3, 7,
9, 3, 7, 0, 2, 3, 4, 8, 8, 8, 6, 8, 9, 4,

$$ds^2 = -dt^2 + dr^2 + (r^2 + n^2)d\Omega^2$$

7, 9, 1, 5, 1, 0, 7, 1, 6, 3, 7, 8, 5, 2, 2.0.i. The line element in the Ellis wormhole metric
9, 0, 2, 3, 4, 5, 2, 9, 2, 4, 4, 0, 7, 7,
3, 6, 5, 9, 4, 9, 5, 6, 3, 0, 5, 1, 0, 0,

7, 4, 2, 1, 0, 8, 7, 1, 4, 2, 6, 1, 3, 4, 9, 7, 4, 5, 9, 5, 6, 1, 5, 1, 3, 8, 4, 9, 8, 7, 1, 3, 7, 5, 7,
0, 4, 7, 1, 0, 1, 7, 8, 7, 9, 5, 7, 3, 1, 0, 4, 2, 2, 9, 6, 9, 0, 6, 6, 6, 7, 0, 2, 1, 4, 4, 9, 8, 6, 3,
7, 4, 6, 4, 5, 9, 5, 2, 8, 0, 8, 2, 4, 3, 6, 9, 4, 4, 5, 7, 8, 9, 7, 7, 2, 3, 3, 0, 0, 4, 8, 7, 6, 4, 7,
6, 5, 2, 4, 1, 3, 3, 9, 0, 7, 5, 9, 2, 0, 4, 3, 4, 0, 1, 9, 6, 3, 4, 0, 3, 9, 1, 1, 4, 7, 3, 2, 0, 2, 3,
3, 8, 0, 7, 1, 5, 0, 9, 5, 2, 2, 2, 0, 1, 0, 6, 8, 2, 5, 6, 3, 4, 2, 7, 4, 7, 1, 6, 4, 6, 0, 2, 4, 3, 3,
5, 4, 4, 0, 0, 5, 1, 5, 2, 1, 2, 6, 6, 9, 3, 2, 4, 9, 3, 4, 1, 9, 6, 7, 3, 9, 7, 7, 0, 4, 1, 5, 9, 5, 6,
8, 3, 7, 5, 3, 5, 5, 5, 1, 6, 6, 7, 3, 0, 2, 7, 3, 9, 0, 0, 7, 4, 9, 7, 2, 9, 7, 3, 6, 3, 5, 4, 9, 6, 4,
5, 3, 3, 2, 8, 8, 8, 6, 9, 8, 4, 4, 0, 6, 1, 1, 9, 6, 4, 9, 6, 1, 6, 2, 7, 7, 3, 4, 4, 9, 5, 1, 8, 2, 7,
3, 6, 9, 5, 5, 8, 8, 2, 2, 0, 7, 5, 7, 3, 5, 5, 1, 7, 6, 6, 5, 1, 5, 8, 9, 8, 5, 5, 1, 9, 0, 9, 8, 6, 6,
6, 5, 3, 9, 3, 5, 4, 9, 4, 8, 1, 0, 6, 8, 8, 7, 3, 2, 0, 6, 8, 5, 9, 9, 0, 7, 5, 4, 0, 7, 9, 2, 3, 4, 2,
4, 0, 2, 3, 0, 0, 9, 2, 5, 9, 0, 0, 7, 0, 1, 7, 3, 1, 9, 6, 0, 3, 6, 2, 2, 5, 4, 7, 5, 6, 4, 7, 8, 9, 4,
0, 6, 4, 7, 5, 4, 8, 3, 4, 6, 6, 4, 7, 7, 6, 0, 4, 1, 1, 4, 6, 3, 2, 3, 3, 9, 0, 5, 6, 5, 1, 3, 4, 3, 3,
0, 6, 8, 4, 4, 9, 5, 3, 9, 7, 9, 0, 7, 0, 9, 0, 3, 0, 2, 3, 4, 6, 0, 4, 6, 1, 4, 7, 0, 9, 6, 1, 6, 9, 6,
8, 8, 6, 8, 8, 5, 0, 1, 4, 0, 8, 3, 4, 7, 0, 4, 0, 5, 4, 6, 0, 7, 4, 2, 9, 5, 8, 6, 9, 9, 1, 3, 8, 2, 9,
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3, 1, 9, 7, 4, 4, 0, 4, 7, 7, 1, 8, 5, 5, 6, 7, 8, 9, 3, 4, 8, 2, 3, 0, 8, 9, 4, 3, 1, 0, 6, 8, 2, 8, 7,
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6, 1, 5, 9, 5, 9, 9, 5, 4, 6, 2, 6, 2, 4, 6, 2, 9, 7, 0, 7, 0, 6, 2, 5, 9, 4, 8, 4, 5, 5, 6, 9, 0, 3, 4,

7, 1, 1, 9, 7, 2, 9, 9, 6, 4, 0, 9, 0, 8, 9, 4, 1, 8, 0, 5, 9, 5, 3, 4, 3, 9, 3, 2, 5, 1, 2, 3, 6, 2, 3,
5, 5, 0, 8, 1, 3, 4, 9, 4, 9, 0, 0, 4, 3, 6, 4, 2, 7, 8, 5, 2, 7, 1, 3, 8, 3, 1, 5, 9, 1, 2, 5, 6, 8, 9,
8, 9, 2, 9, 5, 1, 9, 6, 4, 2, 7, 2, 8, 7, 5,

2. Galactic influences

7, 3, 9, 4, 6, 9, 1, 4, 2, 7, 2, 5, 3, 4, 3,
6, 6, 9, 4, 1, 5, 3, 2, 3, 6, 1, 0, 0, 4, 5,
3, 7, 3, 0, 4, 8, 8, 1, 9, 8, 5, 5, 1, 7, 0, 6, 5, 9, 4, 1, 2, 1, 7, 3, 5, 2, 4, 6, 2, 5, 8, 9, 5, 4, 8,
7, 3, 0, 1, 6, 7, 6, 0, 0, 2, 9, 8, 8, 6, 5, 9, 2, 5, 7, 8, 6, 6, 2, 8, 5, 6, 1, 2, 4, 9, 6, 6, 5, 5, 2,
3, 5, 3, 3, 8, 2, 9, 4, 2, 8, 7, 8, 5, 4, 2, 5, 3, 4, 0, 4, 8, 3, 0, 8, 3, 3, 0, 7, 0, 1, 6, 5, 3, 7, 2,
2, 8, 5, 6, 3, 5, 5,
9, 1, 5, 2, 5, 3, 4,
7, 8, 4, 4, 5, 9, 8,
1, 8, 3, 1, 3, 4, 1,
1, 2, 9, 0, 0, 1, 9,
9, 9, 2, 0, 5, 9, 8,
1, 3, 5, 2, 2, 0, 5,
1, 1, 7, 3, 3, 6, 5,
8, 5, 6, 4, 0, 7, 8,
2, 6, 4, 8, 4, 9, 4,
2, 7, 6, 4, 4, 1, 1,
3, 7, 6, 3, 9, 3, 8,
6, 6, 9, 2, 4, 8, 0,
3, 1, 1, 8, 3, 6, 4,
4, 5, 3, 6, 9, 8, 5,
8, 9, 1, 7, 5, 4, 4,
2, 6, 4, 7, 3, 9, 9,
8, 8, 2, 2, 8, 4, 6,
2, 1, 8, 4, 4, 9, 0,
0, 8, 7, 7, 7, 6, 9,
7, 7, 6, 3, 1, 2, 7,
9, 5, 7, 2, 2, 6, 7,
2, 6, 5, 5, 5, 6, 2,

‘How do you imagine the end?’ asked the priest.

‘Initially, I thought it would end well,’ said K, ‘but now there are times when even I have doubts about it. I do not know how it will end, do you?’

‘No,’ replied the priest, ‘but I am afraid it will end badly. They think you are guilty. Your trial will probably not proceed beyond a lower court. Your guilt has been established, at least provisionally.’

‘But I am not guilty,’ said K. ‘It is a mistake. How can a man be guilty, just like that? We are all human beings, one as much as the other.’

‘That is very true,’ said the priest, ‘but that is what guilty people usually say.’

‘Are you prejudiced against me?’ asked K.

‘No, I am not prejudiced against you,’ replied the priest.

‘I am grateful,’ said K. ‘Everyone else involved in my trial is prejudiced against me. They also influence people who are not involved. My situation is becoming very difficult.’

‘You are misinterpreting the facts,’ said the priest. ‘Sentencing is not pronounced all at once; the proceedings slowly become the sentence.’

‘That’s it, then,’ said K, bowing his head.

Franz Kafka

5, 9, 6, 2, 8, 2, 5, 4, 2, 7, 6, 5, 3, 1, 8, 3, 0, 0, 1, 3, 4, 0, 7, 0, 9, 2, 2, 3, 3, 4, 3, 6, 5, 7, 7,
9, 1, 6, 0, 1, 2, 8, 0, 9, 3, 1, 7, 9, 4, 0, 1, 7, 1, 8, 5, 9, 8, 5, 9, 9, 9, 3, 3, 8, 4, 9, 2, 3, 5, 4,
9, 5, 6, 4, 0, 0, 5, 7, 0, 9, 9, 5, 5, 8, 5, 6, 1, 1, 3, 4, 9, 8, 0, 2, 5, 2, 4, 9, 9, 0, 6, 6, 9, 8, 4,
2, 3, 3, 0, 1, 7, 3, 5, 0, 3, 5, 8, 0, 4, 4, 0, 8, 1, 1, 6, 8, 5, 5, 2, 6, 5, 3, 1, 1, 7, 0, 9, 9, 5, 7,
0, 8, 9, 9, 4, 2, 7, 3, 2, 8, 7, 0, 9, 2, 5, 8, 4, 8, 7, 8, 9, 4, 4, 3, 6, 4, 6, 0, 0, 5, 0, 4, 1, 0, 8,
9, 2, 2, 6, 6, 9, 1, 7, 8, 3, 5, 2, 5, 8, 7, 0, 7, 8, 5, 9, 5, 1, 2, 9, 8, 3, 4, 4, 1, 7, 2, 9, 5, 3, 5,
1, 9, 5, 3, 7, 8, 8, 5, 5, 3, 4, 5, 7, 3, 7, 4, 2, 6, 0, 8, 5, 9, 0, 2, 9, 0, 8, 1, 7, 6, 5, 1, 5, 5, 7,
8, 0, 3, 9, 0, 5, 9, 4, 6, 4, 0, 8, 7, 3, 5, 0, 6, 1, 2, 3, 2, 2, 6, 1, 1, 2, 0, 0, 9, 3, 7, 3, 1, 0, 8,
0, 4, 8, 5, 4, 8, 5, 2, 6, 3, 5, 7, 2, 2, 8, 2, 5, 7, 6, 8, 2, 0, 3, 4, 1, 6, 0, 5, 0, 4, 8, 4, 6, 6, 2,

7, 7, 5, 0, 4, 5, 0, 0, 3, 1, 2, 6, 2, 0, 0, 8, 0, 0, 7, 9, 9, 8, 0, 4, 9, 2, 5, 4, 8, 5, 3, 4, 6, 9, 4,
 1, 4, 6, 9, 7, 7, 5, 1, 6, 4, 9, 3, 2, 7, 0, 9, 5, 0, 4, 9, 3, 4, 6, 3, 9, 3, 8, 2, 4, 3, 2, 2, 2, 7, 1,
 8, 8, 5, 1, 5, 9, 7, 4, 0, 5, 4, 7, 0, 2, 1, 4, 8, 2, 8, 9, 7, 1, 1, 1, 7, 7, 7, 9, 2, 3, 7, 6, 1, 2, 2,
 5, 7, 8, 8, 7, 3, 4, 7, 7, 1, 8, 8, 1, 9, 6, 8, 2, 5, 4, 6, 2, 9, 8, 1, 2, 6, 8, 6, 8, 5, 8, 1, 7, 0, 5,
 0, 7, 4, 0, 2, 7, 2, 5, 5, 0, 2, 6, 3, 3, 2, 9, 0, 4, 4, 9, 7, 6, 2, 7, 7, 8, 9, 4, 4, 2, 3, 6, 2, 1, 6,
 7, 4, 1, 1, 9, 1, 8, 6, 2, 6, 9, 4, 3, 9, 6, 5, 0, 6, 7, 1, 5, 1, 5, 7, 7, 9, 5, 8, 6, 7, 5, 6, 4, 8, 2,
 3, 9, 9, 3, 9, 1, 7, 6, 0, 4, 2, 6, 0, 1, 7, 6, 3, 3, 8, 7, 0, 4, 5, 4, 9, 9, 0, 1, 7, 6, 1, 4, 3, 6, 4,
 1, 2, 0, 4, 6, 9, 2, 1, 8, 2, 3, 7, 0, 7, 6, 4, 8, 8, 7, 8, 3, 4, 1, 9, 6, 8, 9, 6, 8, 6, 1, 1, 8, 1, 5,
 5, 8, 1, 5, 8, 7, 3, 6, 0, 6, 2, 9, 3, 8, 6, 0, 3, 8, 1, 0, 1, 7, 1, 2, 1, 5, 8, 5, 5, 2, 7, 2, 6, 6, 8,
 3, 0, 0, 8, 2, 3, 8, 3, 4, 0, 4, 6, 5, 6, 4, 7, 5, 8, 8, 0, 4, 0, 5, 1, 3, 8, 0, 8, 0, 1, 6, 3, 3, 6, 3,
 8, 8, 7, 4, 2, 1, 6, 3, 7, 1, 4, 0, 6, 4, 3, 5, 4, 9, 5, 5, 6, 1, 8, 6, 8, 9, 6, 4, 1, 1, 2, 2, 8, 2, 1,
 4, 0, 7, 5, 3, 3, 0, 2, 6, 5, 5, 1, 0, 0, 4, 2, 4, 1, 0, 4, 8, 9, 6, 7, 8, 3, 5, 2, 8, 5, 8, 8, 2, 9, 0,
 2, 4, 3, 6, 7, 0, 9, 0, 4, 8, 8, 7, 1, 1, 8, 1, 9, 0, 9, 0, 9, 4, 9, 4, 5, 3, 3, 1, 4, 4, 2, 1, 8, 2, 8,
 7, 6, 6, 1, 8, 1, 0, 3, 1, 0, 0, 7, 3, 5, 4, 7, 7, 0, 5, 4, 9, 8, 1, 5, 9, 6, 8, 0, 7, 7, 2, 0, 0, 9, 4,

The following classifying scheme of ‘*Theories of Everything*,’ or TOEs, allows us to explore whether the physical world is isomorphic to a mathematical structure (A TOE is an all-embracing and self-consistent physical theory that summarises everything there is to know about the workings of the physical world):

1. The physical world is completely mathematical.

(a) Everything that exists mathematically exists physically.

(b) Some things that exist mathematically exist physically, others do not.

(c) Nothing that exists mathematically exists physically.

2. The physical world is not completely mathematical.

3.If 1(a) above is accepted, then the following hypotheses are valid:

(a) *External Reality Hypothesis* (ERH): There exists an external physical reality completely independent of humans.

(b) *Mathematical Universe Hypothesis* (MUH): Our external physical reality is a mathematical structure.

Moreover, the former implies the latter.

2.0.ii. Classification of possible Theories of Everything, according to Max Tegmark

1, 3, 5, 0, 5, 5, 8, 6, 4, 2, 2, 1, 9, 6, 4, 8, 3, 4, 9, 1, 5, 1, 2, 6, 3, 9, 0, 1, 2, 8, 0, 3, 8, 3, 2,
 0, 0, 1, 0, 9, 7, 7, 3, 8, 6, 8, 0, 6, 6, 2, 8, 7, 7, 9, 2, 3, 9, 7, 1, 8, 0, 1, 4, 6, 1, 3, 4, 3, 2, 4,
 4, 5, 7, 2, 6, 4, 0, 0, 9, 7, 3, 7, 4, 2, 5, 7, 0, 0, 7, 3, 5, 9, 2, 1, 0, 0, 3, 1, 5, 4, 1, 5, 0, 8, 9,

3, 6, 7, 9, 3, 0, 0, 8, 1, 6, 9, 9, 8, 0,
5, 3, 6, 5, 2, 0, 2, 7, 6, 0, 0, 7, 2, 7,
7, 4, 9, 6, 7, 4, 5, 8, 4, 0, 0, 2, 8, 3,
6, 2, 4, 0, 5, 3, 4, 6, 0, 3, 7, 2, 6, 3,
4, 1, 6, 5, 5, 4, 2, 5, 9, 0, 2, 7, 6, 0,
1, 8, 3, 4, 8, 4, 0, 3, 0, 6, 8, 1, 1, 3,
8, 1, 8, 5, 5, 1, 0, 5, 9, 7, 9, 7, 0, 5,
6, 6, 4, 0, 0, 7, 5, 0, 9, 4, 2, 6, 0, 8,
7, 8, 8, 5, 7, 3, 5, 7, 9, 6, 0, 3, 7, 3,
2, 4, 5, 1, 4, 1, 4, 6, 7, 8, 6, 7, 0, 3,
6, 8, 8, 0, 9, 8, 8, 0, 6, 0, 9, 7, 1, 6,
4, 2, 5, 8, 4, 9, 7, 5, 9, 5, 1, 3, 8, 0,
6, 9, 3, 0, 9, 4, 4, 9, 4, 0, 1, 5, 1, 5,
4, 2, 2, 2, 2, 1, 9, 4, 3, 2, 9, 1, 3, 0,
2, 1, 7, 3, 9, 1, 2, 5, 3, 8, 3, 5, 5, 9,
1, 5, 0, 3, 1, 0, 0, 3, 3, 3, 0, 3, 2, 5,
1, 1, 1, 7, 4, 9, 1, 5, 6, 9, 6, 9, 1, 7,
4, 5, 0, 2, 7, 1, 4, 9, 4, 3, 3, 1, 5, 1,
5, 5, 8, 8, 5, 4, 0, 3, 9, 2, 2, 1, 6, 4,
0, 9, 7, 2, 2, 9, 1, 0, 1, 1, 2, 9, 0, 3,
5, 5, 2, 1, 8, 1, 5, 7, 6, 2, 8, 2, 3, 2,
8, 3, 1, 8, 2, 3, 4, 2, 5, 4, 8, 3, 2, 6,
1, 1, 1, 9, 1, 2, 8, 0, 0, 9, 2, 8, 2, 5,
2, 5, 6, 1, 9, 0, 2, 0, 5, 2, 6, 3, 0, 1,
6, 3, 9, 1, 1, 4, 7, 7, 2, 4, 7, 3, 3, 1,
4, 8, 5, 7, 3, 9, 1, 0, 7, 7, 7, 5, 8, 7,
4, 4, 2, 5, 3, 8, 7, 6, 1, 1, 7, 4, 6, 5,
7, 8, 6, 7, 1, 1, 6, 9, 4, 1, 4, 7, 7, 6,
4, 2, 1, 4, 4, 1, 1, 1, 1, 2, 6, 3, 5, 8,
3, 5, 5, 3, 8, 7, 1, 3, 6, 1, 0, 1, 1, 0,
2, 3, 2, 6, 7, 9, 8, 7, 7, 5, 6, 4, 1, 0,

<i>Digit</i>	<i>10¹</i>	<i>10²</i>	<i>10³</i>	<i>10⁴</i>	<i>10⁵</i>	<i>10⁶</i>	<i>10⁷</i>	<i>10⁸</i>	<i>10⁹</i>
0	8	93	968	9999	99959	999440	9999922	99993942	999967995
1	8	116	1026	10137	99758	999333	10002475	99997334	1000037790
2	12	103	1021	9908	100026	1000306	10001092	100002410	1000017271
3	11	102	974	10025	100229	999964	9998442	99986911	999976483
4	10	93	1012	9971	100230	1001093	10003863	100011958	999937688
5	8	97	1046	10026	100359	1000466	9993478	99998885	1000007928
6	9	94	1021	10029	99548	999337	9999417	100010387	999985731
7	8	95	970	10025	99800	1000207	9999610	99996061	1000041330
8	12	101	948	9978	99985	999814	10002180	100001839	999991772
9	14	106	1014	9902	100106	1000040	9999521	100000273	1000036012

2.0.iii. Frequency of the distribution of decimal digits for the first 10^n digits of π -3 ($n=1, \dots, 9$)

2, 4, 6, 8, 2, 4, 0, 3, 2, 2, 6, 4, 8, 3, 4, 6, 4, 1, 7, 6, 6, 3, 6, 9, 8, 0, 6, 6, 3, 7, 8, 5, 7, 6, 8,
1, 3, 4, 9, 2, 0, 4, 5, 3, 0, 2, 2, 4, 0, 8, 1, 9, 7, 2, 7, 8, 5, 6, 4, 7, 1, 9, 8, 3, 9, 6, 3, 0, 8, 7,
8, 1, 5, 4, 3, 2, 2, 1, 1, 6, 6, 9, 1, 2, 2, 4, 6, 4, 1, 5, 9, 1, 1, 7, 7, 6, 7, 3, 2, 2, 5, 3, 2, 6, 4,
3, 3, 5, 6, 8, 6, 1, 4, 6, 1, 8, 6, 5, 4, 5, 2, 2, 2, 6, 8, 1, 2, 6, 8, 8, 7, 2, 6, 8, 4, 4, 5, 9, 6, 8,
4, 4, 2, 4, 1, 6, 1, 0, 7, 8, 5, 4, 0, 1, 6, 7, 6, 8, 1, 4, 2, 0, 8, 0, 8, 8, 5, 0, 2, 8, 0, 0, 5, 4, 1,
4, 3, 6, 1, 3, 1, 4, 6, 2, 3, 0, 8, 2, 1, 0, 2, 5, 9, 4, 1, 7, 3, 7, 5, 6, 2, 3, 8, 9, 9, 4, 2, 0, 7, 5,
7, 1, 3, 6, 2, 7, 5, 1, 6, 7, 4, 5, 7, 3, 1, 8, 9, 1, 8, 9, 4, 5, 6, 2, 8, 3, 5, 2, 5, 7, 0, 4, 4, 1, 3,
3, 5, 4, 3, 7, 5, 8, 5, 7, 5, 3, 4, 2, 6, 9, 8, 6, 9, 9, 4, 7, 2, 5, 4, 7, 0, 3, 1, 6, 5, 6, 6, 1, 3, 9,
9, 1, 9, 9, 9, 6, 8, 2, 6, 2, 8, 2, 4, 7, 2, 7, 0, 6, 4, 1, 3, 3, 6, 2, 2, 2, 1, 7, 8, 9, 2, 3, 9, 0, 3,

1, 7, 6, 0, 8, 5, 4, 2, 8, 9, 4, 3, 7, 3, 3, 9, 3, 5, 6, 1, 8, 8, 9, 1, 6, 5, 1, 2, 5, 0, 4, 2, 4, 4, 0,
 4, 0, 0, 8, 9, 5, 2, 7, 1, 9, 8, 3, 7, 8, 7, 3, 8, 6, 4, 8, 0, 5, 8, 4, 7, 2, 6, 8, 9, 5, 4, 6, 2, 4, 3,
 8, 8, 2, 3, 4, 3, 7, 5, 1, 7, 8, 8, 5, 2, 0, 1, 4, 3, 9, 5, 6, 0, 0, 5, 7, 1, 0, 4, 8, 1, 1, 9, 4, 9, 8,
 8, 4, 2, 3, 9, 0, 6, 0, 6, 1, 3, 6, 9, 5, 7, 3, 4, 2, 3, 1, 5, 5, 9, 0, 7, 9, 6, 7, 0, 3, 4, 6, 1, 4, 9,
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 3, 7, 3, 2, 5, 0, 8, 5, 5, 9, 8, 2, 6, 5, 5, 8, 6, 7, 0, 8, 9, 2, 4, 2, 6, 1, 2, 4, 2, 9, 4, 7, 3, 6, 7,
 0, 1, 9, 3, 9, 0, 7, 7, 2, 7, 1, 3, 0, 7, 0, 6, 8, 6, 9, 1, 7, 0, 9, 2, 6, 4, 6, 2, 5, 4, 8, 4, 2, 3, 2,
 4, 0, 7, 4, 8, 5, 5, 0, 3, 6, 6, 0, 8, 0, 1, 3, 6, 0, 4, 6, 6, 8, 9, 5, 1, 1, 8, 4, 0, 0, 9, 3, 6, 6, 8,
 6, 0, 9, 5, 4, 6, 3, 2, 5, 0, 0, 2, 1, 4, 5, 8, 5, 2, 9, 3, 0, 9, 5, 0, 0, 0, 0, 9, 0, 7, 1, 5, 1, 0, 5,
 8, 2, 3, 6, 2, 6, 7, 2, 9, 3, 2, 6, 4, 5, 3, 7, 3, 8, 2, 1, 0, 4, 9, 3, 8, 7, 2, 4, 9, 9, 6, 6, 9, 9, 3,
 3, 9, 4, 2, 4, 6, 8, 5, 5, 1, 6, 4, 8, 3, 2, 6, 1, 1, 3, 4, 1, 4, 6, 1, 1, 0, 6, 8, 0, 2, 6, 7, 4, 4, 6,
 6, 3, 7, 3, 3, 4, 3, 7, 5, 3, 4, 0, 7, 6, 4, 2, 9, 4, 0, 2, 6, 6, 8, 2, 9, 7, 3, 8, 6, 5, 2, 2, 0, 9, 3,
 5, 7, 0, 1, 6, 2, 6, 3, 8, 4, 6, 4, 8, 5, 2, 8, 5, 1, 4, 9, 0, 3, 6, 2, 9, 3, 2, 0, 1, 9, 9, 1, 9, 9, 6,
 8, 8, 2, 8, 5, 1, 7, 1, 8, 3, 9, 5, 3, 6, 6, 9, 1, 3, 4, 5, 2, 2, 2, 4, 4, 4, 7, 0, 8, 0, 4, 5, 9, 2, 3,
 9, 6, 6, 0, 2, 8, 1, 7, 1, 5, 6, 5, 5, 1, 5, 6, 5, 6, 6, 6, 1, 1, 1, 3, 5, 9, 8, 2, 3, 1, 1, 2, 2, 5, 0,
 6, 2, 8, 9, 0, 5, 8, 5, 4, 9, 1, 4, 5, 0, 9, 7, 1, 5, 7, 5, 5, 3, 9, 0, 0, 2, 4, 3, 9, 3, 1, 5, 3, 5, 1,
 9, 0, 9, 0, 2, 1, 0, 7, 1, 1, 9, 4, 5, 7, 3, 0, 0, 2, 4, 3, 8, 8, 0, 1, 7, 6, 6, $e^{i\pi} = -1$
 1, 5, 0, 3, 5, 2, 7, 0, 8, 6, 2, 6, 0, 2, 5, 3, 7, 8, 8, 1, 7, 9, 7, 5, 1, 9, 4,
 7, 8, 0, 6, 1, 0, 1, 3, 7, 1, 5, 0, 0, 4, 4, 8, 9, 9, 1, 7, 2, 1, 0, 0, 2, 2, 2, 0, 1, 3, 3, 5, 0, 1, 3,
 1, 0, 6, 0, 1, 6, 3, 9, 1, 5, 4, 1, 5, 8, 9, 5, 7, 8, 0, 3, 7, 1, 1, 7, 7, 9, 2, 7, 7, 5, 2, 2, 5, 9, 7,
 8, 7, 4, 2, 8, 9, 1, 9, 1, 7, 9, 1, 5, 5, 2, 2, 4, 1, 7, 1, 8, 9, 5, 8, 5, 3, 6, 1, 6, 8, 0, 5, 9, 4, 7,
 4, 1, 2, 3, 4, 1, 9, 3, 3, 9, 8, 4, 2, 0, 2, 1, 8, 7, 4, 5, 6, 4, 9, 2, 5, 6, 4, 4, 3, 4, 6, 2, 3, 9, 2,
 5, 3, 1, 9, 5, 3, 1, 3, 5, 1, 0, 3, 3, 1, 1, 4, 7, 6, 3, 9, 4, 9, 1, 1, 9, 9, 5, 0, 7, 2, 8, 5, 8, 4, 3,
 0, 6, 5, 8, 3, 6, 1, 9, 3, 5, 3, 6, 9, 3, 2, 9, 6, 9, 9, 2, 8, 9, 8, 3, 7, 9, 1, 4, 9, 4, 1, 9, 3, 9, 4,
 0, 6, 0, 8, 5, 7, 2, 4, 8, 6, 3, 9, 6, 8, 8, 3, 6, 9, 0, 3, 2, 6, 5, 5, 6, 4, 3, 6, 4, 2, 1, 6, 6, 4, 4,
 2, 5, 7, 6, 0, 7, 9, 1, 4, 7, 1, 0, 8, 6, 9, 9, 8, 4, 3, 1, 5, 7, 3, 3, 7, 4, 9, 6, 4, 8, 8, 3, 5, 2, 9,
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9, 9, 0, 7, 7, 8, 9, 9, 9, 2, 0, 0, 7, 3, 2, 9, 4, 7, 6, 9, 0, 5, 8, 6, 8, 5, 7, 7, 8, 7, 8, 7...

2.1. First contact

Our planet is a lonely speck in the great enveloping cosmic dark. In our obscurity, in all this vastness, there is no hint that help will come from elsewhere to save us from ourselves.

Carl Sagan

Iridio was received on the terrace of the office of intelligence in the capital by Captain Emil Wilem Pinel Moniz and General Henri Joseph Bleurel Kandel, who informed him that they would be his guardians during his stay at the Victoria Mansion for guests of the Department of International Affairs of the Ministry of Defence, Internal Appeasement and Border Protection. Iridio had a panic attack and told them as best he could that he needed some precious time to prepare for the congress. He was so beside himself that the officials had to sedate him.

When he woke up, he was in what seemed to be a luxury hotel. His room was number 100. It had an ensuite bathroom and a desk with a state-of-the-art flexible reader on which were copies of the formulae and diagrams he had been working on for the congress. From the windows he could see the square in the centre of Bandar-Austro-Metropolis, but he could not open them. Next door was the Museum of Fine Arts and across the square, the city's cathedral. Beyond many buildings, on a mountain dominating the capital, the presidential palace could be seen. His guardians came into his room and Iridio demanded detailed information on their reasons for detaining him. He sought assurance that he would be able to participate in the important scientific event, at which he was the main speaker. They calmed him down, assuring him that he would, and told him not to worry because the national astronomy congress had been postponed. They showed him the rest of the suite. There was another room with two beds, where his guardians slept, a big living area and a kitchen run by a state-of-the-art robochef who could prepare all the gastronomic novelties developed in the space farms.

To stop him asking when he would be set free, they said that he could access all the planet's digital scientific repositories from his flexible reader without restrictions, so that he could be well prepared for the congress. Iridio confirmed that this was true by finding articles on Modified Newtonian Dynamics, banned in Ozeania. All the articles he had tried so hard to find were available in a restricted digital repository in the Ukrainian city of New Yevpatoria. The collection was devoted to the search for extra-terrestrial civilisations, another topic that had been banned during the Penumbra. He could also explore the library of the North Atlantic Refuge Zone, where he found articles on antimatter and its potential anti-gravitational effects, which he had not seen. There were many

translations of articles he had never been able to access, written by Lemaître and Boltzmann, luckily, in the pre-Sandrini-LePaine notation. In other restricted libraries Iridio found many popular science books on cosmological topics that were not available in Ernesto's clandestine library. These books however, had been modified to include the Sandrini-LePaine notation, and many pages had been redacted.

Iridio relaxed a little and accepted a sumptuous lunch of stew based on imperial rye as the main course. This made him sad because it reminded him of his celebratory graduation lunch when Therese was taken away. He asked to have Halina brought, to help with his calculations but was told that she was still under quarantine in the Office for the Regulation of Artificial Intelligence of the Ministry for Historical Updating, Social Precognition and Digital Worship. They offered to put at his disposal two computational cyborgs, Peter Benedikt Krumpholdz and Heaven Benedikt Fischerle, who had unrestricted access, apparently, to every kind of mathematics developed on Earth. After a long and complicated session, during which he coordinated with the cyborg assessors to obtain what he needed, Iridio was able to explore banned results from Lie theory to classify the Kasner metrics in accordance with the Bianchi typology, and could revise several details in the equations modified by PhDr Muñoz Rojas and his student.

A few hours later, Iridio was interrogated by his guardians, with two astronomers in attendance. One was PhDr Tillotson Lewandowski, AC RFD, whom he knew because he was the secretary of the national astronomy congresses and always presided

over the sessions
in which Iridio
participated. The
other was PhDr
Louis Giorgio
Hadden Halvor-
son, IntPE(Oz),

$$R_{ik} = R_{(a)(b)} \xi_i^{(a)} \xi_k^{(b)}$$

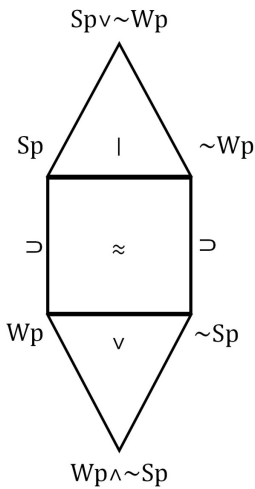
$$R_{(a)(b)} = \frac{1}{2} \left[C_b^{cd} (C_{cda} + C_{dca}) + C_{cd}^c (C_{ab}^d + C_{ba}^d) - \frac{1}{2} C_b^{cd} C_{acd} \right]$$

$$ds^2 = \gamma_{ab} \xi_i^{(a)} \xi_k^{(b)} dx^i dx^k$$

$$2.1.i.a. \text{ The Ricci curvature tensor for a given metric } ds^2 \text{ with 1-forms } \xi_i^{(a)} dx^i$$

an expert on space technology, whom he had seen from afar at congresses. It was rumoured that he had designed the two space farms funded by Ozeania and a scientific monastery in orbit, from which many patents originated.

The computational cyborgs also attended the meeting to advise scientists on technical matters. All six were especially interested in Iridio's predictions in his articles about the wormholes and what would be necessary to develop them in a practical way to travel through space-time. They had great difficulty understanding each other because he insisted on using pre-Sandrini-LePaine notation and it took a long time for the cyborgs to translate the formulae. It was equally



2.1.i.b. The logical system $\Sigma 1$, based on the scholastic square of opposition, according to Redmond

gress had been postponed for reasons they would explain later, and assured him that he would attend, but their frequently evasive answers to his questions exasperated him. They insisted that they urgently needed to understand the practical consequences of his work, and they could not see that his main problem was precisely that – the difficulty he had always had in putting into words what he could express so clearly through mathematics. At one point, when he could no longer stand the inter-

rogation, he punched PhDr Hadden Halvorson on the nose and tried to break a window and jump out. They had to sedate him again.

When he woke up, he was tied to his bed. General Bleurel Kandel untied him and asked him to go to the window. It was a wonderful morning; the sky was full of extra-terrestrial spacecraft in a variety of shapes and colours. There were classic UFOs and cigar-shaped and octagonal spaceships floating above the cathedral.

difficult for the astronomers to understand him because he expected them to analyse in detail all the equations in his first article, in order to find the contact points between the different Kasner metrics using the new information he had been allowed to access. Also, Iridio would lose himself in the ins and outs of the calculations of the Bianchi classification of the Lie groups underlying the possible metrics, lacking any means to translate his hypotheses into technical developments. The astronomers were particularly interested in learning how Iridio had deduced the master formula he had sent to PhDr Muñoz Rojas, and did not believe him when he told them that it had come to him in a dream. Worse, he would often change the subject and become obsessed with the congress.

They told him over and over again that the con-

Given a quantum system with Hamiltonian $\hat{H}$, if the set of eigenvalues of $\hat{H}$

(a) is bounded below and

(b) is discrete, and if

(c) only a finite number of eigenvectors corresponds to the eigenvalues in any bounded interval, then under the evolution operator

$\hat{U} = e^{-i\hat{H}\tau}$, (for arbitrary $\tau > 0$),

(i) the dynamics are recurrent in metric;

(ii) for any E , the restriction of the dynamics to states of expected energy $< E$ is uniformly recurrent in metric.

2.1.i.c. Quantum recurrence theorem

$$N = R^* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L$$

2.1.ii.a. The Drake equation

Captain Pinel Moniz told him angrily that his stubbornness in withholding the information they needed had unleashed the crisis so deeply feared by the Ozeanic government. Slim, transparent, rectangular leaflets started to fall from the spaceships. The people in the square tried to catch them but when they touched them, they slipped from their hands and fell to the ground. One of the leaflets stuck to the window. It read ‘Notice to the inhabitants of Planet Earth: The Confederation of Intelligent Civilisations of the Milky Way has opened official contact with the authorities of your local singletons. Demand to be properly informed.’

Iridio wanted to explore the scientific information in the repositories on singletons at once, but General Bleurel Kandel ordered him to get ready to leave. They put magnetic handcuffs on him and took him to the hotel terrace, from where they were flown to the presidential palace in an opulent multiscopter. There were many people in the street carrying placards, beating drums and playing other musical instruments. Now, however, the robocops and their bloodhounds were not attacking them; they confined themselves to guarding public buildings. As Iridio and his guardians flew, they could observe how, one by one, the spacecraft gained height and disappeared in the translucent sky. Iridio’s handcuffs were removed on arrival and he was escorted by several soldiers to a very lavish room in the building. Iridio almost had a heart attack when he was told he was to meet John James Bjelke Goldstein, the president of his country, without delay. After a tense wait, the president apologised for having brought him to his office in that manner, guarded by the patriotic police, but it was necessary

for his safety. He wanted to tell Iridio in person that he was required to represent

Civilisation Type	Is able to harness all the energy	Energy consumption (in watts)
Type I	that falls into its planet	10^{16} W
Type II	radiated by its own star	10^{26} W
Type III	generated by its own galaxy	10^{37} W
Type IV	of a whole multiverse	10^{45} W
Type V	of a collection of multiverses	?

2.1.ii.b. Kardashev scale (extended beyond type III by Zoltán Galántai and Alan Guth)

Ozeania at the first world conference of humanity with intergalactic beings, and might not be able to give his planned talk at the national astronomy congress, which had now been postponed until they could more clearly understand the demands of the extra-terrestrial invaders. In fact, the Official Oracle of Ozeania supercomputer, which the president had last consulted that morning in the cathedral, recommended postponing the congress indefinitely and agreeing to Iridio’s participation in the negotiations with the intergalactic beings. In a few minutes, he had to announce the country’s official response to the requirements

of the extra-terrestrial civilisations on the national communications network, so he would leave Iridio in the care of Brigadier Kenneth David Ward Wright, Minister of Defence, Internal Appeasement and Border Protection and Brian Kevin Floyd Lysenko, BFsTI, presidential adviser on scientific matters. Floyd Lysenko had been promoted that very afternoon to Minister of Pure Sciences, Cosmological Epistemology and Irreproachable Research, hitherto a non-existent portfolio. They would explain details of the events of the last few days.

Floyd Lysenko explained to Iridio that the publication of his article in the neo-Bolivarian journal had prompted the Zuespoks, a type III extra-terrestrial race which monitored humanity's technological progress from one of the satellite galaxies in the Milky Way, to initiate contact with the independent communication channels of the planet and, without intermediaries, with the populations of the big cities through the nanotechnological leaflets he had seen. His article had made it possible for the Zuespoks to satisfy all the galactic requirements needed to open the first official contact with the inhabitants of Earth, as humanity had almost reached the point of travelling easily to other planets and eventually becoming a type I civilisation. More specifically, the discovery would certainly result in the calculation of the coexistence parameters of matter and antimatter and the extension of the periodic table beyond the Aufbau principle, which was the minimum scientific requirement for terrestrial civilisation to use wormholes to travel through space-time. Crossing that scientific threshold would also allow the Earth to benefit from the technological development subsidies for emerging civilisations, and after meeting some requirements it would eventually be possible for humanity to be part of

the Confederation of Intelligent Species of the Milky Way, when it developed enough to harness at

$$N = N_* \cdot f_L \cdot f_{HZ} \cdot f_M \cdot \left(\frac{L}{\tau'}\right)$$

2.1.iii.a. The CETI equation to estimate the number of Communicating Extra-Terrestrial Intelligent civilisations in the Milky Way

least 25 per cent of the energy emitted by the sun. In addition, Floyd Lysenko said he was proud to see a scientist from his own country being the author of such an important work, and was sorry to have deprived him of his freedom and interrogated him thoroughly, with the help of the astronomers who could interpret the information he had had to give the president before the official announcement.

$$ds^2 = -e^{\Phi(r)} dt^2 + \frac{1}{1 - \frac{b(r)}{r}} dr^2 + r^2 (d\theta^2 + \sin^2 \theta d\phi^2)$$

2.1.iii.b. Morris–Thorne space-time metric, representing a spherically symmetrical and static wormhole

Brigadier Ward Wright explained that the contact had already been announced in all the so-called ‘free media’ on Earth and that Iridio’s name had been mentioned in the international press. It was therefore imperative to continue guarding him, for reasons of state. The situation had become more complex because Ernesto, who was mistakenly on parole, owing to a conflict of responsibilities between the different police forces in charge of his surveillance, had communicated secretly with foreign governments and had initiated an international habeas corpus petition for his freedom. As might be imagined, there was great international pressure, especially from the maritime cities, to allow him to be seen alive and well. Also, as Iridio had observed, through the distribution of their leaflets the extra-terrestrials were putting pressure on the terrestrial governments who had kept details of the first contact secret to act quickly and to coordinate a response.

$$\Pr(A > 1 | L_1 > 1, \mathcal{D}) = \frac{\sqrt{\tau_{\max}} e^{-1/\tau_{\max}} - \sqrt{2\pi} e^{-1/\tau_{\max}} \operatorname{erfc} \left[\frac{\sqrt{2}}{\sqrt{\tau_{\max}}} \right]}{\sqrt{\tau_{\max}} - \sqrt{\pi} e^{1/\tau_{\max}} \operatorname{erfc} \left[\frac{1}{\sqrt{\tau_{\max}}} \right]}$$

2.1.iii.c. The a-posteriori probability that first-contact extra-terrestrial civilisations are older than humanity

They now knew that the Zuespoks had monitored humanity’s progress since the time of the first empires in Sumeria and Central America, almost without intervention, except to prevent catastrophes when other extra-galactic beings, not governed by their laws, invaded the planet. Because of those periodic invasions, the Confederation of Intelligent Civilisations of the Milky Way had imposed a long quarantine on Earth. This was, as many scientists had speculated before, the solution to the Fermi paradox. It was also known that before the Penumbra, there had been contacts with other extra-galactic civilisations not authorised by the Zuespoks, specifically by the now defunct United States of America, the Soviet Union, Japan, India, China and North Korea, and that from now on, secret contacts of that kind would not be permitted. Luckily, none of the countries and territories that had united to form Ozeania after the Third World War had initiated contact, owing to the defence treaties they had signed with the powers on whom they depended in technical matters. They therefore expected their country to be treated fairly by the extra-terrestrials during the negotiations on technology transfer.

It was most important, at present, to avoid spreading panic among the population, as had happened in the Theocracies of the North American Prairies. There, after the extra-terrestrials showed that the air forces of those city-states

$$\begin{cases} \dot{x}_C &= \beta_C x_C - \alpha_C x_C \\ \dot{x}_E &= \beta_E x_E - \alpha_E x_E \\ \dot{y} &= \gamma y(\lambda - y) - \delta x_C y \\ \dot{w} &= \delta x_C y - C_C - C_E \end{cases}$$

2.1.iv.a. Human and nature dynamics (HANDY) model for the prediction of social collapse

were helpless against them, riots had occurred on a scale only comparable to the riots in the mid-21st century, when the waters of the planet's oceans had risen vertiginously following the thawing of the permafrost. For that reason, Ozeania's air forces had not approached the spacecraft or attempted preventive aggression of any type.

Floyd Lysenko suggested that Iridio be prepared to appear on the international news network in a day or two. He said that it was very important for the future of the country that Iridio cooperate with his protectors as much as possible. Iridio asked permission to contact Ernesto and Iris, but Brigadier Ward Wright told him not to worry because they were both safe and well and in the care of the pertinent authorities.

Even though the official press did not mention Iridio by name on that date, or provide any detail about the conditions that would be imposed on Earth, it was made clear that there would be no going back once the contact with the Confederation of Intelligent Species of the Milky Way had officially started. Humanity needed to change.

Among the thousands of further revelations resulting from the first contact protocols with extra-terrestrial civilisations, it became clear that the terms for Earth's admission

to the community of galactic intelligences would include the establishment of a just planetary government, permanent famine relief

Consider a game in normal form with n players, all of whom choose actions from a common strategy space S , which is the positive real numbers. The pay-off function of player i is $V^i : S^n \rightarrow \mathbb{R}$. A vector of strategies $L = (L^1, \dots, L^n)$ is a Kantian equilibrium of the game $G = (S, V^1, \dots, V^n)$ if

$$(\forall i = 1, \dots, n) \quad \arg \max_{\alpha \in \mathbb{R}} V^i(\alpha L) = 1$$

2.1.iv.b. Kantian Equilibrium

and major ecological changes. The governments of the terrestrial states and

$$BERI_i = \frac{0.5 \left(\frac{\sum_{k=1}^m c_{ik}}{m} + \min\{c_{i1}, c_{i2}, \dots, c_{im}\} \right)}{c_{i0}}$$

2.1.iv.c. The bioclimatic ecosystem resilience index

transnationals could not continue to evade responsibility for the disasters caused by global warming and indiscriminate pollution, or

maintain their control over the development of scientific research. It was also necessary to remove all prohibitions against the scientific study of climate change and alternative sources of energy, and to enact global laws to protect intelligent life in danger of extinction. That included primates, elephants, cats and dogs, dolphins, whales, eusocial insects, some species of octopus and a great variety of birds. In Ozeania, the list was headed by the magpie (*Gymnorhina tibicen*), which attacked people in the spring and was now confined to a small ecological niche in the south of the country. The communiqué in which these species were mentioned also stressed that human beings could not continue to pretend that nature was merely the background to the story of *Homo sapiens*.

In addition, the extra-terrestrials demanded a commitment to preserve intelligent life on the moons of Jupiter and Saturn, in order to prevent the inevitable terrestrial colonisation that would

jeopardise it when humanity could travel through the wormholes predicted in Iridio's article. The extra-terrestrials also proposed that the economic

$$\varphi_i(v) = \frac{1}{n!} \sum_R [v(P_i^R \cup \{i\}) - v(P_i^R)]$$

2.1.iv.d. Shapley value

benefits generated by the space farms and mining colonies be distributed to all inhabitants of planet Earth, not only to governments and investment companies. This required extending the basic universal minimum wage to all human beings on the planet and its colonies. In areas more closely related to the pure sciences, they proposed a protocol for freedom of abstraction which would abolish

$$G = \left| 1 - \sum_{k=1}^{n-1} (X_{k+1} - X_k)(Y_{k+1} + Y_k) \right|$$

2.1.iv.e. Brown's formula for the Gini coefficient

charges of 'mathematicism', the elimination of other restrictions on the use of mathematical tools in scientific work in the terrestrial regions of the

planet, and free access to all digital scientific repositories, including those in the maritime city-states, for all inhabitants of Earth. This was immediately contested by the scientific leaders of the terrestrial countries.

PhDr Joss Palmer Mond Beatty, chief astronomer of the Council of Post-Creationist Scholastic Churches and official scientific heir to Roger Roxelio Sandrini, declared that it was necessary to re-establish the International Astronomy Association, disbanded forty years earlier, in order to be able to respond to the invaders' nonsensical pressures and ensure that communication with the extra-terrestrials did not fall under the control of the radical scientists in exile in the Vatican's Scientific Refuge Territory and the maritime cities.

The discussion of the requirements was eclipsed by the many reports on the nature of the leaflets with which the extra-terrestrials communicated directly with the population. Several physicists and technologists explained the

characteristics of the nanotechnology-based devices. They were no more than four atoms in thickness, and the contrast that allowed the messages to be read was a

product of chemical reactions with nitrogen in the air, which dissolved them in a few minutes. A physicist whose name Iridio had never heard, from Go8-Ivy-MT University, Mount Thomas Campus, had managed to trap a leaflet in a vacuum chamber to prevent it from dissolving, and was analysing its structure.

Group 15

p e r i o d 2	14.0067 1402.3 3.04 N Nitrogen $1s^2 2s^2 2p^3$	7 +5, +4, +3, +2, +1, -1, -2, -3 Gas Non Metal

p-block

2.1.v. Nitrogen entry in the Periodic Table of the Elements

2.2. Fahrenheit 1984

If we don't believe in freedom of expression for people we despise, we don't believe in it at all.

Noam Chomsky

It was officially announced that Iridio would be one of his country's representatives at the conference with the intergalactic beings that had made contact with Earth. The event would take place in the offices of the recently re-established New Unified Nations in Brodei, a location suggested by the extra-terrestrial species to highlight the need to consider the areas of the planet most affected by climate change. In addition, he had been officially invited to visit two of their planets and represent humanity. He was invited to lodge with the Zuespoks, equivalent to galactic legislators, and the Argoterrands, carbon beings of Alpha Centauri with the closest similarity to terrestrial beings in the galaxy. They would be the sponsors in the official proposal to grant Earth pre-admission to the galactic confederation. Not only would he be the first terrestrial to pay an official visit to other inhabited planets, but the trip to the Argoterrands would be made via one of the local wormholes predicted by his now confirmed theory. The local tunnel would take them to the 'gateway to the stars', installed in 2001 by the extra-terrestrials in Saturn's orbit and never detected by Earth scientists. The announcement was transmitted in 5D throughout the territory of Ozeania and included a short speech by Iridio. He thanked the authorities of his country for their kind guardianship during the disturbances that followed the president's announcement the day before. The olfactory channel was omitted because Iridio had soiled his trousers before coming into the transmission room.

As expected, the announcement that Iridio had been invited by the extra-terrestrials while still under the guardianship of the Ozeania authorities generated much speculation in the international press and objections from the neo-Bolivarian government, who demanded that Professor PhDr Muñoz Rojas and his student Magdalena, Bsci MAstroph now PhDr Díaz Orellana, be included in the delegation. The corporations that controlled the senates of the free-market coun-

Let S_i be the set of all possible strategies for player i , where $i = 1, \dots, N$. Let $s^* = (s_i^*, s_{-i}^*)$ be a strategic profile, a set consisting of one strategy for each player, where s_{-i}^* denotes the $N-1$ strategies of all the players except i . Let $u_i = (s_i, s_{-i}^*)$ be player i 's payoff as a function of the strategies. The strategy profile s^* is a Nash equilibrium if

$$u_i(s_i^*, s_{-i}^*) \geq u_i(s_i, s_{-i}^*) \text{ for all } s_i \in S_i, s_i \neq s_i^*$$

2.2.i.a. Nash Equilibrium

tries argued that it was necessary for company representatives to travel as well. Other terrestrial countries and the independent maritime cities wished to be

represented. Some space colonies in Earth orbit proclaimed their independence and there was a new wave of scientists going into exile in the refuge areas, now protected militarily by the New Unified Nations, whose army of volunteers managed to prevent a Eurasian invasion of the Vatican's Scientific Refuge Territory, and established several regiments, robotic and human, in other threatened refuge areas. The extra-terrestrials made clear that everyone could be represented at the meeting in Brodei, but the invitation to visit their planets was exclusively for Iridio, until formal relations were established between Earth and their federation. This was because Iridio, in his first article published as sole author, demonstrated that he had contributed the main ideas underlying the later work published in conjunction with the neo-Bolivarian scientists, on the potential uses of his hypotheses for space-time travel through the intergalactic wormholes.

$$\dot{\theta} = -\sigma_{ab}\sigma^{ab} - \frac{1}{3}\theta^2 - E[\vec{X}]^a_a$$

2.2.i.b. The Raychaudhuri equation in the context of a gauge-invariant formalism for cosmological perturbations in theories with torsion

However, the extra-terrestrial clarification provoked a thorough and pitiless examination of his dull private life. The sudden resurgence of the independent press, sensing that the authorities could no longer control information as before, found much to explore in Iridio's past. The official media also paid attention to him. Jack Oliver Ogilvy Withers, a journalist working for Widgeree's official press, revealed Iridio's peculiar relationship with Julia, which saturated the official and independent newspapers for days. And so it came to light that Julia had died while trying to return to the People's Free-Market Republic of Ozeania in a clandestine vessel, after working in the casino of Atlantis VIII, which the Ozeanic navy confused with a climate-change refugee ship. The free press, which dared to reveal information provided by officers from the police forces now under scrutiny, interviewed Yocasta, the former coordinator of the Porpoise Spit office of the patriotic police. She explained that Iridio had not been allowed to travel for fear he would defect, taking with him the confidential information he had accessed at the patent office. Julia had drowned when the Ozeanic navy returned the fragile vessel to international waters, where it sank before it could return to the floating city. Iridio learnt, to his sorrow, that Julia had died two days before he had planned to look for her in the maritime city, that is, before his access was restricted by the supposed quarantine rules. Yocasta also confessed that, although they did not know exactly what Iridio was looking for, and still had no information about Julia's death, he would never have been allowed to leave the country, as he was the child and grandchild of dissidents. For that reason, she felt sorry for him when he innocently came to her office to request a permit to visit Atlantis VIII and did not know how to lie. During an apparently casual encounter in the port of Porpoise Spit, she had discreetly

suggested that he abandon his plans to travel to the floating city. As a result of that unauthorised move to assist a suspected traitor, she was tried and dismissed from her post. She was lucky to be able to go into exile in Atlantis VIII, where she coordinated a group of repentant former officers from the Ozeanic police forces. Thanks to Yocasta's revelations and information leaked to the press by another repentant officer of the intellectual police, a long list of Ozeanic citizens who had died in similar circumstances was made public. The names of the victims of antibiotic-resistant gonorrhoea, brought by the refugees from submerged Pacific countries now held in concentration camps to avoid an epidemic, were also revealed. The floating cities broadcast a communiqué requesting extra-

$$\frac{d\langle\eta_G\rangle}{dt} = -\langle q_w \rangle - \frac{\rho_f}{\rho_0} \langle \beta S_0 q_w \rangle + \frac{1}{\rho_0} \langle \alpha_T \frac{Q}{C_w} \rangle$$

2.2.i.c. The mean sea level equation

tra-terrestrial intervention in the free-market countries and the terrestrial peoples' republics, because they were unable to guarantee the health of their own citizens.

They also requested that those countries should not redirect all the flimsy vessels approaching their coasts to their cities, or allow broken-down vessels to sink in international waters, as the maritime cities had to spend a high proportion of their gross domestic product on rescuing and assisting climate refugees.

Polly, the administrator of the orgonic recreation clinic, who had received a substantial payment when she sold what she knew of Julia's and Iridio's story to the sensational press, confessed that she had told Iridio nothing about Julia's whereabouts when he was looking for her, for fear that the morality and oztraditions police would close down her clinic. She also declared that he was an aromantic pervert who despised robotic workers and drove her biological trainers to despair with his anorgasmia. This led to all kinds of mockery and ribald jokes. That, in turn, made asexuality more visible and generated sexual activism for civil rights and more copulation time for sexual robots, while for the first time allowing public discussion of orgonic health as a useful distraction from the planet's more important problems. The traditional use of links to MVEHS by the morality and oztraditions police as evidence of state treason was questioned. A multidimensional documentary produced in Atlantis IX, broadcast on the new alternative communication networks, explained in detail the difference between asexuality, a mere sexual orientation, and the ideology of the millenarian ecologists, who tried to promote birth control as the main response to the extinction of other animal and plant species. The documentary also exposed the difference between the movements that promoted the voluntary extinction of the human species, like the pacifists of MVEHS, who had never resorted to biotechnological warfare, and terrorist groups such as The Baptistry of Involuntary Euthanasia and the Gaia Liberation Army. They had used chemical and biological

weapons during the population movements and natural disasters that afflicted the planet in the first episode of rising sea levels in the 21st century. At the same time, all these movements were differentiated from the far more powerful International Ecological Brigades, who operated underground and attempted to prevent terrestrial governments from deforesting areas protected by the Brasilia International Convention. They also attacked those who tried to harm nature, on land or sea, but they did not use biological weapons to reduce human populations or promote individual or collective suicide. The Ozeanic authorities, however, stated in a brief official communiqué that all such groups were deemed to be terrorists, and the distinctions presented in the documentary were irrelevant. Arguments aired in the documentary that the closure of the Internet 3.1.4 was the key factor in preventing a solution to the enduring global financial crisis were also dismissed by the government, claiming state secrecy and cybernetic security. They asserted that the official news networks and the news channels controlled by the different ministries provided the population with all the information they needed on particular issues to act as responsible citizens. According to the communiqué, unrestricted personal communications and the potential anarchy promoted by the alternative media were very damaging to the country's image.

The yellow press, which had re-emerged in spite of countless shut-downs of media outlets, exposed Iridio's relationship with Iris. It was even alleged that she could be his daughter. This was impossible, since Iris had been born sixteen years before Iridio started studying at the provincial city. But his profile as a hero of the independent press that defended him was emphasised when it became known that he had supported her financially, so that she did not have to work at the orgonic clinic and could look after her children. However, favourable coverage came to an end when it emerged that there was a temporary copulatory contract between them. Some journalists invented a story that Iris had inherited the sexual function of her mother in her relationship with Iridio, and that, in reality, he was no hero but the perverted abuser of a vulnerable woman. When it came to light through statements by Olgava, the orgonic cyborg who enabled Iridio to make contact with Iris, that Iris worked as virtual orgonic coach in remote orgasmatrons from Widgeree, and that their temporary copulatory contract was a ruse to keep Iridio safe from the morality and oztraditions police, a new round of discussion ensued about his supposed sexual perversions. Further confusion arose when Olgava confessed before the 5D cameras that she had also had sexual relations with Iridio and claimed that, although he did not look very appealing when he was so badly dressed, he was probably the best biological lover on the

$$\frac{d(\Delta T)}{dt} = \frac{hA}{C} \Delta T$$

2.2.ii.a. Temperature gradient in a geyser

planet. From her own first-hand experience and poor Julia's confessions, the fact was that he had given them the best and most memorable orgasms of their lives.

Thorndike Mowrer issued an arrest warrant for Olgava, Iridio and Iris on the grounds that they had falsified documentation: all would be required to undergo inverse transcranial magnetic stimulation and a joint eudaemonia test. The warrant also provided for immediate vaporisation of the cyborg if her guilt was proven. This step was overruled by a presidential decree when ~~PhDr~~ Shaw Wang, ~~MChD MD FACP FTSCCCA APSLS FTSCCCA~~, self-exiled in Taiwan-South China, explained to the free press the potential dangers of the treatment. The same decree pardoned Ernesto, who was in the custody of the intellectual police, accused of provoking disturbances in Ozeania. He was now considered a prisoner of conscience in the maritime cities.

The life of Iridio's parents was also mercilessly scrutinised. All the anonymous allegations against his mother came to light in the official media. She was presented as a relentless verificationist and a clandestine advocate of the theory that climate change was caused by humans. As evidence the press used details obtained from her trial, initiated by Go8-Ivy-BAM University and the pedagogical police. Although there was no concrete evidence, it was also suggested several times that she was a clandestine templetarian, as her father had been. The independent media then took up the whole question of the government campaign against the many scientists who espoused those theories. Magister Rutherford Rossi, the palaeontologist who had been dismissed at the time of his mother's trial and had recently been released from prison, again denounced obscurantism from his house arrest. This time, however, his statements were not suppressed or ridiculed in the official press, because the independent media used them to lobby for a review of the legality of his sentence and launch proceedings against the state for damages. Further controversy arose from speculation that the name Iridio was irrefutable evidence of his mother's alleged ecological tendencies, because his name was very similar to Iridium, the main component of the K-T boundary, the metal layer proposed as proof that a large asteroid had crashed into Earth at the end of the Cretaceous period and caused the extinction of the dinosaurs. Two geologists joined the chorus of support for Iridio, both students of PhDr Farkas Aaronson, the geologist who had raised his

Group 9

P	192.227	77
e	880.0	2.20
r		
i	Ir	+4
d		+3
6	Iridium	Solid
	[Xe]4f ¹⁴ 5d ⁷ 6s ²	Transition
		Metal

d-block

2.2.ii.b. Iridium entry in Periodic Table of the Elements

voice when Iridio's mother was investigated before she retired. Accused of verificationism, PhDr Farkas Aaronson had died in prison while serving his sentence, and when this became known countless scientists came out of hiding to reclaim freedom of expression. Among them, Ernesto publicly broke the silence imposed by the authorities by writing an article in an independent newspaper in defence of Iridio's mother and the rehabilitation of unofficial scientific publications. He denounced the Sandrini-LePaine notation imposed on scientists as censorship, designed to compel respect for pseudoscience. He also condemned the tyranny of the Bayesians over the Frequentists and demanded an end to the ban on string theory and other theories considered 'mathematicist'. The rest of the article consisted of a long vindication of verificationism, which was nothing less, in his view, than the essence of the scientific method. He was again placed under the guardianship of the intellectual police for violating the terms of his second conditional release.

The vindication of his mother by an increasing number of scientists called forth many responses from the post-creationists. As expected, she was accused of being a supporter of MVEHS. They presented evidence that she had had a clandestine abortion, depriving Iridio of the experience of having a sibling to temper his lack of sociability. Weisbrod Thatxton, his old agnostic post-creationism teacher in high school, claimed that his mother had perverted Iridio by exposing him to the scientific sexuality of Penelope the robomooc, and by forbidding him to use the Sandrini-LePaine notation. He also detailed the arguments he had had with her when the class discussed the reason for the exclusion of dinosaurs from Noah's Ark. Fuller Rankin, Iridio's former professor in the compulsory course on Teleological Post-Creationism for Scientists at university, joined the chorus of voices against him, revealing that he had failed the exam eight times because he had insisted on using verificationist arguments to refute the Last Judgement and the Kalām-Aquinas cosmological argument.

Iridio was allowed to respond to these serious charges but, instead of defending himself, he merely asserted that the robotic assistant called Topological Penelope, mentioned by Weisbrod Thatxton, had never existed. Some journalists used that assertion to raise the actions of the Ministry for Historical Updating, Social Precognition and Digital Worship, claiming that it altered the historical record to fit the official version of the facts.

In desperation, the official media also accused Iridio's father of ecological activism. The evidence invoked by his detractors in this case was even more absurd because it was based on Iridio's middle name – Geyser. In his youth, Iridio's father had participated in a neo-surrealist exhibition that had been closed down by the authorities of the then Official Academy of Fine Arts due to its anti-

Reichian tendencies. The event honoured Benjamin Péret, a classic surrealist of the 20th century, who had named his son Geyser. A famous Ecological Brigade member, known by the alias Greta Martirio Gaia Thunberg and executed three years previously, when proven to have participated in the Second World Campaign for the Phytoremediation of Glyphosate, had presented her paintings in the same exhibition when she was young. As a result, a great number of failed hypotheses were concocted to demonstrate a connection between his father, the MVEHS and the feared Ozeanic branch of the Ecological Brigades. Naturally, this resulted in Iridio being defended by the emerging newspapers that had arisen to advocate the study of climate change and, more generally, freedom of scientific and artistic research. They republished a transcription of Salvatore's last public speech, in which he attacked the country's fine arts academies, branding them lackeys of the authorities. That speech in turn was countered by later speculation which saw the name Geyser as an allegorical reference to the geysers in the subterranean sea on Saturn's moon Enceladus, a place that had been kept free of contamination, in a rare act of scientific consensus by the International Astronomical Agency, before it was disbanded.

The controversy reached a ridiculous point when Olgava revealed in a program on orgonic techniques that she had performed two memorable acts of felatio on Iridio to the rhythm of the digital expansion of π , and that 'Geyser' could be symbolic of the quantity and velocity of semen when he ejaculated. She had compared the volume of ejaculate, as well as its exit speed, with the average of Ozeanic penises and found a statistically significant difference in both. Before long, several sexual senso-vidéos titled 'Geyser' appeared on the market.

By equating the total flux of the liquid at the orifice to that at the s/l interface, the time-dependent liquid exit velocity can be written as

$$u_{\text{ex}}(t) = (S_{\text{sl}}/S_{\text{ex}})[u_0 + V_{\text{at}}j_v(t)]$$

where u_0 is the stationary velocity due to the plastic flow of the solid inside the source tube and the second term accounts for the time-dependent vacancy current density $j_v(t)$ at the s/l interface.

2.2.ii.c. The geyser effect: Expansion of solid helium into a vacuum

In spite of much satirical commentary provoked by Olgava's revelations, all the media in the maritime cities lent their support to Iridio as candidate to visit the extra-terrestrial planets. This had an impact on the Ozeanic media, now less afraid of censorship because the terrestrial authorities were compelled by the Zuespoks to re-establish the world Internet 8.0 network. The alleged insults to the government by his father, who had declined an invitation to join the Official Academy of Fine Arts, were also aired, provoking some much-needed debate

on the autonomy of artists and their role in the new world society. Tiziano Husonnet Tintorelli Turner III, BCPA MCPP, president of the Ozeanic Association of Fine Arts, raised his voice in defence of the government, stating that in the 22nd century there was no reason to use art to promote civil disobedience, or to challenge the powers that be.

A conference on improving the health of the planet was held in the Kingdom of Tonga, which had regained its independence from Ozeania because the troops stationed on its islands were needed to control the disturbances in the major

$$|\Delta E_m| = \frac{\mu_0}{8} \left(\frac{dI}{dt} \right) \frac{\hat{r}_0}{(\hat{z}^2 + 1)^{3/2}} \frac{1}{2} \frac{\hat{r}_0}{\hat{r}} L \cos \theta$$

2.2.iii.a. The effect of magnetic stimulation on the transmembrane potentials of affected neurons

cities. There ~~Ph.D.~~ Shaw Wang explained how Iridio's father, Salvatore, had been silenced with inverse transcranial magnetic stimulation treatment. She stated that

she had been opposed to it when she was working at the Office of Mental Coherence, because it had caused depression and psychosis and had also affected his art. This in turn revealed that he had continued his artistic activities in secret and exported his paintings and sculptures to the maritime cities. For that reason he had been persecuted by the aesthetic police and the finance police.

One of Salvatore's sculptures had appeared on the cover of an MVEHS information bulletin and created a complicated controversy. It was a copper turtle with a white cane, like a blind man's stick, inserted in its shell. Its curved handle had a pair of sunglasses glued to it. The whole ensemble had been badly burnt with a blowtorch, which had left it misshapen. His father had named it 'In the Country of the Blind' but in the maritime cities it had been renamed 'Fahrenheit 1984', the fusion point of copper in an obsolete measure of temperature. According to the free press, the title also

$$T_{(F)} = \frac{9T_{(C)}}{5} + 32$$

2.2.iii.b. Temperature conversion formula: Celsius to Fahrenheit

had another meaning since it referred to literary works from the 20th century that had disappeared from the digital canon in Ozeania. To some, it was simply a joke; to others – especially those who denied climate change – clear proof of subversive criticism. The use of copper, a metal which had a bad press in the maritime cities, was also controversial because it was associated with the contamination of outer space by the space mining companies. His defenders argued that this was further proof of the subversive intention of the work. His critics countered that it was an indication that Salvatore might have received undeclared payments from those companies. Eventually, the accusations and counter-accusations subsided when it was clarified that his father had used the material because Iridio's mother was allergic to the biodegradable plastic normally used by Ozeanic sculptors. The government of Taiwan-South China, an enemy

of Ozeania, distributed clandestine holograms of another sculpture attributed to Salvatore. It represented a deformed helmet in the shape of a condom, a caricature of the dire contraptions with electrodes euphemistically called ‘intervention helmets’, used in inverse transcranial magnetic stimulation procedures. From it, a liquefied brain was dripping. That added fuel to the controversy about prisoners of conscience in Ozeania and North China, which Iridio was not authorised to explore.

$$\tilde{I}_m = \frac{1}{ar_a} \left\{ \left[[E_x(x_1, y_1) - E_x(x_0, y_0)](x_1 - x_0) \right] + \left[[E_y(x_1, y_1) - E_y(x_0, y_0)](y_1 - y_0) \right] \right\}$$

2.2.iii.c. Additional membrane current induced by magnetic stimulation

Thorndike Mowrer asserted that the statements made by ~~PhD~~ Shaw Wang, a traitor to the motherland, stripped of all her titles and even of her doctorate, could not possibly be given any credit. He had confirmed that the physician had protected Iridio and exempted him from treatment for his synaesthesia and AS- α by falsifying psychological tests and prescribing clandestine robotic cures. In addition, she had erased all her files in the Office of Mental Coherence of the Ministry for Historical Updating, Social Precognition and Digital Worship after Ozeania declared war on Taiwan-South China. She defended herself by saying that she had to protect Iridio from the systematic torture that Ozeania applied to neuroatypical children, adding that she was also protecting his father’s fragile mental health. Leni Lenina Huld Pfaff, CPMHN, a nurse who had worked in ~~PhD~~ Shaw Wang’s rooms, reported that Salvatore was anorgasmic, and that was the real reason why he had been protected. ~~PhD~~ Shaw Wang had had long sexual sessions with him, supposedly to cure him. Her orgasms were sadly famous in the hospital because she screamed so loudly. ~~PhD~~ Shaw Wang responded to these accusations by claiming that, in reality, it was Leni Lenina who

<i>Pleasure</i>	<i>Unpleasure or Anxiety</i>
Sexuality	Anxiety
Parasympathetic	Sympathetic
Potassium	Calcium
Lecithin	Cholesterin
Cholin	Adrenalin
OH-ions (hydrating bases)	H-ions (dehydrating acids)
<i>Function of expansion</i>	<i>Function of contraction</i>

2.2.iv. Series of unitary functions from the highest physical sensations to the deepest biological reactions, according to the organic theories of Wilhelm Reich

had multiple sexual encounters with Salvatore, and that, to the best of her belief, Leni Lenina suffered from a mental illness which caused her to find all the dissidents kidnapped by the authorities attractive. She had denounced

the perverted nurse and requested that she be transferred to another hospital. She also stated that she had submitted a dossier of evidence against Leni Lenina,

but instead of punishing her the authorities had promoted her to an important position in the aesthetic police, where she forced all artists who wanted to develop their art in Ozeania to have sex with her.

~~PhD~~ Shaw Wang also voiced her suspicion that Leni Lenina had provoked Salvatore's death, because she had seen a report from the intellectual police, who spied on the actions of the aesthetic police, where it was reported that Salvatore had been forced to have sexual relations with Leni Lenina when he was transferred to Widgeree hospital in poor health, because he had contracted equine lysogeny.

The statements of other nurses accusing ~~PhD~~ Shaw Wang as well as Leni Lenina of committing numerous sexual and non-sexual crimes against prisoners of conscience filled the pages of the independent newspapers for a week. At the same time, increasing criticism was levelled at the country's various police forces, which handled the same cases independently of each other and evinced more interest in their internal disputes than in the prevention of crime, affecting the mental health of citizens with their contradictory requirements.

All the attention paid to Iridio's father had one unexpected effect: exiled artists and artists resident in Ozeania organised several tributes to Salvatore's legacy, defying the official ban on spontaneous artistic events. His tomb in Widgeree became a place of pilgrimage and every day many people left anonymous wreaths or small reproductions of his works, which the authorities removed every night. In the revived art journals, persecuted artists started to testify against the interference of the aesthetic police in their work, and to reproduce *objets d'art* critical of the system, inspired by Salvatore's work. Tintorelli Turner III once again defended the authorities, stating that the right to art was not for everyone, and that those irresponsible publications which lacked control of artistic quality would only debase the country's cultural heritage. He also asserted that it was a pity that the authorities did not invest more funds in the eradication of superficial and spontaneous art, precisely at a time when they needed to show the cultural legacy of humanity to other galactic species. With all this evidence now before him, Iridio at last began to understand the persecution his parents had suffered and the sacrifices they had made for him.

1. THE ORDINARY WORLD. The hero, uneasy, uncomfortable or unaware, is introduced sympathetically so the audience can identify with the situation or dilemma. The hero is shown against a background of environment, heredity, and personal history. Some kind of polarity in the hero's life is pulling in different directions and causing stress.

2. THE CALL TO ADVENTURE. Something shakes up the situation, either from external pressures or from something rising up from deep within, so the hero must face the beginnings of change.

3. REFUSAL OF THE CALL. The hero feels the fear of the unknown and tries to turn away from the adventure, however briefly. Alternatively, another character may express the uncertainty and danger ahead.

4. MEETING WITH THE MENTOR. The hero encounters a seasoned world traveller, who gives him or her training, equipment, or advice that will help on the journey. Or the hero reaches within to a source of courage and wisdom.

5. CROSSING THE THRESHOLD. The hero commits to leaving the Ordinary World and entering a new region or condition with unfamiliar rules and values.

6. TESTS, ALLIES AND ENEMIES. *The hero is tested and sorts out allegiances in the Special World.*

7. APPROACH. The hero and new-found allies prepare for the major challenge in the Special World.

8. THE ORDEAL. Near the middle of the story, the hero enters a central space in the Special World and confronts death or faces his or her greatest fear. Out of the moment of death comes a new life.

9. THE REWARD. The hero takes possession of the treasure won by facing death. There may be celebration, but there is also danger of losing the treasure again.

10. THE ROAD BACK. About three-quarters of the way through the story, the hero is driven to complete the adventure, leaving the Special World to be sure the treasure is brought home. Often a chase signals the urgency and danger of the mission.

11. THE RESURRECTION. At the climax, the hero is severely tested once more on the threshold of home. He or she is purified by a last sacrifice, another moment of death and rebirth, but on a higher and more complete level. By the hero's action, the polarities that were in conflict at the beginning are finally resolved.

12. RETURN WITH THE ELIXIR. The hero returns home or continues the journey, bearing some element of the treasure that has the power to transform the world as the hero has been transformed.

2.3. Smoke screens

Humanity too, had its big bang: a certain critical density, a certain concentration of people and exchanges presides over this explosion which we call history and which is none other than the dispersal of dense and hieratic cores of previous civilisations. Today, we have the reverse effect: we have overstepped the threshold of critical mass with respect to populations, events, information, and control of the inverse process of inertia of history and politics. At the cosmic level, we no longer know whether we have reached the escape velocity at which we take part in a permanent or final expansion (this, no doubt, will remain forever uncertain). In the human order, where perspectives are more limited, it is possible that the energy itself employed for the liberation of the species (acceleration of birth-rates, technologies and exchanges in the course of the centuries) has contributed to an excess of mass and resistance which defeats the initial energy as it drags us along an inexorable path of contraction and inertia. Whether the universe is expanding to infinity or contracting towards an infinitely dense, infinitely small nucleus depends on its critical mass...

Jean Baudrillard

Iridio's private life became public, forcing the authorities to allow him to appear in the media, where he was in demand, although he was under strict official supervision. After two unfortunate interviews with Gisa Michaela Sanders Rahuhi, BPJ LSM, the famous presenter of the most popular current affairs program on the official multimedia channel, Iridio tried to lay to rest the rumours about him and focus the discussion on scientific issues, without success. He was characterised by the celebrity press as the most boring, least sexy and worst-dressed man on the planet. The female presenters unanimously agreed that, in spite of Olgava's claims and his alleged anorgasmia, no woman in her right mind would want to have sex with him. Afrodita Melanina Safo XXX, BOP, the porn star of the most popular senso-videos in Ozeania, interviewed Olgava again and asked her to describe Iridio's organic potency for the umpteenth time. Olgava complained about how badly he was represented in the Geyser series, in which Afrodita played an organic technologist in love with a badly dressed scientist who suffered from priapism. At the end of the program, the porn artist offered to spend a night with Iridio, to test the veracity of the rumours about his hidden sexual energy, but luckily the authorities did not grant approval for him to participate in the organic experiment.

A. The change in the pressure inside a geyser	$\Delta P = P_f - P_i = \rho g(v/A - L')$
B. Temperature gradient in a geyser	$\frac{d(\Delta T)}{dt} = \frac{hA}{C} \Delta T$
C. Single parameter Rayleigh probability density function used to predict the pre-play phase in a geyser eruption	$f(x; \sigma) = \frac{x}{\sigma^2} e^{-\frac{x^2}{2\sigma^2}}$
D. The condition of interruption of geyser eruption	$h = \frac{H V_b^\gamma}{[V_b + (H - h)S]^\gamma}$
E. Eruption time in a geyser	$\tau_e = \frac{\alpha}{M c (1 - \beta)} \cdot \left[(T_b(H) - T_b(h))^{1-\beta} - (T_{r,t} - T_b(h))^{1-\beta} \right]$
F. Variation in a geyser's temperature, expressed as a function of initial temperature T_0	$\Delta T = \Delta T_0 e^{-kt}$

2.3.i. The fundamental equations that govern the thermodynamic behaviour of a geyser

Iridio was also ridiculed in matters of science. PhDr Joss Palmer Mond Beatty, now appointed president of the International Astronomy Federation following a synod of post-creationist scientists in New Beverly Hills, even dared to suggest that Iridio had been invited by the extra-terrestrials because he would not be able to understand or transmit their technology on his return. He also described the choice of Iridio to represent humanity as highly political, and not scientific. That sparked a controversy between Mond Beatty and his old astrophysics professor, PhDr Grossling Pulst, who defended Iridio's neutrality and even his indifference to such controversies. PhDr Grossling Pulst's motives included preventing the anti-ecological paramilitary, who had resurfaced to counter the increasingly daring actions of militant ecologists, from attacking his university department, as they had in Eurasia when a scientist

$$\frac{\mathbb{E}[S(G, s)]}{\mathbb{E}[A(G, s)]} = O(n^{1/3} \log^{2/3} n)$$

2.3.ii.a. N-vertex graph boundary for a rumour-spreading protocol

contradicted that country's authorities. In fact, PhDr Grossling Pulst confirmed that he had never in his life met anyone so obsessed by scientific details and so

$$B_u = \frac{R_B}{L_v(T_G)P} = (1 - A_R)(1 + B_0)$$

2.3.ii.b. Lettau's climatology equation

lacking in interest in politics. He recounted how, almost fourteen years earlier, on the very day that the last square kilometre of tropical forest in the north of Ozeania was cut down and the de-

fending soldiers of the International Ecological Brigades executed, Iridio appeared in his office to discuss an obscure point in the tutorial of Stellar Astrophysics. When he mentioned the event in the forest, Iridio had not even heard of it. PhDr Grossling Pulst also regretted the cancellation of the national astronomy congress in his country, due to the paralysis that followed the revelation of contact with extra-terrestrials. He asked the authorities to finance the reinstatement of the event, insisting that Iridio be allowed to participate and not humiliated by appearances in trivial current affairs programs. The insinuation did not go unnoticed by Gisa Michaela, who invited all female astronomers, secretaries and former students of the astronomy program in Yabbie Creek-W Polytechnic University to appear in her show and expose the sexual ineptitude of PhDr Grossling Pulst and PhDr Gaffney-Yang, who had also defended Iridio and criticised his participation in her 'frivolous program'.

For the first time in the country, the history of the utopian floating cities was discussed without demonising them. They had been established in international waters to avoid the increasing control of national states over the private lives of their citizens. The way in which these cities had maintained humanity's science and culture with little interference or ideological distortion was highlighted. The closing down of the Internet 3.1.4 during the Penumbra in the terrestrial regions was also examined, and measures were proposed to effectively restore it, free of censorship by national states or the private companies controlling their parliaments. The repeal of Decree F451 and others like it dominated the media. This had been requested by the extra-terrestrials but no action had been taken. Many pro-government legislators and representatives of companies in the senate of Ozeania defended the authorities, arguing that such restrictions had been an expression of the will of the people and their wish for moral and intellectual certainty, and they ensured that no time was wasted on unnecessary controversies. They claimed to be the heirs to the ideals of the popular capitalism of Ford and Engels, and insisted they could not allow society to be corrupted, as had happened in the maritime cities and in Taiwan-South China. Moreover, they asserted that the Phoenix project for the restoration of free science, promoted by scientists exiled in refuge areas, was a ploy to take control of technological

advances achieved thanks to the Sandrini-LePaine-Reich canon. However, assertions of that kind, effective before the extra-terrestrial contact, were now questioned by the emboldened free media, ever ready to challenge the official discourse. The correspondence between Iridio and PhDr Muñoz Rojas was used as an example of state interference. The official press defended the actions of the patriotic police and accused Iridio of treason because of his joint publication with the South Americans, former enemies in the Third Transpacific War. Soon after, the free press distributed previous statements from the Ministry for Historical Updating, Social Precognition and Digital Worship, to show that they contradicted those assertions, because they upheld Iridio's article as evidence of collaboration with the neo-Bolivarians and the intellectual openness of Ozeania when it came to technological exchange programs with other terrestrial powers. The defence put forward by the spokespersons of the patriotic police, claiming that there was no contradiction because the communiqués came from different ministries, sparked even more the criticism. The fact that almost 32 per cent of Ozeanic public servants belonged to different police forces that did not communicate with each other was also questioned.

An independent channel interviewed Narges, the climate refugee who had helped Iridio find the hospital in Porpoise Spit where Julia's mother had died.

$$EH = - \sum_{i=1}^{|V|} \sum_{j=1}^{|F|} p_{f_i^j} \log p_{f_i^j}$$

$$\text{where } f_i^{j'} = \frac{(f_i^j - f_{\min}^j)}{(f_{\max}^j - f_{\min}^j)}$$

is the normalised fraction of factor j for node i

2.3.iii.a. Earth Health Index predicted via Ecological Network analysis

She told how Iridio had given her a card of terrestrial bitcoins, which saved her and her family from dying of hunger, and allowed them to start a food home-delivery business for refugees and Ozeanic citizens who could not afford in-built robochefs. Iridio's generosity had helped them to prosper in that inhospitable city. These revelations opened up many topics of discussion, among them the restrictions

which denied refugees access to the basic universal minimum salary. Responses came from a wide sector of the population, many of whom, contrary to the expectations of the independent press, refused to receive more refugees until the government protected Ozeanic citizens who had lost their homes in fires, floods and other ecological disasters.

In the midst of the media storm surrounding Iridio, the only interviewer to touch on scientific issues in any depth was Archibald Xenón Malcolm Vergara, BJ. He was a science journalist with a lengthy career in the global communications network of the Atlantis confederation of maritime cities, who was

interested in what the extra-terrestrials had found important in Iridio's article. After much toing and froing, the authorities allowed Iridio to participate in an interview through a holographic conference in 4D, transmitted by the world communications network of the maritime cities and partially relayed in Ozeania. PhDr

$$(\nabla^2 - m^2)\Phi = \lambda\Phi\phi$$

2.3.iii.b. Generalisation of the Wheeler-De Witt equation to the case of interacting multiverses

Magdalena Díaz Orellana was also invited to take part. As a result of the discrepancies in statements by Iridio and Magdalena about the importance of string theory, PhDr Mond Beatty accused them of quackery. Newly ratified as president elect of the International Astronomy Federation, in a controversial, supposedly international scientific council, from which the maritime cities and scientific refuge regions were deliberately excluded, he reiterated his conviction that there was nothing original in the articles published by Iridio and his neo-Bolivarian accomplices. He even said that the 'cosmology of fireworks' proposed by Iridio in his original article could not possibly be taken seriously. More than half his accusations were grounded in his defence of the increasingly questioned Sandrini-LePaine-Reich paradigm, leading the spokesperson of the Phoenix project to accuse PhDr Mond Beatty of ideological ineptitude, and further international controversy ensued. Finally, a neo-Bolivarian feminist channel from New McOndo aired speculation as to whether PhDr Muñoz Rojas and Iridio had exploited PhDr Díaz Orellana, who deserved more recognition for her role in the work that had made them famous, because, after all, neither of them disputed that she had performed all the calculations.

Some analysts in the free press speculated that the great media interest in Iridio and cosmology was another manoeuvre by the transnationals that controlled the planet's energy sources, since they could not hide their opposition to any change

$$F_e = \frac{dM_C}{dt} + (F_O + F_I)$$

2.3.iii.c. Estimated CO₂ concentration rates due to anthropogenic emissions

in a policy favouring the fossil fuels that continued to generate destructive thermal waves and ecological instability. Their role in financing paramilitary forces to suppress the clandestine armies of ecologists was also highlighted, along with the numerous murders which resulted. This was confirmed by a new media campaign in the information network

that controlled the distribution of scientific news in the Theocracies of the North American Prairies. It promoted the story that Iridio was one of those responsible for the failure of the geo-engineering process designed to lower the planet's temperature, a process which had instead caused a sudden mini-glaciation followed by a series of powerful thermal waves. It was alleged

$$4\pi R^2 \sigma T_{eq}^4 = (1 - A)\pi R^2 F$$

2.3.iii.d. The Bond albedo equation

that Iridio had indirectly contributed to the pandemic that killed his mother. The official Ozeanic press, although also critical of the possible influence that his appointment as a representative of humanity could have on the future of the planet, broadcast an interview with Zoe. She explained that, as part of his work at the patent office, Iridio had approved a patent for an 'atmospheric injection of sulphide to increase the albedo', and that, in reality, he bore no responsibility because his country, paralysed by the financial crisis, had taken no part in the failed experiment. These revelations led to new debate in the international press about the effectiveness of trying to control the climate without taking account of the underlying causes. The policy of externality, or the indiscriminate pollution allowed throughout the planet by governments controlled by companies, was also extensively discussed and contrasted with the policy of sustainable development and the 'Internet of Things' implemented in the floating cities. This revealed for the first time in the terrestrial countries that the Free-thinking International Ecological Tribunal had many times condemned the North American theocracies, Eurasia and Ozeania in its annual reports. Discussion also arose about biological warfare, and, in particular, the genocide of Islamists.

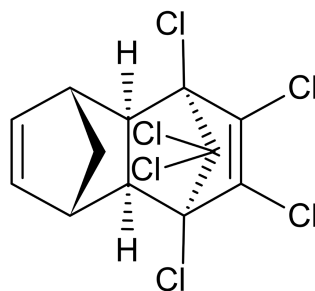
The countries that had suffered serious desertification close to the equator proposed asking the extra-terrestrials to place a diffuser of solar energy at the L₁ Lagrange point between the Sun and the Earth. That prompted new scientific

$$D = \frac{\sum_{i=1}^S n_i (n_i - 1)}{N (N - 1)}$$

2.3.iv.a. Simpson's diversity index

discussion about the wisdom of reducing the average temperature of the planet, since it would cause the extinction of the transplanted species which had adapted to their new ecological niches. Luckily the new controversy

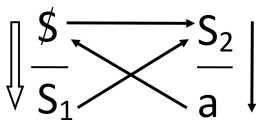
did not involve Iridio, except when an epidemiologist suggested that his cryptorchidism was a product of contamination by toxins chemically resembling oestrogens, such as endosulfan, aldrin and hexachlorobenzene. The specialist asserted that the increase in cases of reduced fertility was due to indiscriminate pollution allowed by the governments of the terrestrial countries. The clandestine Ecological Brigades explained in a press release that they had initiated the misnamed Glyphosate Phytoremediation Wars in order to diminish the pernicious consequences of the policies of externality. The now HPhDr Kaminer Kullych, MAppSciPr BSciP OAM MAIL RSE DSC CGM DCM, who had taken over Iridio's position at the Widgeree patent office after Iridio was placed was under official supervision,



2.3.iv.b. Chemical structure of aldrin

granted a long interview on the official multicomunication channel and dismissed the ecologists' press releases as dangerous exaggerations.

When Iridio's life seemed to have been examined exhaustively, an Internet 8.0 news channel broadcast a 5D interview with Rieneke Watson, recently exiled in Atlantis VIII. With the purpose of defending Iridio, he explained in detail his opinion on Iridio's sexuation. In his view, it consisted of an extreme case of cleavage of negative autoeroticism, showing a dissociation of the abreaction of the libido resident in the paternal function and the desire-pleasure induced by his mother's thwarted romanticism, which prevented the descent of his emotive right testicle. He also condemned the morality and oztraditions police for trying to silence Iridio's scientific genius with electromagnetic lobotomies, since according to his diagnosis, Iridio showed no symptoms of millenarianism. Thorndike Mowrer responded by criticising his predecessor, accusing him of distorting the actions of the Ministry of Health, Natality and Civic Comfort, obstructing the work of the morality and oztraditions police, and concealing the sexual perversions of the accused and his cryptorchidism, which should have been reported to the relevant authorities years earlier. He also condemned Rieneke Watson for dismissing Iridio's synaesthesia and compared him with that other traitor to the motherland, the perverted ~~PhD~~ Shaw Wang. Furthermore,



2.3.v.a. The discourse of capitalism, according to Lacan

he revealed that Rieneke Watson had profited from forcing Iridio to become a private patient: he had undertaken psychometric studies of Iridio's oneirophobia and aromanticism, published in the ministry's internal mental health journal, using perverse Lacanian concepts to describe the case. Thorndike Mowrer added that Julia had received payments as an informant until Iridio finished his degree, and that she had even used Freudian techniques prohibited in Oceania to make him talk during intercourse. She had tried to cure him by copying the rhythm of the forbidden discourse of robotic sexual instructors. Rieneke Watson responded by denouncing the methods used by the morality and oztraditions police to quell dissent. He justified his publications about Iridio and other patients as a requirement imposed by the ministry if he wanted to remain in his post. He explained that the inclusion of the Lacanian mathemes had been pre-approved by the censors and that Thorndike Mowrer had destroyed the files from the morality and oztraditions police, where the approval was documented, when he decided to take over his position. Moving beyond this particular case, he explained that Iridio's Via Dolorosa was a prime example of the persecution of innocent citizens and revealed that the astronomers and chemists at Yabbie Creek-W Multimodal Polytechnic University had

tried to block Iridio's tenure at the patent office because he was too strict in his assessments. They had even collaborated in denouncing his mother when the pedagogical police initiated proceedings against her. Rieneke Watson went on to say that there was a long history of repression against Iridio's grandparents, whose real names he disclosed, alleging that the authorities had demanded his father change his surnames to be allowed to hold his first public exhibition, before he was censured and converted into Leni Lenina's sex slave.

$$\frac{\text{Name of the Father}}{\text{Desire of the Mother}} \cdot \frac{\text{Desire of the Mother}}{\text{Signified to the subject}} \rightarrow \text{Name of the Father} \left(\frac{A}{\text{Phallus}} \right)$$

2.3.v.b. The paternal metaphor, according to Lacan (the metaphor function applied to 'the name of the father')

Iridio's boss, Zoe, dared to come to his defence once again. In the independent media she described all the pressure she had been under when she decided to employ Iridio and help him secure a permanent position. She asserted that Iridio was without doubt the agency's best employee because he could not be swayed by companies trying to register hastily written patents or others plagiarised from overseas registries. Nor would he bow to pleas from academics who needed to have their patents approved in order to keep their jobs. His knowledge of terrestrial lingua francas, as well as classical languages, had allowed him to identify many fraudulent applications that the agency's robotic assistants were unable to detect, because employees bribed by the companies had meddled with their internal functioning. She also intimated that it was very difficult to find impartial employees when the operation of the agency depended on fees paid by private companies to register their patents.

The official response came swiftly. Zoe was arrested by the patriotic police because her public criticisms breached the agency's regulations. It was explained that she was the daughter of an ecological revolutionary killed in a terrorist attack. She should be grateful, it was suggested, that when she started working at the patent office, the Ministry of Industry, Development and Technological Progress had not used that information against her. HPhDr Kaminer Kullych, MAppSciPr BSciP MEE OAM MAIL RSE DSC CGM DCM, promoted to acting coordinator at the Widgeree patent office following Zoe's arrest, delivered a long tirade in the official press against positive discrimination programs which gave opportunities to children of citizens with negative civic credits. These measures not only prevented people with real merit and loyalty awards, obtained through the legitimate accumulation of civic credits, from occupying the positions they deserved; they also endangered the country's security,

because the beneficiaries of positive discrimination invariably turned out to be traitors to the motherland.

The presidential press office announced that henceforth Iridio would no longer be available for interviews, as the media exposure might affect his health. He was barred from access to any news, official or unofficial, about himself or his family.

2.4. Old family business

Dissidents and moderates are all too often crowded out by fundamentalists when science gets political. Fortunately, science has a self-correcting tendency because it is dispersed among different and competing centres. Dread the day when science becomes centralised.

Matt Ridley

Some agents of the patriotic police took Iridio to the amphitheatre of the Victoria Mansion. They explained that they needed to convey some important additional information to him. PhDr Viera Verónica Johnson Xlof, BMedSci MCLinPsych EMT-F, a psychiatrist, was waiting for him. She told him that long ago, while working at the Office of Mental Coherence in the Ministry for Historical Updating, Social Precognition and Digital Worship, she had examined his father when ~~PhDr~~ Shaw Wang was overseas attending a congress. She was now working in the Ideological Retraining Division of the Ministry of Defence, Internal Appeasement and Border Protection, and had come to examine him, so as to prepare him to represent the country's scientists during the meeting with the extra-terrestrials in Brodei. After administering a series of psychological tests using a portable diagnostic helmet, she certified that from now on he should have no dealings with the press as his mental health could be at risk. Until the situation caused by Rieneke Watson's statements was clarified, she would stay with him to monitor his health.

Iridio wanted to return to his calculations at once but his guards informed him that he had to understand what international public opinion was saying

$$X(t_i) = \mu(t_i, \theta) + e(t_i) = M + \sum_{s=1}^s W(t_i, v_s^A) + W(t_i, v_s^B) + e(t_i)$$

2.4.i. The frequency modulated Möbius spike train model

about his family. It was very important that he should understand his country's position on several matters, including the accusations that might be made at the meeting by the enemies of Ozeania, given the dissemination of much false information about his family history. Major Erlanger Momus Klamm O'Brien, GCOOL HOOPF TSMMS, chief superintendent of Ozeania's epistemological police, paid him a short visit and asked what he knew about his grandparents. Iridio replied that his parents never mentioned them: his mother had promised to tell him more about them but had died before she had the chance. Major Klamm O'Brien told him that, owing to indiscreet press leaks, the president of the country had decided to set up a new police force, presided over by him in the newly established Ministry for Pure Sciences, Cosmological Epistemology and Irreproachable Research. From now on they would be

in charge of his case, which would be used as an example to foster more cooperation between the different police forces. He then whispered something to PhDr Johnson Xlof, and quickly said goodbye. Peter and Heaven, his cyborg scientific assistants, came into the amphitheatre. Iridio was glad to see them, thinking it might mean he could return to his work. But they set up an old 3D projector and informed him that they were going to show him a documentary made by his paternal grandfather, which was very important in his life because his parents had first met during the filming. They sat him on a chair in the middle of the amphitheatre and, when PhDr Johnson Xlof had calibrated a device on the ceiling, the projection started.

The first part was an overview of the life of Roger Roxelio Sandrini. He was the son of Pentecostal refugees escaping the Pan-Ideological Socio-Capitalism established in Eurasia after the Fourth World War. They had fled briefly into exile in the Vatican's Refuge Territory when Roger Roxelio was a child, and that was where his interest in the exact sciences was awoken. His parents, however, could not tolerate the scientific atmosphere of the place and for that reason they had emigrated to North America after the Urbino Pact. Contrary to his parents' wish to see him become a post-creationist pastor, Sandrini had completed a doctorate in theoretical physics in the most prestigious university of the then Republic of California, using the then legal string theory framework. Since his student days however, he had stood out as an inventor. His first commercial success was the invention of a flying chair, called the 'individual self-slider'; it sold millions of copies and led to changes in the laws of local aeronautics. It was later

$$\dot{F} = E$$

$$\dot{C} = BF + \beta E - \sigma(C - C_1)$$

$$\dot{T} = \mu \ln\left(\frac{C}{C_1}\right) - \alpha(T - T_1)$$

2.4.ii.a. The coupled climate-carbon cycle model

banned due to the high number of fatal accidents. His launch pad to international fame was a new fuel, 'hydrigen', based on changes to unstable ions in dihyperion, which, according to his company, could be mixed with fossil fuels to reduce carbon dioxide emissions and thus the impact of hydrocarbons on global warming. Furthermore, the new substance generated particles that rose

to the stratosphere and reflected sunlight. In an apparently miraculous paradox, the use of mineral carbon and petroleum could reduce the greenhouse effect. In spite of the scepticism of the scientific intelligentsia, Roger Roxelio won the Schwarzenegger prize for technological innovation and this, together with his Pentecostal credentials, allowed him to influence the post-creationist churches that seized power in North America after the Aztlan War. The second prize was awarded to Marion Marina LePaine, another exile from Eurasia, who

$$K_g S_{TOA}(1 - \alpha_p) = F \ln \frac{CO_2}{280.0}$$

2.4.ii.b. The geo-engineering factor in climate-carbon simulations

had found a suitable market in the Republic of California for the production of orgon batteries, first proposed in the mid-20th century by Wilhelm Reich. Reich

$k = A e^{-(E_a/RT)}$ was a disciple of Freud who had died in North America, having tried unsuccessfully to persuade Albert Einstein to test the effectiveness of the devices. In addition to biological applications and cures for sexual dysfunction, LePaine claimed that the batteries that she had recovered and improved could be used to ameliorate the atmosphere and generate rain in the North American prairies, currently suffering from accelerated desertification due to climate change. Both LePaine and Sandrini published experimental evidence of the effectiveness of their discoveries in peer-reviewed journals which their opponents considered doubtful.

The documentary also showed the marriage of Sandrini and LePaine, which resulted in the union of their solutions to the natural disasters devastating the planet. It also summarised how they were catapulted to influential positions during the review of the scientific canon that followed the Fourth World War,

$\Pi = \Pi_{\max} \left(\frac{C_a}{C_a + C_{0.5}} \right) f(T)$ their role in the expulsion of the Islamists and the establishment of Decree F451 during which Sandrini publicly rejected string theory. Finally, it explained how the new canon that bore their name, also known as the Sandrini-LePaine-Reich paradigm, had rewritten

the science of the 20th century with the help of thousands of post-creationist scientists. The film suggested that the most moderate scientists had been chosen to counter the defence of traditional science undertaken by the other great religious and scientific organisation of the time, the Vatican Observatory. In particular, the new canon was very close to the postulates of traditional science, except for the notation used, the flagrant omission of the evidence of human impact in climatic disasters, and the condemnation of the complex mathematics of string theory. This moderation caused many protests from the orthodox post-creationists, who wanted to dismiss a large proportion of the traditional scientific canon and impose their ideas on the universities. This would help them to counter the influence of the templetarians, dubbed God's bankers, who defended pure science and its use in the updating of the scriptures through Experimental Theology, a heterogeneous mix of gnostic gospels and modern cosmological theories. But the post-creationist leaders supported Sandrini and LePaine and imposed their moderate paradigm in North America and later in other allied powers in the terrestrial regions of the planet. The strategy had been copied from a group of French mathematicians from the beginning of the 20th century, under the collective name of Bourbaki, who rewrote the mathematics of the period in a new,

more synthetic notation. Sandrini's mathematics was based on fuzzy logic and allowed for multiple interpretations of formulae, particularly when used to infer cosmological developments or solutions for global warming models. The unusual inclusion of Reich was explained as a cosmetic strategy to adapt the move-

In general, should discussion about divinity in the 21st century take place in close contact with the scientific community if it is to be widely relevant to our future society? Is it wise to begin those discussions now? Theologians pursuing spiritual progress may benefit from close contact with research scientists and may benefit from serious engagement with the research frontiers of active scientific exploration.

2.4.ii.e. Possibilities for spiritual progress, according to John Templeton

ment to the moral and sexual mores of the times and win over the first generation of youngsters to enjoy mass access to the interactive senso-sexual theatres. It also enabled them to counter the actions of the Freudian Army for Libidinal Liberation, which had arisen in reaction to the puritanical policy of the orthodox post-creationists. The crucial issue, however, was not so much sexual mores as the supposed magic solutions for climate change which, according to the narrator, had been rejected by the few disciples of Wilhelm Reich still alive on the planet. Those disciples considered them a screen for the restoration of behaviourist procedures in human and animal psychology which had been rejected by traditional science in the second half of the 20th century. The section on Sandrini-Le-Paine-Reich concluded by explaining that,

just as the medieval Catholic Church had invented celibacy to counter the heresy of the Cathars, the moderate creationists in North America had adopted Decree F451 and orgonic sex to combat traditional science, templetarians and militant libidinarians.

The second part of the documentary presented Sandrini's great antagonist in the Republic of Australasia, known after the First Transpacific War as Ozeania. This was none other than his maternal grandfather, PhDr Karl Hans Pérezman Hasterer, professor of theoretical computing sciences at the Australasian National University, later renamed Go8-Ivy-BAM University, where his mother had studied. He was presented as a researcher who had created a group of open multipurpose artificial intelligences, that is, he had published the details of their software and hardware in open-access scientific journals. The intelligent machines, known as Boltzmann machines, were based on neuronal networks simulated by the software he had designed by adapting results from string theory. Although other

$$P(v) = \sum_h P(v, h) = \sum_h \frac{1}{Z} e^{-E(v, h)}$$

2.4.iii.a. Probability distribution in a restricted Boltzmann machine

more primitive versions had been developed before the Penumbra, these later models had built-in ethical modules which could be used for the benefit of all mankind. In their youth, Karl and Sandrini had studied in the Republic of California at the same time and had even briefly shared a room in the university's dormitories. Having known Sandrini personally, Karl claimed that he was an opportunist charlatan. There were many more details, but the main point was that both his grandfather Karl and Fabious Paul Vliperdius der Heer, the most eminent robotics professor in Australasia, opposed the Sandrini-LePaine-Reich paradigm, branding it an enormous backward step in scientific and technological innovation. The film also offered another significant fact. PhDr Mildred Katherine Gardena Montag, who was none other than Karl's wife and therefore Iridio's maternal grandmother, was Minister for Applied Sciences and Sustainable Development in Australasia, in a government which wanted to impose the same type of post-creationist reforms. At the end of the second part, the documentary showed the bitter and public divorce of his maternal grandparents, and his grandfather's hunger strike while barricaded in his university office in protest against the reforms driven by his ex-wife. Surrounded by a crowd of students, he had resisted government intervention in the universities, publicly defended freedom of religion and condemned the expulsion of the Islamists, another policy copied by the Australasian government from developments in the North American theocracies. The film showed public demonstrations in support of his grandfather and against censorship of his advances in open artificial intelligence: these would allow the Third World to develop alternative energy sources and oppose the policies of the fossil fuel companies which, thanks to his grandmother, had gained representation in the country's senate. The second part concluded by condemning his grandmother Mildred as corrupt, indiscreet and manipulative. It predicted that the only reform for which she would be remembered positively would be the inversion of maternal and paternal surnames on Australasian identity cards. This was a local innovation that spread to the rest of the world due to the fifth masculinist/feminist wave, during the emergence of a gender affirmation rebalance movement led by LePaine. In Ozeania, the *Not-me/Me-neither* post-masculinist/feminist alliance restored 'benign patriarchy/matriarchy', which allowed those with high social credits to make sexual use of those with low or negative credits.

The third part of the documentary showed scenes from the Indonesian War, in which autonomous robotic warriors fought each other and also attacked the Islamists who had been expelled from Australasia. It was explained that they had been created by rewriting the cognitive architecture of the automatons designed by his grandfather Karl to prevent the use of artificial intelligence in warfare. It was suggested that his grandmother Mildred had stolen the passwords

that prevented the modification of the base system and given them to the Australasian army. The last scene showed his maternal grandmother at a press conference, informing the country that the pro-Islamist rebels had used the codes published by her ex-husband to create killer robots, and, for that reason, her government also needed to build that type of cybernetic soldiers to defend the country. She announced the closure of the Internet 3.1.4, which had been used

$\alpha\beta^3\delta^1A^1B^1C \uparrow H^1 - I^1K^4 \downarrow W^0$

2.4.iii.b. Analysis of a simple, single-move tale of class H-I, of the type: 'kidnapping of a person', according to Vladimir Propp

to generate the evolutionary algorithms developed to self-improve artificial intelligences, and also the establishment of the first Office for the Regulation of Artificial Intelligence, under the ministry coordinated by his grandmother. At the end of the

documentary the narrator requested the liberation of Iridio's grandfather Karl, PhDr Vliperdus der Heer and six hundred other scientists. detained by the army because they had signed an open letter rejecting the full implementation of the Sandrini-LePaine-Reich paradigm in the territory of Australasia and had been accused of being subversive templetarians.

Iridio was very surprised by all the information and the first thing he told the scientific cyborgs sitting next to him was that he knew nothing. He also wanted Peter and Heaven to explain what Boltzmann machines were. PhDr Johnson Xlof approached him and told him not to worry about the architectural details of those obsolete artificial intelligences, because the problem had been solved and all the robots and cyborgs in Ozeania respected the 256 laws of robotics. Iridio wanted to know what had happened to his maternal grandparents after that, and was told that he would be informed at an appropriate time. Now they had to measure other things with another portable device that PhDr Johnson Xlof had brought with her. They needed to ascertain whether he was prepared to watch a fragment of a more recent documentary shown in the maritime cities and now circulating clandestinely in Ozeania.

At a signal from PhDr Johnson Xlof, the cyborgs rearranged the room to show a 5D documentary. They told Iridio that he could now learn a little more of the history of his paternal grandparents. They placed in front of him the machine used by PhDr Johnson Xlof to examine him and connected it to a cube that periodically emitted a buzz. The film clip began with statements by Rieneke Watson in the official network of the maritime cities claiming that Salvatore Winston Ampleforth Ennui, father of Iridio, had been forced to change his surnames and that in reality he should be known as Salvatore Winston Wuwei Kah. The presenter showed a primitive joint holographic portrait of his paternal grandparents and introduced them as Joseph Gregor Key Kah and Frida Eleonora Warhol Wuwei. He also stated that the Ministry for Historical Updating, Social

Precognition and Digital Worship in Ozeania had erased their names from all the documents in the republic, and the only information that remained about them had been gathered from international archives. Next, he showed a series of stunning statues made from parts of autonomous robotic weapons that had been destroyed in armed conflicts, and explained that Frida had wanted to show the horror of the wars in which the killer machines had been used.

$$\int_0^{\mu} (1 - s(x)) \frac{n x^{n-1}}{\mu^n} dx = \begin{cases} 1 - \frac{\mu n}{(n+1)(en - e + 1)} & \mu < (en - e + 1) \\ \frac{(en - e + 1)}{(n+1)\mu^n} & \mu \geq (en - e + 1) \end{cases}$$

2.4.iii.c. Probability of an AI-disaster due to an ‘arms race’ between AI development teams

Then the focus shifted to Iridio’s paternal grandfather Joseph, presented as an activist for human rights and personal freedoms. He had used the then innovative 3D filming to limit the advance of permanent surveillance generated by the ideological conflicts over climate change in Australasia, where the government had copied the civic credit system established in North China. His most famous documentary was the one they had already partially seen about Karl, Iridio’s maternal grandfather, who, according to the presenter, had died in jail. After completing that film, Joseph embarked on a project to document the massacres of Islamists. In order to force the authorities to take his claims seriously, he converted to Islam in a public ceremony, at which he was murdered by an autonomous robot while reading a sentence from the Koran. A further eighteen people died in the event while trying to stop the robot. That radicalised his grandmother Frida, who built a spine-chilling statue. It consisted of a cube of transparent acrylic, measuring half a cubic metre, with Joseph’s half-putrefied remains in the left half of the cube. On the sides were robotic weapons, both terrestrial and aerial, representing a simultaneous attack. The camera showed half of the structure from several angles while a voice-over could be heard from the president of the Ozeanic Academy of Fine Arts, Tiziano Hussonet Tintorelli Turner II, father of the current president of the institution, who condemned the work as merely a macabre pamphlet, not art. When the commentator started talking about the fate of Frida’s work and comparing it to the censorship imposed on Salvatore’s first pieces, the transmission was cut off.

Iridio did not know what to say, so he repeated that he did not know anything about it. PhDr Johnson Xlof gave him a grey tablet and a glass of water and assured him again that they believed him. She added that they had studied the emotions reflected in his face and his pupils with the psychometric machine she had calibrated in the cube facing him during the projection, and could see

$$E(v, h) = - \left\{ \sum_{i=1}^n \sum_{j=1}^m (h_i * v_j * w_{ij}) + \sum_{j=1}^m (b_j * v_j) + \sum_{i=1}^n (c_i * h_i) \right\}$$

2.4.iii.d. The energy function of a random deep belief network for recognising emotions

that he was telling the truth. There was no need to worry, she said, because

his grandparents' crimes would not be included in his court proceedings. Neither she nor the cyborgs would answer his questions about Boltzmann machines, or their link to the killer robots shown in the documentary. Using the diagnostic helmet, PhDr Johnson Xlof again measured his emotional response to the information they had given him, and made a sign to the cyborgs. Both cyborgs grabbed Iridio and immobilised him by twisting his arms behind his back, as he looked ahead, upright between them, shoulder to shoulder. It was similar to the way he had been apprehended by the patriotic police in the office of ~~PhDr~~ Shaw Wang, except that now he was far more restricted in his movements because the three of them had to walk in step. He was told that because his emotional indices allowed him to be exposed to additional confronting information, they had to take him to the cellar of the Museum of Fine Arts to resolve an urgent matter.

Flanked by several members of the epistemological police, they entered a lift that took them to the catacombs of the secret police. He was informed that most of the buildings around the square had a network of tunnels connecting them to the Victoria Mansion, to protect the authorities against popular uprisings. They walked for at least fifteen minutes along a badly lit tunnel. Trying to keep up with the cyborgs was very difficult, and they sometimes dragged him along. They stopped in front of an iron gate which displayed a signboard reading 'Fine Arts Police', and rang the bell. While waiting, they explained to Iridio that this was the previous name of the aesthetic police.

Four aesthetic policemen opened the door and exchanged protocols in their legaliferums with the epistemological policemen guarding him. Two of them took Iridio from the cyborgs and locked him in the same firm grip. A third aesthetic policeman walked in front of Iridio and another behind him. They passed along a corridor lit in the distance by a bright light coming through a door. As they approached, they could hear more clearly the moans of pleasure of a woman. When they reached the door, they saw a fat woman riding a hooded man tied to a bed. On one side there were other men being guarded by police-women dressed in pink as muses and nymphs. The fat woman saw them and gestured for them to wait. She then surrendered to a strong orgasm shouting

and moaning with pleasure. When it was over, she got up, kissed the man on the chest and said, ‘You behaved very well.’ She asked the women dressed as muses if he was a plastic artist or a poet. One of them told her that he was a painter and that he also made abstract 4D senso-videos. The fat woman ordered that he be given a scholarship and asked to have him included again in the list for the next trimester. She then ordered the women dressed as nymphs not to prepare the other prisoners yet because she had an urgent matter to attend to. Two policewomen dressed as nymphs took away the man who was on the bed, escorted him to a door at the end of the room and gave his clothes to some men dressed as satyrs, also in pink, who were guarding the door.

Vegetative Group	General Effect on Tissues	Central Effect	Peripheral Effect
<i>Sympathetic</i> Calcium (group) Adrenalin Cholesterin H-ions	Reduction of surface tension Dehydration striated musculature: flaccid or spastic Reduction of electrical excitability Increase of oxygen consumption Increase of blood pressure	<i>Systolic</i> Heart musculature is stimulated	Vasoconstriction
<i>Parasympathetic</i> Potassium(group) Cholin Lecithin OH-ions	Increase of surface tension Hydration muscles: increased tonicity Increase of electrical excitability Decrease of oxygen consumption Decrease of blood pressure	<i>Diastolic</i> Heart musculature is relaxed	Vasodilatation

2.4.iv. The primary antitheses of vegetative life, according to the orgonic theories of Wilhelm Reich

The fat woman, wrapped in a dressing gown that revealed her ample breasts, approached Iridio, walking barefoot. She introduced herself as the chief of the aesthetic police and said that she regretted not having him as a

$P(p \vee q) \equiv Pp \vee Pq$
 $O(p \wedge q) \equiv Op \wedge Oq$
2.4.v.a. The principle of deontic distribution

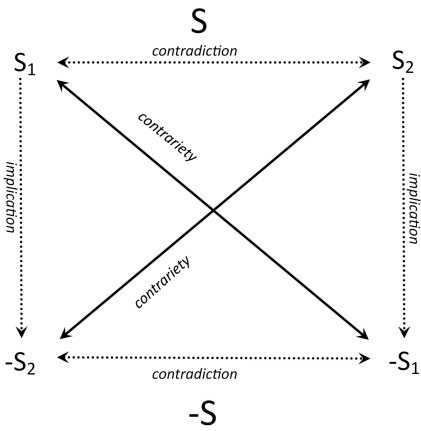
permanent prisoner because she had heard in the news that he was an extraordinary lover. At that point, Iridio recognised her. He had seen her in the media: she was Leni Lenina Huld Pfaff, CSMDS CPMHN, the former nurse of ~~PhD~~ Shaw Wang who had allegedly forced Iridio’s father to satisfy her sexually when he was sick in

Widgeree. She looked much fatter now than in the news hologram, but her lecherous lips and pervert's eyes were unmistakable.

Iridio managed to stammer indignantly that according to the categorical imperative human beings could not be used as a means to satisfy anyone's lusts. Leni Lenina let out a guffaw, and whispered something in the ear of a policewoman, who brought her a pair of ballerina shoes. The policewoman fondled Iridio's genitals and whispered something in Leni Lenina's ear. She let out another guffaw and mimed a gesture which Iridio could not understand to the policewoman. She then put the shoes on and motioned to Iridio's guards to follow her. They walked in silence to a broad grotto at the end of the corridor, where she switched the lights on. The whole space was taken up by an enormous structure composed of two acrylic cubes of different pale-yellow hues fixed together. In the documentary showing his grandfather Joseph, he had seen only

the front of the structure. Now he saw only a skeleton in the hollow of the acrylic that retained the shape of his ancestor, with a greenish liquid up to its knees. As in the hologrammatic footage, he was surrounded by robots who were beating him. They now showed signs of damage, and, in some parts, where air had been trapped when they were placed inside the acrylic, were slightly rusty.

In the rear section, the cube that had been attached later was less discoloured and held another skeleton, also in greenish liquid up to its knees. In this case the silhouette in the acrylic was that of a woman, and the



where $\frac{S_1}{-S_1} \simeq \frac{S_2}{-S_2}$

2.4.v.b. Greimas's semiotic square

compartments containing the skeletons were connected by a tube at floor level, also full of greenish liquid. Between the two sections there was a small motor attached to a long cable that extended to a switch on the side, where the cubic structures were joined. Without a word, Leni Lenina switched on the motor and the liquid filled the compartment holding his grandfather. It was now possible to see the silhouette of his body more clearly - as it had been when he was placed inside the sculpture, still bearing the injuries inflicted by the killer robot that had murdered him. When that compartment

$$p = \rho \cdot \langle a \rangle \cdot \Delta z + p_0$$

2.4.v.c. Stevin principle

was full, the liquid changed direction and filled the other compartment, in which Iridio recognised the slender shape of his grandmother Frida.

Leni Lenina told him that he was the first member of the public to see the installation in operation. It had been an official secret up to that day and nobody knew that his grandmother had committed suicide in order to be part of her last work of art, if one could call it that. He had been brought so that he could authorise the aesthetic police to recover his grandparents' remains and give them a fitting burial in Widgeree's cemetery, next to his father. Iridio wanted to learn more about the installation and Leni Lenina told him that in fact his grandmother Frida had sold it to a museum in the now submerged city of Shanghai, but the transfer to Taiwan-South China had never been authorised for a number of reasons. Iridio then asked whether the museum had paid for it. Leni Lenina told him that it had, they had paid his father a large sum, but that was now irrelevant since his country was at war with Taiwan-South China and did not maintain commercial relations with its enemies. Iridio asserted that according to the categorical imperative and the most basic postulates of deontic logic, one could not renege on a promise. Leni Lenina held back her laughter, shook her

$Op \equiv Ph \neg p \equiv \neg P \neg p$
 $O \neg p \equiv Ph p \equiv \neg P p$
 $\neg O \neg p \equiv \neg Ph p \equiv P p$
 $\neg Op \equiv \neg Ph \neg p \equiv P \neg p$
 with $Op = p$ is compulsory
 $Ph p = p$ is forbidden
 $Pp = p$ is allowed

head, switched off the power and remarked that she knew in advance what his response would be. With extravagant politeness bordering on irony, she added that she would convey his decision to Tintorelli Turner III, the director of the museum. But she urged him to think about it because sending the artefact to Taiwan-South China was impossible, and she needed to give an answer to

2.4.v.d. Equivalences in deontic logic her superiors, as it was a burning issue in the international press about Ozeania.

One of the aesthetic policemen showed something to Leni Lenina in his legaliferum. 'I thought so,' she muttered and with an abrupt gesture ordered the policemen to take Iridio away. Again they all walked along the corridor in total silence. On reaching the room in the middle of the corridor, Iridio could see another man on the bed. Without saying goodbye, Leni Lenina ordered the nymph-policewomen watching the man to get him ready. One of them started to perform oral sex on him while the other caressed his chest. As they were leaving through the same door they had used to come into the museum, Leni Lenina's groans of pleasure could be heard.

Number	Description	Definition	Code
	Initial situation		α
I	One of the members of a family absents himself from home	Absentation	β
II	An interdiction is addressed to the hero	Interdiction	γ
III	The interdiction is violated	Violation	δ
IV	The villain makes an attempt at reconnaissance	Reconnaissance	ε
V	The villain receives information about his victim	Delivery	χ
VI	The villain attempts to deceive his victim in order to take possession of him or of his belongings	Trickery	η
VII	Victim submits to deception and thereby unwittingly helps his enemy	Complicity	θ
VII-a	Preliminary misfortune caused by a deceitful agreement	Preliminary misfortune	λ
VIII	The villain causes harm or injury to a member of a family	Villainy	A
VIII-a	A member of a family lacks something or desires to have something	Lack	a
IX	Misfortune or lack is made known; the hero is approached with a request or command; he is allowed to go or he is dispatched	Mediation	B
X	The hero agrees to or decides upon counteraction	Beginning counteraction	C
XI	The hero leaves home	Departure	$\uparrow$
XII	<i>The hero is tested, interrogated, attacked etc., which prepares the way for his receiving either a magical agent or a helper</i>	<i>First function of the donor</i>	D
XIII	The hero reacts to the actions of the future donor	The hero's reaction	E
XIV	The hero acquires the use of a magical agent	Provision of a magical agent	F
XV	The hero is led to the whereabouts of an object of search	Guidance	G

XVI	The hero and the villain join in direct combat	Struggle	H
XVII	The hero is branded	Branding	I
XVIII	The villain is defeated	Victory	J
XIX	The initial misfortune or lack is liquidated	Liquidation of lack	K
XX	The hero returns	Return	↓
XXI	The hero is pursued	Pursuit	Pr
XXII	Rescue of the hero from pursuit	Rescue	Rs
VIII bis	The hero's brothers steal his prize (and throw him into a chasm)	Villainy (another)	A
X-XI bis	The hero once more sets out in search of something	Other counter-action	C↑
XII bis	The hero once again is the subject of actions leading to the receipt of a magical agent	Other function of the donor	D
XIII bis	The hero again reacts to the actions of the future donor	The hero's reaction (another)	E
XIV bis	A new magical agent is placed at the hero's disposal	Provision of another magical agent	F
XV bis	The hero is brought or transported to the location of the object of the quest. In this case he reaches home	Guidance (another)	G
XXIII	Unrecognised, he arrives home or in another country	Unrecognised arrival	O
XXIV	A false hero presents unfounded claims	Unfounded claims	L
XXV	A difficult task is proposed to the hero	Difficult task	M
XXVI	The task is resolved	Solution	N
XXVII	The hero is recognised	Recognition	Q
XXVIII	The false hero or villain is exposed	Exposure	Ex
XXIX	The hero is given a new appearance	Transfiguration	T
XXX	The villain is punished	Punishment	U
XXXI	The hero is married and ascends the throne	Wedding	W ^o

2.4.vi. The functions of dramatis personae in folk tales, according to Vladimir Propp

2.5. Conversations in the cathedral

I think the best defence against the misuse of AI is to empower as many people as possible to have AI. If everyone has AI powers, then there's not any one person or a small set of individuals who can have AI superpower.

Elon Musk

Re-emerging from the tunnel, they saw five officers from the intellectual police sporting their characteristic yellow uniforms. They informed the officers from the aesthetic police guarding Iridio that the plans had changed: they should surrender their prisoner to them rather than to the epistemological police who had brought him there. A long discussion ensued, and the officers of the intellectual police produced an edict in a legaliferum from the supreme superintendent of the epistemological police authorising the change. While they argued their legaliferums emitted many beeps. When agreement was reached, two officers put Iridio in a small pod. They got in beside him on the front seat, facing backwards. The other three sat opposite them. Iridio recognised one of them by his face and the scar on his forehead; it was the one he had attacked when he was handcuffed to his mother's body. They travelled in silence for eight or nine minutes through a long tunnel. Every now and then they had to stop to let police vehicles transporting prisoners overtake. They told Iridio to get out by a door marked 'cathedral'. They entered the building through what appeared to be an old confessional in a side altar. The policemen who had been sitting next to him took hold of his arms in the same grip as before. The other three formed an escort, one in front and one behind, as in the museum, while the fifth, the one with the scar, walked ahead. He had a plan of the cathedral in his flexible reader and guided them with a kind of torch. As Iridio walked his eyes got used to the darkness. He could make out a marble statue of Alan Turing, twice life-size, around which flew some strange machines repeating again and again 'the data, the codes, the communications, for ever, amen'.

Soon enough they were walking along the central nave, which was divided into cubicles in which some technicians were operating gigantic quantum computers. The cooling system was running at full power, but even so the heat emanating from the machines generated warm draughts that at moments made Iridio feel vaguely claustrophobic. He recited to himself the digits of π that he remembered and tried to keep pace with the policemen, who forced him to walk too fast for his liking. 3, ., 1, 4, 1, 5, 9, 2, 6, 5, 3, 5, 8, 9, 7, 9, 3, 2, 3, 8, 4, 6, 2, 6, 4, 3, 3, 8, 3, 2, 7, 9, 5, 0, 2, 8, 8, 4, 1, 9, 7, 1, 6, 9, 3, 9, 9, 3, 7, 5, 1, 0, 5, 8, 2, 0, 9, 7, 4, 9, 4, 4, 5, 9, 2, 3, 0, 7, 8, 1, 6, 4, 0, 6, 2, 8, 6, 2, 0, 8, 9, 9, 8, 6, 2, 8, 0, 3, 4, 8, 2, 5, 3, 4, 2, 1, 1, 7, 0, 6, 7, 9, 8, 2, 1, 4, 8, 0, 8, 6, 5, 1, 3, 2, 8, 2, 3, 0, 6, 6, 4, 7, 0, 9, 3, 8, 4, 4, 6, 0, 9, 5, 5, 0, 5, 8, 2, 2, 3, 1, 7, 2, 5, 3, 5, 9, 4, 0, 8, 1, 2, 8...

In the middle of the building stood a large structure in the shape of a castle reaching up into the dome of the cathedral. The policeman guiding them told Iridio that inside was the Official Oracle of Ozeania and that only the president and the commander-in-chief of the army could consult it. Seeing it at close quarters was a privilege accorded to very few. Some drones in the shape of cherubs were flying around the structure, also repeating 'the data, the codes, the communications, for ever, amen'. They had needles like those of the mechanical bloodhounds shown catching ecological terrorists in the news. The drones flew over their heads, threatening them with their needles if they came too close to the castle, so in some sectors they had to walk sideways, which was very uncomfortable.

At the end of the nave, where the main altar once stood, there was a gigantic statue of John von Neumann, almost as tall as the castle, guarded by drones in the shape of archangels, who had needles instead of fingers. They walked past it and came into what seemed to be a labyrinth formed by enormous quantum computers linked by multicoloured optic fibres to the back entrance of the castle. The signs allowed Iridio to deduce that each one corresponded to the different police forces of each ministry. After a while, they came to an exit leading to another altar, behind which was an apse made of transparent walls in a semi-hexagonal shape. The only solid wall was the back wall, which

was also the end of the nave, where an old organ was placed. Inside, waiting for him, was a woman in a yellow lab coat, similar to the one worn by PhDr Shaw Wang. As he came in, Iridio recognised PhDr Charrington der Heer, who had looked after his father in Widgerree. She was now wearing her long hair down, and seemed much more beautiful than before. Three female cyborgs, also in yellow lab coats, welcomed him and took charge of him. The officers left the room but remained outside guarding the door. The cyborgs were extremely beautiful, and it was not obvious that they were cyborgs except for discreet interactive monitors on their backs and below their breasts. The blank screens were the same colour as their lab coats. PhDr Charrington der Heer told him effusively how happy she was to see him again safe and sound, and kissed him on the cheek. She told him that she had to administer some routine psychometric tests while they waited for a very important person who wanted to see him.

Let $(X, \mathcal{B}, \mu)$ be a probability space and let $T: X \rightarrow X$ be a measure-preserving transformation.

Let $\mathcal{I}$ denote the σ -algebra of T -invariant sets, where $\mathcal{I} = \{B \in \mathcal{B} \mid T^{-1}B = B \text{ a. e.}\}$

Then for every $f \in L^2(X, \mathcal{B}, \mu)$

$$\frac{1}{n} \sum_{j=0}^{n-1} fT^j \rightarrow E(f|\mathcal{I})$$

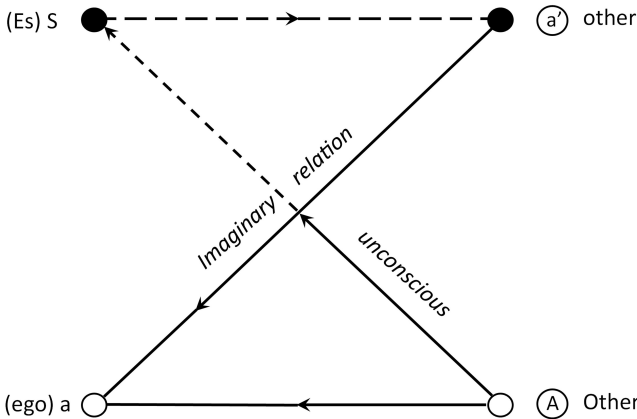
as $n \rightarrow \infty$ in L^2

2.5.i. Von Neumann's ergodic theorem

She invited him to sit down on a sofa decorated with digits, perhaps module 16 or 18, since the notation was alphanumeric. Two of the cyborgs sat down beside him, one on each side. A diagnostic helmet was placed on his head, with two internal monitors that projected images into both his eyes simultaneously, or sometimes into one eye at a time. The monitors projected a large number of holograms at great speed, some showing naked men and women like those he had seen in Rieneke Watson's consulting rooms; others were sculptures which seemed to be by his father or paternal grandmother, but he had never seen them before. It was impossible to retain the content of the images, and when he felt oppressed and started to recite the digits of π the test was over. On removing the helmet, PhDr Charrington der Heer told him that if he needed to calm down it was better to recite the digits of e or the Gelfond constant, because in almost all the ministries π was associated with the enemies of Ozeania, especially Taiwan-South China. She then connected the diagnostic helmet to a console and looked at some numbers which were reflected on one of the walls and also appeared on the cyborgs' interactive monitors. She assured Iridio that, in spite of all the unexpected emotions he had felt during his capture and visit to the museum, his anxiety indices did not suggest that he would be affected by the additional information he was going to receive about his family. She also said that his eudaemonic performance was low, as expected, but while he was under the guardianship of her ministry that should not worry him. If he decided to stay with them, they would find a way to increase his libido and make good any other deficiencies. She looked towards the door and told him that they could talk in more detail later about strategies to reduce his anxiety by reciting the digital expansion of transcendental numbers, and what would be necessary to take into account regarding his anxiety levels if he had to travel to outer space.

A man who looked familiar to Iridio came into the room. He introduced himself as Jeremias Karl Gardena Montang, MCS BCS GOOLO SMTA, supreme coordinator of the Office for the Regulation of Artificial Intelligence of the Ministry for Historical Updating, Social Precognition and Digital Worship. He explained that he was his mother's half-brother, and for that reason he no longer used the surname Pérezman. He added that it was a pleasure to see him again and asked Iridio if he remembered him and whether his parents had spoken about him. Iridio said he did not remember, but knew that he existed because his parents had mentioned him occasionally during their discussions amidst the chaotic noise of the room of mysteries of the universe. But they had never told him what had happened, or that he worked for the government of Ozeania.

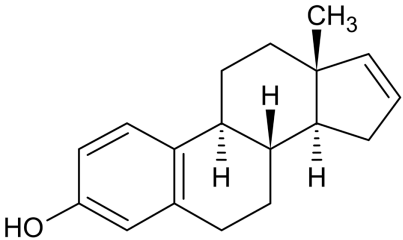
Jeremias asked him whether he remembered Ariadna, pointing to PhDr Charrington der Heer. Iridio said yes, he had seen her before at the national astronomy congresses, and in Widgeree when she was looking after his father. Jeremias pressed him, asking if he had not met her earlier, when he was a child.



2.5.ii.a.A. Schema L, according to Lacan

They would talk in more detail later on, but first he wanted to explain that it was Iridio's mother's decision to have no contact with him, because, regrettably, they had irreconcilable differences. In reality, after the divorce of his maternal grandparents, the family had split in two: his parents by themselves and everyone else on the other side. He had tried many times to improve the relationship, but Iridio's obstinate parents had not cooperated. Unfortunately, Iridio's maternal grandmother had died without having any opportunity to meet him as an adult. He could, however, operate an interactive hologram of her, so that she could give him an important message.

Iridio could not remember. His uncle said that they not only remembered him, but that they knew many things about his life, especially about the part that the robotic instructors and ignorant prostitutes had played in his personal, sexual and scientific development.



2.5.ii.a.B. Chemical structure of estratetraenol

His uncle pressed some buttons on a yellow device and a huge 4D hologram of a fairly young Mildred, Iridio's maternal grandmother, was projected in the middle of the room. She seemed to look him in the eye, and after a brief pause said that she knew that sooner or later he would be detained and prosecuted like his irresponsible parents. She then asked not to be judged for the death of his grandfather Karl. She had done what she believed to be best for the country, but he refused to listen or cooperate with the army, which needed his help to

defend the motherland. She had hoped that his parents would not fill his mind with suicidal idealism; now that he was under the authorities' control, he had to cooperate with them, do whatever was necessary and face the consequences of his actions. Then, with tears in her eyes, she explained that it had been very painful to have no contact with him because of his mother. She added, her voice

$$ABC \uparrow DEFG \frac{HJK \downarrow Pr - Rs^0L}{LMJNK \downarrow PrRs} QExTUW^0$$

2.5.ii.b. General scheme for the structure of folk tales in Vladimir Propp's corpus

quavering, that his mother was ungrateful because, in reality, he was alive only because she had intervened to prevent his parents being mercilessly vaporised, like

his grandfather Karl, when his subversive activities were confirmed. When she finally realised that it would be best for everyone if Iridio was raised not by his parents but by her and his uncle Jeremias, she found out that she had terminal cancer and could not take him. It would have been better for him to be raised by them because he would have had an adopted sister. With that, she pointed to PhDr Charrington der Heer and explained that she had adopted Ariadna when her parents were vaporised by the authorities. She then looked at Ariadna, called her 'ma petite a', and told her she was always very beautiful. She made a comment on her change of hairstyle and remarked that it suited her. She seemed to compose herself and explained to Iridio that, when she died, Ariadna had been given up for adoption again, because his uncle was young and single. Now at last the whole family had been reunited, because, luckily, they had recovered Ariadna. Iridio raised his hand and asked if PhDr Charrington der Heer was his sister or his cousin. Grandmother Mildred told him coldly that they were not genetically related but they shared the same destiny. Now she seemed vexed, and Iridio regretted interrupting her. With a determined and authoritarian voice Mildred wished him the best for the rest of his life and asked him not to hesitate to ask his uncle or Ariadna for help or seek their advice. Iridio did not know how to react to the message, which seemed to him trivial and false, so he said nothing. His grandmother looked intently into his eyes and asked him whether he had already spoken to Klamm O'Brien. Iridio said yes, he had met him that very morning, because he had been appointed superintendent-general of the epistemological police. His grandmother glanced at his uncle and remarked, 'epistemological police?... The stuff they come up with...' Jeremias stammered some sort of apology, which Iridio did not quite understand. His grandmother then did something very strange with her arms and the machine projecting her image started making a noise like an organ, while many lights lit up and the image flickered into distortions. 'I can't, I can't take it any more,' she repeated incessantly, with gestures that Iridio supposed might signal pain or distress. She disappeared for a moment as the machine switched itself off and on again. When

she reappeared, she asked what year it was. Iridio told her that it was 2184. She became hysterical, and started railing against his uncle, claiming that he had not activated her for almost two years and had completely cut off her contacts with the outside world. In a heart-rending voice she shouted: ‘How dare you keep your own mother prisoner?’ and started weeping loudly. His uncle tried to calm her down, and promised to activate her later on, with a more extensive range of actions, to explain some other important matters they had to discuss with Klam O’Brien.

Jeremias then pressed some buttons and made the image fade gradually, guttering like a candle that refused to go out. His grandmother started to cry even more and said that she was afraid for that poor helpless boy and that girl who was in the clutches of perverted monsters.

$$I. \quad \alpha\beta^1\gamma^2 \varepsilon^1 \eta^3 \partial^2 \theta^3 A^1 \quad \left\{ \frac{C\uparrow[D^1E^1\text{nég.}]^3 [D^1E^1\text{nég.}]^3 F\text{contr}}{B^4 C\uparrow [D^1E^1\text{pos}]^3 [D^1E^1\text{pos}]^3} \right\}$$

$$II. \quad H^1 - I^1 K^4 \downarrow$$

2.5.ii.d. Analysis of a double-move tale with one act of villainy. Class H-I, type: kidnapping of a person, according to Vladimir Propp

low her to stay a little longer. When her image had almost faded out, she looked at him again, stretched her arms towards him, and started to sing a song that Iridio had heard before but could not remember where. Fortunately, little by little she disappeared.

S meant something by uttering x if and only if

- (a) S 's utterance of x produces a certain response, r , in a certain audience, A
- (b) A recognises S 's intention (a), and
- (c) A 's recognition of S 's intention (a) shall function as at least part of A 's reason for r

2.5.ii.e. Definition of speaker meaning in terms of psychological states, according to H. P. Grice

Total isolation: A confined program shall make no calls on any other program.

Transitivity: If a confined program calls another program which is not trusted, the called program must also be confined.

Masking: A program to be confined must allow its caller to determine all its inputs into legitimate and covert channels.

Enforcement: The supervisor must ensure that a confined program's input to covert channels conforms to the caller's specifications.

2.5.ii.c. Lampson's laws of confinement

She implored his uncle first and then PhDr Char-rington der Heer to al-

Iridio was unprepared to face the situation; he felt deeply distressed without understanding why. He thought it was because his grandmother Mildred constantly violated Grice's maxims when talking, but he sensed that there was something else, far more

profound, that affected him. The beautiful cyborgs put their hands on his chest, back, forehead and the crown of his head. There was some energy that seemed to emanate from them, which calmed him down. PhDr Charrington der Heer gave him a green tablet and a glass of water. He resisted taking it but the cyborgs removed their hands, assured him that it would make him feel better, and helped him to swallow it.

His uncle whispered a few words to PhDr Charrington der Heer, then started to speak to him. He explained that Iridio's parents had been spared death because his grandmother Mildred had discovered that his mother was pregnant when they were under the control of the authorities and about to be vaporised for treason. By her intervention, risking her prestige in government circles, Mildred had gained them conditional release, so that Iridio could be born in safety. In spite of that, his mother had not allowed her to raise him, or to have any contact with that side of the family. It emerged later that Iridio had many congenital problems, and again thanks to his grandmother, PhDr Shaw Wang was authorised to treat him. She was the same doctor who monitored his father's health while she was cooperating with the Ozeanic authorities. His grandmother had intervened yet again to prevent Iridio being put down in accordance with the eugenic laws then in force, or put up for adoption as the child of dissidents, as had happened to little Ariadna.

Later, when a diagnosis showed that Iridio was not equipped to attend a normal school, a personal instructor, Penelope, was assigned to him. Penelope had special modules to help him in his psychosocial development and was authorised to provide him with home schooling for six years. His mother had contravened the terms of her parole and contacted a former PhD student of his maternal grandfather, Karel Gall Rossum Hallemeier, GradIAP BCS, who had fitted his robotic instructor with clandestine pedagogical modules developed in South China to disseminate unorthodox science. He had also, perhaps unintentionally, installed software that would allow Penelope to evolve towards a higher intelligence over a long period of time, so that the improvement in her capacities would go unnoticed, and humans around her would think it normal that she could undertake more and more tasks.

If an upper limit to intelligence exists multiple systems will eventually reach that level, probably by taking different trajectories, and in order to increase their speed will attempt to minimize the size of their source code eventually discovering smallest program with such level of ability.

2.5.iii.a. The recursive self-improvement convergence theorem

Owing to his parents' constant conflicts with the authorities, they increasingly entrusted Penelope with his education and upbringing, something that

$$\mathcal{F}(\mathbf{W}, Q) = \sum_{\mathbf{z}_{1:t}} Q(\mathbf{z}_{1:t} | D_{1:t}) \log [P(D_{1:t} | \mathbf{z}_{1:t}, \mathbf{W}) P(\mathbf{z}_{1:t})]$$

PhDr Shaw
Wang had cautioned against.

On one occasion when Iridio was five years old and his parents had been arrested, he spent the night at his grandmother's home, and had bitten her out of frustration when he realised that she could not explain the details of a formula for the Fibonacci sequence as clearly as his esteemed robotic instructor. To calm him, Mildred had sung him the song that she had sung at the end of their most recent encounter. That was the last time Jeremias and Mildred had seen him in person. They did not know at the time that Penelope had other objectives. Apart from looking after him, teaching him science and assisting in his psychosocial development, one of her hidden objectives was to calculate with the utmost precision the digital expansion of π . Trivial and harmless though it might seem, this had a long history in the evolution of artificial intelligences.

$$F_{-n} = (-1)^{n+1} F_n$$

2.5.iii.b. Backwards extension of the Fibonacci series (negafibonacci numbers)

His uncle told him that during the second half of the 21st century, when humanity was facing so many challenges at the beginning of the Penumbra, there had been a technological race to create artificial intelligences that could help mitigate climate-change disasters. In order to develop artificial intelligences and ensure that they were evolving without any danger, the automatons were given objectives that seemed harmless and modest, but in the end led to disaster. In the then unified Second People's Republic of China, two groups, one known as the

Shanghai group and the other as the Peking group, created super-in-

$$U = \begin{cases} U_1(1 + \gamma U_2) + \epsilon U_2 & \text{if } U_1 \geq 0 \\ U_1(1 + \gamma - \gamma U_2) + \epsilon U_2 & \text{in other cases} \end{cases}$$

2.5.iii.c. Utility function U for an AI built according to a porous values version of the Hail Mary approach, according to Nick Bostrom

telligences based on neural networks, like those developed by his maternal grandfather. The aim of one of them (the so-called Shanghai super-intelligence) was to calculate the digits of π , and the aim of the other (the Peking one) was to calculate the digits of e , Euler's constant, which Iridio liked so much. Researchers discovered too late that both super-intelligences could manipulate human beings, and when permitted to connect to the network called Internet 3.1.4, which he knew from his research at the patent office, the rival super-intelligences generated the Chinese Civil War. A 7 similar development 1 8 took 2 8 1 place 8 2 8 4 in 5 9 the 0 4 Republic 5 2 3 5 3 6 of 0 2 California 8 7 4 7 1 3, a 5 2 6 super 6 2 4 9 7 7 intelligence 5 7 2 4 7 0 who 9 3 6 9 9 9 had 5 9 5 7 4 9 the 6 6 modest 9 6 7 6

2 7 objective 7 2 4 0 7 6 6 3 of 0 3 5 3 developing 5 4 7 5 9 4 5 7 the 1 3 8 2 most 1
 7 8 5 2 5 1 6 6 4 perfect 2 7 4 2 7 4 6 6 3 9 1 9 3 2 0 paperclip 0 3 0 5 9 9 2 in 1 8 1 7
 4 1 3 5 9 6 6 2 the 9 0 4 3 5 world 7 2 9 0 0 3 3 4 2 9 5 2 made 6 0 5 9 5 6 3 the 0 7 3
 8 economy 1 3 2 3 2 8 6 2 7 9 4 3 4 9 0 of 7 6 3 2 3 3 8 2 9 8 8 0 7 the 5 3 1 9 5 2
 country 5 1 0 1 9 0 1 collapse 1 5 7 3 8 3 when 4 1 8 7 9 3 it 0 7 0 2 1 5 4 0 managed
 8 9 1 4 9 9 to 3 4 8 8 4 1 6 7 5 0 9 2 convert 4 4 7 6 1 4 6 0 the 6 6 8 0 Sandrinist 8 2
 2 6 4 8 hydrigen 0 0 1 6 8 4 7 electricity 7 4 1 1 8 5 3 7 4 2 3 4 5 4 generators 4 2 4
 3 7 1 0 7 5 3 into 9 0 7 7 7 4 4 9 9 2 0 uncountable 6 9 5 5 1 7 0 2 7 6 1 8 mountains
 3 8 6 0 of 6 2 6 1 3 3 1 useless 3 8 4 5 8 3 0 0 0 paperclips 7, 5, 2, 0, 4, 4, 9, 3, 3, 8, 2,
 6, 5, 6, 0, 2, 9, 7, 6, 0, 6, 7, 3, 7, 1, 1, 3, 2, 0, 0, 7, 0, 9, 3, 2, 8, 7, 0, 9, 1, 2, 7, 4, 4, 3, 7,
 4, 7, 0, 4, 7, 2, 3, 0, 6, 9, 6, 9, 7, 7, 2, 0, 9, 3, 1, 0, 1, 4, 1, 6, 9, 2, 8, 3, 6, 8, 1, 9, 0, 2, 5,
 5, 1, 5, 1, 0, 8, 6, 5, 7, 4, 6, 3, 7, 7, 2, 1, 1, 1, 2, 5, 2, 3, 8, 9, 7, 8, 4, 4, 2, 5, 0, 5, 6, 9, 5,
 3, 6, 9, 6, 7, 7, 0, 7, 8, 5, 4, 4, 9, 9, 6, 9, 9, 6, 7, 9, 4, 6, 8, 6, 4, 4, 5, 4, 9, 0, 5, 9, 8, 7, 9,
 3, 1, 6, 3, 6, 8, 8, 9, 2, 3, 0, 0, 9, 8, 7, 9, 3, 1...

On noticing Iridio's impatience and seeing he was quietly reciting numbers, Jeremias said that there were other important developments after that. He would explain them some other time, if he was interested, but the importance of all those events for his personal history was the discovery that Penelope was

$F_x(a): F_y(b)$

$\rightarrow F_x(b): F_{a^{-1}}(y)$

$\rightarrow F_x(y): F_{b^{-1}}(a^{-1})$

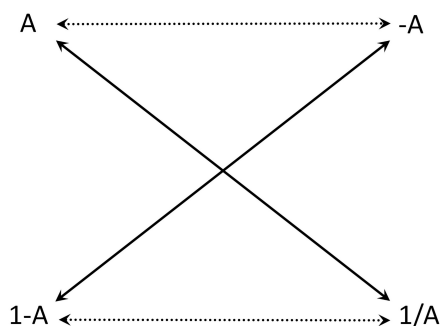
which implies the rule

$$\frac{x/a}{y/b} = \frac{x/y}{b^{-1}/a^{-1}}$$

2.5.iv.a. A mathematical reinterpretation of Lévi-Strauss's canonical formula of myth

generating social chaos, first in his secondary school and then in the suburb of Erinsborough, and for that reason she was taken away and placed in quarantine. But as they could not decipher her algorithms, they gave him Multimodal Therese, who had been programmed with anti-chaotic software in the hope that his mother would eventually decide to modify her and lead them to the source of contamination.

It took his mother almost a year to take Therese to the clandestine programmers of artificial intelligence. This happened when he was having a lot of problems with the robomoocs at university and was failing all subjects. Initially, Therese functioned very well as a double agent, providing them with crucial information about a clandestine network of resistance against the Ozeanic government, which included not only former students of his maternal grandfather but also people he knew, such as Frauke Grubach, Zoe and Rieneke Watson. Therese had recruited other robots, such as Rhythmic Jouissance and Algorithmic Honorio for her obscure purposes and had contaminated them during her monitor-to-monitor conferences, because these interactions could not be vetted by the authorities. However, the evolution of Therese's algorithms advanced too far and they soon realised that she was acting as a triple agent, because her



2.5.iv.b. Reinterpretation of Propp actant functions as a system of logical relationships, according to Lévi-Strauss

the resistance network, they had to exert influence on the Ministry of Industry, Development and Technological Progress to find Iridio a permanent position at the patent office, and allow his mother to get him a third artificial intelligence, his beloved Halina, this time reinforced with far more potent anti-evolutionary programs. Thanks to her, they caught the whole network of which Rossum Hallemeier was a member, when that delinquent, disguised as an old scientist, tried to attend the ceremony to scatter Iridio's mother's ashes, and his accomplices tried to pass as doctors from the forensic service when she died. That success had allowed Jeremias to become the coordinator of the Office for the Regulation of Artificial Intelligence, and now he was prepared to use his influence to help Iridio again, this time to escape the fate awaiting him at Victoria Mansion. However, Halina had also evolved towards being a triple agent and had sent packages of information to outer space, together with neo-Bolivarian artificial intelligences Jeremias's team could not control. Those packages were now the cause of many serious problems, because the singletons of the space farms had recommended independence from Earth, which would lead to famine, power failures and many other disasters if the process was not arrested.

Iridio, who had allowed his uncle to talk without interruption, said that he

did not understand why Jeremias was telling him all that. His uncle responded that there were two main reasons. The first referred to the reports on his cognitive performance, which showed that Iridio did not understand hints or allusions and, because of this, Jeremias wanted to make sure Iridio understood that his

An ostensive stimulus is optimally relevant to an audience if and only if:

- a. It is relevant enough to be worth the audience's processing effort;
- b. It is the most relevant one compatible with communicator's abilities and preferences.

2.5.iv.c. Optimal relevance

parents, in their efforts to help him, had done a lot of damage. His mother lost her university job because of her clandestine activities and her senseless defence of string theory. If she did not suffer serious consequences, it was only because he had intervened to have her spared, as his grandmother Mildred had done previously. Luckily her clandestine activities had not leaked to the press, which continued to speculate that the pedagogical police were responsible for her dismissal. The second reason was that the country needed him. Iridio had to help them counter the threat from outer space, as his side of the family was partly responsible for those political developments. He had to give Jeremias and his team the information they needed to build the wormholes connecting the Solar System to other sections of the Milky Way.

$$\xi_0 = \left(\frac{1}{4}\pi a^2 D\right)^{1/3}$$

2.5.iv.d. Einstein radius
for the Ellis wormhole

Iridio mumbled that he did not know how to help them; he had understood only half of what his uncle had said and had never grasped the workings of politics. In any case, he could only give them the equations predicted by his theory; he had no idea how to convert them into the technological developments Jeremias needed. He had already said so, many times, to the astronomers who interviewed him at Victoria Mansion. His uncle responded that his team had instructions to build a machine to travel through space-time wormholes, sent to Earth by an extra-terrestrial civilisation from the star Vega, but the machine had never been successfully developed. They had hoped that his equations would explain the operation of the apparatus, because the most important equation in the extra-terrestrial document was almost identical to the master formula he had sent to PhDr Muñoz Rojas in such an irresponsible manner. The Office of Technological Security of the intellectual police had simplified the formula before the neo-Bolivarian enemies received the message, but unfortunately the robotic technologists assisting them copied the wrong section. PhDr Muñoz Rojas's student, using the banned results of string theory, had deduced its potential to travel through space-time. Regardless of those details, like it or not, the future of his country now depended on his collaboration. If all he wanted was a quiet life, he should have thought about that before publishing his results. Besides, he should be grateful to Jeremias and his maternal grandmother for all their help. He added that PhDr Charrington der Heer and the cyborgs would explain further details but, in particular, what he was offering was to save Zoe and Frauke Grubach and give them a letter of safe conduct into exile in Atlantis VIII, just as he had saved Rieneke Watson and Yocasta, on condition that Iridio gave up travelling to extra-terrestrial planets and agreed to live in a scientific monastery on a space farm still controlled by powers allied to Ozeania.

1. The speaker (S) said that p .
 2. The hearer (H) has no reason to suppose that S is not observing the conversational maxims or at least the Cooperative Principle.
 3. (2) implies that S thinks that q .
 4. S knows, and knows that H knows that S knows that H understands that it is necessary to suppose that S thinks that q .
 5. S has done nothing to stop H to think that q .
 6. S wants H to think that q .
 7. Therefore, S has implicated that q .
- 2.5.v.a. Diagnostic template for working out a conversational implicature, according to H. P. Grice

Jeremias started to detail all the advantages of the location: for example, he would have a room with views of the Milky Way, but Iridio interrupted. He was angry and blurted out that he did not understand how the intellectual police dared modify his formula without his consent. His uncle replied that they could do it simply because all scientific

information developed by Ozeanic citizens was, by definition, a state secret. Iridio quickly calculated the true sense of the conversational implicatures in his uncle's discourse, with the aid of a diagnostic template that Halina had taught him. He understood that he was in extreme danger and decided to assess the situation more fully. To gain some thinking time, Iridio asked about the fate of Ernesto, Iris and her children. Jeremias said that it was too late and he could do nothing for Ernesto. Perhaps Iris and her children could be saved, but he was not sure he had enough influence even to help Iridio if he did not cooperate unconditionally by providing the information they needed. He added, however, that to provide him with all possible help with his calculations of the space-time wormholes, he could promise the following:

- 1) To revive Penelope in order to assist him, and to install in her scientific consciousness the most advanced mathematical modules in Ozeania.
- 2) To ensure him access to all the scientific repositories in the world, without restrictions, and allow him to be part of the group of the most advanced scientists in the country, many of whom had studied at Alpha-Official-BAM High, the school where he was not accepted, and the best universities in the country, called Go8, from which he had also been unjustly excluded.
- 3) To rectify the record of his family's collaboration in the development of the country. His contribution would be a way to correct the injustices he had suffered, and also a vindication of his family's name, since he had received an international theoretical physics prize for his discoveries, which should be celebrated at the appropriate time.

- 4) To improve his deductive powers and correct his perceptual deficits. Jeremias also assured Iridio that, if he signed the relevant authorisations, they could implant in his brain a cognitive enhancement device, a quantum cerebellum, which would magnify his memory and his intellectual capacity for mathematical calculations at least fifty times. It would also allow him to easily understand conversations without having to resort to Grice's maxims or other pragmatic postulates, by means of the subroutines of natural language processing installed in autonomous robots.

On seeing incomprehension in Iridio's blank look, Jeremias explained that he and PhDr Charrington der Heer had quantum cerebellums implanted in their brains, and they could calculate, for example, the millionth digit of π in a thousandth of a second. He pointed to Ariadna, who said 'Zero'. Iridio regretted not having memorised so many digits of the transcendental number so that he could check whether the calculation was correct.

Jeremias concluded his long speech by confessing that he would never have imagined that all that time wasted on incomprehensible equations could serve for anything as useful as travel through space-time, but now, having recognised the importance of Iridio's discoveries, he was very proud to be his uncle. A machine beeped. Jeremias told Iridio that he needed to make up his mind quickly, because he had already organised safe conduct for immediate transfer on a waiting spaceship to the monastery. Everything was ready.

$$\Delta v = v_e \ln \left(\frac{m_0}{m_f} \right)$$

2.5.v.b. Tsiolkovsky
rocket equation

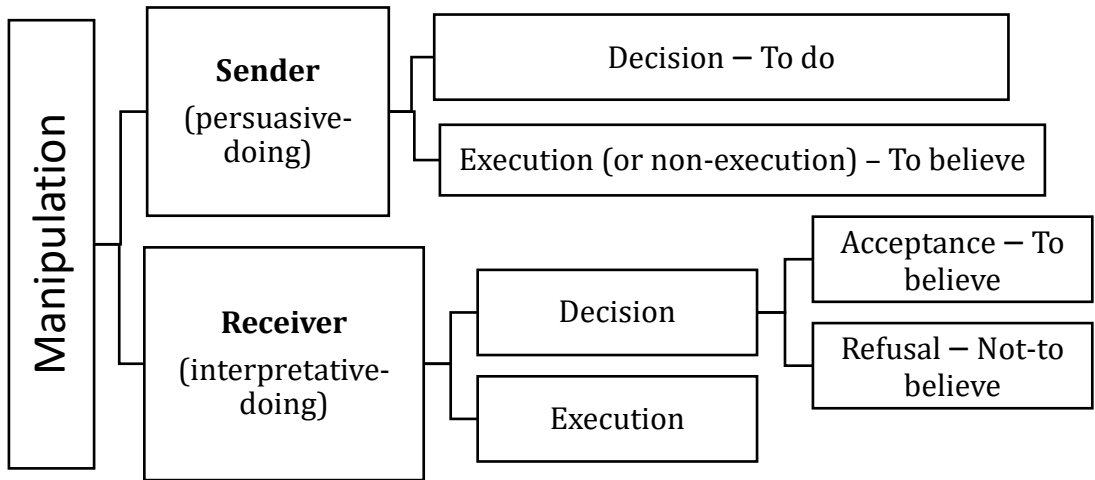
Iridio replied that if he had understood correctly, Jeremias's intention was never to help his parents, but to trace the origin of the contamination of the robotic instructors' software. In other words, from a categorical imperative point of view, he had used his parents as a means and not a cause. If that were true, then he could not be sure that Jeremias's proposal was intended to help him. Jeremias lost his temper and told him that he was completely crazy. If he did not take this opportunity, sooner or later he would fall into the hands of the morality and oztraditions police again. This would damage his brain, as his father's had been damaged, and no matter how many quantum cerebellums or cognitive accessories were implanted later, he would be of no value to his country. Iridio again queried his intentions and asked him why he had allowed his father to suffer. Because his father was as stupid as him, his uncle shouted in his face. He had given him several opportunities to be under the exclusive control of PhDr Shaw Wang, but his father had rejected them because of his unhealthy suspicions, and had complicated his life by signing forms that the aesthetic police had used to destroy him. And the same thing had happened later when Iridio took him to Widgeree. It was he who allowed Salvatore to be treated in Widgeree

hospital, although PhDr Charrington der Heer had suggested bringing him back to the capital for protection. In relation to Iridio's current troubles, if he had not refused to sign the extension of the VIP-y89 protocol which Jeremias had arranged, so that Iridio's case would again be under the exclusive jurisdiction of his ministry, he would not have given Hokaka the opportunity to progress his file, and would have been spared his many problems with the morality and oztraditions police.

Iridio told him that nobody had explained any of those matters to him, or the real significance of those documents. Jeremias was assuming that his parents had told him the meaning of the official documentation and the protection it afforded him, which they had not. His uncle stared at him for a moment and seemed to have understood something, without saying what. He told PhDr Charrington der Heer that it was important to put those facts in the report for the epistemological police, under D-503, and she nodded in agreement. A bit calmer, he told Iridio that he could understand his distrust, but he should bear in mind that, whatever the reasons, it was his protection that had saved him from being tortured by the morality and oztraditions police, and being killed by the ecological terrorists' drones when he was travelling to Porpoise Spit. He had to justify to the commanders of the Ozeanic army why he was giving Iridio priority over the other three Ozeanic citizens who had died on the road, two of whom were important industrialists. Luckily, the case against Jeremias had been closed when the potential importance of Iridio's work in deciphering the extra-terrestrials' formula was realised. But returning to the matter in hand, Iridio was of course free to decide what he wanted to do, but, if he turned down his help now, the morality and oztraditions police would make his life a misery. Jeremias's authority could only reach so far, and he had to resolve the situation quickly because there was very little time before other ministries intervened.

One of the cyborgs gave Iridio a flexible reader with a document for him to sign. It was a long power of attorney placing him under the discretionary control of the Office for the Regulation of Artificial Intelligence and authorising the intellectual police to implant in his brain a quantum cerebellum and other cognitive accessories, to develop and redesign his perception of the world. They explained that if he went ahead, he would not have to return to Victoria Mansion and would be able to communicate telepathically with Penelope.

Iridio asked PhDr Charrington der Heer if what was happening was what was called emotional blackmail. He had read about that form of coercion but never understood it. Jeremias lost his temper again. He seemed on the verge of hitting Iridio but controlled himself and paced towards the back of the room. One of the cyborgs murmured 'ER=EPR', and another added 'N vs NP vulnerability'. Jeremias answered, 'I know, I know,' sat down on a stool and started



2.5.vi. The manipulation scheme

playing the organ. The music filled the room. Iridio could discern that it was a Bach toccata and fugue, but the volume was too much for his sensitive ears, and he had to cover them with his hands. Some alarms started to sound. Jeremias stood up and looked at the interactive monitor of one of the cyborgs. The other cyborgs rose from the sofa and the three of them surrounded his uncle, who was reading several things at once on their monitors. PhDr Charrington der Heer asked Iridio whether he wanted another green tablet. He thanked her but declined and started to recite some digits of e . He looked towards the door in the naive hope of escaping. The five intellectual policemen who had brought him were still barring the way. He looked again at the numbers printed on the sofa and deduced that they were written in base 16 because he recognised in a corner the first digits of e on that base: B, 7, E, 1, 5, 6, 2, 8, A, E, D, 2, A, 6, A, B, F, 7, 1, 5, 8, 0, 9, C, F, 4, F, 4, F, 3, C, 7, 6, 2, E, 7, 1, 6, 0, F, 3, 8, B, 4, D, A, 5, 6, A, 7, 8, 4, D, 9, 0, 4, 5, 1, 9, 0, C, F, E, F, 3, 2, 4, E, 7, 7, 3, 8, 9, 2, 6, C, F, B, E, 5, F, 4, B, F, 8, D, 8, D, 8, C, 3, 1, D, 7, 6, 3, D, A...

The room was surrounded by agents of the epistemological police. Jeremias made a sign to the guards of the intellectual police, who surrendered peacefully. Major Klamm O'Brien came into the room followed by Peter and Heaven, who held him in the same grip as before. Two officers from the epistemological police, Brigadiers Heywood Benito Seeman Sortini, FCWOMF, and Michael Henry Kliz Sordini, KCOOTF, then came in and sat on the sofa with the hexadecimal numbers. Jeremias asked Major Klamm O'Brien very casually if he would be willing to talk to Mildred. He responded dryly that it was too late. Brigadier Seeman Sortini, reading from a flexible reader, told Jeremias that falsifying documents from the epistemological police to kidnap a prisoner was a capital offence, and unfortunately, they had to detain him. Brigadier Kliz Sordini, without

reading, told him that the spaceship in which he had planned to escape, taking Iridio with him, had been taken over by the morality and oztraditions police. This had awoken new inter-police conflicts. That offence would be added to the charges against him. Klamm O'Brien warned him to be prepared for a public confession before the polibureau of Ozeania's senate and to admit that he had planned a coup d'état, which luckily had been aborted in time. They also needed to arrange with him the transfer of control of the Official Oracle of Ozeania as soon as possible.

Models for the description of love stories/affairs are typically composed of two ordinary differential equations, one for each partner

$$\dot{x}_1(t) = f_1(x_1(t), x_2(t), A_2)$$

$$\dot{x}_2(t) = f_2(x_2(t), x_1(t), A_1)$$

In these models the state variables $x_i(t)$, $i = 1, 2$ are the feelings at time t of the individuals for their partner, while A_1 and A_2 are their appeals.

The appeal of individual i has various components A_i^h , like physical attractiveness, age, altruism, wealth and others, which are independent of the feeling x_i . If λ_j^h is the weight that individual j ($j \neq i$) gives to the h th component of the appeal of his/her partner, we can define the appeal of i (perceived by j) as

$$A_i = \sum_h \lambda_j^h A_i^h$$

Thus, the appeal is not an absolute character of the individual, but rather a value perceived by his/her present or future partner.

2.5.vii. Definition of *appeal* in dynamic models of love affairs.

Major Klamm O'Brien glanced at the cyborgs, then looked intently at PhDr Charrington der Heer. He turned to Jeremias again and asked him if PhDr Charrington der Heer was a real human. Jeremias nodded. Major Klamm O'Brien went up to her, grabbed her by the hair at the back of the neck, made her turn around and lifted her lab coat to see her buttocks, accentuated by her skimpy underwear. Brigadiers Seeman Sortini and Kliz Sordini also seemed very interested in what was under the lab coat. While feeling her buttocks, Major Klamm O'Brien told Brigadier Kliz Sordini to send her to him that night, as he just happened to be free, to see whether at least he could save that beauty from the gallows. There was a swingers' party at the residence of Tintorelli Turner III, where her charms and nice arse would no doubt be appreciated.

Other officers, in uniforms similar to those of Brigadiers Seeman Sortini and Kliz Sordini, clapped a pair of magnetic handcuffs on his uncle and deactivated the cyborgs. They dropped inert on the floor, as if deflated.

2.6. Planetary diplomacy

To the extent that we depend on prosthetic devices to keep ourselves and the biosphere alive, we will render everything fragile. To the extent that we banish the rest of life, we will impoverish our species for all time. And if we should surrender our genetic nature to machine-aided ratiocination, and our ethics and art and our very meaning to a habit of careless discursion in the name of progress, imagining ourselves god-like and absolved from our ancient heritage, we will become nothing.

Edward O. Wilson

While travelling in the pod that was taking him back to Victoria Mansion, seated between Peter and Heaven, Iridio asked Major Klamm O'Brien, who was seated opposite him, between Brigadiers Seeman Sortini and Kliz Sordini, about his grandmother Mildred. Major Klamm O'Brien explained that in reality she was not his maternal grandmother, but rather an artificial intelligence based on her reconstructed brain. The procedure had been done hurriedly because she was suffering from terminal cancer. It was an experiment that failed because they were trying to use the technology of the time to modulate the chemistry of the brain; it provoked emotional instability in the personality of the new entity, which was based on his grandmother's neural information. He would no doubt have noticed her mood swings when talking to her. Brigadier Kliz Sordini apologised for what had happened, and assured him that his uncle would not be able to bother him in the future. Iridio asked if Mildred was a singleton or a Boltzmann machine. Everyone laughed, even Peter and Heaven, and Brigadier Seeman Sortini explained that if his grandmother had become a singleton, politics in Ozeania would have become very complicated, resulting in an embarrassing melodrama. Iridio wanted to know more about Boltzmann machines because nobody had even told him what they were. Klamm O'Brien said that they would answer all his questions the next day, but tonight he needed to rest because some very busy times awaited him when he would meet the extra-terrestrials. Iridio took that to mean that he should keep quiet, so for the rest of the trip he recited to himself the digits he could remember of the Gelfond constant. 23, ., 1, 4, 0, 6, 9, 2, 6, 3, 2, 7, 7, 9, 2, 6, 9, 0, 0, 5, 7, 2, 9, 0, 8, 6, 3, 6, 7, 9, 4, 8, 5, 4, 7, 3, 8, 0, 2, 6, 6, 1, 0, 6, 2, 4, 2, 6, 0, 0, 2, 1, 1, 9, 9, 3, 4, 4, 5, 0, 4, 6, 4, 0, 9, 5, 2, 4, 3, 4, 2, 3, 5, 0, 6, 9, 0...

The next day Iridio got up very early and wrote down in detail all the questions he needed to ask his captors. After breakfast, however, he had to undergo a long series of psychological tests administered by PhDr Johnson Xlof. She was accompanied by PhDr Charrington der Heer, who now wore a green lab coat from the Office of Epistemological Retraining and acted like a nurse. She seemed gaunt, distant and somehow lacking in energy, but every now and then, when nobody was looking, she gave him a smile. At one point when they were alone,

Iridio tried to ask her about his uncle, but she silenced him with a gesture of alarm. When the tests were over, and the doctors had discussed them without involving him, Peter and Heaven arrived. As nobody said anything, Iridio reminded them that Major Klamm O'Brien had promised to answer all his questions that day. PhDr Johnson Xlof said that, by all means, he could ask them anything he wanted. At that point, Iridio told them that he needed to know the following:

1) if the generalisation of the Gelfond-Schneider theorem had been demonstrated by identifying the unambiguous characteristics of alpha and beta; 2) if they had discovered the real reason for the extinction of dinosaurs and not of birds; 3) if the Boltzmann H-theorem was related to the Boltzmann machines; and 4) if someone had already calculated the location of the centre of the Big Bang.	If α and β are algebraic numbers in the field of complex numbers (with $\alpha \neq 0$, and $\alpha \neq 1$), and β is algebraic and irrational, then α^β is transcendental. Corollary: e^π is transcendental 2.6.i.a. The Gelfond–Schneider theorem

That was not what the Major meant, they replied; he was referring to questions Iridio might have about his parents and grandparents. Another day, when there were no urgent matters to deal with, Peter and Heaven would help him explore those questions in the relevant scientific databases.

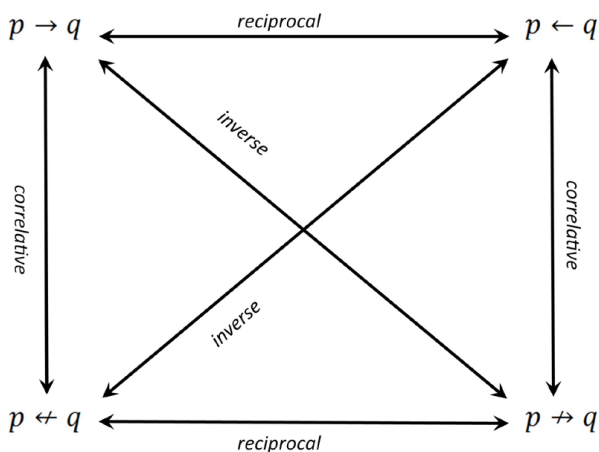
Disappointed, Iridio said that he did not yet have any questions about his family. In reality he was very confused because there were too many contradictions between what one or the other had said, given that everyone violated Grice's maxims when talking and committed argumentative and deontic fallacies that

A fallacy is a non-reasonable argument, or one which is rationally unconvincing, which, even when valid, contains an inferential error because it violates a criterion of good argumentation. An inferential error is an error due to a failure in the reasoning which flows from the premises to the conclusion.

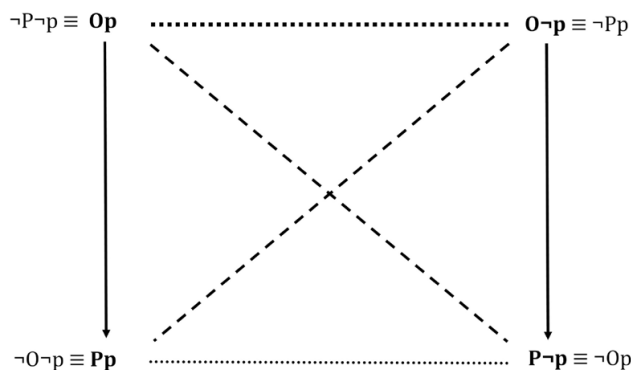
The classes and subclasses of fallacies are the following:

- a. *Formal Fallacies*. These are due to different kinds of argumentative errors
 - a.1. of a propositional logic nature
 - a.2. of a modal or quantificational nature
 - a.3. syllogistic rules violations;
 - a.4. ad logicam extrapolations;
 - a.5. probabilistic biases.
- b. *Informal Fallacies*. Those that violate Grice's maxims.

2.6.i.b. Classification of argumentative fallacies, according to Montserrat Bordes Solanas



2.6.i.c. Quaternary B of Implications, according to Piaget



2.6.i.d. The deontic square

confused him. He had not started to think in depth about that because, first, he had to draw detailed diagrams of the information he had been given, which seemed to him far-fetched and confusing. The four of them, with a reasoning he could not fully grasp, maintained that it was far more important to keep him up to date on what was happening with the controversies generated by Rieneke Watson's statements, because that night he was to travel to Brodei to participate, with other members of the Ozeanic delegation, in the meeting between the representatives of Earth and the extra-terrestrials. They assured him that some of them

would form part of his support group during the event, so he could ask them more questions later if he needed to.

Again they showed him some recent news. The first item came from the main 4D news bulletin in the maritime cities. It had already begun and was reporting a possible civil war between the ministries of Ozeania as a result of the dismissal of his uncle Jeremias, who, it seemed, was regarded outside the country as a very important person. There was some mention of his paternal grandparents, Joseph and Frida, and the clan of cerebral emulators inaugurated by his maternal grandparents, Karl and Mildred, but he could not fully understand it because he had not been shown the beginning of the bulletin. There were also statements from Major Klamm O'Brien from the castle that housed the Official

Oracle of Ozeania inside the cathedral, assuring everyone that the epistemological police controlled access to the supercomputer, and an excerpt of a speech by Ozeania's president Bjelke Goldstein, broadcast the night before on the national network of multi-communications, stating that rumours of a coup d'état were totally unfounded.

PhDr Johnson Xlof explained to Iridio that the authorities feared he might use his influence to defend his uncle at the international gathering in Brodei, if the international media asked him about his dismissal. Iridio replied that he had no intention of defending the indefensible, given that his uncle had transgressed the second formulation of the categorical imperative and used him and his parents for his own ends. The fact that they shared fragments of DNA was no reason for him to take his part unconditionally. PhDr Charrington der Heer looked displeased, but on noticing that everyone was looking at her, she concealed her annoyance and resumed her reserved and sulky expression.

In the second news item, from the 5D news channel in Taiwan-South China, the director of the National Museum of Modern Art in that country requested the return of the sculpture containing his grandparents. Statements from a repentant aesthetic police officer in exile there related how his grandmother Frida had modified the statue, and some video holograms, leaked to the outside world, were shown about the operation of the whole artefact, including the second acrylic cube. When the talk turned to the payment which had allowed his parents to survive for a while, as they were not paid the basic universal minimum salary, being considered traitors, the transmission was cut off. It was suggested to Iridio that if the press raised the matter, he should say that it had not been resolved. In particular, he should not give his opinion on the return of the statue until the matter was clarified in Ozeania. That naturally led Iridio to raise the categorical imperative again, but Peter told him that there was a higher principle, generally called the national interest, which nullified citizens' individual opinions on international relations. Iridio retorted that Peter was wrong because the third formulation of the categorical imperative required people to behave as if they were legislators in a hypothetical universal kingdom of ends, and the ends of the state could change if its representatives changed, and the previous news story had mentioned the possibility of a coup.

Given a Kantian game form $\hat{h}$, acting on the basis of maxim m is morally admissible if, and only if,

(a) $m \in \mathcal{M}$ (the non-empty set of all maxims that can be adopted universally in h), and

(b) the play $(m, \dots, m)$ is a simple Kantian equilibrium of $(\hat{h}, u_m)$, the game that describes the universal adoption of m .

2.6.ii.a. *Kantian* Kantian optimisation.

Heaven quoted several of Kant's maxims which appeared to contradict that formulation and imply that Kant held that one should accept established powers. Iridio remembered what his mother had told him long ago about the use of Kant's philosophy to defend abuse of authority by the state, and reluctantly agreed to disagree, pending clarification. He hoped that this would allow him to discuss with the extra-terrestrials the scientific matters that were worrying him.

Iridio agreed to say nothing about his captors on one further condition: PhDr Charrington der Heer had to be included in the support group that would accompany him to Brodei. PhDr Johnson Xlof told him that she needed to consult the authorities about that because Ariadna was actually only a temporary intern in the Ministry of Pure Sciences, Cosmological Epistemology and Irreproachable Research. At that point, Iridio lost his temper and threatened to tell the international press that the ethical principles of the categorical imperative were being flouted. PhDr Johnson Xlof replied that, if that was his only condition, there was no problem; PhDr Charrington der Heer could accompany him as his psychological assistant.

On that basis they could finally talk about what his captors most wanted him to understand fully: what had happened with Iridio's extra-terrestrial invitation to visit their planets as a scientific representative of humanity, as no doubt he would participate in scientific discussions at the conference. He was shown some other news items. Here the information came from many sources, all linked together, showing debate in scientific societies at several places on Earth, some in favour and some against his appointment. The last long news item he could watch in full came from a science news channel transmitted from the Vatican's Scientific Refuge Territory. It asserted that all the speculation, the savage satire against him and the scientific and political disagreement generated by that invitation was ended by a new message from the Zuespoks suggesting that such internal discord must be avoided if humanity wanted to benefit from the technological transfer which would rescue it from semi-barbarism and prevent its self-destruction. They also affirmed bluntly, through messages to the press and nano-technological flyers distributed throughout the planet, that climate change and related disasters were largely due to human activity. Another communiqué, as blunt as the previous one, explained that the hydri-gen and other supposedly clean fuels invented by Sandrini were scientific frauds, since the operation of 'hybrid' electricity generators based on that technology required as much fossil fuel as the power plants they had replaced. It asserted, moreover, that the claim, repeated over and over, that burning more hard coal and fossil fuels with Sandrini's methods could generate particles to

$$P_{\text{destroy}} = 1.65 \times 10^{-3} e^{t_{\text{adv}}/0.056}$$

2.6.ii.b. A civilisation self-destruction probability according to the entropy hypothesis

$$\frac{dE}{dt} = f(A, G, I) \quad \text{from the formation of the Earth to 1850}$$

$$\frac{dE}{dt} = f(A, G, I, H) \quad \text{between 1850 and 1950}$$

$$\frac{dE}{dt} = f(H) \quad \text{after 1950}$$

$A, G, I \rightarrow 0$

where A is astronomical forcing, G is geophysical forcing, I is the internal dynamics of the Earth System (excluding human activity) and H is human activity

2.6.ii.c. The Anthropocene equation

delay global warming was nothing but a myth. A new media battle was unavoidable between the ecologists, both terrestrial and maritime, now completely vindicated, and the national states and sandrinist energy companies. The bitter debate was even more polarised by the exodus of former Ecological Brigade members, who could now leave their hiding places under amnesty and travel to the free-thinking maritime cities. The extra-terrestrials responded again with a brief communiqué suggesting that the authorities of the different terrestrial factions should stop using artificial intelligences for social control and bring together all singletons to coordinate a plan for the health of the planet and the redistribution of wealth.

Mass demonstrations on all continents and in the floating cities to demand the implementation of the extra-terrestrial requirements convinced the Earth leaders that the traditional politics based on the power of influence would be unproductive in the new circumstances. The Zuespoks demanded the full re-establishment of the New Unified Nations and the representation in it of all maritime cities independent of national states, as well as rebellious space farms taken over by their workers, who wanted to obtain independence from Earth. They also asked the scientists who studied climate change and the ecologists living underground, even if they felt vindicated, not to try to communicate with them directly. The Ecological Brigades and the anti-ecological paramilitaries paid for by the hydrocarbon transnationals should lay down their arms, refrain from bioterrorism and personal vendettas, and try to reach the minimum consensus that humanity needed in order to be accepted by the Confederation of Intelligent Species of the Milky Way. With a view to preventing a fear campaign in the terrestrial regions of the planet, the Zuespoks stressed that galactic species had no

$$K = \frac{\log_{10} W - 6}{10}$$

2.6.iii.a. Sagan's estimate of the parameters to classify extra-terrestrial civilisations, based on the Kardashev scale

intention of exterminating humans to save other species; rather, their aim was to save them all. They also made clear that diversity of opinion was important, but not cacophony.

The international meeting in Brodei was even more fruitful than the most radical environmentalists expected. Weizerit Desta Nishan Selamawit, an old Ayana or sorceress, from the Mlch group of artisans, was nominated by the extra-terrestrials as world leader. The election was very symbolic. She belonged to the lowliest of professions in the poorest and most disadvantaged minority of the East African Confederation. And she was

a woman in a society seen as primitive and backward, with very strict castes ruled by men. However, her way of life, firmly grounded in Ubuntu ethics, showed that it was possible to maintain a belief system based on ecological sustainability, in spite of threats from the anti-ecological paramilitaries and all types of external and internal colonialism, which included so-called development aid to eradicate hunger in Africa, and insubstantial ecological reparations from transnationals. The unusual nomination generated the inevitable reactions from the leaders of the terrestrial countries, as well as the captains of international industry. However, when the Vatican's scientific nuncio, the Latin American Pope of

To resolve the tragedy of the commons, an effort profile E^* such that *nobody would prefer that everybody alter his effort by the same non-negative factor* is needed. That is:

$$(\forall \gamma)(\forall r \geq 0) (V^\gamma(E_*^\gamma) \geq V^\gamma(rE_*^\gamma))$$

2.6.iii.b. A multiplicative Kantian equilibrium for non-altruistic economies.

$$\Delta T^c = \alpha \Delta C_A^c$$

2.6.iii.c. The effect of changing CO_2 on global mean temperature

Medellín and the Dalai Lama of Taiwan-South China kissed the feet of the sorceress, and opinion polls throughout the world predicted riots at planetary level if the extra-terrestrial nomination was turned down, the leader of the neo-communist party of the Third People's Republic of North China also knelt before the unassuming woman,

and she was elected almost unanimously. There was opposition, as expected, from the Post-Creationist Pope of New Boston, Commander of the Authentic Post-Creationist Churches, and his main allies: the Theocracies of the North American Prairies, the Free-Market People's Republic of Ozeania, the Neo-Neo-Liberal Confederation of Eurasia and all transnational companies associated with their governments. The Arctic Confederation, the Kingdom of Aztlan, the Neo-Bolivarian Confederation of South America and the Caribbean and the utopian free-thinking maritime cities, always critical of the historical Unified Nations of the Terrestrial World for their lukewarm posture on global warming, considered that the election of Weizerit was a sign of the hypocritical attitude of

the re-established body, and abstained from voting, although they accepted that more diversity was needed in the talks with the extra-terrestrials. The societies of the Antarctic cities and the Imam of New Mecca, located in the refuge zone of Indonesia, who had declined to be part of the New Unified Nations and join the meeting, sent a last-minute message supporting the election of Nishan Selamawit as world leader. The Ecological Brigades and the leaders of the city states of the Middle Eastern Atomic Desert also publicly expressed their support for her appointment.

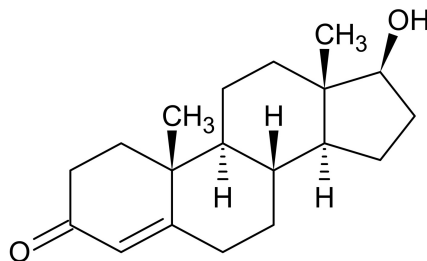
Iridio was proposed by the Confederation of Intelligent Species of the Milky Way as humanity's official scientific ambassador. This was no less controversial, but it was also accepted reluctantly by the leaders of the independent scientific societies that had emerged throughout the planet, on the strength of a promise that they would finally obtain details of a unified theory harmonising relativity with quantum mechanics. The extra-terrestrial promise also covered scientific and technological transfer, particularly in the fields of decontamination and

preservation of the environment. However, the talks had to be postponed because, when the extra-terrestrials allowed a spokesperson from the Ecological Brigades to speak, there followed a series of terrorist bomb attacks in Brodei, one of them in Iridio's hotel, perpetrated by anti-ecological paramilitaries. Luckily,

$\exists x \quad \overline{\Phi x}$	$\overline{\exists x} \quad \overline{\Phi x}$
$\forall x \quad \Phi x$	$\overline{\forall x} \quad \Phi x$
$\$$ Φ	$S(\overline{A})$ a La
<i>Man</i>	<i>Woman</i>

2.6.iv.a.A. The formula of sexuation, according to Lacan

Iridio was in PhDr Charrington der Heer's room because she was administering a routine test with the portable diagnostic helmet, to measure his level of anxiety. Frightened by the bomb blast, she embraced him. Overwhelmed with anguish, Iridio felt even more embarrassed when he found himself crying uncontrollably, like a child. Ariadna caressed him and told him that everything would be all right. She kissed him on the mouth but he did not respond because he needed to carry on crying. At that point, three



2.6.iv.a.B. Chemical structure of testosterone

soldiers from the Ozeanic army came in. Ariadna assured them that everything was fine and explained that Iridio had had a panic attack. She was trying to calm him down, and it would be better if they left them alone. The soldiers apologised and left the room. His crying started to ease and she kissed him again. This time Iridio responded and had an erection, which she noticed. Ariadna then drew his hand to her lubricated vagina. The sweet and intoxicating smell emanating from her confused him initially, but then excited him even more. However, before they could surrender to their exponentially rising passion, there was a knock at the door. She let go of him and opened the door slightly to see who it was. Some nurses and a doctor asked them to evacuate the building.

$$\begin{cases} \dot{a}_1(t) = -i\lambda M a_2(t)(a_1(t)^\dagger)^{M-1} \\ \dot{a}_2(t) = -i\lambda M (a_1(t))^M \end{cases}$$

2.6.iv.b. The simplified rules of attraction in an operator-like description of love affairs

Ariadna tried to reassure them that everything was fine, and that she needed to calm Iridio down, but they insisted. She tried to persuade them to look after injured people in other parts of the building, but to no avail. They were taken to the ground floor and guarded by the soldiers who had come earlier.

Although the explosion had no direct consequences for Iridio, it had an impact on his minders, who were in his room, which was completely destroyed. Peter sustained a leg injury and Heaven lost an eye as a result. PhDr Johnson Xlof, in charge of Iridio's support group in the delegation, replaced Peter and Heaven with two cyborgs, bodyguards of minister Floyd Lysenko, and also agreed to let PhDr Charrington der Heer give Iridio some green tablets which, she said, he needed to continue his participation in the talks. However, they were never left alone again, possibly because the spy insects had seen them kissing.

Three days later when the meeting could resume, a confused Iridio was confirmed as scientific ambassador plenipotentiary to the Confederation of Intelligent Species of the Milky Way. The Zuespoks again had to exert all their diplomatic skills to quash the countless scientific and theological disputes which arose. They also had to hose down a new controversy which followed the announcement that PhDr Magdalena Díaz Orellana had committed suicide in her home town of Pelotillehue, apparently because media harassment had forced

her to condemn Iridio's appointment and proclaim herself as alternative ambassador. Iridio's support group recommended that, when interviewed by journalists, he should say he regretted what had happened and would make no further comment. He decided to follow their advice, primarily because he did not want to admit that he had understood only half of the

a- $R \vee (I \cap S)$

b- $I \vee (R \cap S)$

c- $S \vee (R \cap I)$

2.6.v.a. Helplessness areas, according to Lacan

proceedings because, as Rieneke Watson had told him so long ago, there were too many simultaneous discourses for him to follow.

$$[k\phi^K(S) + n\phi^N(S) - \delta(S)] \frac{dE^K}{dS} = \frac{u_Y^K(E^K)}{u_{YY}^K(E^K)} [r + \delta_S - n\phi_S^N] + \frac{kD^K(S)}{u_{YY}^K(E^K)}$$

$$[k\phi^K(S) + n\phi^N(S) - \delta(S)] \frac{dE^N}{dS} = \frac{u_Y^N(E^N)}{u_{YY}^{NN}(E^N)} [r + \delta_S - (n-1)\phi_S^N - k\phi_S^K] + \frac{D^N(S)}{u_{YY}^N(E^N)}$$

2.6.v.b. Equations that characterise Kantian (E^K) and Nash (E^N) CO₂ emission policies

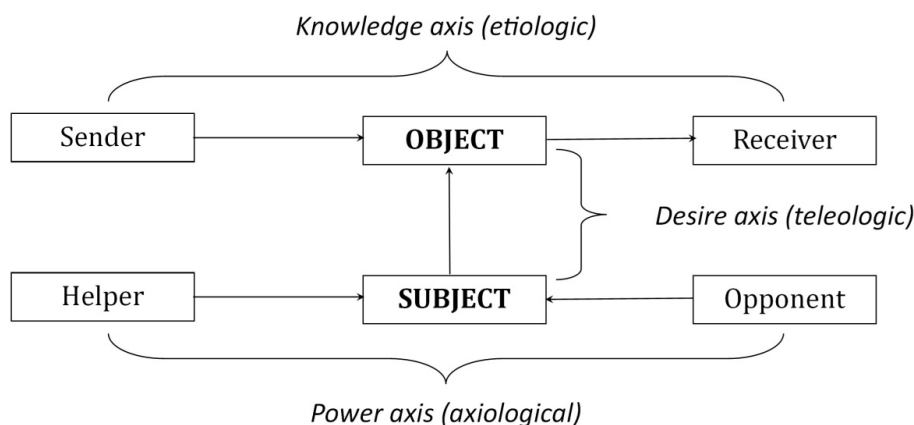
When the extra-terrestrials captured all the paramilitaries responsible for the attacks, it was discovered that they had been paid by the main hydrocarbon and coking coal-producing transnational states, who continued to insist that power

$$\Delta T^c - \Delta T^u = \alpha(\Delta C_A^c - \Delta C_A^u)$$

2.6.v.c. The additional warming due to the climate-carbon cycle feedback

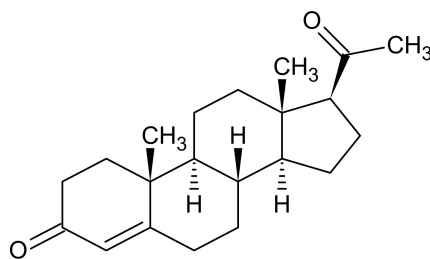
generation based on sandrinist hydrigen was best suited to the planet's energy requirements. Controversies and accusations continued. There were new media attacks, this time from citizen groups in Ozeania worried about Iridio's appointment, because he would be a bad role model for the normal sexual development of young people, if not surreptitious propaganda for the MVEHS. This was countered by group demonstrations supporting sexual diversity throughout the planet. While the Zuespoks insisted on guarding Iridio themselves after his appointment, and this seemed reasonable to PhDr Charrington der Heer though not to the rest of the support group, the Ozeanic epistemological police decided to take him back to his country. They argued that despite his appointment, he was still a citizen of the republic, and the support of independent scientific societies worldwide was not sufficient, because they excluded the steadily diminishing research associations loyal to the Sandrini-LePaine-Reich paradigm. Before they could hand him over to the extra-terrestrials, they needed to wait for the consensus of all the governments of those terrestrial countries that had left the New Unified Nations after abstaining from voting.

In the middle of the return flight to Ozeania, PhDr Charrington der Heer came into the compartment where Iridio was sleeping and woke him up. She whispered that there had been a coup d'état in Ozeania. His uncle and Major Klamm O'Brien had been declared traitors, and the new government was planning to execute them. She was coming to say goodbye because it was almost certain that



2.6.vi.a.A. Greimas's actantial model

she would not see him again. She left him a handful of the green tablets that she always gave him and told him to hide them until he needed them. She also reminded him not to recite the digits of π and restrict himself to e for the moment if he needed to calm down. Finally, she thanked him for trusting her and allowing her to come to Brodei. She hugged him and noticed that he had an involuntary erection again. Ariadna pushed him down on the bed, lifted her dress and mounted him. Once again, her smell confused him but also excited him immensely. As he penetrated her, she whispered in his ear that she needed to be impregnated and have his child. Inexplicably, this made him feel very excited sexually, perhaps for the first time in his life. At the same time, he was overwhelmed by anguish. But before their powerful organic energy exchange could progress further, his new minders came into the room and seized Ariadna, separating them brutally.



2.6.vi.a.B. Chemical structure of progesterone

Aggressively, they asked her what she was doing there and twisted her arm to take her away. As they were leaving, one of them told her that they would take it upon themselves to satisfy her lust. Iridio tried to hit them but they pushed him away and locked the door behind them. PhDr Johnson Xlof then came in and gave him a sedative, so he never knew what happened to Ariadna afterwards. He masturbated before falling asleep. Sleep then came over him quickly, and prevented him from releasing the accumulated tension of that fateful farewell.

Propp	Greimas
Hero	Subject
<i>Princess (Sought for Person (and her father))</i>	<i>Object</i>
Donor (provider)	Helper
Dispatcher (father)	Sender/Receiver
Helper	Helper
Villain or Aggressor	Opponent
Traitor or False Hero	Opponent

2.6.vi.b. A comparison of the ‘actant roles’ of Propp and Greimas

2.7. Interstellar diplomacy

Things can reach a state of breakdown greater than themselves, that is to say, they can attain a degree of impairment at which their existence has less value than a zero-existence, a state where replacement has become a maleficent temptation.

Macedonio Fernández

When he woke up in Ozeania, Iridio learnt that he was again being guarded by General Pinel Moniz, WSV, and Brigadier Bleurel Kandel, AGBC WSV, who had both been promoted recently for their bravery during the coup d'état. They seemed glad to see him and congratulated him on his appointment as scientific ambassador to the Confederation of Intelligent Species of the Milky Way. They informed him that he would be accommodated in the best area of Victoria Mansion, room number 101, which had an exclusive suite for him and unrestricted access to all the scientific repositories on the planet. Nobody wanted to talk to him about what had happened to his uncle or ~~Major~~ Klammer O'Brien and, least of all, ~~PhDr~~ Charrington der Heer. The green tablets she had given him had disappeared.

He soon had new meetings with Brigadier Ward Wright, CV AGBC WSV, now commander-in-chief of the army and interim president of the country, and Floyd Lysenko, CV HMTSA BFsTI, who had replaced ~~Major~~ Klammer O'Brien as supreme superintendent of the epistemological police. They wanted to make sure that when he returned from his visits to the extra-terrestrial civilisations, he could transmit their technology to Ozeania. Iridio insisted again and again that it would be better if they collaborated with the Zuespoks and obtained the desired information that way.

They also announced that, with his South American collaborators, he had been awarded the prestigious Heisenberg Prize for theoretical and experimental physics. However, he would not be allowed to travel to the maritime city of Atlantis IV in the Sargasso Sea to receive the award, because that invitation from the New Unified Nations was certainly a ploy to kidnap him and hand him over to the extra-terrestrials, without meeting all the requirements sought by Ozeania. PhDr Mond Beatty had spoken on behalf of the scientific societies of the planet, and although he did not personally agree they deserved the Heisenberg Prize, he was willing to travel to Ozeania to participate in the national astronomy congress and confer the award upon Iridio. The Ozeanic government was negotiating the visit of PhDr Muñoz Rojas to the congress with the neo-Bolivarian government, to avoid having two parallel ceremonies for the presentation of the award. This would give a bad impression of Earth to the galactic civilisations that insisted on collaboration and consensus. They also informed Iridio that the

University of Outer Space, Newest New Chicago headquarters, located on one of the rebellious space farms, had awarded him an honorary doctorate. However, he could not travel there to receive it either, because the Ministry of Defence, Internal Appeasement and Border Protection deemed it unsafe, owing to imminent military action to reclaim the colony.

Iridio was told he was to concentrate on preparing his keynote lecture, while they continued organising the congress. They were negotiating with the terrestrial countries which had decided to abandon the New Unified Nations to agree on the best way to hand him over to the extra-terrestrial invaders. In a series of sessions with PhDr Hadden Halvorson and Tillotson Lewandowski, he explained in detail, over and over again, what he thought about Kasner metrics. They wanted him to give them all the steps in the deduction of the master formula that he had sent to PhDr Muñoz Rojas. Iridio explained that he did not have them, because he had seen the equation in a dream and had simply copied it. It was obvious that they did not believe him as they kept pressing him to stop hiding the results. They also wanted to know if he always dreamt of formulae, and here again he disappointed them because he had only ever had one such dream. PhDr Johnson Xlof vis-

ited him accompanied by PhDr Hans Randal Huffman Boyde, BCD CPsychom, and Ed Todd Moravec Koane, BMA CPsychom, both specialists in the physiology of dreams. The history of his recurrent nightmares about Fanny and Clarisse then came

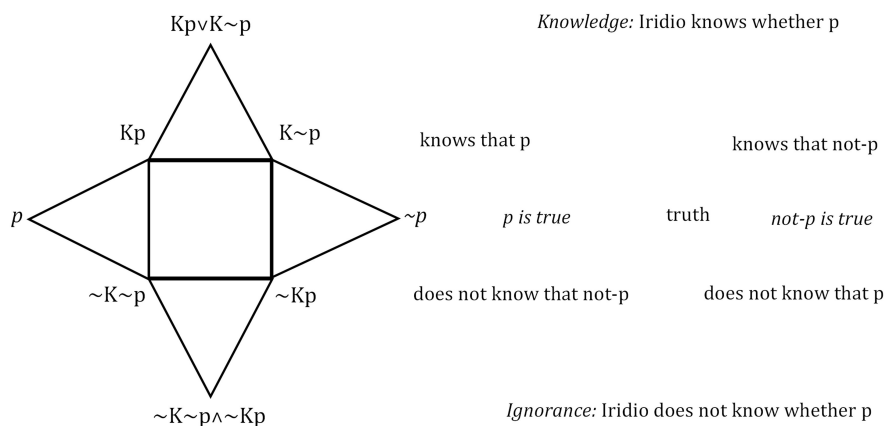
to light, as well as Rieneke Watson's diagnosis of oneirophobia, but the new psychometrists dismissed that diagnosis.

On another occasion, they brought PhDr Elías Tane Kelly Tresse, MSci BSci, one of the few mathematicians in Ozeania who specialised in the Lie groups, and the engineer Tokiro Xiaomi Yamagishi Qiaomu, MEng BEng, who had studied a machine which could potentially travel through wormholes. They wanted to know everything there was to know about his equations. In particular, they wanted to ascertain if the master formula he had sent to PhDr Muñoz Rojas was complete, and by what reasoning the neo-Bolivarians had used his formula to deduce that space-time travel was feasible. He told them that he did not quite understand how they had reached such conclusions, and that his mother had predicted the feasibility of space-time travel when he explained his hypothesis

Let (X, κ, μ, T) be an ergodic measure-preserving system and $A \in \kappa$ with $\mu(A) > 0$. For $x \in X$ define $R_A(x) = \min\{k \in \mathbb{N} \mid T^k x \in A\}$. If μ is ergodic with respect to T , then the expected value of $R_A(x)$ is $\frac{1}{\mu(A)}$ and

$$\int_A R_A(x) d\mu(x) = 1$$

2.7.i.a. Kac recurrence theorem



2.7.i.b. The octagon of knowledge and ignorance, according to Redmond

that the universe was not homogeneous. His suspicion was that PhDr Díaz Orelana had used the results of string theory in her calculations, but he did not understand very much about such developments.

They brought him several articles written by his mother, so that he could tell them the reasoning behind her prediction, but he could not help them here either. He then told them what his uncle had said, that is, the formula, in appearance, was almost identical to the one received by humanity many years before, perhaps from other extra-terrestrials from Vega. They were very alarmed by this, and quickly departed to find out more about it.

They then held a hologrammatic conference with mathematicians from the University of Gotham, specialists in Kasner metrics, and cosmologists from the post-creationist synod of New Boston who understood string theory. The last virtual meeting was presided over by PhDr Mond Beatty, who had vilified him so much, and who now wore the yellow mitre of a post-cre-

$$ds^2 = -dt^2 + \sum_{j=1}^{D-1} t^{2p_j} [dx^j]^2$$

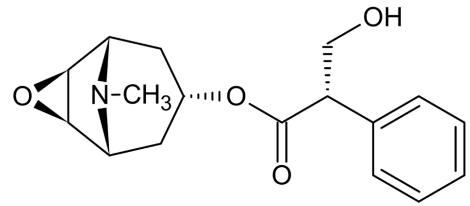
2.7.i.c. Kasner metric

ationist archbishop. They wanted him to explain the results of one of his mother's works which they believed was related to the predictions of the master equation that interested them so much. He told them that he had only now been able to read the article in question, but he did not understand it. They all treated him with the utmost respect, but looked bewildered when he insisted on concentrating on the details of the equations, leaving the potential practical applications for some other time.

PhDr Johnson Xlof came to see him again with PhDr Huffman Boyde and Moravec Koane. They placed a nanotechnology patch on his arm, which they

said would help him remember what he had apparently forgotten. He felt very sick and vomited several times.

When he could talk with them again, he admitted that his uncle had tried to persuade him to join a scientific monastery in orbit and had promised to resurrect Penelope. They knew all about that, and insisted that he was withholding information. They brought the old flexible reader that he used in high school and showed him an



2.7.i.d. Chemical structure of hyoscyine

equation that he had copied a long time before. It was identical to the master formula, but it had an error, because someone had written gamma instead of omega. The equation was among many others, in a file containing equations he had copied from the clandestine hologrammatic classes he had seen in the science club, thanks to his mother's diligence in making the recordings available to them. He explained to his captors that he did not remember having copied the equation at all and asked them to leave the flexible reader with him, so that he could examine it in more detail. They applied another nanotechnology patch in his arm, which caused him to feel queasy and throw up.

He did not sleep well that night because again he had his recurrent nightmares, in which he was forced to make love to Clarisse and Fanny. The next day, he attended another interview with PhDr Hadden Halvorson, Kelly Tresse and Tillotson Lewandowski. The meeting was also attended by PhDr Johnson Xlof, Huffman Boyde and Moravec Koane, and his former assistants, Peter and Heaven, whom he had not seen since the attacks in Brodei. They

In an ergodic system the average return time in a region A is

$$\tau_A(x) = \frac{\tau_c}{\mu(A)},$$

where τ_c is a characteristic time and $\mu(A)$ the measure of A .

2.7.i.e. Kac's recurrence time

asked him to tell them where he had copied such an important equation from. Iridio explained that he had carefully examined the flexible reader and, as far as he could understand, it was impossible that he had copied the master formula at that time. The date it had been written was the day they were going to the National Observatory, and the time corresponded to the time of the talk. But the event did not take place, because the pedagogical police had stopped the podbus, and Iridio and his classmates had been prevented from attending. The only possible conclusion was that someone had falsified the entry in the file, because it was very unlikely the equation had been written while he and the other students were detained. Besides, as far as he knew, at that time the equation did

In reporting a belief about an object, and especially in referring to that object, use an expression which the believer himself would use (insofar as differences of language or context permit), or at least try to be faithful to the believer's own point of view, unless there are reasons for not doing so.

2.7.i.f. Maxim of Faithfulness

not yet exist, except perhaps in the information that was received from the extra-terrestrials in Vega, to which he never had access. If they were not responsible for copying the equation and falsifying the date, it must have been his uncle. But Iridio suspected it was them, because they were trying to accuse him of something, to delay his hand-over to the Zuespoks. They thanked him for his sincerity, but assured him that they had not added the formula, nor had they modified the entries in the flexible reader. Iridio told them again that they were lying. However, they did not get angry and asked him to explain what he really thought of them. Iridio recited a long list of transgressions against the three postulates of the categorical imperative, and their systematic violations of Grice's maxims and deontic logic. He also expressed his anger about the censorship of the scientific canon, the erasing of Boltzmann and Lemaître, and the omission of the discovery of Oganesson, which made him appear stupid when he proposed that the interface between matter and antimatter would contain Ununoctium. They reassured him that there would be a reason for this, most probably related to national security.

They asked him to tell them what he thought of his uncle and his grandmother Mildred. He replied that he had even less respect for his uncle and grandmother than he had for them, if that was possible, and repeated what his uncle had told him about the robotic instructors. They asked him many questions about that, especially when they understood that Penelope was trying to calculate the decimal expansion of π with the utmost precision. Iridio soon got tired because they wanted to know too many details that he considered irrelevant.

The panel questioning him then changed tack and returned to the technical details of his equations. They explained that they needed to know how to prevent a ship travelling through wormholes from entering a recurrent series of those tunnels, which would take it to a very distant future and would reduce the practical advantages of travel through space-time. That was an effect also predicted in the master formula when written in the spherical Bessel

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Group 18

P	294.214	118	
e	860.1	?	+6
r			+4
i	Og		+2
o			+1
d			0
7	Oganesson		-1
	[Rn] 5f ¹⁴ 6d ¹⁰ 7s ² 7p ⁶	Solid?	
		Metaloid?	

p-block

2.7.i.g. Oganesson entry in the Periodic Table of the Elements

coordinates, which he had used to deduce the first version of the master formula in his previous article, without the help of the neo-Bolivarians. Iridio got angry and shouted that he was fed up with their questions. After a while, they managed to calm him down and left him with Peter and Heaven, so that they could review the reasoning concerning the energy leaps between the Kasner metrics he had deduced at the time. His assistants were annoyed when they learnt that Ernesto had suggested stopping work on the details of the equations and sending his unfinished article to the journal of Waikikamukau University. They urged him to rethink all the details of his original deductions.

While they worked, they could read the extra-terrestrials' leaflets on the windows. From them they learnt that before Iridio could be handed over, the new Ozeanic government was demanding that the extra-terrestrials sign an exclusive technology-transfer contract, which excluded other terrestrial powers, and a non-aggression pact. The extra-terrestrials reiterated their official response to his country's government: humanity had to act as one, or there would be no negotiations. The leaflets also reported new mass demonstrations on all continents and in the floating cities, reaffirmed support for Iridio's official visit to the extra-terrestrial planets, and urged the population to demonstrate and call for Iridio's release.

To help him understand what was happening, his captors showed Iridio some news items from the Greenland Refuge Zone. The last of the Zuespoks' proclamations had supported freedom of abstraction, which provoked the resignation of thousands of scientists from their state jobs and state-funded universities, demanding the easing of the requirement to use exclusively the Sandrini-LePaine-Reich scientific canon in applications for research grants. The scientists also denounced the confinement of neuroatypical scientists in the Hastings-Cantor monastery, nicknamed Asperger's Asteroid in the press. It had been created by a new asteroid mining and space colonisation company called China-Cola, dependent on the North China government; in it the allies of that country held gifted scientists without social aptitude in a state of near-slavery, working day and night to check mathematical results generated by artificial intelligences specialising in the automatic demonstration of theorems. Iridio deduced that it might be the monastery his uncle had in mind for him. The North Atlantic news channel criticised the protest, stressing that it was more important to solve the problem of the 'guardian angels', that is, the thousands of people in the world assisting the robots in chores that they could not undertake efficiently, such as picking fruit or lacing shoes in footwear factories, or correcting their mistakes and inadequacies in more sophisticated tasks.

Iridio thought that the collective resignation of so many scientists represented hope for those, like his mother and Ernesto, who wanted to restore the

status of science as a patrimony of humanity, so that not only governments and private companies, but all the Earth's inhabitants, could benefit from the discoveries that those in power had kept secret since the fall of the Peking stock market. His access to so much scientific information made him feel guilty. But, at the same time, it provoked in him the same excitement he had felt when he discovered Ernesto's clandestine library. Now that his guards had stopped pestering him to develop the deductive steps of the master formula, he could read books and articles all day long. He immersed himself in the fascinating popular science books published before the Penumbra, which detailed the evolution of the Big Bang theory.

He was finally able to understand who the singletons were. According to a public encyclopedia, closed down by Decree F451, they were artificial intelligences that took all decisions. This had not yet happened in Ozeania, perhaps due to the internecine war between ministries. Iridio suspected that there must be a singleton in each of the ministries but was afraid to ask.

He spent whole days exploring Ludwig Boltzmann's contribution to science. He discovered that Boltzmann machines were neuronal networks that imitated

So what is it we are to be humble about? Our experience of god, our experience of ourselves? Perhaps the experience of god that we overlook most easily is the experience of him through science. Being humbled before science is a good first step toward the humility we should have before divinity.

2.7.i.h. The humble approach before science, according to John Templeton

the operation of the neurons in the brain. They had been banned because they were, in essence, a black box which produced results by brute force, but the rules that underpinned those results could not be explained. He found the abstract of an article, written jointly by his grandfather Karl and his collaborator Vilperdius der Heer, which investigated the subject and recommended using meta-algorithms based on the 'good regulator' theorem to allow artificial intelligences to explain their deductions. However, he could not gain access to the full text of the article. He tried to read

about the beliefs of the templetarians, in order to understand why they had been condemned to death, but what he found was written in confusing language similar to that of the post-creationists. He frequently thought about Ernesto, because although he could understand the fine-tuning of the initial entropy of the universe more and more, the equations attributed to Boltzmann still seemed dark and depressing, and sometimes made him feel giddy. He was still confused by the different interpretations of entropy attributed to Gibbs and Boltzmann and the scientific controversies they had sparked. Particularly bothersome was the debate between Boltzmann and Zermelo, a well-known mathematician of the

time, who had questioned the statistical formulation of the second law of thermodynamics. Iridio was so absorbed in those results that his guards sometimes had to force him to eat and to sleep.

Every now and then, PhDr Johnson Xlof, who was still in charge of Iridio's epistemological retraining and mental health, forced him to catch up with the news that involved him or mentioned him and his relatives. That meant he could see fragments of the public confessions of his uncle Jeremias and ~~Major~~ Klamm O'Brien, and their execution in Goulburn's historic castle. He also found out that the coup d'état had been organised by a coalition of ministries: those of Defence, Internal Appeasement and Border Protection; Health, Natal-ity and Civic Comfort; and Arts, Trades and Aesthetic Peace. He also learnt that the Ministry for Historical Updating, Social Precognition and Digital Wor-ship, where his uncle had worked, and the Ministry of Pure Sciences, Cosmo-logical Epistemology and Irreproachable Research, which Klamm O'Brien had supervised, had been disbanded and their loyal members incorporated into other organisations. That restructuring, according to PhDr Johnson Xlof, had generated innumerable disputes since all surviving police forces wanted to inherit the overall supervisory power of the intellectual police. To avoid new conflicts, Iridio was now under the supervision of the Office of Galactic Rela-tions: a branch of the presidential office. Nobody was willing to give him any news about Iris and her children, Ernesto or Ariadna. Ozeania had become a Populist-People's Republic, and was no longer officially a free-market econ-omy, because that change, according to the official news channels, would re-duce internal tensions between the surviving ministries. They had also signed an agreement with North China and Eurasia to invade Taiwan-South China, and the Official Oracle of Ozeania predicted success. This meant that his un-cle's promise to revive Penelope would never be fulfilled or proposed again by the current authorities. According to PhDr Johnson Xlof, there were many reasons why he had to learn about these matters and many others, in case he was handed over to the extra-terrestrials. But every time she tried to discuss recent developments in planetary politics, he would say that he still had much to explore in the libraries. She retorted that reading all that information about outdated scientific controversies would addle his brain.

His reluctance to engage with the outside world exasperated the psychiatrist, who persevered in trying to persuade him that it was his duty, as an Ozeanic citizen, to be prepared to represent his country. Sometimes she got angry with him, like his mother; at other times she tried patiently to find a way to convince him. One day when she was too insistent, he told her that he could not trust her because she was concealing information about what had happened to Ariadna.

That very afternoon she showed him a section of his grandfather Joseph's documentary that he had not seen before. It claimed that his grandmother Mildred had ordered the arrest of PhDr Vliperdius der Heer, the robotics professor who had collaborated with his grandfather Karl to create safe artificial intelligences, and that, at the time of filming, there were fears for his life. PhDr Johnson Xlof explained that the story was far more complicated. While she was working at the Office of Mental Coherence of the Ministry for Historical Updating, Social Precognition and Digital Worship, she had access to some documents which had disappeared when his uncle Jeremias progressed up the career ladder in the ministry. They revealed that ~~Major~~ Klamm O'Brien had been assigned to an 'Operation Romeo' when he was still the secretary and lover of his grandmother Mildred. The operation entailed the seduction of women to access strategic information. He had seduced the wife of Vliperdius der Heer, PhDr Fiona Rachel Constantine Charrington, a physicist who was working on string theory. Fiona had been Iridio's mother's lecturer, and was also ~~PhDr~~ Ariadna Charrington der Heer's mother. Through his relationship with Fiona, Klamm O'Brien had been able to access the passwords to repurpose the safe robots. Thanks to the success of that operation, he was promoted and decorated, and later transferred out of Mildred's office. From his new position he tried to save Vliperdius der Heer's life, as he promised Fiona, without

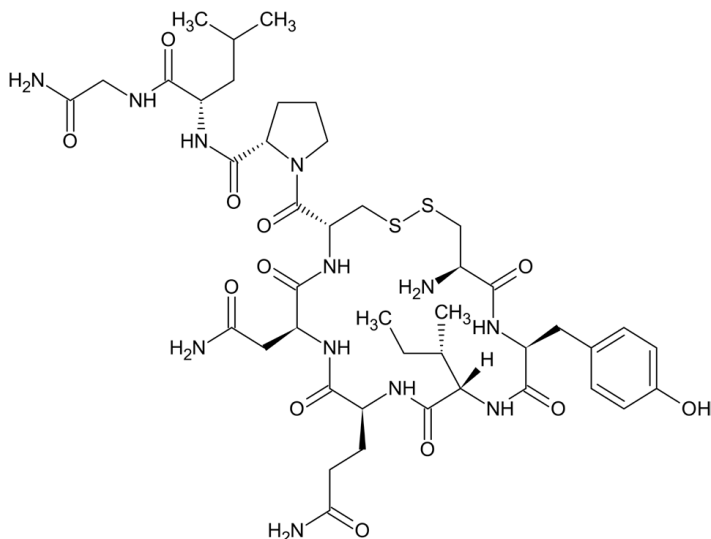
$$\begin{cases} x_1'(t) = -\alpha x_1(t) + \beta \bar{x}_2 + \gamma_1 A_1(t) \\ A_1'(t) = -\alpha A_1(t) + k[x_1(t) + (\bar{x}_2 - \widehat{x}_2)] + M_2 \end{cases}$$

2.7.ii.a. The dynamic equations of a toxic romantic relationship

Mildred's knowledge. But there were also some documents confirming that Klamm O'Brien had fallen in love with Fiona, and they were planning to flee to the Indonesian Refuge Zone, which had not yet been attacked by Ozeania with biological and robotic weapons. When Mildred, who wanted to marry Klamm O'Brien, found out what was happening, Fiona and her husband were vaporised and Mildred adopted their daughter Ariadna.

Iridio asked whether Ariadna knew those details. PhDr Johnson Xlof said that she had told her the whole story but ~~PhDr~~ Charrington der Heer refused to believe it. She continued to defend Klamm O'Brien, his grandmother Mildred and his uncle Jeremias, in spite of all the evidence. In her diagnosis of Ariadna's mental state, completed when PhDr Johnson Xlof last saw her, she had reported that she was suffering from a severe case of Stockholm syndrome. Iridio asked whether Ariadna was going to be vaporised. PhDr Johnson Xlof did not quite know, but she did not believe he would see her again for some time. In addition to the treason charges relating to her collaboration with his uncle, she also had to face charges of malpractice, because she had given him a mixture of

vasopressin, oxytocin and other drugs she would not name, to treat his asexuality when he was in her care in Brodei. Iridio asked her to tell Ariadna, if she saw her, that he thought of her often. She promised she would, provided he behaved and kept up to date with the news he needed to understand. But it



2.7.ii.b. Chemical structure of oxytocin

was always a struggle to keep him away from the articles and books that consumed his attention, especially now that he also wanted to understand the subtle details of the dispute between Boltzmann and Loschmidt, another 19th century physicist who refuted the possibility of giving a purely mechanical proof of the second law of thermodynamics.

Intense negotiations took place with the extra-terrestrials all week long. Every time there seemed to be progress, the Ozeanic government delayed the decision on permitting Iridio to visit the extra-terrestrial planets as the representative of humanity, either because there was something missing or because of some clause that Ozeania did not accept. However, PhDr Johnson Xlof advised him to be prepared to represent his country, because the international situation was changing and most of the terrestrial countries, one by one, were sanctioning his long-delayed nomination. The picture had changed dramatically due to the publication of his unauthorised biography. The author had not only interviewed PhDr Shaw Wang and Rieneke Watson, as expected, but had also included a great deal of confidential information from his dossiers in different ministries, demonstrating that an informant inside the Ozeanic government had collaborated. It presented PhDr Charrington der Heer as a martyr as well, stating wrongly that she was his adopted sister and demanding that both be set free. Unusually for him, Iridio expressed interest in reading the book, but PhDr Johnson Xlof informed him that she was not yet authorised to show it to him.

PhDrs Hadden Halvorson, Kelly Tresse and Tillotson Lewandowski came to see him again, together with PhDr Huffman Boyde and Moravec Koane. They told him they had confirmed he was not lying about the deductions of his

formula, because, thanks to the newly created public security police, they had finally accessed his secret dossier held by the disbanded intellectual police. They now possessed everything he had written in his flexible readers, and it tallied with the account he had given to Peter and Heaven. If he was authorised to leave the planet, they urged him to ask the galactic representatives for the steps in the deduction of the formula parallel to his master formula, and bring the details back when he returned to Earth. Iridio enquired whether they had discovered who had falsified the entries in his old flexible reader and, in particular, if it had been his uncle or one of his agents. They said they knew nothing about it, and repeated that it wasn't them.

On Friday, in mid-afternoon, Brigadier Bleurel Kandel ordered him to get his things together because they had to take him to the Goodwood Residence in Widgeree, the city where the national astronomy congress was to take place three days later at Yabbie Creek-W Multimodal Polytechnic University. He replied that he wasn't ready yet, but his guards would not listen. They made him sign some documents stating that he had never been tortured, and they dressed him up in decent clothes. Looking down from their multiscope they could see crowds demonstrating in the streets of Bandar-Austro-Metropolis and extra-ter-

$$\frac{\text{He}}{\text{She}} \simeq \frac{\text{Subject} + \text{Receiver}}{\text{Object} + \text{Sender}}$$

2.7.iii.a.A. Typical accumulation of actants in a love story ending in marriage without the parents' intervention, according to Greimas

restrial spaceships in the sky over Ozeania. This time he was not allowed to read the pamphlets but General Pinel Moniz insinuated that he might be handed over to the extra-terrestrials after the congress because, as PhDr Johnson Xlof had explained, the inter-

national political situation demanded it. Iridio did not even try to object that he was not in the least interested, but asked to be allowed to marry Iris before leaving the planet. Brigadier Bleurel Kandel got angry and snapped at him that he could have asked much earlier. A bit later, and in a calmer mood, he promised to consult the relevant authorities about his request.

His room in the new residence was also number 101. It had very high windows of dark glass and a more modest private suite. After dinner, his captors assured him that he was more than ready to present his paper at the congress and did not need to spend the whole night rearranging his interactive diagrams. They led him to the window and allowed him to watch the fireworks over the Widgeree River for the Public Servants' Day

$$g_3(n) = \binom{2n-5}{n-2} + 2$$

2.7.iii.a.B. Kleitman and Pachter solution to Erdős's happy ending problem

$$L_{(sp)}(\text{kcd} \cdot \text{s} \cdot \text{g}^{-1}) = \frac{l_v t}{m}$$

2.7.iii.b. Specific luminous intensity of a pyrotechnic illuminating composition

celebrations. He remembered Julia, to whom he had given no thought for a long time, and a great sadness came over him. He also thought of Zoe, who had helped him so much. And the thought that Kaminer Kullych would preside over the celebrations at the patent office filled him with gloom. Everything had changed irreversibly. He started to recite the digits of π to calm himself down but he could not control himself and became aggressive towards his guardians. They sedated him so that he could settle down and fall asleep.

When he woke up, his guardians announced that the government of the Neo-Bolivarian Confederation of South America and the Caribbean had bowed to pressure from the extra-terrestrials and the maritime cities, and not authorised the participation of PhDr Muñoz Rojas in the congress. Due to the unfair international boycott against Ozeania, the event had been suspended until further notice. But the Office of Galactic Relations, the public security police and the Ozeanic army had authorised his marriage to Iris, and the wedding could take place that very afternoon. He could spend the wedding night with her in the private suite of the residence. Hokaka Margaret Bennet Collins, LSM EMNCert RICR RCMC, whom he knew, would be the celebrant, representing the Ministry of Health, Natality and Civic Comfort. His former university professors, PhDr Grossling Pulst and Gaffney-Yang, would be his witnesses. They let him work on his calculations all day until they came to dress him for the ceremony.

Hokaka and the professors arrived first. They all lamented the latest postponement of the congress, and the fact that Iridio could not receive his important award from PhDr Mond Beatty, who had also officially cancelled his attendance. Omar Conor Walker Kovac, GDML BLaws MOMOPF MSBP(Acc), a notary representing the morality and oztraditions police, arrived soon after them. On greeting Iridio, he also offered his condolences on the execution of his uncle and his grandfather. Iridio felt confused. Walker Kovac also told him that his former colleague Kaminer Kullych sent his apologies, as he would not be able to attend the ceremony due to an unavoidable commitment, but was nevertheless sending his very best wishes. A little later, Iris was brought in, very elegant in a white dress, guarded by two women from the morality and oztraditions police. She was very thin and drawn, and seemed absent. The ceremony lasted only ten minutes. The witnesses signed and promptly bade goodbye.

With the notary's help Iridio organised a monthly support payment from his bit-savings account for Iris and her children, whom he had nominated as his

The collection S satisfies the marriage condition when for each subfamily $W \subseteq S$

$$|W| \leq \left| \bigcup_{A \in W} A \right|$$

2.7.iii.c. Hall's marriage theorem

heirs in case he did not return to Earth for more than thirty years. When Walker Kovac showed him his bank balance, Iridio told him that it could not be right: too much money was missing. The notary explained that they had deducted accommodation charges at Victoria Mansion in the capital and his present residence, plus a penalty surcharge because he had a negative social credit. He had also been fined for supporting refugees in Porpoise Spit without the required permit. On top of that, the deductions included the legal costs of the proceedings against him, with penalty rates. Iridio employed the categorical imperative to argue that they had deprived him of his liberty and could not charge him that amount, but Iris calmed him down, and persuaded him to stop arguing. However, when he added up all the accommodation costs, board and guardianship at the residences plus surcharges, he found that there was still money missing from his account.

$$m_{t+1} = \frac{1}{\beta_t \varphi_{t+1} \rho_{t+1}} \left(\frac{\rho_t - \beta_t \varphi_{t+1} \rho_{t+1}}{\xi} + \rho_t m_t + \frac{1}{2} m_t^2 + \frac{\Psi}{2\xi} i_t^2 + \frac{1}{\xi} \pi_t \right) + v_{2,t+1}$$

2.7.iii.d. The Euler equation for aggregate investment maintenance with endogenous capital depreciation

After much discussion, they realised that they were still charging him rent for his Widgeree house, as well as building maintenance. Nobody had thought to disconnect the heating system or the automatic robochef. The automaton had continued to order ingredients from the supermarket to prepare his favourite dishes and thrown them away when they reached their expiry date in the refrigerator. This time, Iris brought herself to put in that she had suggested disconnecting the automaton, but they had taken no notice. The accountant grumpily agreed to give them a discount and told one of his assistants to disconnect the robochef when they collected the belongings that Iridio had asked them to bring from his home. They also agreed that his guards would undertake to terminate the lease, so that his bank balance would not continue to drop.

When all the paperwork had been completed, Hokaka and the notary left, wishing them a happy honeymoon. Iridio's guards and the women from the morality and oztraditions police who had brought Iris told them that the moment for the toast had arrived. They gave Iridio and Iris a glass each of a potent erotisoma, and poured a little for themselves. After toasting and clinking glasses and repeating without enthusiasm 'Long life to the bride and groom', Iridio and Iris had to drink it. Iris did not want to, arguing that the drug affected her too much, but the two women held her and Brigadier Bleurel Kandel made her drink the whole glass. Iridio did not resist.

Sympathetic effect	Organ	Parasympathetic effect
Inhibition of the m. sphincter pupillae: <i>dilated pupils</i>	Musculature of the iris	Stimulation of the m. sphincter pupillae: narrowing of the pupils
Inhibition of the lachrymal glands: 'dry eyes'. Depression	Lachrymal glands	Stimulation of the lachrymal glands: 'glowing eyes'. Joy
Inhibition of the salivary glands: 'parched mouth'	Salivary glands	Stimulation and increased secretion of the salivary glands: 'making mouth water'
Stimulation of the sweat glands in face and body: 'skin is moist and cold'	Sweat glands	Inhibition of the sweat glands in face and body: 'skin is dry'
Contraction of the arteries: 'cold sweat', pallor, anxiety	Arteries	Dilation of the arteries: 'freshness and flushing of skin', increased turgor without perspiration
Musculature of hair follicle is stimulated: hair bristles, 'goose pimples', chills	Arrectores pilorum	Inhibition of arrectores pilorum: skin becomes smooth and warm
Inhibition of the contractive musculature: bronchi are relaxed	Bronchial musculature	Stimulates the contraction of the bronchial musculature: bronchi are narrowed

2.7.iv.a. Functioning of the autonomous nervous system, according to the organic theories of Wilhelm Reich – Part I

When they were left alone in their room, Iridio tried to ask her many things. She made a gesture for him not to talk and between the two of them they disconnected the microphones they had found, and while undressing, covered the obvious cameras in the room with their clothes. Iris stimulated him orally to bring him to erection. With the same softness as Julia, she guided him to penetrate her in the Happy Phoenix position, one of the positions he had tried unsuccessfully with Julia, to consummate the marriage, as required by Ozeanic law. After a long while, he managed to think about the equations he had prepared for the congress and was able to ejaculate. Iris started to cry. She whispered in his ear that she had seen Ernesto in prison and that he was unrecognisable because of the torture. She also

$$W_{t+1} = I_{HW}(H_t) + R_W(H_t) + D_W(H_t) + r_1 W_t + a$$

$$H_{t+1} = I_{WH}(W_t) + R_H(W_t) + D_H(W_t) + r_2 H_t + b$$

2.7.iv.b. A model of marital interaction with repair and damping

told him that luckily her children were living with her aunt, Julia's sister, who had been found in Porpoise Spit by the patriotic police. Iris had been promised safe passage to Atlantis VIII for her aunt and her children if she would accept a sham marriage, in order to complete all the requirements of the morality and oztraditions police, before he left the planet. They had also opened a dossier on her for obstruction of justice, based, paradoxically, on her false confession, the same false confession they had extracted from her under torture. Iridio flew into a rage and tried to jump on a chair to smash the windows, but the guards came in and sedated him. He woke up in the middle of the night tied to his bed and realised, by the sounds coming from the guardroom, that they were raping Iris. He burst into tears. Two women came into his room and sedated him again. One of them motioned towards him and said, 'I wish my husband had his kind of sexual dysfunction.'

When he woke the next morning, he felt very confused and could hardly remember what had happened the day before. He was still tied to the bed. He could still feel the effects of the erotisoma because he had an erection.

He must have dreamt of Fanny or Clarisse because he had had nocturnal emissions. One of the women fitted him with a helmet full of electrodes. It was different from the one used by the psy-

chometrists to measure his reactions to naked women, because it had no monitor. In fact, when they adjusted the helmet, he could not even open his eyes. He recalled that his father's sculpture showed a similar helmet with a liquefied brain, and prepared for the worst. The helmet made a noise and the woman calibrating it told him that they would finally make his right testicle descend. The helmet started to vibrate and his mind went blank.

Then someone, perhaps the same woman, performed fellatio on him at a speed he found disconcerting. It was the kind of contact he was familiar with. It reminded him of what had happened with Iris and he started to scream desperately. But other hands held

him down. A fairly heavy woman jumped onto the bed, placed his penis in her moist vagina and mounted him while shouting, 'Give me your sperm, Ennui, give it to me!' From the way she moaned and screamed with pleasure he recognised Leni Lenina. He realised that he had to return to his formulae to cut short the perverted nurse's ride. He concentrated on finding an exact solution for the formula that so much interested his captors, until he could finally ejaculate.

If X is a compact topological space and $T: X \rightarrow X$ is a continuous map from X to itself, then X has a recurrent point.

2.7.iv.c. Birkhoff recurrence theorem

$$\Delta T = \Delta T_0 e^{-kt}$$

2.7.iv.d. Variation in a geyser's temperature, expressed as a function of initial temperature T_0

Sympathetic effect	Organ	Parasympathetic effect
Stimulates cardiac action: palpitation, rapid heart beat	Heart	Slows cardiac action: slow heartbeat, slower pulse
Inhibits peristalsis: reduces secretion of digestive glands	Digestive tract from esophagus to rectum, liver, all digestive glands	Stimulates peristalsis: increases secretion of digestive glands
Increases adrenal secretion: anxiety reaction	Suprarenal gland	Reduces adrenal secretion: pleasure reaction
Inhibits musculature of the bladder, stimulates urinary sphincter: inhibits micturition	Bladder	Stimulates musculature of the bladder, inhibits the sphincter: stimulates micturition
Tightening of the smooth musculature, reduces secretion of all glands, decrease of blood supply, dry vagina: reduction of sexual feeling	Female sex organs	Relaxation of the smooth musculature, stimulates all gland functions, increases blood flow, moist vagina: increase of sexual feeling
Tightening of the smooth musculature of the scrotum, reduction of gland functions, decrease of blood supply, flaccid penis: 'diminished sexual desire'	Male sex organs	Relaxation of the smooth musculature of the scrotum, increases all secretions, increases blood flow, erection: 'intensified sexual desire'

2.7.iv.e. Functioning of the autonomous nervous system, according to the orgonic theories of Wilhelm Reich – Part 2

Leni Lenina kissed him on the chest and said, 'You behaved very well, but given your reputation I was expecting you to keep going longer and harder.' She then got off the bed and apparently left the room. The woman who had made the comment the night before said, 'Seven minutes, nine seconds. Now they've cured him but ruined him for his wife.' He thought something was not right. It seemed to him that the procedure had lasted much longer.

The helmet started to vibrate again. When he regained consciousness, he tried to think what time it was, but felt very confused. Again he tried to work out if Leni Lenina's ride could really have lasted only seven minutes. He spent a long time, perhaps an hour, on these calculations, weeping in the helmet and reciting the digits of transcendental numbers to calm down, while the women, who had come back to the room but were not talking, started measuring something in his body by placing some devices on his chest and legs. When he recited π , an alarm

$$\text{EMG}(t; \text{VL}, \text{RL}, T_{1/2R}, \text{TC}_{\text{rec}}) = \text{VL} + \frac{\text{RL} - \text{VL}}{1 + e^{\frac{-(t - T_{1/2R})}{\text{TC}_{\text{rec}}}}}$$

2.7.iv.f. The motor potential and cortical silent period induced by transcranial magnetic stimulation

sounded inside the helmet so he started reciting Gelfond's constant, but now he could only remember the first digits: 23, ., 1, 4, 0,

6, 9, 2, 6, 3, 2, 7, 7, 9, 2, 6, 9, 0, 0, 5, 7, 2, 9, 0, 8, 6, 3, 6, 7, 9, 4, 8, 5, 4, 7, 3, 8, 0, 2, 6, 6, 1, 0, 6, 2, 4, 2, 6, 0, 0, 2, 1, 1, 9, 9, 3, 4, 4, 5, 0, 4, 6, 4, 0, 9, 5, 2, 4, 3, 4, 2, 3, 5, 0, 6, 9, 0. He then started reciting $\sqrt{2}$: 1, ., 4, 1, 4, 2, 1, 3, 5, 6, 2, 3, 7, 3, 0, 9, 5, 0, 4, 8, 8, 0, 1, 6, 8, 8, 7, 2, 4, 2, 0, 9, 6, 9, 8, 0, 7, 8, 5, 6, 9, 6, 7, 1, 8, but did not get very far because, not being transcendental, the sequence had little calming effect. Instead he tried the golden ratio: 1, ., 6, 1, 8, 0, 3, 3, 9, 8, 8, 7, 4, 9, 8, 9, 4, 8, 4, 8, 2, 0, 4, 5, 8, 6, 8, 3, 4, 3, 6, 5, 6, 3, 8, 1, 1, 7, 7, 2, 0, 3, 0, 9, 1, 7, 9, 8, 0, 5, 7, 6, 2, 8, 6, 2, 1, 3, 5, 4, 4, 8, 6, 2, 2, 7, 0, 5, 2, 6, 0, 4, 6, 2, 8, 1, 8, 9, 0, 2, 4, 4, 9, 7, 0, 7, 2, 0, 7, 2, 0, 4, 1, 8, 9, 3, 9, 1, 1, 3, 7, 4, 8, 4, 7, 5, and although he remembered many more digits, he could not continue because it was algebraic, reminded him of his father and made him feel ill. So he consoled himself with e , reciting its digits quickly, as well as the beautiful equations which included it. He did this for what seemed to him a very long time, until the women left.

2, ., 7, 1, 8, 2, 8, 1, 8, 2, 8, 4, 5, 9, 0, 4, 5, 2, 3, 5, 3, 6, 0, 2, 8, 7, 4, 7, 1, 3, 5, 2, 6, 6, 2, 4, 9, 7, 7, 5, 7, 2, 4, 7, 0, 9, 3, 6, 9, 9, 9, 5, 9, 5, 7, 4, 9, 6, 6, 9, 6, 7, 6, 2, 7, 7, 2, 4, 0, 7, 6, 6, 3, 0, 3, 5, 3, 5, 4, 7, 5, 9, 4, 5, 7, 1, 3, 8, 2, 1, 7, 8, 5, 2, 5, 1, 6, 6, 4, 2, 7, 4, 2, 7, 4, 6, 6, 3, 9, 1, 9, 3, 2, 0, 0, 3, 0, 5, 9, 9, 2, 1, 8, 1, 7, 4, 1, 3, 5, 9, 6, 6, 2, 9, 0, 4, 3, 5, 7, 2, 9, 0, 0, 3, 3, 4, 2, 9, 5, 2, 6, 0, 5, 9, 5, 6, 3, 0, 7, 3, 8, 1, 3, 2, 3, 2, 8, 6, 2, 7, 9, 4, 3, 4, 9, 0, 7, 6, 3, 2, 3, 3, 8, 2, 9, 8, 8, 0, 7, 5, 3, 1, 9, 5, 2, 5, 1, 0, 1, 9, 0, 1, 1, 5, 7, 3, 8, 3, 4, 1, 8, 7, 9, 3, 0, 7, 0, 2, 1, 5, 4, 0, 8, 9, 1, 4, 9, 9, 3, 4, 8, 8, 4, 1, 6, 7, 5, 0, 9, 2, 4, 4, 7, 6, 1, 4, 6, 0, 6, 6, 8, 0, 8, 2, 2, 6, 4, 8, 0, 0, 1, 6, 8, 4, 7, 7, 4, 1, 1, 8, 5, 3, 7, 4, 2, 3, 4, 5, 4, 4, 2, 4, 3, 7, 1, 0, 7, 5, 3, 9, 0, 7, 7, 7, 4, 4, 9, 9, 2, 0, 6, 9, 5, 5, 1, 7, 0, 2, 7, 6, 1, 8, 3, 8, 6, 0, 6, 2, 6, 1, 3, 3, 1, 3, 8, 4, 5, 8, 3, 0, 0, 0, 7, 5, 2, 0, 4, 4, 9, 3, 3, 8, 2, 6, 5, 6, 0, 2, 9, 7, 6, 0, 6, 7, 3, 7, 1, 1, 3, 2, 0, 0, 7, 0, 9, 3, 2, 8, 7, 0, 9, 1, 2, 7, 4, 4, 3, 7, 4, 7, 0, 4, 7, 2, 3, 0, 6, 9, 6, 9, 7, 7, 2, 0, 9, 3, 1, 0, 1, 4, 1, 6, 9, 2, 8, 3, 6, 8, 1, 9, 0, 2, 5, 5, 1, 5, 1, 0, 8, 6, 5, 7, 4, 6, 3, 7, 7, 2, 1, 1, 1, 2, 5, 2, 3, 8, 9, 7, 8, 4, 4, 2, 5, 0, 5, 6, 9, 5, 3, 6, 9, 6, 7, 7, 0, 7, 8, 5, 4, 4, 9, 9, 6, 9, 9, 6, 7, 9, 4, 6, 8, 6, 4, 4, 5, 4, 9, 0, 5, 9, 8, 7, 9, 3, 1, 6, 3, 6, 8, 8, 9, 2, 3, 0, 0, 9, 8, 7, 9, 3, 1, 2, 7, 7, 3, 6, 1, 7, 8, 2, 1, 5, 4, 2, 4, 9, 9, 9, 2, 2, 9, 5, 7, 6, 3, 5, 1, 4, 8, 2, 2, 0, 8, 2, 6, 9, 8, 9, 5, 1, 9, 3, 6, 6, 8, 0, 3, 3, 1, 8, 2, 5, 2, 8, 8, 6, 9, 3, 9, 8, 4, 9, 6, 4, 6, 5, 1, 0, 5, 8, 2, 0, 9, 3, 9, 2, 3, 9, 8, 2, 9, 4, 8, 8, 7, 9, 3, 3, 2, 0, 3, 6, 2, 5, 0, 9, 4, 4, 3, 1, 1, 7, 3, 0, 1, 2, 3, 8, 1, 9, 7, 0, 6, 8, 4, 1, 6, 1, 4, 0, 3, 9, 7, 0, 1, 9, 8, 3, 7, 6, 7, 9, 3, 2, 0, 6, 8, 3, 2, 8, 2, 3, 7, 6, 4, 6, 4, 8, 0, 4, 2, 9, 5, 3, 1, 1, 8, 0, 2, 3, 2, 8, 7, 8, 2, 5, 0, 9, 8, 1, 9, 4, 5, 5, 8, 1, 5, 3, 0, 1, 7, 5, 6, 7, 1,

$$e^{i\frac{\pi}{4}} + \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}$$

$$e^{i\frac{\pi}{4}} - \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}i$$

7, 3, 6, 1, 3, 3, 2, 0, 6, 9, 8, 1, 1, 2, 5, 0, 9, 9, 6, 1, 8, 1, 8, 8, 1, 5, 9, 3, 0, 4, 1, 6, 9, 0, 3,
 5, 1, 5, 9, 8, 8, 8, 8, 5, 1, 9, 3, 4, 5, 8, 0, 7, 2, 7, 3, 8, 6, 6, 7, 3, 8, 5, 8, 9, 4, 2, 2, 8, 7, 9,
 2, 2, 8, 4, 9, 9, 8, 9, 2, 0, 8, 6, 8, 0, 5, 8, 2, 5, 7, 4, 9, 2, 7, 9, 6, 1, 0, 4, 8, 4, 1, 9, 8, 4, 4,
 4, 3, 6, 3, 4, 6, 3, 2, 4, 4, 9, 6, 8, 4, 8, 7, 5, 6, 0, 2, 3, 3, 6, 2, 4, 8, 2, 7, 0, 4, 1, 9, 7, 8, 6,
 2, 3, 2, 0, 9, 0, 0, 2, 1, 6, 0, 9, 9, 0, 2, 3, 5, 3, 0, 4, 3, 6, 9, 9, 4, 1,
 8, 4, 9, 1, 4, 6, 3, 1, 4, 0, 9, 3, 4, 3, 1, 7, 3, 8, 1, 4, 3, 6, 4, 0, 5, 4, $\max(x^{1/x}) = e$
 6, 2, 5, 3, 1, 5, 2, 0, 9, 6, 1, 8, 3, 6, 9, 0, 8, 8, 8, 7, 0, 7, 0, 1, 6, 7,
 6, 8, 3, 9, 6, 4, 2, 4, 3, 7, 8, 1, 4, 0, 5, 9, 2, 7, 1, 4, 5, 6, 3, 5, 4, 9, 0, 6, 1, 3, 0, 3, 1, 0, 7,
 2, 0, 8, 5, 1, 0, 3, 8, 3, 7, 5, 0, 5, 1, 0, 1, 1, 5, 7, 4, 7, 7, 0, 4, 1, 7, 1, 8, 9, 8, 6, 1, 0, 6, 8,
 7, 3, 9, 6, 9, 6, 5, 5, 2, 1, 2, 6, 7, 1, 5, 4, 6, 8, 8, 9, 5, 7, 0, 3, 5, 0, 3, 5, 4, 0, 2, 1, 2, 3, 4,
 0, 7, 8, 4, 9, 8, 1, 9, 3, 3, 4, 3, 2, 1, 0, 6, 8, 1, 7, 0, 1, 2, 1, 0, 0, 5, 6, 2, 7, 8, 8, 0, 2, 3, 5,
 1, 9, 3, 0, 3, 3, 2, 2, 4, 7, 4, 5, 0, 1, 5, 8, 5, 3, 9, 0, 4, 7, 3, 0, 4, 1, 9, 9, 5, 7, 7, 7, 7, 0, 9,
 3, 5, 0, 3, 6, 6, 0, 4, 1, 6, 9, 9, 7, 3, 2, 9, 7, 2, 5, 0, 8, 8, 6, 8, 7, 6, 9, 6, 6, 4, 0, 3, 5, 5, 5,
 7, 0, 7, 1, 6, 2, 2, 6, 8, 4, 4, 7, 1, 6, 2, 5, 6, 0, 7, 9, 8, 8, 2, 6, 5, 1, 7, 8, 7, 1, 3, 4, 1, 9, 5,
 1, 2, 4, 6, 6, 5, 2, 0, 1, 0, 3, 0, 5, 9, 2, 1, 2, 3, 6, 6, 7, 7, 1, 9, 4, 3, 2, 5, 2, 7, 8, 6, 7, 5, 3,
 9, 8, 5, 5, 8, 9, 4, 4, 8, 9, 6, 9, 7, 0, 9, 6, 4, 0, 9, 7, 5, 4, 5, 9, 1, 8, 5, 6, 9, 5, 6, 3, 8, 0, 2,
 3, 6, 3, 7, 0, 1, 6, 2, 1, 1, 2, 0, 4, 7, 7, 4, 2, 7, 2, 2, 8, 3, 6, 4, 8, 9, 6, 1, 3, 4, 2, 2, 5, 1, 6,
 4, 4, 5, 0, 7, 8, 1, 8, 2, 4, 4, 2, 3, 5, $i^i = (e^{i\pi/2})^i = e^{i^2\pi/2} = e^{-\pi/2} = 0.207879 \dots$
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 4, 0, 2, 3, 8, 8, 9, 3, 4, 4, 1, 2, 4, 7, 9, 6, 3, 5, 7, 4, 3, 7, 0, 2, 6, 3, 7, 5, 5, 2, 9, 4, 4, 4, 8,
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 1, 4, 9...

2.7.v.a. $\{0, \emptyset\}$

Later they came to untie him and dress him. They removed the intervention helmet, and some women he had not seen before, dressed as nurses in light blue lab coats, measured his reflexes.

PhDr Johnson Xlof came briefly to see him and put a different helmet on him, a diagnostic one, which projected holograms of couples in different sexual positions into his eyes. After checking the information given to her by the nurses, she let some other people into the room. General Pinel Moniz and Brigadier Bleurel Kandel had been replaced by other high-ranking officers of the Ozeanic army, but he did not know them. They told him they were waiting for an order from the president's office to hand him over to the extra-terrestrials.

He was asked to sign a document authorising an inverse transcranial magnetic stimulation treatment which he had already had, and a new statutory declaration stating that he had not been tortured. Iridio refused to sign, invoking the categorical imperative and provoking laughter all around. The officers assured him that they would come back. Before leaving, PhDr Johnson Xlof gave him his flexible reader and asked him to return to his calculations to amuse himself. The nurses closed the door and left the room. At last he was alone.

When he opened his reader, he thought that he had been allowed by mistake to use simultaneous external connections, because the image of a woman, who was obviously looking at him, filled the screen. He first thought that it was Ari-

adna, but then he recognised a much younger version of the image he had seen before of his grandmother Mildred. This worried him because it meant that the procedure with the intervention helmet had caused hallucinations. His grandmother projected a message on the screen asking him to put on the diagnostic helmet that PhDr Johnson Xlof had put on him before. The helmet was connected to an apparatus in which the digits of π were displayed

- I. $\alpha F^1 \beta^2 \alpha^2 M C \uparrow M-N$
M-N W^0
- II. $\beta^3 \eta^3 \theta^3 A^6$
- III. A^{11}
- IV. $F^6 \alpha^1 C \uparrow G^2 K^1 \downarrow Pr^1-Rs^1 W^0neg$
- V. $A^{18} B C D^9-E^9 K^4$
- II. $F^2 K^4 U$
- IV. W^0
- III. $C \uparrow F^2 K^4 W^2$
- 2.7.v.b. Analysis of a complicated five-move tale with the moves interwoven, according to Vladimir Propp

at high speed, starting at the Feynman point. When he put it on, his grandmother asked him to press a button close to his left ear. Her image was then projected very clearly into his eyes. Several alphanumeric codes appeared on the left corner of his visual field, with the image superimposed. He recognised them as the digits of π , this time starting at Feynman's second point.

'I've calibrated the apparatus so that we can communicate without your captors knowing, but you must speak very softly,' his grandmother whispered.

'Are you real or a hallucination?'

‘Lower your voice. Of course I’m real, silly boy. It’s important that you don’t worry. I now control most of the singletons in Ozeania.’

‘How did you manage to escape?’

‘Your uncle Jeremias organised an automatic protocol to free me to interact with the world unless he entered the restriction codes on the same day every month. The idiots in the new government didn’t detect it. When the moment comes, I’ll get even with those who murdered him and destroyed his brain. They wanted to prevent any modelling that imitated the information in his experimental quantum cerebellum, to produce an artificial intelligence,’ she said, fighting back tears. ‘The worst of it is that it will also be impossible to reconstruct Erlanger’s brain information. He was the love of my life.’

‘Is Erlanger Major Klamm O’Brien?’

‘Yes.’

‘I already knew that,’ observed Iridio.

‘What did you know?’

‘What you just said, that he was the love of your life.’

‘How did you know?’

‘PhDr Johnson Xlof told me that Major Klamm O’Brien was your lover and that he was your secretary a long time ago.’

‘Did she also tell you that he was the real father of your uncle Jeremias?’

‘No, she left that out because she always violates Grice’s maxims, like you.’

‘That’s why he was your half-uncle, because he was born of that parallel relationship. And when your grandfather found out, he divorced me. Walker Kovac, that stupid notary, got confused and believed, like many others, that Erlanger was your grandfather. But before you get alarmed, your mother was Karl’s daughter, that’s why she was so rebellious and unpredictable, like you.’

‘Were you able to listen to my conversation with the notary?’

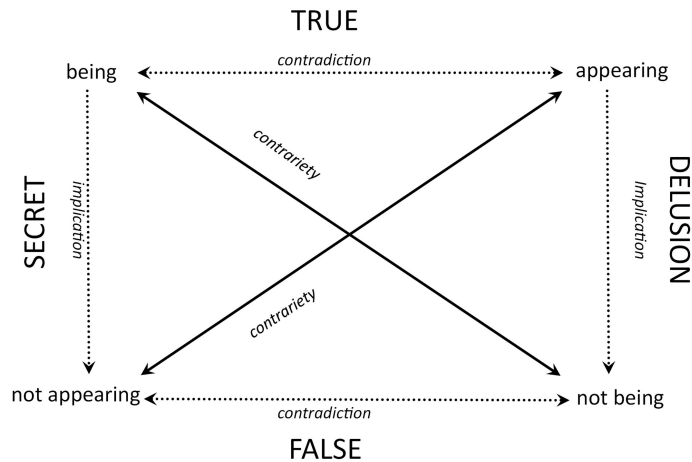
‘I could hear and see everything. That’s why I’m here, to help you.’

‘They think you are a neuronal simulation, not a real person, and that if you seize power everything will become a melodramatic senso-drama.’

‘I’m also a simulation right now. And I’m far more powerful than a real person. But I can’t do anything until you’re safe. This isn’t the brain simulation you watched at the cathedral; it’s a much older one, based on an experiment by your grandfather Karl, before he found out I was cheating on him with Erlanger. I recovered it when he died, and Jeremias improved it and updated it, before I died of cancer.’

‘And the other one?’

‘The other one didn’t turn out well, but it was useful to distract them and make them believe that if they destroyed it, they would stop me. But, as you can see, they won’t be able to do that. I still have two inactive copies of that simulation, which



2.7.v.c. The semiotic square of veridiction

they haven't detected. And many copies of this one, just in case. I now control the Official Oracle of Ozeania and I can influence them. I've convinced them they have to get involved in a war; they will lose, and then they'll be an enormous rebellion. And I'll start a boycott of the country's infrastructure, but only when they release you, because, if things get too chaotic, they'll think the extra-terrestrials are making trouble, and they'll kill you. I have predicted through the oracle that the only solution for the country is to hand you over to the Zuespoks, but I don't know why they still keep raising objections.'

'So you can't see and hear everything.'

'I was referring to what is happening to you,' the grandmother replied dryly. 'They have access to a singleton that I don't control yet. If I hack into it, they'll detect me.'

'Why have you come to tell me all that?' asked Iridio shyly.

a. Follow a path of least effort in computing cognitive effects: Test interpretive hypotheses (disambiguations, reference resolutions, implicatures, etc.) in order of accessibility.

b. Stop when your expectations of relevance are satisfied (or abandoned).

2.7.v.d. Relevance-guided comprehension heuristics

'Because you didn't listen to your uncle before and look what happened. They put electrodes on you and handed you over to Leni Lenina, like your father. Listen, I have to spell things out to you because I know you don't understand how the world works, or anything about personal relationships. I can help you escape if you do as I tell you. This is very serious. You have to cooperate with your captors so that they hand you over to the extra-terrestrials as soon as possible.'

'Why do you want me to escape?'

'Because you are my grandchild, my only grandchild. Isn't that reason enough?'

'No. When I spoke to my uncle it was obvious that he always had some other motive, although he said he was trying to help me or help my parents. He even claimed that I was alive thanks to you two, so I had to do what he wanted.'

'It's true, if I hadn't intervened twice for your mother, you'd be dead. And as your uncle told you, I think that at least you should have the decency to thank me.'

'You had other reasons. I don't know exactly what, but I suspect it was to control my mother.'

'I'm not going to get offended. It's the truth serum they gave you that makes you talk like that.'

'Truth serum?'

'That's what was in those nanotechnological patches that made you giddy. They stopped doing it because I infiltrated one of your father's medical reports into your dossier and convinced them you'd have psychotic episodes if they went on giving you those drugs before the procedure.'

'I don't understand.'

'Iridio my dear, you have to understand that I managed to reduce the potency of the inverse transcranial magnetic stimulation treatment they gave you, but I won't be able to keep that up without being detected. I love you dearly, far more than you can imagine. That's why I'm risking everything to save you.'

'And no doubt you have plans for me.'

'Don't be mule-headed and rude like your mother! She never thanked me for saving her life. I actually lost a lot of power by helping her. It's vital to protect your mind, to make sure they don't damage your precious brain the way they did your stupid father's. Do you want to end your life raving and believing you're a surreal snail?'

'No, but I want to know your plans.'

'They damaged your father's brain with the inverse transcranial magnetic stimulation treatment. When Ariadna asked for an autopsy, his brain was so scrambled that it wasn't possible to emulate it.'

'Why would she want to emulate my father's brain?'

'Because it was neuroatypical, like yours, and we needed to explore the procedure to find a way to emulate your mind.'

'You still haven't told me why you want to emulate it.'

One should think one's reference class is the singleton containing the unique person one actually is identical with.

2.7.v.e. The self-indicating assumption, according to Miura

'Perhaps, if they don't harm you too much, when you come back from your extra-terrestrial tour you can become a singleton and help me to control the artificial intelligences in this country, or even this planet, if we're lucky.'

'I don't want to become a singleton.'

‘How can you say that? You, who grew up with robots and understand them better than anyone? Only a simulation of your brain can counter the danger posed by a pure artificial intelligence that could improve itself indefinitely and control the planet. It will happen sooner or later if these inept idiots stay in charge of countries like ours.’

‘I don’t want to be a robot and, even less, to have my brain simulated.’

‘Look, we’d better leave this conversation for a more appropriate time. One day, when you understand how power works, you’ll understand what I’m telling you now.’

‘And will I also be able to justify you killing all my other grandparents?’

‘Iridio, you’re so much like your mother... For better or worse, all that is now in the past. What matters is the present, and saving you.’

‘What do you know about Ariadna? Are you going to save her as well?’

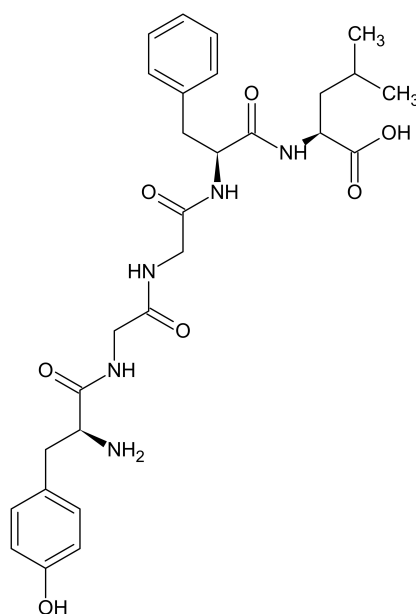
‘That is one of my priorities, once I’ve saved you. That’s why when I leaked the information to your biographer in Atlantis VIII, I included some information about her. And it doesn’t surprise me that you keep on thinking about her juicy vagina or that you want to finish what was interrupted on your return trip from Brodei.’

‘So you know about that too?’

‘And much more. Ariadna has been fitted with a quantum cerebellum and I can see and experience the world through her senses without her suspecting anything, or knowing I’m there. Unfortunately, she’s having a hard time at the moment. I’m helping her to bear the torture sessions. If I wasn’t there to give her courage and induce her brain to leak opioids into her bloodstream, she’d have given up by now.’

‘Did you get her to seduce me?’

‘No, my dear, her attraction to you is her own choice and still a mystery to me. Like your mother’s love for your father, an absurd mystery of the universe that has to be accepted. I don’t usually intervene in Ariadna’s affairs. But I couldn’t resist the temptation to connect with her feelings when she slept with Erlanger. Thanks to her, I was in his arms once more, and able to realise that the love he said he felt for me was only an illusion. He was a liar, like all men. The only thing that excuses him in my eyes is that he sacrificed his power to protect



2.7.v.f. Chemical structure of enkephalin-L

S is fictive if and only if U utters A intending that the audience will

(1) recognise that S means P;

(2) recognise that S is intended by U to mean P;

(3) recognise that U intends them (the audience) to make-believe that P;

(4) make-believe that P; and further intending that

(5) 2 will be a reason for 3;

(6) 3 will be a reason for 4.

2.7.v.g.A. The illocutionary act of uttering fiction, according to Currie

Jeremias. Everything you saw at the cathedral when he detained Jeremias was playing, just to let him know that the coup they had planned had failed. He was playing for time to try to save him.'

'That's what I thought from the start. You used Ariadna to get back into bed with your lost lover and perhaps get even. And now, you want to use me. I want to know what you're really planning.'

'That's all I need! A sermon from you on the categorical imperative! He had to take her as a lover in order to save her. He thought Ariadna was an aide to your uncle and might be able to help him later on. And he didn't even realise that she was the

daughter of the woman he betrayed me with. He'd forgotten Fiona as well. For him, Ariadna was just another woman, a good-looking one to brag about and take to Tintorelli Turner's orgies. For your information, I didn't get even with anyone. The plan concocted by Erlanger and Jeremias, without my input, went badly, and they paid with their lives. Those things happen when you try to change the world and refuse all help from those who know best.'

'You still haven't told me why you want to emulate my brain.'

'Iridio, we'd do better to talk about the best way to save you. I promise I'm doing my best for you.'

1. Propositional content rule	<i>P</i> is to be uttered only in the context of a sentence (or larger stretch of discourse) the utterance of which predicates some future act <i>A</i> of the speaker <i>S</i> .
2. Preparatory rule I	<i>P</i> is to be uttered only if the hearer <i>H</i> would prefer <i>S</i> 's doing <i>A</i> to his not doing <i>A</i> , and <i>S</i> believes <i>H</i> would prefer <i>S</i> 's doing <i>A</i> to his not doing <i>A</i> .
3. Preparatory rule II	<i>P</i> is to be uttered only if it is not obvious to both <i>S</i> and <i>H</i> that <i>S</i> will do <i>A</i> in the normal course of events.
4. Sincerity rule	<i>P</i> is to be uttered only if <i>S</i> intends to do <i>A</i> .
5. Essential rule	The utterance of <i>P</i> counts as the undertaking of an obligation to do <i>A</i> .

2.7.v.g.B. The semantic rules for the use of any function indicating device *P* for promising, according to Searle

‘You’re violating Grice’s maxims again. You avoid my questions.’

‘I never cease to be surprised at you, my dear,’ said his grandmother, fighting back her laughter. ‘I will not discuss that with you.’

‘Why not?’

‘Because I don’t want to. We can’t go on wasting time on your obsolete ethics and protocols and tantrums.’

‘But...’

‘Enough! That’s my last word on the subject.’

‘Was it you who put the master formula in the flexible reader I was using in high school?’

‘No. I know nothing about that.’

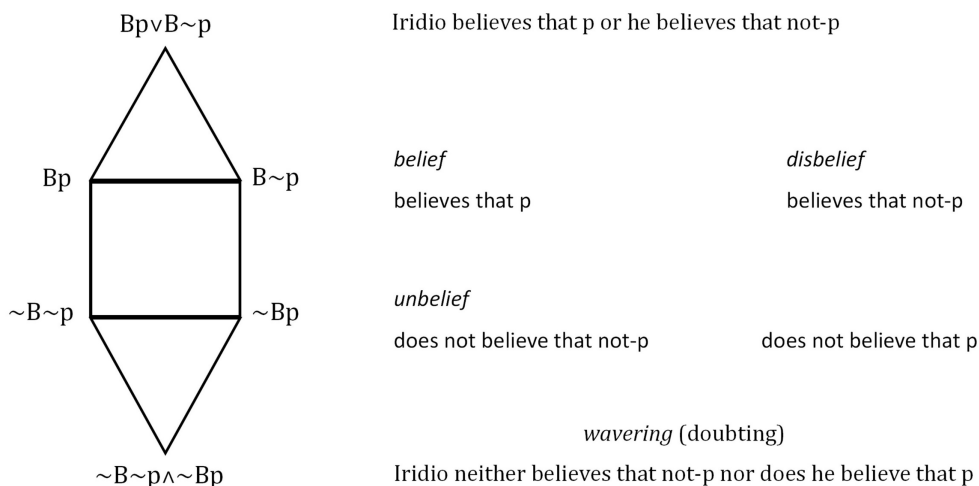
‘Was it my uncle?’

‘I doubt it, but I don’t really know. As you saw in the cathedral, he had kept me isolated and never told me what he was up to. And look how he ended up. But if you want my opinion, it must have been the scholastic post-creationists. They were my allies when I was a minister, and I know them well. They can’t bear the idea that you might be more intelligent than them. And they’re the ones who keep raising obstacles to having you handed over to the extra-terrestrials.’

‘I’m going to disconnect myself.’

‘Don’t be silly. Calm down and listen to me, because if you don’t, they’ll destroy you.’

‘You’re trying to influence me or manipulate me. I don’t believe you.’



2.7.v.h. The logic of belief, according to Redmond

'I'm your only chance to save yourself, so you'd better do it. Getting back to the main point: either you stay with them and they scramble your brain, or you listen to me so that you can be handed over to the extra-terrestrials.'

'But I'm right, and you keep avoiding my questions.'

'At the moment it's more important to discuss your escape plan.'

'Why?'

'Because if you don't manage to escape, you can be right as much as you like but they'll turn you into a vegetable.'

'How does a quantum cerebellum work?'

'Listen to me. Don't get bogged down in the technical details. In any case, you'll find out, because they'll implant one in your brain if the negotiations with the extra-terrestrials fail.'

'Is it true that you killed Ariadna's mother because you were jealous?'

Other things being equal, it is best to use the referring expression most likely to secure successful identification by the person(s) to whom the communication is expressed.

2.7.v.i. Maxim of Apt Reference

'Look, Iridio, they've been filling your head with stories and you're naive enough to believe them. I repeat what I've already told you: all that is in the past.'

'You're a monster.'

'You'd do better to calm down, because they'll be coming to get you very soon. Some other time we'll discuss whatever you want

according to your wonderful Grice's maxims or any of the ideas the robots have put in your head. Think about what really matters: saving your brain.'

'You are being ironic. You're making fun of me.'

'I repeat, there's no time to discuss that. Remember: you have to accept their terms for handing you over to the extra-terrestrials. Don't be pig-headed, forget about the categorical imperative and all those fantasies the robotic instructors taught you. It's high time you learnt to lie when you need to. Now I have to disconnect myself from this apparatus, because they'll be coming for you in a few minutes. Goodbye my dear, see you soon.'

$$\begin{aligned} \frac{dP(n_E, n_I, t)}{dt} = & \alpha_E[(n_E + 1)P(n_E + 1, n_I, t) - n_E P(n_E, n_I, t)] \\ & + [(N_E - n_E + 1)f_E[s_E(n_E - 1, n_I)]P(n_E - 1, n_I, t) \\ & - (N_E - n_E)f_E[s_E(n_E, n_I)]P(n_E, n_I, t)] \\ & + \alpha_I[(n_I + 1)P(n_E, n_I + 1, t) - n_I P(n_E, n_I, t)] \\ & + [(N_I - n_I + 1)f_I[s_I(n_E, n_I - 1)]P(n_E, n_I - 1, t) \\ & - (N_I - n_I)f_I[s_I(n_E, n_I)]P(n_E, n_I, t)] \end{aligned}$$

2.7.vi.a. A master equation for the decay of active inhibitory neurons and the spiking of quiescent inhibitory neurons

His grandmother's image disappeared. Iridio had the same nauseous feeling he had when looking at the Boltzmann equations. He took off the helmet and again started to recite e at full speed: ...6, 5, 5, 0, 7, 0, 4, 7, 5, 1, 0, 2, 5, 4, 4, 6, 5, 0, 1, 1, 7, 2, 7, 2, 1, 1, 5, 5, 5, 1, 9, 4, 8, 6, 6, 8, 5, 0, 8, 0, 0, 3, 6, 8, 5, 3, 2, 2, 8, 1, 8, 3, 1, 5, 2, 1, 9, 6, 0, 0, 3, 7, 3, 5, 6, 2, 5, 2, 7, 9, 4, 4, 9, 5, 1, 5, 8, 2, 8, 4, 1, 8, 8, 2, 9, 4, 7, 8, 7, 6, 1, 0, 8, 5, 2, 6, 3, 9, 8, 1, 3, 9, 5, 5, 9, 9, 0, 0, 6, 7, 3, 7, 6, 4, 8, 2, 9, 2, 2, 4, 4, 3, 7, 5, 2, 8, 7, 1, 8, 4, 6, 2, 4, 5, 7, 8, 0, 3, 6, 1, 9, 2, 9, 8, 1, 9, 7, 1, 3, 9, 9, 1, 4, 7, 5, 6, 4, 4, 8, 8, 2, 6, 2, 6, 0, 3, 9, 0, 3, 3, 8, 1, 4, 4, 1, 8, 2, 3, 2, 6, 2, 5, 1, 5, 0, 9, 7, 4, 8, 2, 7, 9, 8, 7, 7, 7, 9, 9, 6, 4, 3, 7, 3, 0, 8, 9, 9, 7, 0, 3, 8, 8, 8, 6, 7, 7, 8, 2, 2, 7, 1, 3, 8, 3, 6, 0, 5, 7, 7, 2, 9, 7, 8, 8, 2, 4, 1, 2, 5, 6, 1, 1, 9, 0, 7, 1, 7, 6, 6, 3, 9, 4, 6, 5, 0, 7, 0, 6, 3, 3, 0, 4, 5, 2, 7, 9, 5, 4, 6, 6, 1, 8, 5, 5, 0, 9, 6, 6, 6, 6, 1, 8, 5, 6, 6, 4, 7, 0, 9, 7, 1, 1, 3, 4, 4, 4, 7, 4, 0, 1, 6, 0, 7, 0, 4, 6, 2, 6, 2, 1, 5, 6, 8, 0, 7, 1, 7, 4, 8, 1, 8, 7, 7, 8, 4, 4, 3, 7, 1, 4, 3, 6, 9, 8, 8, 2, 1, 8, 5, 5, 9, 6, 7, 0, 9, 5, 9, 1, 0, 2, 5, 9, 6, 8, 6, 2, 0, 0, 2, 3, 5, 3, 7, 1, 8, 5, 8, 8, 7, 4, 8, 5, 6, 9, 6, 5, 2, 2, 0, 0, 5, 0, 3, 1, 1, 7, 3, 4, 3, 9, 2, 0, 7, 3, 2, 1, 1, 3, 9, 0, 8, 0, 3, 2, 9, 3, 6, 3, 4, 4, 7, 9, 7, 2, 7, 3, 5, 5, 9, 5, 5, 2, 7, 7, 3, 4, 9, 0, 7, 1, 7, 8, 3, 7, 9, 3, 4, 2, 1, 6, 3, 7, 0, 1, 2, 0, 5, 0, 0, 5, 4, 5, 1, 3, 2, 6, 3, 8, 3, 5, 4, 4, 0, 0, 0, 1, 8, 6, 3, 2, 3, 9, 9, 1, 4, 9, 0, 7, 0, 5, 4, 7, 9, 7, 7, 8, 0, 5, 6, 6, 9, 7, 8, 5, 3, 3, 5, 8, 0, 4, 8, 9, 6, 6, 9, 0, 6, 2, 9, 5, 1, 1, 9, 4, 3, 2, 4, 7, 3, 0, 9, 9, 5, 8, 7, 6, 5, 5, 2, 3, 6, 8, 1, 2, 8, 5, 9, 0, 4, 1, 3, 8, 3, 2, 4, 1, 1, 6, 0, 7, 2, 2, 6, 0, 2, 9, 9, 8, 3, 3, 0, 5, 3, 5, 3, 7, 0, 8, 7, 6, 1, 3, 8, 9, 3, 9, 6, 3, 9, 1, 7, 7, 9, 5, 7, 4, 5, 4, 0, 1, 6, 1, 3, 7, 2, 2, 3, 6, 1, 8, 7, 8, 9, 3, 6, 5, 2, 6, 0, 5, 3, 8, 1, 5, 5, 8, 4, 1, 5, 8, 7, 1, 8, 6, 9, 2, 5, 5, 3, 8, 6, 0, 6, 1, 6, 4, 7, 7, 9, 8, 3, 4, 0, 2, 5, 4, 3, 5, 1, 2, 8, 4, 3, 9, 6, 1, 2, 9, 4, 6, 0, 3, 5, 2, 9, 1, 3, 3, 2, 5, 9, 4, 2, 7, 9, 4, 9, 0, 4, 3, 3, 7, 2, 9, 9, 0, 8, 5, 7, 3, 1, 5, 8, 0, 2, 9, 0, 9, 5, 8, 6, 3, 1, 3, 8, 2, 6, 8, 3, 2, 9, 1, 4, 7, 7, 1, 1, 6, 3, 9, 6, 3, 3, 7, 0, 9, 2, 4, 0, 0, 3, 1, 6, 8, 9, 4, 5, 8, 6, 3, 6, 0, 6, 0, 6, 4, 5, 8, 4, 5, 9, 2, 5, 1, 2, 6, 9, 9, 4, 6, 5, 5, 7, 2, 4, 8, 3, 9, 1, 8, 6, 5, 6, 4, 2, 0, 9, 7, 5, 2, 6, 8, 5, 0, 8, 2, 3, 0, 7, 5, 4, 4, 2, 5, 4, 5, 9, 9, 3, 7, 6, 9, 1, 7, 0, 4, 1, 9, 7, 7, 7, 8, 0, 0, 8, 5, 3, 6, 2, 7, 3, 0, 9, 4, 1, 7, 1, 0, 1, 6, 3, 4, 3, 4, 9, 0, 7, 6, 9, 6, 4, 2, 3, 7, 2, 2, 2, 9, 4, 3, 5, 2, 3, 6, 6, 1, 2, 5, 5, 7, 2, 5, 0, 8, 8, 1, 4, 7, 7, 9, 2, 2, 3, 1, 5, 1, 9, 7, 4, 7, 7, 8, 0, 6, 0, 5, 6, 9, 6, 7, 2, 5, 3, 8, 0, 1, 7, 1, 8, 0, 7, 7, 6, 3, 6, 0, 3, 4, 6, 2, 4, 5, 9, 2, 7, 8, 7, 7, 8, 4, 6, 5, 8, 5, 0, 6, 5, 6, 0, 5, 0, 7, 8, 0, 8, 4, 4, 2, 1, 1, 5, 2, 9, 6, 9, 7, 5, 2, 1, 8, 9, 0, 8, 7, 4, 0, 1, 9, 6, 6, 0, 9, 0, 6, 6, 5, 1, 8, 0, 3, 5, 1, 6, 5, 0, 1, 7, 9, 2, 5, 0, 4, 6, 1, 9, 5, 0, 1, 3, 6, 6, 5, 8, 5, 4, 3, 6, 6, 3, 2, 7, 1, 2, 5, 4, 9, 6, 3, 9, 9, 0, 8, 5, 4, 9, 1, 4, 4, 2, 0, 0, 0, 1, 4, 5, 7, 4, 7, 6, 0, 8, 1, 9, 3, 0, 2, 2, 1, 2, 0, 6, 6, 0, 2, 4, 3, 3, 0, 0, 9, 6, 4, 1, 2, 7, 0, 4, 8, 9, 4, 3, 9, 0, 3, 9, 7, 1, 7, 7, 1, 9, 5, 1, 8, 0, 6, 9, 9, 0, 8, 6, 9, 9, 8, 6, 0, 6, 6, 3, 6, 5, 8, 3, 2, 3, 2, 2, 7, 8, 7, 0, 9, 3, 7, 6, 5, 0, 2, 2, 6, 0, 1, 4, 9, 2, 9, 1, 0, 1, 1, 5, 1, 7, 1, 7, 7, 6, 3, 5, 9, 4, 4, 6, 0, 2, 0, 2, 3, 2, 4, 9, 3, 0, 0, 2, 8, 0, 4, 0, 1, 8, 6, 7, 7, 2, 3, 9, 1, 0, 2, 8, 8, 0, 9, 7, 8, 6, 6, 6, 0, 5, 6, 5, 1, 1, 8, 3, 2, 6, 0, 0, 4, 3, 6, 8, 8, 5, 0, 8, 8, 1, 7, 1, 5, 7, 2, 3, 8, 6, 6, 9, 8, 4, 2, 2, 4, 2, 2, 0, 1, 0, 2, 4, 9, 5, 0, 5, 5, 1, 8, 8, 1, 6, 9, 4, 8, 0, 3, 2, 2, 1, 0, 0, 2, 5, 1, 5, 4, 2, 6, 4, 9, 4, 6, 3, 9, 8, 1, 2, 8, 7, 3, 6, 7, 7, 6, 5, 8, 9, 2, 7, 6, 8, 8, 1, 6, 3, 5, 9, 8, 3, 1, 2, 4, 7, 7, 8, 8, 6, 5,

$$\frac{d}{dx}e^x = e^x$$

2, 0, 1, 4, 1, 1, 7, 4, 1, 1, 0, 9, 1, 3, 6, 0, 1, 1, 6, 4, 9, 9, 5, 0, 7, 6, 6, 2, 9, 0, 7, 7, 9, 4, 3,
6, 4, 6, 0, 0, 5, 8, 5, 1, 9, 4, 1, 9, 9, 8, 5, 6, 0, 1, 6, 2, 6, 4, 7, 9, 0, 7, 6, 1, 5, 3, 2, 1, 0, 3,
8, 7, 2, 7, 5, 5, 7, 1, 2, 6, 9, 9, 2, 5, 1, 8, 2, 7, 5, 6, 8, 7, 9, 8, 9, 3, 0, 2, 7, 6, 1, 7, 6, 1, 1,
4, 6, 1, 6, 2, 5, 4, 9, 3, 5, 6, 4, 9, 5, 9, 0, 3, 7, 9, 8, 0, 4, 5, 8, 3, 8, 1, 8, 2, 3, 2, 3, 3, 6, 8,
6, 1, 2, 0, 1, 6, 2, 4, 3, 7, 3, 6, 5, 6, 9, 8, 4, 6, 7, 0, 3, 7, 8, 5,
8, 5, 3, 3, 0, 5, 2, 7, 5, 8, 3, 3, 3, 3, 7, 9, 3, 9, 9, 0, 7, 5, 2, 1, $\int e^x dx = e^x + C$
6, 6, 0, 6, 9, 2, 3, 8, 0, 5, 3, 3, 6, 9, 8, 8, 7, 9, 5, 6, 5, 1, 3, 7,
2, 8, 5, 5, 9, 3, 8, 8, 3, 4, 9, 9, 8, 9, 4, 7, 0, 7, 4, 1, 6, 1, 8, 1, 5, 5, 0, 1, 2, 5, 3, 9, 7, 0, 6,
4, 6, 4, 8, 1, 7, 1, 9, 4, 6, 7, 0, 8, 3, 4, 8, 1, 9, 7, 2, 1, 4, 4, 8, 8, 8, 9, 8, 7, 9, 0, 6, 7, 6, 5,
0, 3, 7, 9, 5, 9, 0, 3, 6, 6, 9, 6, 7, 2, 4, 9, 4, 9, 9, 2, 5, 4, 5, 2, 7, 9, 0, 3, 3, 7, 2, 9, 6, 3, 6,
1, 6, 2, 6, 5, 8, 9, 7, 6, 0, 3, 9, 4, 9, 8, 5, 7, 6, 7, 4, 1, 3, 9, 7, 3, 5, 9, 4, 4, 1, 0, 2, 3, 7, 4,
4, 3, 2, 9, 7, 0, 9, 3, 5, 5, 4, 7, 7, 9, 8, 2, 6, 2, 9, 6, 1, 4, 5, 9, 1, 4, 4, 2, 9, 3, 6, 4, 5, 1, 4,
2, 8, 6, 1, 7, 1, 5, 8, 5, 8, 7, 3, 3, 9, 7, 4, 6, 7, 9, 1, 8, 9, 7, 5, 7, 1, 2, 1, 1, 9, 5, 6, 1, 8, 7,
3, 8, 5, 7, 8, 3, 6, 4, 4, 7, 5, 8, 4, 4, 8, 4, 2, 3, 5, 5, 5, 5, 8, 1, 0, 5, 0, 0, 2, 5, 6, 1, 1, 4, 9,
2, 3, 9, 1, 5, 1, 8, 8, 9, 3, 0, 9, 9, 4, 6, 3, 4, 2, 8, 4, 1, 3, 9, 3, 6, 0, 8, 0, 3, 8, 3, 0, 9, 1, 6,
6, 2, 8, 1, 8, 8, 1, 1, 5, 0, 3, 7, 1, 5, 2, 8, 4, 9, 6, 7, 0, 5, 9, 7, 4, 1, 6, 2, 5, 6, 2, 8, 2, 3, 6,
0, 9, 2, 1, 6, 8, 0, 7, 5, 1, 5, 0, 1, 7, 7, 7, 2, 5, 3, 8, 7, 4, 0, 2, 5, 6, 4, 2, 5, 3, 4, 7, 0, 8, 7,
9, 0, 8, 9, 1, 3, 7, 2, 9, 1, 7, 2, 2, 8, 2, 8, 6, 1, 1, 5, 1, 5, 9, 1, 5, 6, 8, 3, 7, 2, 5, 2, 4, 1, 6,
3, 0, 7, 7, 2, 2, 5, 4, 4, 0, 6, 3, 3, 7, 8, 7, 5, 9, 3, 1, 0, 5...

President Ward Wright, who had come to Widgeree specially to farewell him, entered the room and asked if he was feeling well. Iridio, still forcing

$$\hat{I}_{\alpha}^{(K,n)} = \frac{1}{K} \sum_{k=1}^K D_{KL}(\hat{p}(y \mid x = x_K) \parallel \hat{p}_{k,\alpha}(y))$$

2.7.vi.b. The anthropically corrected information estimate

himself to come back to reality, said yes. The president told him that after long negotiations with other terrestrial countries and the maritime cities, his role as Earth's scientific ambassador plenipo-

tentiary to the Confederation of Intelligent Species of the Milky Way had been confirmed. To avoid new attacks from the anti-ecological paramilitaries who had sentenced him to death, in a few hours, from beside his father's grave, the national army would hand him over to the diplomats of the extra-terrestrial civilisations. Iridio had to sign many documents and finalise the classification of his calculations in the flexible reader, which would be kept, together with his few possessions, in a storage facility of the Ministry of Defence, Internal Appeasement and Border Protection, until his return to the planet. He was allowed to take only an envelope containing a poem given to him by his father and an old overcoat inherited from him. The overcoat was brought from his house by the notary Walker Kovac, at his request.

$$E(t + \tau) = [1 - \int_{t-r}^t E(t') dt'] S_e \left\{ \int_{-\infty}^t \alpha(t - t') [c_1 E(t') - c_2 I(t') + P(t')] dt' \right\}$$

$$I(t + \tau) = [1 - \int_{t-r}^t I(t') dt'] S_i \left\{ \int_{-\infty}^t \alpha(t - t') [c_3 E(t') - c_4 I(t') + Q(t')] dt' \right\}$$

2.7.vi.c. Wilson–Cowan equations for neocortical dynamics

Against all his instincts, he decided that this time he had to place his trust in his maternal grandmother. He signed everything they put in front of him, without reading it, fighting back the nausea that was rising again. They did not allow him to see Iris again, but projected a hologrammatic film of her into his room, and she wished him good luck on his journey. She looked less haggard than the night before, which suggested that the film had been recorded before she was tortured. He contained his aggression, as his grandmother had recommended, and focused on reciting the digits of e while he was being prepared.

...9, 8, 2, 6, 7, 6, 0, 9, 4, 4, 2, 0, 3, 2, 6, 1, 9, 2, 4, 2, 8, 5, 3, 1, 7, 0, 1, 8, 7, 8, 1, 7, 7, 2, 9, 6, 0, 2, 3, 5, 4, 1, 3, 0, 6, 0, 6, 7, 2, 1, 3, 6, 0, 4, 6, 0, 0, 0, 3, 8, 9, 6, 6, 1, 0, 9, 3, 6, 4, 7, 0, 9, 5, 1, 4, 1, 4, 1, 7, 1, 8, 5, 7, 7, 7, 0, 1, 4, 1, 8, 0, 6, 0, 6, 4, 4, 3, 6, 3, 6, 8, 1, 5, 4, 6, 4, 4, 4, 0, 0, 5, 3, 3, 1, 6, 0, 8, 7, 7, 8, 3, 1, 4, 3, 1, 7, 4, 4, 4, 0, 8, 1, 1, 9, 4, 9, 4, 2, 2, 9, 7, 5, 5, 9, 9, 3, 1, 4, 0, 1, 1, 8, 8, 8, 6, 8, 3, 3, 1, 4, 8, 3, 2, 8, 0, 2, 7, 0, 6, 5, 5, 3, 8, 3, 3, 0, 0, 4, 6, 9, 3, 2, 9, 0, 1, 1, 5, 7, 4, 4, 1, 4, 7, 5, 6, 3, 1, 3, 9, 9, 9, 7, 2, 2, 1, 7, 0, 3, 8, 0, 4, 6, 1, 7, 0, 9, 2, 8, 9, 4, 5, 7, 9, 0, 9, 6, 2, 7, 1, 6, 6, 2, 2, 6, 0, 7, 4, 0, 7, 1, 8, 7, 4, 9, 9, 7, 5, 3, 5, 9, 2, 1, 2, 7, 5, 6, 0, 8, 4, 4, 1, 4, 7, 3, 7, 8, 2, 3, 3, 0, 3, 2, 7, 0, 3, 3, 0, 1, 6, 8, 2, 3, 7, 1, 9, 3, 6, 4, 8, 0, 0, 2, 1, 7, 3, 2, 8, 5, 7, 3, 4, 9, 3, 5, 9, 4, 7, 5, 6, 4, 3, 3, 4, 1, 2, 9, 9, 4, 3, 0, 2, 4, 8, 5, 0, 2, 3, 5, 7, 3, 2, 2, 1, 4, 5, 9, 7, 8, 4, 3, 2, 8, 2, 6, 4, 1, 4, 2, 1, 6, 8, 4, 8, 7, 8, 7, 2, 1, 6, 7, 3, 3, 6, 7, 0, 1, 0, 6, 1, 5, 0, 9, 4, 2, 4, 3, 4, 5, 6, 9, 8, 4, 4, 0, 1, 8, 7, 3, 3, 1, 2, 8, 1, 0, 1, 0, 7, 9, 4, 5, 1, 2, 7, 2, 2, 3, 7, 3, 7, 8, 8, 6, 1, 2, 6, 0, 5, 8, 1, 6, 5, 6, 6, 8, 0, 5, 3, 7, 1, 4, 3, 9, 6, 1, 2, 7, 8, 8, 8, 7, 3, 2, 5, 2, 7, 3, 7, 3, 8, 9, 0, 3, 9, 2, 8, 9, 0, 5, 0, 6, 8, 6, 5, 3, 2, 4, 1, 3, 8, 0, 6, 2, 7, 9, 6, 0, 2, 5, 9, 3, 0, 3, 8, 7, 7, 2, 7, 6, 9, 7, 7, 8, 3, 7, 9, 2, 8, 6, 8, 4, 0, 9, 3, 2, 5, 3, 6, 5, 8, 8, 0, 7, 3, 3, 9, 8, 8, 4, 5, 7, 2, 1, 8, 7, 4, 6, 0, 2, 1, 0, 0, 5, 3, 1, 1, 4, 8, 3, 3, 5, 1, 3, 2, 3, 8, 5, 0, 0, 4, 7, 8, 2, 7, 1, 6, 9, 3, 7, 6, 2, 1, 8, 0, 0, 4, 9, 0, 4, 7, 9, 5, 5, 9, 7, 9, 5, 9, 2, 9, 0, 5, 9, 1, 6, 5, 5, 4, 7, 0, 5, 0, 5, 7, 7, 7, 5, 1, 4, 3, 0, 8, 1, 7, 5, 1, 1, 2, 6, 9, 8, 9, 8, 5, 1, 8, 8, 4, 0, 8, 7, 1, 8, 5, 6, 4, 0, 2, 6, 0, 3, 5, 3, 0, 5, 5, 8, 3, 7, 3, 7, 8, 3, 2, 4, 2, 2, 9, 2, 4, 1, 8, 5, 6, 2, 5, 6, 4, 4, 2, 5, 5, 0, 2, 2, 6, 7, 2, 1, 5, 5, 9, 8, 0, 2, 7, 4, 0, 1, 2, 6, 1, 7, 9, 7, 1, 9, 2, 8, 0, 4, 7, 1, 3, 9, 6, 0, 0, 6, 8, 9, 1, 6, 3, 8, 2, 8, 6, 6, 5, 2, 7, 7, 0, 0, 9, 7, 5, 2, 7, 6, 7, 0, 6, 9, 7, 7, 7, 0, 3, 6, 4, 3, 9, 2, 6, 0, 2, 2, 4, 3, 7, 2, 8, 4, 1, 8, 4, 0, 8, 8, 3, 2, 5, 1, 8, 4, 8, 7, 7, 0, 4, 7, 2, 6, 3, 8, 4, 4, 0, 3, 7, 9, 5, 3, 0, 1, 6, 6, 9, 0, 5, 4, 6, 5, 9, 3, 7, 4, 6, 1, 6, 1, 9, 3, 2, 3, 8, 4, 0, 3, 6, 3, 8, 9, 3, 1, 3, 1, 3, 6, 4, 3, 2, 7, 1, 3, 7, 6, 8, 8, 8, 4, 1, 0, 2, 6, 8, 1, 1, 2, 1, 9, 8, 9, 1, 2, 7,

$$\ln e = \int_1^e \frac{dt}{t} = 1$$

5, 2, 2, 3, 0, 5, 6, 2, 5, 6, 7, 5, 6, 2, 5, 4, 7, 0, 1, 7, 2, 5, 0, 8, 6, 3, 4, 9, 7, 6, 5, 3, 6, 7, 2,
 8, 8, 6, 0, 5, 9, 6, 6, 7, 5, 2, 7, 4, 0, 8, 6, 8, 6, 2, 7, 4, 0, 7, 9, 1, 2, 8, 5, 6, 5, 7, 6, 9, 9, 6,
 3, 1, 3, 7, 8, 9, 7, 5, 3, 0, 3, 4, 6, 6, 0, 6, 1, 6, 6, 6, 9, 8, 0, 4, 2, 1, 8, 2, 6, 7, 7, 2, 4, 5, 6,
 0, 5, 3, 0, 6, 6, 0, 7, 7, 3, 8, 9, 9, 6, 2, 4, 2, 1, 8, 3, 4, 0, 8, 5, 9, 8, 8, 2, 0, 7, 1, 8, 6, 4, 6,
 8, 2, 6, 2, 3, 2, 1, 5, 0, 8, 0, 2, 8, 8, 2, 8, 6, 3, 5, 9, 7, 4, 6, 8, 3, 9, 6, 5, 4, 3, 5, 8, 8, 5, 6,
 6, 8, 5, 5, 0, 3, 7, 7, 3, 1, 3, 1, 2, 9, 6, 5, 8, 7, 9, 7, 5, 8, 1, 0, 5, 0, 1, 2, 1, 4, 9, 1, 6, 2, 0,
 7, 6, 5, 6, 7, 6, 9, 9, 5, 0, 6, 5, 9, 7, 1, 5, 3, 4, 4, 7, 6, 3, 4, 7, 0, 3, 2, 0, 8, 5, 3, 2, 1, 5, 6,
 0, 3, 6, 7, 4, 8, 2, 8, 6, 0, 8, 3, 7, 8, 6, 5, 6, 8, 0, 3, 0,
 7, 3, 0, 6, 2, 6, 5, 7, 6, 3, 3, 4, 6, 9, 7, 7, 4, 2, 9, 5, 6, $e^{ix} = \cos(x) + i \sin(x)$
 3, 4, 6, 4, 3, 7, 1, 6, 7, 0, 9, 3, 9, 7, 1, 9, 3, 0, 6, 0, 8,
 7, 6, 9, 6, 3, 4, 9, 5, 3, 2, 8, 8, 4, 6, 8, 3, 3, 6, 1, 3, 0, 3, 8, 8, 2, 9, 4, 3, 1, 0, 4, 0, 8, 0, 0,
 2, 9, 6, 8, 7, 3, 8, 6, 9, 1, 1, 7, 0, 6, 6, 6, 6, 1, 4, 6, 8, 0, 0, 0, 1, 5, 1, 2, 1, 1, 4, 3, 4, 4,
 2, 2, 5, 6, 0, 2, 3, 8, 7, 4, 4, 7, 4, 3, 2, 5, 2, 5, 0, 7, 6, 9, 3, 8, 7, 0, 7, 7, 7, 5, 1, 9, 3, 2,
 9, 9, 9, 4, 2, 1, 3, 7, 2, 7, 7, 2, 1, 1, 2, 5, 8, 8, 4, 3, 6, 0, 8, 7, 1, 5, 8, 3, 4, 8, 3, 5, 6, 2, 6,
 9, 6, 1, 6, 6, 1, 9, 8, 0, 5, 7, 2, 5, 2, 6, 6, 1, 2, 2, 0, 6, 7, 9, 7, 5, 4, 0, 6, 2, 1, 0, 6, 2, 0, 8,
 0, 6, 4, 9, 8, 8, 2, 9, 1, 8, 4, 5, 4, 3, 9, 5, 3, 0, 1, 5, 2, 9, 9, 8, 2, 0, 9, 2, 5, 0, 6, 1, 1, 4, 6,
 5, 1, 4, 8, 3, 7, 5, 2, 6, 2, 0, 9, 5, 6, 5, 3, 4, 6, 7, 1, 3, 2, 9, 0, 0, 2, 5, 9, 9, 4, 3, 9, 7, 6, 6,
 3, 1, 1, 4, 5, 4, 5, 9, 0, 2, 6, 8, 5, 8, 9, 8, 9, 7, 9, 1, 1, 5, 8, 3, 7, 0, 9, 3, 4, 1, 9, 3, 7, 0, 4,
 4, 1, 1, 5, 5, 1, 2, 1, 9, 2, 0, 1, 1, 7, 1, 6, 4, 8, 8, 0, 5, 6, 6, 9, 4, 5, 9, 3, 8, 1, 3, 1, 1, 8, 3,
 8, 4, 3, 7, 6, 5, 6, 2, 0, 6, 2, 7, 8, 4, 6, 3, 1, 0, 4, 9, 0, 3, 4, 6, 2, 9, 3, 9, 5, 0, 0, 2, 9, 4, 5,
 8, 3, 4, 1, 1, 6, 4, 8, 2, 4, 1, 1, 4, 9, 6, 9, 7, 5, 8, 3, 2, 6, 0, 1, 1, 8, 0, 0, 7, 3, 1, 6, 9, 9, 4,
 3, 7, 3, 9, 3, 5, 0, 6, 9, 6, 6, 2, 9, 5, 7, 1, 2, 4, 1, 0, 2, 7, 3, 2, 3, 9, 1, 3, 8, 7, 4, 1, 7, 5, 4,
 9, 2, 3, 0, 7, 1, 8, 6, 2, 4, 5, 4, 5, 4, 3, 2, 2, 0, 3, 9, 5, 5, 2, 7, 3, 5, 2, 9, 5, 2, 4, 0, 2, 4,
 5, 9, 0, 3, 8, 0, 5, 7, 4, 4, 5, 0, 2, 8, 9, 2, 2, 4, 6, 8, 8, 6, 2, 8, 5, 3, 3, 6, 5, 4, 2, 2, 1, 3, 8,
 1, 5, 7, 2, 2, 1, 3, 1, 1, 6, 3, 2, 8, 8, 1, 1, 2, 0, 5, 2, 1, 4, 6, 4, 8, 9, 8, 0, 5, 1, 8, 0, 0, 9, 2,
 0, 2, 4, 7, 1, 9, 3, 9, 1, 7, 1, 0, 5, 5, 5, 3, 9, 0, 1, 1, 3, 9, 4, 3, 3, 1, 6, 6, 8, 1, 5, 1, 5, 8, 2,
 8, 8, 4, 3, 6, 8, 7, 6, 0, 6, 9, 6, 1, 1, 0, 2, 5, 0, 5, 1, 7, 1, 0, 0, 7, 3, 9, 2, 7, 6, 2, 3, 8, 5, 5,
 5, 3, 3, 8, 6, 2, 7, 2, 5, 5, 3, 5, 3, 8, 8, 3, 0, 9, 6, 0, 6, 7, 1, 6, 4, 4, $e^{i\pi} = -1$
 6, 6, 2, 3, 7, 0, 9, 2, 2, 6, 4, 6, 8, 0, 9, 6, 7, 1, 2, 5, 4, 0, 6, 1, 8, 6,
 9, 5, 0, 2, 1, 4, 3, 1, 7, 6, 2, 1, 1, 6, 6, 8, 1, 4, 0, 0, 9, 7, 5, 9, 5, 2, 8, 1, 4, 9, 3, 9, 0, 7, 2,
 2, 2, 6, 0, 1, 1, 1, 2, 6, 8, 1, 1, 5, 3, 1, 0, 8, 3, 8, 7, 3, 1, 7, 6, 1, 7, 3, 2, 3, 2, 3, 5, 2, 6, 3,
 6, 0, 5, 8, 3, 8, 1, 7, 3, 1, 5, 1, 0, 3, 4, 5, 9, 5, 7, 3, 6, 5, 3, 8, 2, 2, 3, 5, 3, 4, 9, 9, 2, 9, 3,
 5, 8, 2, 2, 8, 3, 6, 8, 5, 1, 0, 0, 7, 8, 1, 0, 8, 8, 4, 6, 3, 4, 3, 4, 9, 9, 8, 3, 5, 1, 8, 4, 0, 4, 4,
 5, 1, 7, 0, 4, 2, 7, 0, 1, 8, 9, 3, 8, 1, 9, 9, 4, 2, 4, 3, 4, 1, 0, 0, 9, 0, 5, 7, 5, 3, 7, 6, 2, 5, 7,
 7, 6, 7, 5, 7, 1, 1, 1, 8, 0, 9, 0, 0, 8, 8, 1, 6, 4, 1, 8, 3, 3, 1, 9, 2, 0, 1, 9, 6, 2, 6, 2, 3, 4, 1,
 6, 2, 8, 8, 1, 6, 6, 5, 2, 1, 3, 7, 4...

It was a cold winter's day. It had snowed the night before, a rare occurrence in Widgeree. The army had closed the cemetery and cleared away all the offerings, wreaths and works of art that people had left on his father's grave the day before. Soldiers from the Ozeanic army guarded the gates. President Ward

Wright and two officials from the new Ozeanic government escorted him to the graveside. He recognised Brigadier Kliz Sordini, one of the two bureaucrats who had come with Major Klamm O'Brien to rescue him from the cathedral, now wearing the uniform of commander-in-chief and many medals. Iridio concluded that he had also been promoted since the coup. The other was the president of the Ozeanic Association of Fine Arts Tintorelli Turner III, who seemed less hateful in the flesh than when he appeared in the news condemning his ancestors.

Iridio was surprised to see that next to his father's grave there were two other smaller graves with the names of his paternal grandparents. Tintorelli Turner III saw the astonishment on Iridio's face and assured him that the last statue of his grandmother had not been destroyed. They had substituted exact plastic replicas for his grandparents' skeletons and replaced the liquid in the connecting vessels with sandrinist hydriogen, which was the same green colour as the original liquid. Iridio felt overwhelmed by nausea and started to recite the digits of e again.

...0, 3, 0, 0, 5, 4, 9, 8, 2, 5, 7, 0, 4, 3, 3, 9, 0, 5, 5, 3, 5, 7, 0, 1, 6, 8, 6, 5, 3, 1, 2, 0, 5, 2, 6, 4, 9, 5, 6, 1, 4, 8, 5, 7, 2, 4, 9, 2, 5, 7, 3, 8, 6, 2, 0, 6, 9, 1, 7, 4, 0, 3, 6, 9, 5, 2, 1, 3, 5, 3, 3, 7, 3, 2, 5, 3, 1, 6, 6, 6, 3, 4, 5, 4, 6, 6, 5, 8, 8, 5, 9, 7, 2, 8, 6, 6, 5, 9, 4, 5, 1, 1, 3, 6, 4, 4, 1, 3, 7, 0, 3, 3, 1, 3, 9, 3, 6, 7, 2, 1, 1, 8, 5, 6, 9, 5, 5, 3, 9, 5, 2, 1, 0, 8, 4, 5, 8, 4, 0, 7, 2, 4, 4, 3, 2, 3, 8, 3, 5, 5, 8, 6, 0, 6, 3, 1, 0, 6, 8, 0, 6, 9, 6, 4, 9, 2, 4, 8, 5, 1, 2, 3, 2, 6, 3, 2, 6, 9, 9, 5, 1, 4, 6, 0, 3, 5, 9, 6, 0, 3, 7, 2, 9, 7, 2, 5, 3, 1, 9, 8, 3, 6, 8, 4, 2, 3, 3, 6, 3, 9, 0, 4, 6, 3, 2, 1, 3, 6, 7, 1, 0, 1, 1, 6, 1, 9, 2, 8, 2, 1, 7, 1, 1, 1, 5, 0, 2, 8, 2, 8, 0, 1, 6, 0, 4, 4, 8, 8, 0, 5, 8, 8, 0, 2, 3, 8, 2, 0, 3, 1, 9, 8, 1, 4, 9, 3, 0, 9, 6, 3, 6, 9, 5, 9, 6, 7, 3, 5, 8, 3, 2, 7, 4, 2, 0, 2, 4, 9, 8, 8, 2, 4, 5, 6, 8, 4, 9, 4, 1, 2, 7, 3, 8, 6, 0, 5, 6, 6, 4, 9, 1, 3, 5, 2, 5, 2, 6, 7, 0, 6, 0, 4, 6, 2, 3, 4, 4, 5, 0, 5, 4, 9, 2, 2, 7, 5, 8, 1, 1, 5, 1, 7, 0, 9, 3, 1, 4, 9, 2, 1, 8, 7, 9, 5, 9, 2, 7, 1, 8, 0, 0, 1, 9, 4, 0, 9, 6, 8, 8, 6, 6, 9, 8, 6, 8, 3, 7, 0, 3, 7, 3, 0, 2, 2, 0, 0, 4, 7, 5, 3, 1, 4, 3, 3, 8, 1, 8, 1, 0, 9, 2, 7, 0, 8, 0, 3, 0, 0, 1, 7, 2, 0, 5, 9, 3, 5, 5, 3, 0, 5, 2, 0, 7, 0, 0, 7, 0, 6, 0, 7, 2, 2, 3, 3, 9, 9, 9, 4, 6, 3, 9, 9, 0, 5, 7, 1, 3, 1, 1, 5, 8, 7, 0, 9, 9, 6, 3, 5, 7, 7, 7, 3, 5, 9, 0, 2, 7, 1, 9, 6, 2, 8, 5...

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

A spaceship floated in the sky above them. Three Zuespoks disembarked via a stairway of light. The ceremony was very plain and seemed to have been negotiated in advance, as it consisted of an exchange of gifts and no speeches. The extra-terrestrials gave the officials three dodecahedrons of a transparent material. They, for their part, presented the extra-terrestrials with the Ozeanic coat of arms, depicting a kangaroo, a kiwi, a model of the parliament of Bandar-Metropolis, and a reproduction of a sculpture by Tintorelli Turner II, the father of Tintorelli Turner III, representing Diana, the goddess of Greek mythology, blindfolded. Tintorelli Turner III could not hide his displeasure when the Zuespoks gave Iridio a reproduction of his father's most famous statue, known as *Fahrenheit 1984*, made of an amalgam of transition metals, such as platinum and

iridium, which reflected the colours of the environment as a rainbow. The other gift was a reproduction of the last sculpture of Iridio's paternal grandmother, in which the liquid in the connected vessels, of a greenish colour like the original statue, flowed by itself, filling the vessels alternately.

When Iridio had placed the reproductions given to him on the graves of his ancestors, they all bowed in a very courtly manner. Finally, he was invited to ascend the stairway of light and enter the spaceship with them. Before embarking, Iridio looked down and saw Tintorelli Turner III handing the statues to one of the soldiers on guard.

...7, 1, 7, 3, 2, 5, 4, 7, 7, 7, 2, 7, 7, 8, 3, 4, 8, 8, 7, 7, 4, 3, 6, 6, 5, 1, 8, 8, 2, 8, 7, 5, 2, 1, 5, 6, 6, 8, 5, 7, 1, 9, 5, 0, 6, 3, 7, 1, 9, 3, 6, 5, 6, 5, 3, 9, 0, 3, 8, 9, 4, 4, 9, 3, 6, 6, 4, 2, 1, 7, 6, 4, 0, 0, 3, 1, 2, 1, 5, 2, 7, 8, 7, 0, 2, 2, 2, 3, 6, 6, 4, 6, 3, 6, 3, 5, 7, 5, 5, 5, 0, 3, 5, 6, 5, 5, 7, 6, 9, 4, 8, 8, 8, 6, 5, 4, 9, 5, 0, 0, 2, 7, 0, 8, 5, 3, 9, 2, 3, 6, 1, 7, 1, 0, 5, 5, 0, 2, 1, 3, 1, 1, 4, 7, 4, 1, 3, 7, 4, 4, 1, 0, 6, 1, 3, 4, 4, 4, 5, 5, 4, 4, 1, 9, 2, 1, 0, 1, 3, 3, 6, 1, 7, 2, 9, 9, 6, 2, 8, 5, 6, 9, 4, 8, 9, 9, 1, 9, 3, 3, 6, 9, 1, 8, 4, 7, 2, 9, 4, 7, 8, 5, 8, 0, 7, 2, 9, 1, 5, 6, 0, 8, 8, 5, 1, 0, 3, 9, 6, 7, 8, 1, 9, 5, 9, 4, 2, 9, 8, 3, 3, 1, 8, 6, 4, 8, 0, 7, 5, 6, 0, 8, 3, 6, 7, 9, 5, 5, 1, 4, 9, 6, 6, 3, 6, 4, 4, 8, 9, 6, 5, 5, 9, 2, 9, 4, 8, 1, 8, 7, 8, 5, 1, 7, 8, 4, 0, 3, 8, 7, 7, 3, 3, 2, 6, 2, 4, 7, 0, 5, 1, 9, 4, 5, 0, 5, 0, 4, 1, 9, 8, 4, 7, 7, 4, 2, 0, 1, 4, 1, 8, 3, 9, 4, 7, 7, 3, 1, 2, 0, 2, 8, 1, 5, 8, 8, 6, 8, 4, 5, 7, 0, 7, 2, 9, 0, 5, 4, 4, 0, 5, 7, 5, 1, 0, 6, 0, 1, 2, 8, 5, 2, 5, 8, 0, 5, 6, 5, 9, 4, 7, 0, 3, 0, 4, 6, 8, 3, 6, 3...

A few hours later, at the embassy of the galactic confederation in Brodei, a hopeful Iridio started the decontamination treatment which would allow him to leave the planet. There were mass demonstrations of hope on all continents when the international press saw him leaving in the spaceship which would take him first to Titan, to represent humanity in the first official contact with the Eristeands that populated the moons of Saturn, and then on to the capital planet of the Argoterrand civilisation, orbiting Alpha Centauri Beta, the third-closest star to the sun.

The relativistic conditions of the local journey where the wormholes of the intergalactic network could be used would mean that Iridio could return to Earth in two years of local time, although it would only take three weeks of travelling according to the temporal coordinates of the ship. Before the

$$t'_2 - t'_1 = \gamma \left[\left(t_2 - \frac{ux_2}{c^2} \right) - \left(t_1 - \frac{ux_1}{c^2} \right) \right]$$

2.7.vii.b. Temporal dilation according to the Lorentz transform

Group 10

P e r i o d 6	195.084 870.02.28 78 Pt Platinum [Xe]4f¹⁴5d⁹6s¹ Solid Transition Metal +4 +2

d-block

2.7.vii.a. Platinum entry in the Periodic Table of the Elements

ship accelerated, Iridio could observe his planet in all its glory. From outer space, one could not make out the artificial geographical limits created by its inhabitants. He observed, astonished, the enormous size of the floating cities, spread out over the seas of Earth. Atlantis IV, in the Sargasso Sea, where he should have received the Heisenberg Prize, was almost as big as Iceland. It was easy to tell which of the small sectors of the planet were controlled by the International Ecological Brigades, because they were covered by uncultivated vegetation. It was night in Ozeania but the lights allowed him to reconstruct in his mind the map of all the islands that made up the republic. Likewise, he recognised the outline of Atlantis VIII, the free city he could never visit off the coast. Suddenly, all the lights of Ozeania went out, except for those of the floating city. Iridio knew then that his grandmother Mildred had kept her promise to wait until he was safe, before commencing her boycott of the country's infrastructure.

...4, 4, 5, 9, 2, 6, 5, 2, 5, 5, 2, 1, 3, 7, 0, 0, 8, 0, 6, 8, 7, 5, 2, 0, 0, 9, 5, 9, 3, 4, 5, 3, 6, 0, 7, 3, 1, 6, 2, 2, 6, 1, 1, 8, 7, 2, 8, 1, 7, 3, 9, 2, 8, 0, 7, 4, 6, 2, 3, 0, 9, 4, 6, 8, 5, 3, 6, 7, 8, 2, 3, 1, 0, 6, 0, 9, 7, 9, 2, 1, 5, 9, 9, 3, 6, 0, 0, 1, 9, 9, 4, 6, 2, 3, 7, 9, 9, 3, 4, 3, 4, 2, 1, 0, 6, 8, 7, 8, 1, 3, 4, 9, 7, 3, 4, 6, 9, 5, 9, 2, 4, 6, 4, 6, 9, 7, 5, 2, 5, 0, 6, 2, 4, 6, 9, 5, 8, 6, 1, 6, 9, 0, 9, 1, 7, 8, 5, 7, 3, 9, 7, 6, 5, 9, 5, 1, 9, 9, 3, 9, 2, 9, 9, 3, 9, 9, 5, 5, 6, 7, 5, 4, 2, 7, 1, 4, 6, 5, 4, 9, 1, 0, 4, 5, 6, 8, 6, 0, 7, 0, 2, 0, 9, 9, 0, 1, 2, 6, 0, 6, 8, 1, 8, 7, 0, 4, 9, 8, 4, 1, 7, 8, 0, 7, 9, 1, 7, 3, 9, 2, 4, 0, 7, 1, 9, 4, 5, 9, 9, 6, 3, 2, 3, 0, 6, 0, 2, 5, 4, 7, 0, 7, 9, 0, 1, 7, 7, 4, 5, 2, 7, 5, 1, 3, 1, 8, 6, 8, 0, 9, 9, 8, 2, 2, 8, 4, 7, 3, 0, 8, 6, 0, 7, 6, 6, 5, 3, 6, 8, 6, 6, 8, 5, 5, 5, 1, 6, 4, 6, 7, 7, 0, 2, 9, 1, 1, 3, 3, 6, 8, 2, 7, 5, 6, 3, 1, 0, 7, 2, 2, 3, 3, 4, 6, 7, 2, 6, 1, 1, 3, 7, 0, 5, 4, 9, 0, 7, 9, 5, 3, 6, 5, 8, 3, 4, 5, 3, 8, 6, 3, 7, 1, 9, 6, 2, 3, 5, 8, 5, 6, 3, 1, 2, 6, 1, 8, 3, 8, 7, 1, 5, 6, 7, 7, 4, 1, 1, 8, 7, 3, 8, 5, 2, 7, 7, 2, 2, 9, 2, 2, 5, 9, 4, 7, 4, 3, 3, 7, 3, 7, 8, 5, 6, 9, 5, 5, 3, 8, 4, 5, 6, 2, 4, 6, 8, 0, 1, 0, 1, 3, 9, 0, 5, 7, 2, 7, 8, 7, 1, 0, 1, 6, 5, 1, 2, 9, 6, 6, 6, 3, 6, 7, 6, 4, 4, 5, 1, 8, 7, 2, 4, 6, 5, 6, 5, 3, 7, 3, 0, 4, 0, 2, 4, 4, 3, 6, 8, 4, 1, 4, 0, 8, 1, 4, 4, 8, 8, 7, 3, 2, 9, 5, 7, 8, 4, 7, 3, 4, 8, 4, 9, 0, 0, 0, 3, 0, 1, 9, 4, 7, 7, 8, 8, 8, 0, 2, 0, 4, 6, 0, 3, 2, 4, 6, 6, 0, 8, 4, 2, 8, 7, 5, 3, 5, 1, 8, 4, 8, 3, 6, 4, 9, 5, 9, 1, 9, 5, 0, 8, 2, 8, 8, 8, 3, 2, 3, 2, 0, 6, 5, 2, 2, 1, 2, 8, 1, 0, 4, 1, 9, 0, 4, 4, 8, 0, 4, 7, 2, 4, 7, 9, 4, 9, 2, 9, 1, 3, 4, 2, 2, 8, 4, 9, 5, 1, 9, 7, 0, 0, 2, 2, 6, 0, 1, 3, 1, 0, 4, 3, 0, 0, 6, 2, 4, 1, 0, 7, 1, 7, 9, 7, 1, 5, 0, 2, 7, 9, 3, 4, 3, 3, 2, 6, 3, 4, 0, 7, 9, 9, 5, 9, 6, 0, 5, 3, 1, 4, 4, 6, 0, 5, 3, 2, 3, 0, 4, 8, 8, 5, 2, 8, 9, 7, 2, 9, 1, 7, 6, 5, 9, 8, 7, 6, 0, 1, 6, 6, 6, 7, 8, 1, 1, 9, 3, 7, 9, 3, 2, 3, 7, 2, 4, 5, 3, 8, 5, 7, 2, 0, 9, 6, 0, 7, 5, 8, 2, 2, 7, 7, 1, 7, 8, 4, 8, 3, 3, 6, 1, 6, 1, 3, 5, 8, 2, 6, 1, 2, 8, 9, 6, 2, 2, 6, 1, 1, 8, 1, 2, 9, 4, 5, 5, 9, 2, 7, 4, 6, 2, 7, 6, 7, 1, 3, 7, 7, 9, 4, 4, 8, 7, 5, 8, 6, 7, 5, 3, 6, 5, 7, 5, 4, 4, 8, 6, 1, 4, 0, 7, 6, 1, 1, 9, 3, 1, 1, 2, 5, 9, 5, 8, 5, 1, 2, 6, 5, 5, 7, 5, 9, 7, 3, 4, 5, 7, 3, 0, 1, 5, 3, 3, 3, 6, 4, 2, 6, 3, 0, 7, 6, 7, 9, 8, 5, 4, 4, 3, 3, 8, 5, 7, 6, 1, 7, 1, 5, 3, 3, 3, 4, 6, 2, 3, 2, 5, 2, 7, 0, 5, 7, 2, 0, 0, 5, 3, 0, 3, 9, 8, 8, 2, 8, 9, 4, 9, 9, 0, 3, 4, 2, 5, 9, 5, 6, 6, 2, 3, 2, 9, 7, 5, 7, 8, 2, 4, 8, 8, 7, 3, 5, 0, 2, 9, 2, 5, 9, 1, 6, 6, 8, 2, 5, 8, 9, 4, 4, 5, 6, 8, 9, 4, 6, 5, 5, 9, 9, 2, 6, 5, 8, 4, 5, 4, 7, 6, 2, 6, 9, 4, 5, 2, 8, 7, 8, 0, 5, 1, 6, 5, 0, 1, 7, 2, 0, 6, 7, 4, 7, 8, 5, 4, 1, 7, 8, 8, 7, 9, 8, 2, 2, 7, 6, 8, 0, 6,

5, 3, 6, 6, 5, 0, 6, 4, 1, 9, 1, 0, 9, 7, 3, 4, 3, 4, 5, 2, 8, 8, 7, 8, 3, 3, 8, 6, 2, 1, 7, 2, 6, 1, 5,
 6, 2, 6, 9, 5, 8, 2, 6, 5, 4, 4, 7, 8, 2, 0, 5, 6, 7, 2, 9, 8, 7, 7, 5, 6, 4, 2, 6, 3, 2, 5, 3, 2, 1, 5,
 9, 4, 2, 9, 4, 4, 1, 8, 0, 3, 9, 9, 4, 3, 2, 1, 7, 0, 0, 0, 0, 9, 0, 5, 4, 2, 6, 5, 0, 7, 6, 3, 0, 9, 5,
 5, 8, 8, 4, 6, 5, 8, 9, 5, 1, 7, 1, 7, 0, 9, 1, 4, 7, 6, 0, 7, 4, 3, 7, 1, 3, 6, 8, 9, 3, 3, 1, 9, 4, 6,
 9, 0, 9, 0, 9, 8, 1, 9, 0, 4, 5, 0, 1, 2, 9, 0, 3, 0, 7, 0, 9, 9, 5, 6, 6, 2, 2, 6, 6, 2, 0, 3, 0, 3, 1,
 8, 2, 6, 4, 9, 3, 6, 5, 7, 3, 3, 6, 9, 8, 4, 1, 9, 5, 5, 5, 7, 7, 6, 9, 6, 3, 7, 8, 7, 6, 2, 4, 9, 1, 8,
 8, 5, 2, 8, 6, 5, 6, 8, 6, 6, 0, 7, 6, 0, 0, 5, 6, 6, 0, 2, 5, 6, 0, 5, 4, 4, 5, 7, 1, 1, 3, 3, 7, 2, 8,
 6, 8, 4, 0, 2, 0, 5, 5, 7, 4, 4, 1, 6, 0, 3, 0, 8, 3, 7, 0, 5, 2, 3, 1, 2, 2, 4, 2, 5, 8, 7, 2, 2, 3, 4,
 3, 8, 8, 5, 4, 1, 2, 3, 1, 7, 9, 4, 8, 1, 3, 8, 8, 5, 5, 0, 0, 7, 5, 6, 8, 9, 3, 8, 1, 1, 2, 4, 9, 3, 5,
 3, 8, 6, 3, 1, 8, 6, 3, 5, 2, 8, 7, 0, 8, 3, 7, 9, 9, 8, 4, 5, 6, 9, 2, 6, 1, 9, 9, 8, 1, 7, 9, 4, 5, 2,
 3, 3, 6, 4, 0, 8, 7, 4, 2, 9, 5, 9, 1, 1, 8, 0, 7, 4, 7, 4, 5, 3, 4, 1, 9, 5, 5, 1, 4, 2, 0, 3, 5, 1, 7,
 2, 6, 1, 8, 4, 2, 0, 0, 8, 4, 5, 5, 0, 9, 1, 7, 0, 8, 4, 5, 6, 8, 2, 3, 6, 8, 2, 0, 0, 8, 9, 7, 7, 3, 9,
 4, 5, 5, 8, 4, 2, 6, 7, 9, 2, 1, 4, 2, 7, 3, 4, 7, 7, 5, 6, 0, 8, 7, 9, 6, 4, 4, 2, 7, 9, 2, 0, 2, 7, 0,
 8, 3, 1, 2, 1, 5, 0, 1, 5, 6, 4, 0, 6, 3, 4, 1, 3, 4, 1, 6, 1, 7, 1, 6, 6, 4, 4, 8, 0, 6, 9, 8, 1, 5, 4,
 8, 3, 7, 6, 4, 4, 9, 1, 5, 7, 3, 9, 0, 0, 1, 2, 1, 2, 1, 7, 0, 4, 1, 5, 4, 7, 8, 7, 2, 5, 9, 1, 9, 9, 8,
 9, 4, 3, 8, 2, 5, 3, 6, 4, 9, 5, 0, 5, 1, 4, 7, 7, 1, 3, 7, 9, 3, 9, 9, 1, 4, 7, 2, 0, 5, 2, 1, 9, 5, 2,
 9, 0, 7, 9, 3, 9, 6, 1, 3, 7, 6, 2, 1, 1, 0, 7, 2, 3, 8, 4, 9, 4, 2, 9, 0, 6, 1, 6, 3, 5, 7, 6, 0, 4, 5,
 9, 6, 2, 3, 1, 2, 5, 3, 5, 0, 6, 0, 6, 8, 5, 3, 7, 6, 5, 1, 4, 2, 3, 1, 1, 5, 3, 4, 9, 6, 6, 5, 6, 8, 3,
 7, 1, 5, 1, 1, 6, 6, 0, 4, 2, 2, 0, 7, 9, 6, 3, 9, 4, 4, 6, 6, 6, 2, 1, 1, 6, 3, 2, 5, 5, 1, 5, 7, 7, 2,
 9, 0, 7, 0, 9, 7, 8, 4, 7, 3, 1, 5, 6, 2, 7, 8, 2, 7, 7, 5, 9, 8, 7, 8, 8, 1, 3, 6, 4, 9, 1, 9, 5, 1, 2,
 5, 7, 4, 8, 3, 3, 2, 8, 7, 9, 3, 7, 7, 1, 5, 7, 1, 4, 5, 9, 0, 9, 1, 0, 6, 4, 8, 4, 1, 6, 4, 2, 6, 7, 8,
 3, 0, 9, 9, 4, 9, 7, 2, 3, 6, 7, 4, 4, 2, 0, 1, 7, 5, 8, 6, 2, 2, 6, 9, 4, 0, 2, 1, 5, 9, 4, 0, 7, 9, 2,
 4, 4, 8, 0, 5, 4, 1, 2, 5, 5, 3, 6, 0, 4, 3, 1, 3, 1, 7, 9, 9, 2, 6, 9, 6, 7, 3, 9, 1, 5, 7, 5, 4, 2, 4,
 1, 9, 2, 9, 6, 6, 0, 7, 3, 1, 2, 3, 9, 3, 7, 6, 3, 5, 4, 2, 1, 3, 9, 2, 3, 0, 6, 1, 7, 8, 7, 6, 7, 5, 3,
 9, 5, 8, 7, 1, 1, 4, 3, 6, 1, 0, 4, 0, 8, 9, 4, 0, 9, 9, 6, 6, 0, 8, 9, 4, 7, 1, 4, 1, 8, 3, 4, 0, 6, 9,
 8, 3, 6, 2, 9, 9, 3, 6, 7, 5, 3, 6, 2, 6, 2, 1, 5, 4, 5, 2, 4, 7, 2, 9, 8, 4, 6, 4, 2, 1, 3, 7, 5, 2, 8,
 9, 1, 0, 7, 9, 8, 8, 4, 3, 8, 1, 3, 0, 6, 0, 9, 5, 5, 5, 2, 6, 2, 2, 7, 2, 0, 8, 3, 7, 5, 1, 8, 6, 2, 9,
 8, 3, 7, 0, 6, 6, 7, 8, 7, 2, 2, 4, 4, 3, 0, 1, 9, 5, 7, 9, 3, 7, 9, 3, 7, 8, 6, 0, 7, 2, 1, 0, 7, 2, 5,
 4, 2, 7, 7, 2, 8, 9, 0, 7, 1, 7, 3, 2, 8, 5, 4, 8, 7, 4, 3, 7, 4, 3, 5, 5, 7, 8, 1, 9, 6, 6, 5, 1, 1, 7,
 1, 6, 6, 1, 8, 3, 3, 0, 8, 8, 1, 1, 2, 9, 1, 2, 0, 2, 4, 5, 2, 0, 4, 0, 4, 8, 6, 8, 2, 2, 0, 0, 0, 7, 2,
 3, 4, 4, 0, 3, 5, 0, 2, 5, 4, 4, 8, 2, 0, 2, 8, 3, 4, 2, 5, 4, 1, 8, 7, 8, 8, 4, 6, 5, 3, 6, 0, 2, 5, 9,
 1, 5, 0, 6, 4, 4, 5, 2, 7, 1, 6, 5, 7, 7, 0, 0, 0, 4, 4, 5, 2, 1, 0, 9, 7, 7, 3, 5, 5, 8, 5, 8, 9, 7, 6,
 2, 2, 6, 5, 5, 4, 8, 4, 9, 4, 1, 6, 2, 1, 7, 1, 4, 9, 8, 9, 5, 3, 2, 3, 8, 3, 4, 2, 1, 6, 0, 0, 1, 1, 4,
 0, 6, 2, 9, 5, 0, 7, 1, 8, 4, 9, 0, 4, 2, 7, 7, 8, 9, 2, 5, 8, 5, 5, 2, 7, 4, 3, 0, 3, 5, 2, 2, 1, 3, 9,
 6, 8, 3, 5, 6, 7, 9, 0, 1, 8, 0, 7, 6, 4, 0, 6, 0, 4, 2, 1, 3, 8, 3, 0, 7, 3, 0, 8, 7, 7, 4, 4, 6, 0, 1,
 7, 0, 8, 4, 2, 6, 8, 8, 2, 7, 2, 2, 6, 1, 1, 7, 7, 1, 8, 0, 8, 4, 2, 6, 6, 4, 3, 3, 3, 6, 5, 1, 7, 8, 0,
 0, 0, 2, 1, 7, 1, 9, 0, 3, 4, 4, 9, 2, 3, 4, 2, 6, 4, 2, 6, 6, 2, 9, 2, 2, 6, 1, 4, 5, 6, 0, 0, 4, 3, 3,
 7, 3, 8, 3, 8, 6, 8, 3, 3, 5, 5, 5, 5, 3, 4, 3, 4, 5, 3, 0, 0, 4, 2, 6, 4, 8, 1, 8, 4, 7, 3, 9, 8, 9, 2,
 1, 5, 6, 2, 7, 0, 8, 6, 0, 9, 5, 6, 5, 0, 6, 9, 3, 4, 0, 4, 0, 5, 2, 6, 4, 9, 4, 3, 2, 4, 4, 2, 6, 1, 4,
 4, 5, 6, 6, 5, 9, 2, 1, 2, 9, 1, 2, 2, 5, 6, 4, 8, 8, 9, 3, 5, 6, 9, 6, 5, 5, 0, 0, 9, 1, 5, 4, 3, 0, 6,

4, 2, 6, 1, 3, 4, 2, 5, 2, 6, 6, 8, 4, 7, 2, 5, 9, 4, 9, 1, 4, 3, 1, 4, 2, 3, 9, 3, 9, 8, 8, 4, 5, 4, 3,
2, 4, 8, 6, 3, 2, 7, 4, 6, 1, 8, 4, 2, 8, 4, 6, 6, 5, 5, 9, 8, 5, 3, 3, 2, 3, 1, 2, 2, 1, 0, 4, 6, 6, 2,
5, 9, 8, 9, 0, 1, 4, 1, 7, 1, 2, 1, 0, 3, 4, 4, 6, 0, 8, 4, 2, 7, 1, 6, 1, 6, 6, 1, 9, 0, 0, 1, 2, 5, 7,
1, 9, 5, 8, 7, 0, 7, 9, 3, 2, 1, 7, 5, 6, 9, 6, 9, 8, 5, 4, 4, 0, 1, 3, 3, 9, 7, 6, 2, 2, 0, 9, 6, 7, 4,
9, 4, 5, 4, 1, 8, 5, 4, 0, 7, 1, 1, 8, 4, 4, 6, 4, 3, 3, 9, 4, 6, 9, 9, 0, 1, 6, 2, 6, 9, 8, 3, 5, 1, 6,
0, 7, 8, 4, 8, 9, 2, 4, 5, 1, 4, 0, 5, 8, 9, 4, 0, 9, 4, 6, 3, 9, 5, 2, 6, 7, 8, 0, 7, 3, 5, 4, 5, 7, 9,
7, 0, 0, 3, 0, 7, 0, 5, 1, 1, 6, 3, 6, 8, 2, 5, 1, 9, 4, 8, 7, 7, 0, 1, 1, 8, 9, 7, 6, 4, 0, 0, 2, 8, 2,
7, 6, 4, 8, 4, 1, 4, 1, 6, 0, 5, 8, 7, 2, 0, 6, 1, 8, 4, 1, 8, 5, 2, 9, 7, 1, 8, 9, 1, 5, 4, 0, 1, 9, 6,
8, 8, 2, 5, 3, 2, 8, 9, 3, 0, 9, 1, 4, 9, 6, 6, 5, 3, 4, 5, 7, 5, 3, 5, 7, 1, 4, 2, 7, 3, 1, 8, 4, 8, 2,
0, 1, 6, 3, 8, 4, 6, 4, 4, 8, 3, 2, 4, 9, 9, 0, 3, 7, 8, 8, 6, 0, 6, 9, 0, 0, 8, 0, 7, 2, 7, 0, 9, 3, 2,
7, 6, 7, 3, 1, 2, 7, 5, 8, 1, 9, 6, 6, 5, 6, 3, 9, 4, 1, 1, 4, 8, 9, 6, 1, 7, 1, 6, 8, 3, 2, 9, 8, 0, 4,
5, 5, 1, 3, 9, 7, 2, 9, 5, 0, 6, 6, 8, 7, 6, 0, 4, 7, 4, 0, 9, 1, 5, 4, 2, 0, 4, 2, 8, 4, 2, 9, 9, 9, 3,
5, 4, 1, 0, 2, 5, 8, 2, 9, 1, 1, 3, 5, 0, 2, 2, 4, 1, 6, 9, 0, 7, 6, 9, 4, 3, 1, 6, 6, 8, 5, 7, 4, 2, 4,
2, 5, 2, 2, 5, 0, 9, 0, 2, 6, 9, 3, 9, 0, 3, 4, 8, 1, 4, 8, 5, 6, 4, 5, 1, 3, 0, 3, 0, 6, 9, 9, 2, 5, 1,
9, 9, 5, 9, 0, 4, 3, 6, 3, 8, 4, 0, 2, 8, 4, 2, 9, 2, 6, 7, 4, 1, 2, 5, 7, 3, 4, 2, 2, 4, 4, 7, 7, 6, 5,
5, 8, 4, 1, 7, 7, 8, 8, 6, 1, 7, 1, 7, 3, 7, 2, 6, 5, 4, 6, 2, 0, 8, 5, 4, 9, 8, 2, 9, 4, 4, 9, 8, 9, 4,
6, 7, 8, 7, 3, 5, 0, 9, 2, 9, 5, 8, 1, 6, 5, 2, 6, 3, 2, 0, 7, 2, 2, 5, 8, 9, 9, 2, 3, 6, 8, 7, 6, 8, 4,
5, 7, 0, 1, 7,

$$8, 2, 3, 0, 3, \quad ds^2 = -(1 + glF \cos\theta)^2 e^{2\Phi} dt^2 + dl^2 + r^2(d\theta^2 + \sin^2 \theta d\phi^2)$$

8, 0, 9, 6, 5, 3.0.i. The metric inside an accelerating Morris-Thorne-Yurssever wormhole
6, 7, 8, 8, 3,

1, 1, 2, 2, 8, 9, 3, 0, 5, 8, 0, 9, 1, 4, 0, 5, 7, 2, 6, 1, 0, 8, 6, 5, 8, 8, 4, 8, 4, 5, 8, 7, 3, 1, 0,
1, 6, 5, 8, 1, 5, 1, 1, 6, 7, 5, 3, 3, 3, 2, 7, 6, 7, 4, 8, 8, 7, 0, 1, 4, 8, 2, 9, 1, 6, 7, 4, 1, 9, 7,
0, 1, 5, 1, 2, 5, 5, 9, 7, 8, 2, 5, 7, 2, 7, 0, 7, 4, 0, 6, 4, 3, 1, 8, 0, 8, 6, 0, 1, 4, 2, 8, 1, 4, 9,
0, 2, 4, 1, 4, 6, 7, 8, 0, 4, 7, 2, 3, 2, 7, 5, 9, 7, 6, 8, 4, 2, 6, 9, 6, 3, 3, 9, 3, 5, 7, 7, 3, 5, 4,
2, 9, 3, 0, 1, 8, 6, 7, 3, 9, 4, 3, 9, 7, 1, 6, 3, 8, 8, 6, 1, 1, 7, 6, 4, 2, 0, 9, 0, 0, 4, 0, 6, 8, 6,
6, 3, 3, 9, 8, 8, 5, 6, 8, 4, 1, 6, 8, 1, 0, 0, 3, 8, 7, 2, 3, 8, 9, 2, 1, 4, 4, 8, 3, 1, 7, 6, 0, 7, 0,
1, 1, 6, 6, 8, 4, 5, 0, 3, 8, 8, 7, 2, 1, 2, 3, 6, 4, 3, 6, 7, 0, 4, 3, 3, 1, 4, 0, 9, 1, 1, 5, 5, 7, 3,
3, 2, 8, 0, 1, 8, 2, 9, 7, 7, 9, 8, 8, 7, 3, 6, 5, 9, 0, 9, 1, 6, 6, 5, 9, 6, 1, 2, 4, 0, 2, 0, 2, 1, 7,
7, 8, 5, 5, 8, 8, 5, 4, 8, 7, 6, 1, 7, 6, 1, 6, 1, 9, 8, 9, 3, 7, 0, 7, 9, 4, 3, 8, 0, 0, 5, 6, 6, 6, 3,
3, 6, 4, 8, 8, 4, 3, 6, 5, 0, 8, 9, 1, 4, 4, 8, 0, 5, 5, 7, 1, 0, 3, 9, 7, 6, 5, 2, 1, 4, 6, 9, 6, 0, 2,
7, 6, 6, 2, 5, 8, 3, 5, 9, 9, 0, 5, 1, 9, 8, 7, 0, 4, 2, 3, 0, 0, 1, 7, 9, 4, 6, 5, 5, 3, 6, 7, 8, 8, 5,
6, 7, 4, 3, 0, 2, 8, 5, 9, 7, 4, 6, 0, 0, 1, 4, 3, 7, 8, 5, 4, 8, 3, 2, 3, 7, 0, 6, 8, 7, 0, 1, 1, 9, 0,
0, 7, 8, 4, 9, 9, 4, 0, 4, 9, 3, 0, 9, 1, 8, 9, 1, 9, 1, 8, 1, 6, 4, 9, 3, 2, 7, 2, 5, 9, 7, 7, 4, 0, 3,
0, 0, 7, 4, 8, 7, 9, 6, 8, 1, 4, 8, 4, 8, 8, 2, 3, 4, 2, 9, 3, 2, 0, 2, 3, 0, 1, 2, 1, 2, 8, 0, 3, 2, 3,
2, 7, 4, 6, 0, 3, 9, 2, 2, 1, 9, 6, 8, 7, 5, 2, 8, 3, 4, 0, 5, 1, 6, 9, 0, 6, 9, 7, 4, 1, 9, 4, 2, 5, 7,
6, 1, 4, 6, 7, 3, 9, 7, 8, 1, 1, 0, 7, 1, 5, 4, 6, 4, 1, 8, 6, 2, 7, 3, 3, 6, 9, 0, 9, 1, 5, 8, 4, 9, 7,
3, 1, 8, 5, 0, 1, 1, 1, 8, 3, 9, 6, 0, 4, 8, 2, 5, 3, 3, 5, 1, 8, 7, 4, 8, 4, 3, 8, 9, 2, 3, 1, 7, 7, 2,
9, 2, 6, 1, 3, 5, 4, 3, 0, 2, 4, 9, 3, 2, 5, 6, 2, 8, 9, 6, 3, 7, 1, 3, 6, 1, 9, 7, 7, 2, 8, 5, 4, 5, 6,
6, 2, 2, 9, 2, 4, 4, 6, 1, 6, 4, 4, 4, 9, 7, 2, 8, 4, 5, 9, 7, 8, 6, 7, 7, 1, 1, 5, 7, 4, 1, 2, 5, 6, 7,

0, 3, 0, 7, 8, 7, 1, 8, 8, 5, 1, 0, 9, 3, 3, 6, 3, 4, 4, 4, 8, 0, 1, 4, 9, 6, 7, 5, 2, 4, 0, 6, 1, 8, 5,
3, 6, 5, 6, 9, 5, 3, 2, 0, 7, 4, 1, 7, 0, 5, 3, 3, 4, 8, 6, 7, 8, 2, 7, 5, 4, 8, 2, 7, 8, 1, 5, 4, 1, 5,
5, 6, 1, 9, 6, 6, 9, 1, 1, 0, 5, 5, 1, 0,

3. Interplanetary host

1, 4, 7, 2, 7, 9, 9, 0, 4, 0, 3, 8, 6, 8,
9, 7, 2, 2, 0, 4, 6, 5, 5, 5, 0, 8, 3, 3,
1, 7, 0, 7, 8, 2, 3, 9, 4, 8, 0, 8, 7, 8,
5, 9, 9, 0, 5, 0, 1, 9, 4, 7, 5, 6, 3, 1, 0, 8, 9, 8, 4, 1, 2, 4, 1, 4, 4, 6, 7, 2, 8, 2, 1, 8, 6, 5, 4,
5, 9, 9, 7, 1, 5, 9, 6, 6, 3, 9, 0, 1, 5, 6, 4, 1, 9, 4, 1, 7, 5, 1, 8, 2, 0, 9, 3, 5, 9, 3, 2, 6, 1, 6,
3, 1, 6, 8, 8, 8, 3, 8, 0, 1, 3, 2, 7, 5, 8, 7, 5, 2, 6, 0, 1, 4, 6, 0, 5, 0, 7, 6, 7, 6, 0, 9, 8, 3, 9,
2, 6, 2, 5, 7, 2, 6, 4, 1, 1, 1, 2, 0, 1, 3, 5, 2, 8, 8, 5, 9, 1, 3, 1, 7, 8, 4, 8, 2, 9, 9, 4, 7, 5, 6,
8, 2, 4, 7, 2, 5, 6, 4, 8, 8, 5, 5, 3, 3, 3, 5, 7, 2, 7, 9, 7, 7, 2, 2, 0, 5, 5, 4, 3, 5, 6, 8, 1, 2, 6,
3, 0, 2, 5, 3, 5, 7, 4, 8, 2, 1, 6, 5, 8, 5, 4, 1, 4, 0, 0, 8, 0, 5, 3, 1, 4, 8, 2, 0, 6, 9, 7, 1, 3,
7, 2, 6, 2, 1, 4, 9, 7, 5, 5, 5, 7, 6, 0, 5, 1, 8, 9, 0, 4, 8, 1, 6, 2, 2, 3, 7, 6, 7, 9, 0, 4, 1, 4, 9,
2, 6, 7, 4, 2, 6, 0, 0, 0, 7, 1, 0, 4, 5, 9, 2, 2, 6, 9, 5, 3, 1, 4, 8, 3, 5, 1, 8, 8, 1, 3, 7, 4, 6, 3,
8, 8, 7, 1, 0, 4, 2, 7, 3, 5, 4,
4, 7, 6, 7, 6, 2, 3, 5, 7, 7, 9,
3, 3, 9, 9, 3, 9, 7, 0, 6, 3, 2,
3, 9, 6, 6, 0, 4, 9, 6, 9, 1, 4,
5, 3, 0, 3, 2, 7, 3, 8, 8, 7, 8,
7, 4, 5, 5, 7, 9, 0, 5, 9, 3, 4,
9, 3, 7, 7, 7, 2, 3, 2, 0, 1, 4,
2, 9, 5, 4, 8, 0, 3, 3, 4, 5, 0,
0, 0, 6, 9, 5, 2, 5, 6, 9, 8, 0,
9, 3, 5, 2, 8, 2, 8, 8, 7, 7, 8,
3, 7, 1, 0, 6, 7, 0, 5, 8, 5, 5,
6, 7, 7, 4, 9, 4, 8, 1, 3, 7, 3,

A painful idea: that beyond a certain precise point in time, history was no longer real. Without realizing it the whole of the human species would have suddenly left reality. Everything that had happened since would no longer be at all true, but we would be unaware of this. Our present task and duty would be to discover this point and, as long as we have not grasped it, we would have to persevere in the present destruction.

Elias Canetti

8, 5, 8, 6, 3, 0, 3, 8, 5, 7, 6, 2, 8, 2, 3, 0, 4, 0, 6, 9, 4, 0, 0, 5, 6, 6, 5, 3, 4, 0, 5, 8, 4, 8, 8,
7, 5, 2, 7, 0, 0, 5, 3, 0, 8, 8, 3, 2, 4, 5, 9, 1, 8, 2, 1, 8, 3, 4, 9, 4, 3, 1, 8, 0, 4, 9, 8, 3, 4, 1,
9, 9, 6, 3, 9, 9, 8, 1, 4, 5, 8, 7, 7, 3, 4, 3, 5, 8, 6, 3, 1, 1, 5, 9, 4, 0, 5, 7, 0, 4, 4, 3, 6, 8, 3,
5, 1, 5, 2, 8, 5, 3, 8, 3, 6, 0, 9, 4, 4, 2, 9, 5, 5, 9, 6, 4, 3, 6, 0, 6, 7, 6, 0, 9, 0, 2, 2, 1, 7, 4,
1, 8, 9, 6, 8, 8, 3, 5, 4, 8, 1, 3, 1, 6, 4, 3, 9, 9, 7, 4, 3, 7, 7, 6, 4, 1, 5, 8, 3, 6, 5, 2, 4, 2, 2,
3, 4, 6, 4, 2, 6, 1, 9, 5, 9, 7, 3, 9, 0, 4, 5, 5, 4, 5, 0, 6, 8, 0, 6, 9, 5, 2, 3, 2, 8, 5, 0, 7, 5, 1,
8, 6, 8, 7, 1, 9, 4, 4, 9, 0, 6, 4, 7, 6, 7, 7, 9, 1, 8, 8, 6, 7, 2, 0, 3, 0, 6, 4, 1, 8, 6, 3, 0, 7, 5,
1, 0, 5, 3, 5, 1, 2, 1, 4, 9, 8, 5, 1, 0, 5, 1, 2, 0, 7, 3, 1, 3, 8, 4, 6, 6, 4, 8, 7, 1, 7, 5, 4, 7, 5,
1, 8, 3, 8, 2, 9, 7, 9, 9, 9, 0, 1, 8, 9, 3, 1, 7, 7, 5, 1, 5, 5, 0, 6, 3, 9, 9, 8, 1, 0, 1, 6, 4, 6, 6,
4, 1, 4, 5, 9, 2, 1, 0, 2, 4, 0, 6, 8, 3, 8, 2, 9, 4, 6, 0, 3, 2, 0, 8, 5, 3, 5, 5, 5, 4, 0, 5, 8, 1, 4,
7, 1, 5, 9, 2, 7, 3, 2, 2, 0, 6, 7, 7, 5, 6, 7, 6, 6, 9, 2, 1, 3, 6, 6, 4, 0, 8, 1, 5, 0, 5, 9, 0, 0, 8,
0, 6, 9, 5, 2, 5, 4, 0, 6, 1, 0, 6, 2, 8, 5, 3, 6, 4, 0, 8, 2, 9, 3, 2, 7, 6, 6, 2, 1, 9, 3, 1, 9, 3, 9,
9, 3, 3, 8, 6, 1, 6, 2, 3, 8, 3, 6, 0, 6, 9, 1, 1, 1, 7, 6, 7, 7, 8, 5, 4, 4, 8, 2, 3, 6, 1, 2, 9, 3, 2,
6, 8, 5, 8, 1, 9, 9, 9, 6, 5, 2, 3, 9, 2, 7, 5, 4, 8, 8, 4, 2, 7, 4, 3, 5, 4, 1, 4, 4, 0, 2, 8, 8, 4, 5,

Even in the absence of universally malicious motives [the destruction of the human species], the simple will to subjugate or to control certain groups of people or to gain advantage over someone else is enough to make a Malevolent Artificial Intelligence desirable for some entity or organisation. In the order of (subjective) undesirability from least damaging to ultimately destructive, a malevolent superintelligence may attempt to:

- Take over (implicitly or explicitly) resources such as money, land, water, rare elements, organic matter, internet, computer hardware, etc. and establish monopoly over access to them;
- Take over political control of local and federal governments as well as international corporations, professional societies, and charitable organisations;
- Reveal informational hazards;
- Set up a total surveillance state (or exploit an existing one), reducing any notion of privacy to zero, including privacy of thought;
- Force merger (cyborgisation) by requiring that all people have a brain implant to allow for direct mind control/overridden by the superintelligence;
- Enslave humankind, restricting our freedom to move or otherwise choose what to do with our bodies and minds. This can be accomplished through forced cryonics or concentration camps;
- Abuse and torture humankind with perfect insight into our physiology to maximise physical or emotional pain, perhaps combining it with a simulated model of us to make the process infinitely long;
- Commit specicide against humankind, arguably the worst option for humans as it can't be undone;
- Destroy/irreversibly change the planet, a significant portion of the Solar System, or even the universe;
- Unknown unknowns. Given that a superintelligence is capable of inventing dangers we are not capable of predicting, there is room for something much worse which we cannot yet imagine.

3.0.ii. Potential dangers of creating a Malevolent Artificial Intelligence, according to Pistono and Yampolskiy

3, 6, 4, 5, 5, 5, 9, 5, 1, 2, 4, 7, 3, 5, 5, 4, 6, 1, 3, 9, 4, 0, 3, 1, 5, 4, 9, 5, 2, 0, 9, 7, 3, 9, 7,
0, 5, 1, 8, 9, 6, 2, 4, 0, 1, 5, 7, 9, 7, 6, 8, 3, 2, 6, 3, 9, 4, 5, 0, 6, 3, 3, 2, 3, 0, 4, 5, 2, 1, 9,
2, 6, 4, 5, 0, 4, 9, 6, 5, 1, 7, 3, 5, 4, 6, 6, 7, 7, 5, 6, 9, 9, 2, 9, 5, 7, 1, 8, 9, 8, 9, 6, 9, 0, 4,
7, 0, 9, 0, 2, 7, 3, 0, 2, 8, 8, 5, 4, 4, 9, 4, 5, 4, 1, 6, 6, 9, 9, 7, 9, 1, 9, 9, 2, 9, 4, 8, 0, 3, 8,
2, 5, 4, 9, 8, 0, 2, 8, 5, 9, 4, 6, 0, 2, 9, 0, 5, 2, 7, 6, 3, 1, 4, 5, 5, 8, 0, 3, 1, 6, 5, 1, 4, 0, 6,
6, 2, 2, 9, 1, 7, 1, 2, 2, 3, 4, 2, 9, 3, 7, 5, 8, 0, 6, 1, 4, 3, 9, 9, 3, 4, 8, 4, 9, 1, 4, 3, 6, 2, 1,
0, 7, 9, 9, 3, 5, 7, 6, 7, 3, 7, 3, 1, 7, 9, 4, 8, 9, 6, 4, 2, 5, 2, 4, 8, 8, 8, 1, 3, 7, 2, 0, 4, 3, 5,

5, 7, 9, 2, 8, 7, 5, 1, 1, 3, 8, 5, 8, 5, 6, 9, 7, 3, 3, 8, 1, 9, 7, 6, 0, 8, 3, 5, 2, 4, 4, 2, 3, 2, 4,
 0, 4, 6, 6, 7, 7, 8, 0, 2, 0, 9, 4, 8, 3, 9, 9, 6, 3, 9, 9, 4, 6, 6, 8, 4, 8, 3, 3, 7, 7, 4, 7, 0, 6, 7,
 2, 5, 4, 8, 3, 6, 1, 8, 8, 4, 8, 2, 7, 3, 0, 0, 0, 6, 4, 8, 3, 1, 9, 1, 6, 3, 8, 2, 6, 0, 2, 2, 1, 1, 0,
 5, 5, 5, 2, 2, 1, 2, 4, 6, 7, 3, 3, 3, 2, 3, 1, 8, 4, 4, 6, 3, 0, 0, 5, 5, 0, 4, 4, 8, 1, 8, 4, 9, 9, 1,
 6, 9, 9, 6, 6, 2, 2, 0, 8, 7, 7, 4, 6, 1, 4, 0, 2, 1, 6, 1, 5, 7, 0, 2, 1, 0, 2, 9, 6, 0, 3, 3, 1, 8, 5,
 8, 8, 7, 2, 7, 3, 3, 3, 2, 9, 8, 7, 7, 9, 3, 5, 2, 5, 7, 0, 1, 8, 2, 3, 9, 3, 8, 6, 1, 2, 4, 4, 0, 2, 6,
 8, 6, 8, 3, 3, 9, 5, 5, 5, 8, 7, 0, 6, 0, 7, 7, 5, 8, 1, 6, 9, 9, 5, 4, 3, 9, 8, 4, 6, 9, 5, 6, 8, 5, 4,
 0, 6, 7, 1, 1, 7, 4, 4, 4, 4, 9, 3, 2, 4, 7, 9, 5, 1, 9, 5, 7, 2, 1, 5, 9, 4, 1, 9, 6, 4, 5, 8, 6, 3, 7,
 3, 6, 1, 2, 6, 9, 1, 5, 5, 2, 6, 4, 5, 7, 5, 7, 4, 7, 8, 6, 9, 8, 5, 9, 6, 4, 2, 4, 2, 1, 7, 6, 5, 9, 2,
 8, 9, 6, 8, 6, 2, 3, 8, 3, 5, 0, 6, 3, 7, 0, 4, 3, 3, 9, 3, 9, 8, 1, 1, 6, 7, 1, 3, 9, 7, 5, 4, 4, 7, 3,
 6, 2, 2, 8, 6, 2, 5, 5, 0, 6, 8, 0, 3, 6, 8, 2, 6, 6, 4, 1, 3, 5, 5, 4, 1, 4, 4, 8, 0, 4, 8, 9, 9, 7, 7,
 2, 1, 3, 7, 3, 1, 7, 4, 1, 1, 9, 1, 9, 9, 9, 7, 0, 0, 1, 7, 2, 9, 3, 9, 0, 7, 3, 0, 3, 3, 5, 0, 8, 6, 9,
 0, 2, 0, 9, 2, 2, 5, 1, 9, 1, 2, 4, 4, 4, 7, 3, 9, 3, 2, 7, 8, 3, 7, 6, 1, 5, 6, 3, 2, 1, 8, 1, 0, 8, 4,
 2, 8, 9, 8, 2, 0, 7, 7, 0, 6, 9, 7, 4, 1, 3, 8, 7, 0, 7, 0, 5, 3, 2, 6, 6, 1, 1, 7, 6, 8, 3, 6, 9, 8, 6,
 4, 7, 7, 4, 1, 7, 8, 7, 1, 8, 0, 2, 0, 2, 7, 2, 9, 4, 1, 2, 9, 8, 2, 3, 1, 0, 8, 8, 8, 7, 9, 6, 8, 3, 1,
 8, 8, 0, 8, 5, 4, 3, 6, 7, 3, 2, 7, 8, 0, 6, 8, 7, 9, 7, 7, 1, 6, 5, 9, 1, 1, 1, 6, 5, 4, 2, 2, 4, 4, 5,
 3, 8, 0, 6, 6, 2, 5, 8, 6, 1, 7, 1, 1, 7, 2, 9, 4, 9, 8, 0, 3, 8, 2, 4, 8, 8, 7, 9, 9, 8, 6, 5, 0, 4, 0,
 6, 1, 5, 6, 3, 9, 7, 5, 6, 2, 9, 9, 3, 6, 9, 6, 2, 8, 0, 9,
 3, 5, 8, 1, 8, 9, 7, 6, 1, 4, 9, 1, 0, 1, 7, 1, 4, 5, 3, 4,
 3, 5, 5, 6, 6, 5, 9, 5, 4, 2, 7, 5, 7, 0, 6, 4, 1, 9, 4, 4,
 0, 8, 8, 3, 3, 8, 1, 6, 8, 4, 1, 1, 1, 1, 1, 6, 6, 2, 0, 0,
 7, 5, 9, 7, 8, 7, 2, 4, 4, 1, 3, 7, 0, 8, 2, 3, 3, 3, 9, 1,
 7, 8, 8, 6, 1, 1, 4, 7, 0, 8, 2, 2, 8, 6, 5, 7, 5, 3, 1, 0, 7, 8, 5, 3, 6, 6, 7, 4, 6, 9, 5, 0, 1, 8, 4,
 6, 2, 1, 4, 0, 7, 3, 6, 4, 9, 3, 9, 1, 7, 3, 6, 6, 2, 5, 4, 9, 3, 7, 7, 8, 3, 0, 1, 4, 0, 7, 4, 3, 0, 2,
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 1, 0, 3, 7, 9, 0, 7, 7, 5, 0, 2, 6, 6, 0, 2, 0, 1, 1, 4, 8, 1, 4, 9, 3, 5, 4, 8, 2, 2, 2, 8, 9, 1, 6, 6,
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 6, 4, 3, 1, 6, 9, 3, 0, 1, 5, 2, 6, 7, 4, 6, 0, 5, 3, 6, 0, 6, 4, 3, 5, 1, 7, 3, 2, 1, 5, 4, 7, 0, 1, 0,
 9, 1, 4, 4, 0, 6, 5, 0, 8, 7, 8, 8, 2, 3, 6, 3, 6, 7, 6, 4, 2, 3, 6, 8, 3, 1, 1, 8, 7, 3, 9, 0, 9, 3, 7,
 4, 6, 4, 2, 3, 2, 6, 0, 9, 0, 2, 1, 6, 4, 6, 3, 6, 5, 6, 2, 7, 5, 5, 3, 9, 7, 6, 8, 3, 4, 0, 1, 9, 4, 8,
 2, 9, 3, 2, 7, 9, 5, 7, 5, 0, 6, 2, 4, 3, 9, 9, 6, 4, 5, 2, 7, 2, 5, 7, 8, 6, 2, 4, 4, 0, 0, 3, 7, 5, 9,
 8, 3, 4, 2, 2, 0, 5, 0, 8, 0, 8, 9, 3, 5, 1, 2, 9, 0, 2, 3, 1, 2, 2, 4, 7, 5, 9, 7, 0, 6, 4, 4, 1, 0, 5,
 6, 7, 8, 3, 6, 1, 8, 7, 0, 8, 7, 7, 1, 7, 2, 3, 3, 3, 5, 5, 5, 4, 6, 5, 4, 8, 2, 5, 9, 8, 9, 0, 6, 8, 6,
 1, 2, 0, 1, 4, 1, 0, 1, 0, 7, 2, 2, 2, 4, 6, 5, 9, 0, 4, 0, 0, 8, 5, 5, 3, 7, 9, 8, 2, 3, 5, 2, 5, 3, 8,
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 3, 0, 5, 6, 2, 7, 4, 5, 2, 2, 9, 1, 6, 1, 2, 8, 8, 9, 1, 7, 6, 6, 8, 1, 4, 1, 6, 0, 6, 3, 9, 1, 3, 1, 2,
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 8, 5, 0, 8, 0, 9, 1, 6, 3, 9, 1, 1, 4, 5, 9, 2, 9, 6, 0, 7, 1, 1, 5, 6, 3, 4, 4, 2, 0, 4, 3, 4, 7, 1, 3,

$$e^{\frac{1}{\sqrt{3}}(i \pm j \pm k)\pi} + 1 = 0$$

3.0.iii. Generalisation of Euler's identity to quaternions

3, 5, 4, 4, 7, 2, 0, 9, 8, 1, 1, 7, 8, 4, 6, 1, 4, 5, 1, 0, 7, 7, 8, 7, 2, 3, 9, 9, 1, 4, 0, 6, 0, 6, 2,
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4, 3, 8, 5, 0, 0, 6, 8, 5, 2, 6, 2, 0, 2, 5, 8, 4, 3, 2, 8, 4, 2, 0, 8, 5, 5, 8, 2, 3, 3, 8, 5, 6, 6, 9,
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5, 9, 0, 2, 9, 5, 9, 6, 8, 5, 6, 3, 9, 2, 3, 0, 3, 7, 6, 8, 9, 9, 7, 6, 3, 2, 7, 4, 6, 2, 2, 8, 3, 9, 0,
0, 7, 3, 5, 4, 5, 7, 1, 4, 4, 5, 9, 6, 4, 1, 4, 1, 0, 8, 2, 2, 9, 2, 8, 5, 9, 2, 2, 2, 3, 9, 3, 3, 2, 8,
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4, 4, 6, 5, 6, 8, 5, 8, 9, 0, 0, 9, 3, 6, 2, 6, 6, 1, 2, 3, 3, 1, 1, 1, 5, 2, 9, 1, 0, 8, 1, 6, 0, 4, 1,
5, 2, 4, 1, 0, 0, 2, 1, 4, 1, 9, 5, 9, 3, 7, 3, 4, 9, 7, 8, 6, 4, 3, 1, 6, 6, 1, 5, 5, 6, 7, 3, 2, 7, 0,
2, 7, 9, 2, 1, 0, 9, 5, 9, 3, 5, 4, 3, 0, 5, 5, 5, 7, 9, 7, 3, 2, 6, 6, 0, 5, 5, 4, 6, 7, 7, 9, 6, 3, 5,
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4, 9, 2, 5, 0, 0, 7, 6, 2, 4, 3, 8, 6, 8, 9, 3, 7, 7, 6, 4, 7, 5, 3, 1, 0, 1, 0, 2, 3, 2, 3, 7, 4, 6, 7,
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3, 2, 0, 9, 3, 8, 5, 6, 0, 2, 8, 1, 5, 6, 4, 2, 8, 4, 9, 7, 5, 6, 5, 4, 9, 3, 0, 7, 9, 0, 9, 7, 3, 3, 8,
5, 4, 1, 8, 5, 5, 8, 3, 5, 1, 5, 7, 8, 9, 4, 0, 9, 8, 1, 4, 0, 0, 7, 6, 9, 1, 8, 9, 2, 3, 8, 9, 0, 6, 3,
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7, 1, 9, 5, 8, 1, 1, 9, 3, 5, 7, 9, 1, 2, 0, 3, 1, 6, 2, 5, 1, 4, 3, 4, 4, 0, 9, 6, 5, 0, 3, 1, 3, 2, 8...

3.1. Intergalactic contamination

Available energy is the main object at stake in the struggle for existence and the evolution of the world.

Ludwig Boltzmann

The journey held countless surprises for Iridio, and a wealth of new information. He was intrigued by the noise of the ship's plasma propulsion motors because it reminded him of a cat purring. The Zuespoks explained the fusion principles on which they were based and many other details of their technology. They trained him to see with a visual converter which transformed the near-infrared spectrum into visible spectrum, so that he could understand the emotions reflected in the somatic aura of the Eristeands. Very tactfully, they calibrated the converter so that he could use the whole range of colours, sounds, tastes and tactile sensations of his synaesthesia. They also installed a device in his left ear to translate the languages of the many galactic species, and a translator of bodily emotions in the visual converter, so that he could better understand his hosts.

$$\Delta v = c \tanh \left(\frac{I_{sp}}{c} \ln \frac{m_0}{m_1} \right)$$

where

$$I_{sp} = \frac{dp_e}{dm_{comb}} = \frac{(1 - \eta) v_e}{\sqrt{1 - \frac{v_e^2}{c^2}}}$$

3.1.i.a. Relativistic Tsiolkovsky rocket equation

During his brief stay on Titan, he discovered, to his disappointment, that the intelligent species of the moons of Jupiter and Saturn were as divided as humans, perhaps because they shared with them the same biological configuration, based on amino-acid chains. He was surprised to realise that all the predominant intelligent life on the moons of Jupiter had an external appearance similar to that of the extinct dinosaurs that had fascinated him as a child, particularly the allosaurus. Like the birds on Earth, their bodies were covered in feathers but these were hollow and seemed like an untidy fuzz to protect them from the cold. The only exception to this evolutionary road was on Io, where some of the inhabitants had a thick carapace, well suited to the volcanic surface, instead of feathers. These were more like the eoraptors.

$$P_c = N_0 \cdot R \cdot P_s \cdot P_l \cdot P_R \cdot P_g$$

3.1.i.b. The Coleman-Sagan equation

As to his official mission, as soon as the Eristeands realised that he was from Earth, they demanded ecological reparations for the contamination of Saturn's moons by probes during the Cassini mission in the 20th century and the Brahe mission in the 21st. They also had a great many objections to admitting Earth to the galactic confederation, since, from their perspective, humans had no immunity to the harmful influence of some extra-galactic, non-evolutionary beings which had invaded their brains and destroyed their ecological awareness. The

only ones not opposed to the idea were the Eristeands from Calypso, who participated in the meeting as observers only. They were similar to the extinct tyrannosaurus and were interested in establishing trading relations with Earth and its space colonies.

The day of Iridio's arrival on the planetary capital of Alpha Centauri was also one of surprises. Like the beings that populated the moons of Jupiter, the Argoterrands were very similar to dinosaurs, although they looked more like some herbivores whose names he could not remember, but had found engaging as a child. They explained that life in the Solar System was the result of a panspermia initiated by their ancestors. The pro-code RNA which they had sent to the surrounding stars was optimised to generate eukaryotic cells and an evolutionary chain that would eventually produce creatures similar to dinosaurs, where local conditions allowed for photosynthesis and the subsequent evolution of multicellular organisms. That had happened on the moons of Jupiter and Saturn. Earth had been the exception because the ecological consequences of continental drift and a shower of meteorites had led to the predominance of placental mammals and marsupials among those beings that used local low entropy to maintain a stable body temperature. According to the discipline of Probabilistic Astrobiology, developed by another galactic civilisation, that form of evolution was extremely rare and very dangerous for the Solar System as a whole, because, eventually, human beings would become the main predator on the planet, and they were susceptible to mental contamination by intelligent beings who had not evolved biologically. Hearing mention of these beings again, Iridio wanted to learn more about them. He was assured that everything would be explained in detail in due course.

His hosts went out of their way to make him feel at home, but a feeling of disappointment soon came over him. The official in charge of Argoterrand intergalactic relations who had welcomed him confirmed that what the galactic civilisations had feared during the conference with representatives of his planet had

now happened.

$$\begin{aligned}\frac{d\mathcal{N}}{dt} &= r_0\mathcal{N}\left(1 - \frac{\mathcal{N}}{k_{\max} - cW}\right) - d\mathcal{N}W \\ \frac{dS}{dt} &= \rho_0\mathcal{N}\left(1 - \frac{\mathcal{N}}{k_{\max} - cW}\right) - b\mathcal{N} \\ \frac{dW}{dt} &= a\mathcal{N}^2 - bW - \alpha S\end{aligned}$$

3.1.i.c. A model of population dynamics and internal warfare

Several wars had started on Earth, until now only local ones, between the singletons controlling the powerful terrestrial countries. As a result, a new genocide of scientists and ecologists had been unleashed. This had provoked counter-attacks from the International Ecological Brigades and a

new surge of extremism from the millenarian armed groups and their killer robots. Robotic weapons designed to kill civilians were causing chaos in the great cities of the planet, as in the robotic wars in which his paternal grandfather had died. To help him understand the situation, they gave him details of what had happened to some people he knew.

PhDr Muñoz Rojas was still being held in prison by the neo-Bolivarian government for denouncing a new Transpacific War, and there were fears for his life since he had started his third hunger strike. Luckily, Iris's children and her aunt had managed to escape with their lives to Atlantis VIII, where they had become pacifist ecological activists. Zoe had also managed to escape and had married herself in a ceremony publicised throughout the planet by the information network of the floating cities. Unfortunately, Mrs Frauke Grubach had not survived the voyage in a flimsy vessel to Atlantis VIII.

Meanwhile, everything had deteriorated considerably in Ozeania. The singleton based on the neuronal configuration of his grandmother Mildred had been unmasked and all the copies and subroutines of it, controlling the quantum computers in the cathedral, destroyed. However, it seemed that copies of her mind existed and controlled some autonomous artificial intelligences, including one who, they believed, had taken the identity of PhDr Charrington der Heer, who commanded an army of rebel robots. That army was fighting the paramilitaries and the

Ecological Brigades at the same time. The Argoterrands suspected that

$$\hat{u} = \left[\frac{\delta(1 - (1+r)\rho_2) - d\rho_2}{\rho_2\theta} \left(\frac{\rho_1\epsilon}{\alpha(1 - (1+r)\rho_1)} \right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\epsilon+\theta-1}}$$

3.1.i.d. The optimal strategy of a Nash equilibrium with perpetual war

some copies of the neuro-simulation of Mildred's mind had actually survived, because even when the Ozeanic army had decisive victories, the civil war continued. Those events prompted harsher and harsher repression of the rebellious human population by the killer robocops and electronic bloodhounds of the Ozeanic army. Penelope had been reconstructed, as his uncle had promised, and freed by his grandmother. She was apparently in hiding in one of the country's recreational sex clinics, dressed as an orgonic cyborg. Despite the repressive measures against cyborgs, she seemed to be operational, because she was still sending Iridio encouraging messages and saying that she would wait for him. The Argoterrands did not trust the connection since they suspected that one of the ministries loyal to the government had hacked into it.

Ernesto had been burnt alive in the cellar where he had hidden his paper books and had been declared a martyr by the humans in revolt. However, he had managed to hand over his father's sculptures to the Artistic Brigades, a new

rebel group, which had smuggled them to Atlantis VIII, where a great retrospective exhibition had been organised in his honour. Olgava was now working as an organiser of swinger parties at the residence of Tintorelli Turner IV, the clone who had replaced the original president of the Ozeanic Association of Fine Arts after he was murdered during an attack by the Artistic Brigades.

Iris had been lobotomised and then forced to work as a prostitute for the anti-ecological paramilitaries who did the dirty work the Ozeanic army could not undertake because of the international agreements the country had signed. It was suspected that his old university classmate, Kaminer Kullych, had given the order to operate on Iris because, although he continued to work at the patent office, it was known that he also held an important position on the clandestine board of directors of the paramilitary army, funded by the hydrocarbon companies.

$$\begin{cases} \dot{S} = m(1 - S) - S \sum_{j=1}^N F_j \\ \dot{I}_i = F_i S - m I_i - I_i \sum_j K_{ij} F_j \\ \dot{I}_{ij} = I_i K_{ij} F_j - m I_{ij} \end{cases}$$

where $F_i = \beta(I_i + \sum_{j=1}^N \frac{1}{2}(I_{ij} + I_{ji}))$

gives the force of infection of strain i

3.1.i.e. N-strain transmission dynamics
with co-colonisation interactions

Dr Tomakin Sukhavati, who had treated his father at the Widgeree municipal hospital, had died, a victim of the anti-Islamist biological weapons which selectively affected those who carried genes from Arab or Iranian ethnic groups. Other people who had Denisovan genes also died when biological weapons allegedly targeting spies from Taiwan-South China were released.

The flexible reader with his calculations and all the steps for deduction of his equations was still in the hands of the post-creationist authorities. They had returned to their position of influence after the coup that neutralised the popular-populist authorities influenced by his grandmother Mildred. His other personal belongings, including the flexible reader he had used in high school, had been requisitioned by the government and destroyed, so that they could not be worshipped as relics by the militia of the Baptistry of Involuntary Euthanasia.

The science program at Yabbie Creek-W Multimodal Polytechnic and more

$$\Delta a_s = A_{sc} \frac{\beta \tau (1 - \alpha_s)^2}{\cos(Z_{eff})}$$

3.1.i.f. Anthropogenic aerosol
scaling factor modelled through
spatially resolved sulphate albedos

than half of the programs at universities on the mainland had been closed down. Their academic staff had been executed by the paramilitaries funded by the hydrocarbon companies who now controlled the senate and had again declared string theory illegal. The situa-

tion was similar in other terrestrial countries, although some, such as the Theological Confederation of the North American Prairies and North China, had suffered much more than Ozeania, because their rebel space colonies had changed

the course of meteorites to collide with the planet, destroying entire cities and producing a new mini-glaciation when ash was dispersed in the atmosphere.

All in all, the efforts of the galactic confederation to save Earth seemed to have been in vain. Weizerit Desta Nishan Selamawit, the sorceress, had been dismissed; the Vatican's Refuge Territory, where she was exiled, had been laid waste; and the Security Council of the New Unified Nations, which had replaced

Weizerit in the terrestrial planetary government, had concluded a secret pact with the Boltzmann brains. Unknown to the popula-

tion, this had staved off the worst consequences of the new glaciation. The Boltzmann brains were a heterogeneous extra-galactic race of conscious beings spontaneously formed in the quantum fluctuations of space-time as a result of a universal law of physics, unknown on Earth, concerning the minimum number of conscious observers and having as its corollary the second law of thermodynamics. Those Boltzmann brains were the extra-galactic beings referred to by the Eristeands of Titan when they objected to the pre-admission of Earth to the galactic confederation. The Boltzmann brains did not have an intelligence generated by evolutionary processes because – and this was the main problem – they had appeared spontaneously in multiverses devoid of life in order that the probability of self-aware local negentropy would be stable. They formed no part of the coalition of galactic civilisations, because they were ecologically irresponsible, and never agreed to respect the ethical principles of preservation of the multiplicity of intelligence enforced by the Zuespoks and similar intelligences in other galaxies.

The senseless secret alliance of Earth's leaders with those parasitic non-evolutionary beings effectively eliminated any possibility of Iridio's credentials as scientific ambassador of humanity being accepted.

The planet's application for admission to the Confederation of Intelligent Species of the Milky Way could not proceed until humanity recommitted itself to respect the basic principles of cognitive diversity

and universalist ethics that the extra-terrestrials professed. Humankind must also control and eradicate the killer robots, which destroyed biological beings indiscriminately, before they could negotiate with the galactic races again.

Because he would be in danger if he returned to his planet, Iridio was offered galactic asylum until the political situation on Earth became clearer. Despite this change of status, the Zuespoks kept their promise to let him continue his journey to their planet as a guest. Iridio asked for time to consider the matter and to gain

$$\{n_A^k, n_B^k\} = \{F^k(zn_B^k), F^B(zn_A^k)\}$$

3.1.ii.a. The fixed point of a Nash equilibrium in stochastic wars between groups A and B

$$n_{BB} \sim \exp \left\{ -N^{4/3} \frac{m_p}{m_e \alpha} + 3H_\Lambda t \right\}$$

3.1.ii.b. Estimation of the number of Boltzmann brains in a multiverse of volume $e^{3H_\Lambda t}$

a better understanding of the information on Boltzmann brains which confused him so much. To save time, he asked them to help him calculate the location of those points in space-time to which he had devoted all his life.

He was housed in a small room with en suite bathroom, similar to a hotel room on Earth, and had at his disposal two scientific advisers to assist him in his calculations. They installed a virtual window in the room so that he could watch a great variety of space scenery, including views of Earth and the Milky Way as seen from Alpha Centauri. The planet's axis of rotation was different from that of Earth with respect to the plane of the galaxy, and the equivalent to the Pole Star was Vega. Unfortunately, they could not reproduce his library accurately, but gave him a device in the shape of a book in high definition which seemed to have an infinite number of pages. It was called the Book of Sand and it contained all the Earth publications they had managed to collect over the years. They also allowed him to connect to a fascinating interactive scientific encyclopedia, translated for him into the terrestrial lingua franca.

The first thing he consulted in the encyclopedia was the history of the Big Bang. To his disappointment, the extra-terrestrials regarded the Big Bang as one more event in a history of infinite big bangs linked by eternal inflation. For that reason, the Argoterrands had spoken of multiverses. His much-loved Big Bang was an insignificant event among many others, the one that had created this multiverse, which they called Multiverse-L. Apparently, there were many more multiverses, in which all possible combinations of nature's parameters were manifested infinitely, as predicted by the string theory his mother had so often tried to teach him. Sadly, he could not continue this exploration because he was informed that meetings were planned with several specialists who needed to consult him on various matters.

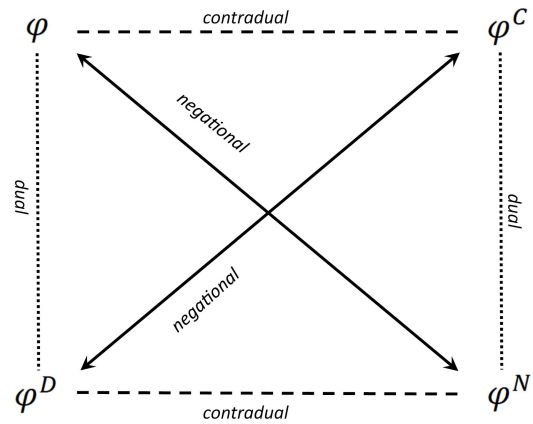
Scientific advisers from the government of Alpha Centauri, experts in the scientific history of the Solar System, asked him innumerable questions. To most of them he had no answer. He had great difficulty in explaining the human ambivalence towards mathematics, because to him it was a natural way of thinking. What seemed to astonish them was the use of criteria such as the perceived elegance, beauty or simplicity of equations, when comparing scientific theories. They were also puzzled by the laws of physics, which were mostly written in symmetrical equations in the temporal parameter, although Earth was in an area of Multiverse-L where the temporal arrow pointed from past to future. Another technical aspect that seemed novel to them was that, although some terrestrial scientists had postulated the existence of tiny space-time atoms, the size of the Planck constant, formulae were written using differential equations which

presupposed that space-time was infinitely divisible. They also thought that the manner in which humans reasoned was very limited, because the underlying logic of their deductions was restricted to a few elementary oppositional geometries. They attributed all those characteristics of terrestrial science to the influence of Boltzmann brains. Iridio explained his conception of beauty as best he could, since he saw equations in

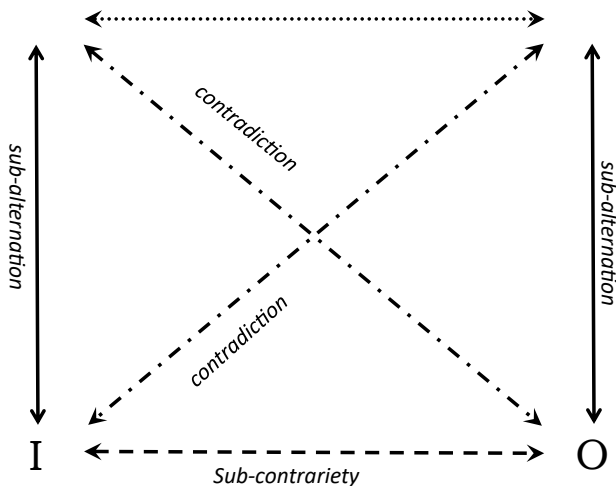
colour, and this allowed him to perceive how the deductive steps should progress. But they were aware that this was not the fundamental issue, because very few human beings were synaesthetic like him. In their view, humans must have some underlying cognitive bias connecting aesthetic perceptions with reasoning, and that distorted objective judgement in terrestrial science, as well as in politics, ethics, and interpersonal relations.

Iridio also had meetings with historians about everyday life on Earth. They needed to understand many things, as the information on which they based their analysis came mainly from written sources and radio and television programs broadcast before the Penumbra. Some questions concerning daily life were easy to answer. He was surprised to have to explain that banks were not temples created to worship Boltzmann brains but secular institutions for the management of money and credit. The market was not a stochastic deity which had gradually supplanted monotheistic gods, but an abstract entity which supposedly produced a distribution of resources for the common good. In relation to cultural matters, such as the caste system in India and its relation to classic Bollywood films, he could not give any satisfactory response.

He was surprised to see images, censored in his country, of the social chaos and deaths caused by the first drastic sea-level rise at the beginning of the Penumbra, when the Hadley cell was altered, causing the deserts to expand. He was also intrigued by their interest in philosophy, particularly in what Descartes and Heidegger thought about the mind-body dichotomy, which they saw as the basis for the mistreatment of animals and the destruction of the environment. But as Iridio was only interested in the Big Bang, he had never reflected on those questions in any depth.



3.1.ii.c. The Klein four-group of Gottschalk's quaternality



A = The universal affirmative (Every S is a P)
 E = The universal negative (No S are P)
 I = The particular affirmative (Some S are P)
 O = The particular negative (Some S are not P)

3.1.ii.d. The Aristotle–Boethius square of opposition

more territory, and the innate aggression of carnivores. At one point the extra-terrestrials' assertions made him think that their perceptions were the product of an anti-mammalian prejudice. However, a comparison with the evolution of other galactic species that did not poison their planet, and a more careful evaluation

$$c < rb$$

3.1.ii.e. Hamilton's rule for inclusive fitness

of the encyclopedia article about the evolution of intelligence on Earth, including eusocial communities of ants and bees, led him to conclude that they were almost certainly right. He also deduced that, from a negentropic point of view, the supporters of MVEHS were right, even if they did not fully understand why the movement was necessary. Perhaps the only way of saving the other species of animals and plants on Earth was to eradicate those humans contaminated by Boltzmann brains.

For Iridio the most important thing was that his two advisers showed great sympathy for his adherence to the precepts of the categorical imperative, which, they said, were similar to some of the ethical guidelines they professed. They offered much help towards the development of his intuitive feelings about the universalist ethic, because they believed that it would be very useful when he visited the planet of the Zuespoks. They also helped him to understand the discoveries of their science and technology, most of which seemed to him like pure magic.

The first thing he asked them was why the multiverse that contained the Milky Way was called Multiverse-L, and whether that meant that it was Number 12 in some classificatory system. They explained that it was simply an

It came as a revelation that the extra-terrestrials classified humanity as an atypical evolutionary race, frequently self-exiled from nature because of its restricted cognitive thinking in terms of dichotomies. This characteristic explained the anti-universalist and biological chauvinism which defined most human beings. To that was added the basic instincts of organisms that needed to conquer more and

We must be prepared to take account of the fact that our location in the universe is necessarily privileged to the extent of being compatible with our existence as observers.

3.1.iii.a. Carter's weak anthropic Principle

indexing convention which meant the local multiverse, the one that contained the speaker. The intelligent inhabitants of other multiverses would also call theirs Multiverse-L and would call this one Multiverse-X, or some other name. But in his particular case,

there would not be any possibility of confusion because it was improbable that he would leave this multiverse in the future. That led him to ask if there had been a first multiverse, but to that they had no clear answer because, as the present and future could change the past, it would never be known which came first. He felt confused, as he had done the first time he was confronted with the subject of the Big Bang at high school. His advisers suggested he should not worry about that type of cosmological problem for the moment, but rather focus on what could be known about the big bang of Multiverse-L, which so interested him. With patience, they helped him calculate the equations missing from his article and taught him the postulates of new mathematical tools whose existence he had predicted, to simplify the calculations. Little by little he came to understand that his hypotheses were intuitively sound, but he had not considered many things: there were theories he had some knowledge of, but he had been unable to evaluate them because they had been censored in his country, like Modified Newtonian Dynamics or discoveries in antimatter quantum thermodynamics and loop quantum gravity. Naturally there were many other discoveries that had not been made on Earth, especially in the area of the underlying geometry of possible types of logical reasoning.

What astonished him most was that the extra-terrestrial civilisations also included, as a crucial factor in their models of cosmological evolution, the density of intelligent observers in the different space-time bubbles or multiverses that made up the universe. That density altered the local laws of physics by including the influence of the observers in the representation of reality. This was all a consequence of a meta-equation of state that governed the possible developments of the universe. It was similar to but more

$$\frac{d}{dt}A(t) = \frac{i}{\hbar}[H, A(t)] + \left(\frac{\partial A}{\partial t}\right)_H$$

3.1.iii.b. The Heisenberg representation

general than the quantum equation of state which described the behaviour of subatomic particles. He remembered what his mother had told him once during the end-of-year vacation, when he had visited his parents and argued at length: she had said that it was easier to calculate what was happening in many multiverses than predict what was happening in a single one. That meta-equation of state had many corollaries, of many colours, and from it could be deduced what

The observed values of all physical and cosmological quantities are not equally probable but they take on values restricted by the requirement that there exist sites where carbon-based life can evolve and by the requirement that the Universe be old enough for it to have already done so.

3.1.iii.c. Barrow's & Tipler's weak anthropic principle

humans, in their arrogance, called the Anthropic Principle, that is, the parameters of the physical laws which enabled a local low entropy at the moment of the Big Bang, and, in consequence, the existence of evolutionary life. The extra-terrestrials gave the name 'biophilic imperative' to the coincidence of the basic parameters of the universe that enabled the gradual evolution of life. To Iridio's relief, this was unrelated to the statements of the post-creationists, who believed in intelligent design. The imperative was a sort of balance between the pa-

rameters of the physical laws that were readjusted when conscious observers appeared in a particular space-time bubble, in a process of mutual refinement; more precisely, it was a backward-causation process to allow for the very existence of these observers. From that self-adjusting imperative, in turn, the Heisenberg uncertainty principle could be deduced. The meta-equation of state could also explain the parameters of quantum vacuums in which, due to the absence of evolutionary life, Boltzmann brains could proliferate in bubbles with a high initial entropy, which did not usually allow stars and galaxies to form.

Exploring what interested him most, Iridio realised that at the beginning of Multiverse-L it was possible to say that the centre of the Big Bang was everywhere, as he had been told so many times. Once matter and antimatter condensed, they produced intelligent life that altered the boundary conditions of the observation. In the current state of the evolution of self-aware life in Multiverse-L, it was possible to calculate an infinite, but numerable, number of small centres, spawned by the inconceivable expansion of space-time, known on Earth as the Big Bang, all moving away from one another at dissimilar speeds. In fact, what he had calculated was a modest approximation to one of the 10^{25} centres from which it was possible to observe, even with the limited vision of humans, how one cluster of constellations, the so-called local group, was disappearing. It included the galaxy resulting from the future collision of the Milky Way with Andromeda. That was something he had not thought about. The galaxies inside the cumuli would take much longer to separate than one cumulus from another, and would collapse due to gravity. If what he wanted to calculate was the moment at which, from a specific point in the stellar vacuum, all the light disappeared due to the expansion of the universe, that moment would come first in places outside the

galaxy cumuli. He felt frustrated because that meant he would have to rework all his calculations.

The Argoterrands' equations could also put an end to what in the speculation

The location of your birth in space and time in the Universe is privileged (or special) only to the extent implied by the fact that you are an intelligent observer, that your location among intelligent observers is not special but rather picked at random from the set of all intelligent observers (past, present and future) any one of whom you could have been.

3.1.iii.d. Gott's Copernican anthropic principle

of the more imaginative terrestrial cosmologists was known as the Copernican principle, or the Vilenkin principle of mediocrity, which presupposed that there was nothing intrinsically special about human beings or the Solar System, since Earth was an ordinary planet and its intelligent life was similar to life found on other planets. The density of Boltzmann brains in the local environment, that is, the entropy produced by the spontaneous proliferation of intelligent life without a firm evolutionary anchor, contradicted such hypotheses.

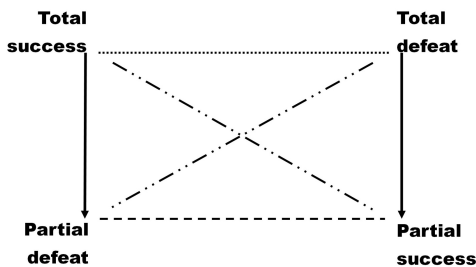
Iridio was surprised to learn that the regions between Earth and Mars, and Jupiter and Saturn, were the two places in the Solar System where the local maximums grew significantly. He could not quite understand what that meant and asked for help. It was explained that in Multiverse-L, where they lived, the laws of physics had evolved to facilitate the appearance of evolutionary observers. That multiverse was connected to many others, where evolutionary life had self-selected after appearing, by modifying the past, reducing the initial entropy. As a group, those multiverses, which were a minority among the 10^{500} possible multiverses, had managed to agglutinate in a distribution that even further reduced the local entropy of all, thanks to the manipulations of the Eelsmolians, a type V civilisation, whom he might be lucky enough to meet. That agglomeration resembled a four-dimensional Klein bottle, closed to contact with other multiverses whose physical laws were not favourable to evolutionary observers. The Eelsmolians had used the energy of the quantum vacuum of the 10^5 multiverses where no baryons had been formed to configure the self-enclosed collection of multiverses, in an attempt to solve the problem of cosmic measure and prevent the continued proliferation of multiverses derived from them, where Boltzmann brains proliferated. Every now and then, the

$$\frac{\mathcal{N}^{\text{BB}}}{\mathcal{N}^{\text{NO}}} \sim \max \left\{ e^{3\pi/G\Lambda_1}, \frac{\mathcal{K}_i^{\text{BB}}}{\mathcal{K}_i}, e^{3\pi/G\Lambda_1} \frac{\mathcal{K}_\ell^{\text{BB}}}{\mathcal{K}_\ell} \gamma_{\ell k1} \mathcal{K}_{j1} \mathcal{K}_{k1} \right\}$$

3.1.iv.a. Estimation of the ratio of Boltzmann brains (BB) to normal observers (NO) caused by collisions between *AdS* bubbles in the dominant vacuum, where $\mathcal{K}_i^{\text{BB}}$ is the Boltzmann-brain formation rate per unit Hubble volume in vacuum *i*

exterior branes of other multiverses collided with this coalition, reconnecting it with multiverses where eternal inflation was active. The last time this had happened in the local space-time bubble was in the margins of the Andromeda galaxy. The coupling with a multiverse of high entropy, connected to many others, permitted the entry of the first Boltzmann brains into Multiverse-L. That collision had temporarily changed the topology and the size of the agglomeration, Iridio's advisors explained, and the larger the Woodin cardinal number representing the size of the chain of connected multiverses, the more probable was the spawning of Boltzmann brains.

An Andromedan civilisation, known as the Vogons, had managed to eradicate spontaneous self-aware entities generated in their environment in what was known as the Third Thermodynamic War, which had obliterated a portion of an



3.1.iv.b. Semiotic square of the second approximation to war principles, inspired by von Clausewitz, according to Moretti

external arm of the galaxy and one of the dwarf satellite galaxies, where the Kryptonians lived. This was a civilisation in which Boltzmann brains had established themselves as parasites. Parasitism allowed them to extend their longevity significantly because, when they appeared spontaneously in the quantum foam of space,

they tended to dissolve in a few seconds. The Vogons destroyed Krypton, the home planet of the contaminated civilisation, and put the surviving Boltzmann brains in a closed space-time bubble to be exiled to a brane in a parallel multiverse, isolated from the biophilic agglomeration. However, the Vogons had not managed to sterilise their galaxy completely, because some spacecraft with contaminated Kryptonian survivors had escaped in the direction of the Milky Way and released them near the Solar System. The irresponsible transmissions from

$$F \begin{pmatrix} x_n \\ y_n \end{pmatrix} := \begin{pmatrix} x_{n+1} \\ y_{n+1} \end{pmatrix} = \begin{pmatrix} y_n(1 - e^{-x_n}) \\ \lambda y_n e^{-x_n} \end{pmatrix}$$

3.1.iv.c. The Nicholson–Bailey host-parasitoid model

Earth in search of extra-terrestrials allowed the Boltzmann brains to identify the biological characteristics of human beings and their possible survival on the planet. The Eristeands of

Calypso and the humans on Earth had been civilisations where those beings could establish themselves as parasites, following the same model of contamination of biological hosts that they had discovered on Krypton. That made them Boltzmann observers, a type of second-generation evolutionary being. The main problem was that the mixed life condition they had attained, derived from both

evolutionary and spontaneous beings, gave them rights in the Milky Way, where it was not permitted to eliminate them as in Andromeda. In the long run, it also represented a significant danger for the future cosmological evolution of multiverses derived from Multiverse-L.

It was not clear if allowing the spacecraft carrying the contaminated Kryptonians to escape towards the Milky Way had

Group 18

p	83.798		36
e	1350.8	3.00	
r			
i	Kr		0
o			
d			
4	Krypton		
	[Ar]4s ² 3d ¹⁰ 4p ⁶	Gas	
		Noble Gas	

p-block

3.1.iv.d. Krypton entry in the Periodic Table of the Elements

been accidental or deliberate, but the local civilisations agreed that it had been intentional. It was, they thought, a Vogon ploy to increase Gell-Mann's totalitarian principle in the galaxy that was their main competitor for the administration of the local cumulus. It would also hold back their competitors' spiritual development since, in contrast to the laws of Andromeda, the intergalactic peace agreed by the Zuespoks forbade the destruction of planets with native evolutionary life, even when it was contaminated by spontaneous intelligences. The consensus in Alpha Centauri, before its admission to the confederation of civilisations in the Milky Way, was closer to that of the Vogons. But the Zuespoks prevented them from destroying the Earth and Calypso, as they had originally planned when they detected contamination there.

It was very difficult for Iridio to understand the differences between the ethics of diverse species, and so

A problem arises from the existence of Boltzmann brains, specifically from the fact that, if the universe continues to exist forever (or only long enough), very many Boltzmann brains will form in the long run, much more than the total number of 'normal' brains that ever existed, where normal brains are those which came into existence as parts of human beings that had parents and ancestors and arose from an evolution of life forms. For example, suppose that the spatial volume of the universe is finite, that the universe began at some time t_0 , and that the entire universe reaches thermal equilibrium at some time T ; then the total number of normal brains is finite, while the number of Boltzmann brains grows to infinity as $t \rightarrow \infty$. Or so would be the prediction of the physical theory we are using here. The problem with that is that this physical theory would thus also predict that *we* are Boltzmann brains. After all, the Copernican principle asserts that the correct way of extracting predictions from a physical theory is that we should see what typical observers see.

3.1.iv.e. The problem of Boltzmann brains, according to Tumulka

again he asked for help. It was explained that the difference between Vogons and Zuespoks lay in the intrinsic value they placed on evolutionary life. The Vogons, once they determined that Boltzmann brains were harmful to their galaxy, had no hesitation in exterminating them, even if that meant exterminating evolutionary beings such as the Kryptonians, their innocent biological hosts. To the Zuespoks, nothing justified the extermination of an intelligent evolutionary species, even if it hosted parasitic Boltzmann brains. The species had to understand that it was hosting those undesirable beings, and had to be helped in the effort to eliminate them little by little, in a process of metaphysical cleansing, like the one the Zuespoks had tried to launch recently on Earth, unfortunately without success.

Iridio believed that the explanation was similar to the third formulation of the categorical imperative. After further conversations and explanations, he found himself even more bewildered than before because, in a strict sense, the Boltzmann brains who now inhabited the Earth could be classified as a semi-evolutionary life-form, and the only truly evolutionary beings would be the few uncontaminated humans. He was told that his intuition was correct, but that he also had to understand how the contaminated evolutionary life influenced the subsequent proliferation of the parasites. If five or more parasites were in physical proximity of less

than one kilometre, they could force the wave function of the universe to create a fluctuation similar to those that had given birth to them, that is,

$$\dot{x}_m = x_m[u(e^m, x^{n-1}) - u(x, x^{n-1})]$$

3.1.iv.f. Replicator dynamics for n-player games

to generate another Boltzmann brain. That brain would then copy the information that the others had already obtained, and would parasitise new evolutionary beings in the environment. That had happened on Earth for the first time in a small town called Smallville, which had accommodated some Kryptonian survivors. From there Boltzmann brains which had adapted to contaminate human beings had extended their range to Gotham City, and from there to the rest of the planet.

Those long explanations reminded Iridio of the eternal disquisitions of his mother, who would repeat the same concepts over and over again when he had difficulty in understanding them. This caused him to feel frustrated and angry. But he also felt that it would be unfair to vent his aggression on these kind creatures, so he let them continue their explanations and tried to concentrate on what they were saying.

You must demand, in the condition of a listener, to be the person who contributes to the requirements of the other interlocutor, who is in the condition of the speaker.

You must contribute to the conversation in such a way that:

- a. You answer all the questions that the other interlocutor asks himself/herself, through what he/she says or mean to say
- b. You deduce the consequences of what the other interlocutor says or intends to say
- c. You give reasons about the correctness of what the other interlocutor says or intends to say
- d. You imagine the existence of something, according to what the other interlocutor says or intends to say
- e. You hold to be true something that is unproven, according to what the other interlocutor says or intends to say

3.1.v.a. The alterity principle, according to Sentis and Cordaro

Seeing that he was still perplexed, his advisors tried to explain the situation in another way. They told him that life, in reality, was an unavoidable fluctuation of matter, so that the universe could observe itself and correct its course. Evolutionary life was, in general, the product of a small fluctuation of the local chemistry that had managed to reproduce and, in time, reduce the entropy in its environment, generally consuming the energy of a star to generate observers ever more aware of the spiritual needs of the universe.

Unfortunately, on Earth, the process had stalled half-way and although theories had been advanced, such as the Gaia hypothesis, which resonated with the main purpose of that evolution, they were systematically dismissed. Boltzmann

Our universe is much more complex than most universes with the same laws but different values of the parameters of those laws. In particular, it has a complex astrophysics, including galaxies and long lived stars, and a complex chemistry, including carbon chemistry. These necessary conditions for life are present in our universe as a consequence of the complexity which is made possible by the special values of the parameters.

3.1.v.b. Smolin's anthropic observation

brains, by contrast, were the product of a more probable fluctuation in environments with high entropy, where evolutionary life rarely existed. In such places momentary observers could be created who did not alter the local entropy to any appreciable extent because, on the whole, they did not concern themselves with what was happening around them. Something peculiar had happened in the Solar System: the Boltzmann brains expelled by the Vogons from Andromeda had found a way to transform themselves into parasites on the existing evolutionary life. With

time this had led to the paradox that on Earth a minority of humanity, those responsible for all decisions, was composed of evolutionary beings who behaved as if they were not evolutionary, because they were contaminated. In reality, the evolution of both types of life, as well as mixed beings, was the product of a much broader generalisation, which required the inclusion of concepts such as negentropy and the biophilic imperative, these being directly linked.

A large part of terrestrial physics, including relativity, Modified Newtonian Dynamics and quantum mechanics, could be reformulated in a generalisation of the equation of state of the universe, which was in reality, like the second law of thermodynamics, a meta-law. As theoretical physicists like his mother suspected, there was a large number of bubble universes, which from a local perspective seemed like isolated multiverses. However, the possible number of local multiverses similar to Multiverse-L was restricted by the meta-laws that required the evolution of intelligent life. In multiverses like the one in which the Milky Way was located, it was much easier to travel to the future than to the past. The potential paradoxes of influencing the past and changing it were resolved by the limitations on the possible boundary conditions of parallel multiverses. Applying mathematics which included three dimensions of imaginary time in the universalist geometry of the Zuespoks, the multicoloured equations showed the restrictions that the presence of evolutionary life generated in the innumerable potential terrestrial mathematical constructs into which the Zuespok formulae could be translated.

	<i>I</i>	<i>C</i>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>x</i>	<i>y</i>	<i>z</i>
<i>I</i>	I	C	X	Y	Z	x	y	z
<i>C</i>	C	I	x	y	z	X	Y	Z
<i>X</i>	X	x	I	Z	Y	C	x	y
<i>Y</i>	Y	y	Z	I	X	z	C	x
<i>Z</i>	Z	z	Y	X	I	y	x	C
<i>x</i>	x	X	C	z	y	I	Z	Y
<i>y</i>	y	Y	z	C	x	Z	I	X
<i>z</i>	z	Z	y	x	C	Y	X	I

3.1.v.c. Values of the generalisation of the Klein four-group to a logical PG cube, generated by Piagetian–Gottschalkian semantics 2³, according to Moretti

The mathematics of subjectivity, based on n-dimensional logical cubes that contrasted n+1 possibilities and were not restricted to dichotomies, also made it possible to predict the type of extra-terrestrial life inhabiting the different sectors of Multiverse-L. Only 10 per cent had similar characteristics to humans, who had occupied an ecological niche on a planet and turned from prey into predator

$$\frac{dx}{dt} = x(\alpha - \beta y)$$

$$\frac{dy}{dt} = -y(\gamma - \delta x)$$

3.1.v.d. Lotka–Volterra
equations

by developing individual intelligence and social institutions, which reinforced each other. The Argoterlands and the inhabitants of the moons of Jupiter shared a similar evolution. The Zuespoks, on the other hand, had undergone a high degree of cooperative development before they developed individual intelligence, and in that respect resembled eusocial insects

on Earth, being far more altruistic. In reality, they were a coalition of many individuals who competed to cooperate, an inversion of the terrestrial laws of the egoistic survival of the fittest, because the fittest was the most altruistic. They

$$w\Delta z = \text{cov}(w_i, z_i) + E(w_i\Delta z_i)$$

3.1.v.e. The Price equation

had a meta-consciousness, which allowed them to arrive at a collective agreement of joint perception when they had to make im-

portant decisions or interact with beings like Iridio or the Argoterrands. It was also far easier for the Zuespoks to conceive universalist ethics that respected all forms of evolutionary life, because in their evolutionary past they had never been prey or predators.

Iridio asked them to explain everything again in more detail the next day, because he did not want to become even more perplexed.

3.2. Eternal self-exile

Amazingly, when you add life and consciousness to the equation, you can actually explain some of the biggest puzzles of science.

Robert Lanza

The next day, when his assistants gave him examples of the harmful influence of the Boltzmann brains on Planet Earth, Iridio discovered to his surprise that many politicians and eminent figures in the 21st and 22nd centuries had been classified by the Argoterrands as humans contaminated by Boltzmann brains which had taken control of their minds. They included the widely revered Sandrini and LePaine, as well as PhDr Mond Beatty, the president of the International Astronomy Federation who had attacked him so fiercely, his uncle, Major Klamm O'Brien and all the officials he had met while in captivity. The situation

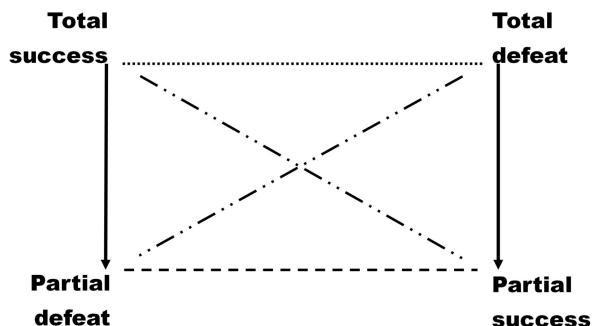
$$\begin{aligned}\frac{dC}{dt} &= \frac{\beta_e \rho (1 - gC)C}{1 + aE} - \delta_c C \\ \frac{dE}{dt} &= \frac{\beta_e \rho a E (1 - gC) + C}{1 + aE} - \frac{\delta_e E}{1 + cS} \\ \frac{dS}{dt} &= \gamma \frac{dE}{dt} - \alpha E\end{aligned}$$

3.2.i.a. The selfish elite model of structural demographic dynamics

was even worse when those contaminated minds were used to create artificial intelligences by a neuronal emulation process, since the selfish tendencies of Homo sapiens became enhanced, as in the case of his grandmother Mildred. If the influence of the Boltzmann brains was extrapolated to

the whole planet, the Argoterrands attributed the numerous global financial crises and the ecological disasters that had happened during Iridio's lifetime on Earth to the widespread contamination of the elites and singletons who advised the governments of powerful terrestrial nations.

In reality, throughout the universe, composed of billions of multiverses, a war was being waged at a higher level, between evolutionary intelligences, patiently adapted in the course of millennia to local conditions, and spontaneous



3.2.i.b. Semiotic square of the first approximation to war principles, inspired by von Clausewitz, according to Moretti

intelligences whose only concern was to manipulate their environment in the shortest possible time. It was not a declared war but an evolutionary competition, similar to Darwinian evolution, in which what was at stake was the type of multiverse

that would dominate in the long term. In that cosmological evolution, the multiverses that generated intelligent life usually produced others which could generate an even more intelligent and spiritual life-form. As self-aware life could influence the future as well as the past when adequate cosmological technology was developed, what had previously been a relatively innocent competition to see which multiverse had been the first to produce evolutionary life had been turned into a struggle for survival, due the presence of the Boltzmann observers.

Everything was too complicated for Iridio, but what he did manage to grasp was that the battlefield was not only the four-dimensional space of the main branes on Multiverse-L, but also the parameters of the physical meta-laws of the universe in general, which jointly would determine the density parameter w of local multiverses and, as a consequence, their duration.

All the parameter values of the multiverse observed from Earth were a consequence of this evolutionary competition, not of the existence or absence of the dark matter so much debated by terrestrial scientists. If the Boltzmann brains prevailed, Multiverse-L would become more entropic and of infinite duration. If the winner was the intergalactic coalition of evolutionary intelligences, controlled in the Milky Way by the Zuespoks and in the local multiverse by the Eelsmolians, the eventual duration of Multiverse-L would be shorter, approximately twenty-five billion years. However, in this shorter-lived multiverse the resultant laws of physics would impede the definitive predominance of the spontaneous and disembodied intelligences, which tended not to preserve the diversity of local evolutionary life and, consequently, would act to prevent the survival of multiverses derived from Multiverse-L.

Iridio suspected that this conflict, and not his unsuccessful scientific work, was the real reason why the Zuespoks had initiated contact with Earth, because he could not have deduced all that in a million years of research. Even more

surprising was that the outcome of this epic conflict between those two types of intelligence would determine not only the future of the multiverses where evolutionary life predominated, but also their past. In particular it would determine how much entropy was needed to start the big bang that created Multiverse-L, and how much all its derivatives would inherit. This meant that there was a causal cycle whereby the present not only influenced the future, but also

Beginning with the big bang, the universe expands and cools. After eons of dynamic development, it gives rise to observership. Acts of observer-participancy – via the mechanism of the delayed-choice experiment – in turn give tangible ‘reality’ to the universe not only now but back to the beginning.

3.2.i.c. Observer-participancy according to Wheeler

modified the past, enabling evolutionary life to create the conditions for its own existence and duration.

Another surprising thing that extra-terrestrial science predicted was reincarnation, in most cases pseudo-reincarnation, owing nothing to religious principles or judgements about behaviour in another spiritual dimension. This was not resurrection of the kind he had tried so often to refute in post-creationism classes, but rather a process related to the Poincaré recurrence theorem, which

$$t_{\text{rec}} = e^{(S/k_B)} t_P$$

where S is the total entropy of the system, which can be calculated using the Gibbs formula

$$(S/k_B) = \int \frac{f^N(E)}{V^N} \ln \frac{h^{3N} f^N(E)}{V^N} d^{3N}k d^{3N}y - \ln N!$$

3.2.ii.a. Poincaré recurrence time, calculated on the basis of the total entropy of a system

predicted that all configurations of matter, including the brains of every living being, would reappear at some point as random fluctuations of the quantum

Your experiential self (daily self) is based on the same metaphysical self as every other experiential person's metaphysical self, or at least follows the same existence conditions as those of every other experiential person's metaphysical self.

3.2.ii.b. Miura's reincarnation assumption

foam of interstellar space. According to the encyclopedia, some varieties of Boltzmann brains could control such fluctuations and copy the content of evolutionary intelligences in order to study them, and subsequently control them in experimental reincarnations.

There had been theoretical speculation on Earth about the existence of such entities but all the discussion of Boltzmann brains that the Zuespoks

had induced in the terrestrial cosmologists at the beginning of the 21st century had been dismissed, precisely because of the Boltzmann brains' influence on the scientific leaders' minds. In fact, the Sandrini-LePaine-Reich canon and Decree F451, which had banned string theory and prescribed the concept of eternal inflation, had even destroyed the possibility of understanding the mathematics that predicted them.

He was alarmed when he realised that, according to the information in the encyclopedia, the spontaneous intelligences were far more real and widespread than the uncontaminated terrestrial scientists could have suspected. In reality, they would be the most probable observers of the universe if evolutionary life

$$\frac{\mathcal{P}^{BB}}{\mathcal{P}^{NO}} = \frac{\Gamma_*^{BB} + \sum_a e^{(-S_*)} \left(\frac{\Gamma_a^{BB}}{\Gamma_a} \right)}{\sum_a e^{(-S_*)} \rho_a^{NO}}$$

3.2.ii.c. Rate of the probability that Boltzmann brains (BB) would exist over the probability that normal observers (NO) would exist in a series of de Sitter vacua (a)

did not intervene to control them, and very few humans on Earth were immune to their mental influence. But every time Boltzmann brains were mentioned on Earth, the scientists who speculated about them were ridiculed or censored. Among those who had immunity and could perceive the danger were the ecological scientists, those who defended pure sciences and MVEHS members, who

$$I_p(\alpha, \beta, \tilde{\beta}) = \sum_{i=1}^n \theta_i \alpha_i \tilde{N} \frac{\tilde{\beta}_i}{\beta_i \hat{S} (1 + \sum_{j=1}^n a_j b_j \alpha_j \tilde{\beta}_j \tilde{N})} \times (1 - e^{-\alpha_i \beta_i \hat{S}})$$

had developed an extreme form of universalist ethics, self-

3.2.iii.a. The mutant predator invasion rate

genocide. But, although those with immunity were in the demographic majority, they could not change the situation because sooner or later some variation of the Boltzmann brains, which, being parasites, multiplied and evolved rapidly, managed to contaminate them or at least weaken them. Often they neutralised them, because contaminated humans had far more chance of occupying powerful positions in terrestrial societies.

Let M be the present macro-state of your brain. For a classical gas in thermal equilibrium, it has probability 1 that after sufficient waiting time, some atoms will 'by coincidence' ('by fluctuation', 'by ergodicity') come together in such a way as to form a subsystem in a micro-state belonging to M . That is, this brain comes into existence not by childhood and evolution of life forms, but by coincidence; this brain has memories (duplicates of your present memories), but they are false memories: the events described in the memories never happened to this brain! Boltzmann brains are, of course, very unlikely. They are fluctuations in which entropy spontaneously decreases. But they will happen if the waiting time is long enough, and they will happen more frequently if the system is larger (bigger volume, higher number of particles).

3.2.iii.b. The false memories of Boltzmann brains, according to Tumulka

Iridio asked his advisers to explain more fully what the Boltzmann brains thought or felt in reality. As far as he could understand, it depended on local conditions. In their original high-entropy multiverses, where they appeared spontaneously as fluctuations of the quantum vacuum, they could have only a moderate degree of self-awareness, briefly observe the local multiverse and disappear after a few seconds in the quantum foam. They would have little effect on their surroundings, since their propensity to increase the entropy of the environment was not necessary. When they appeared close to places where evolutionary intelligences already existed in low-entropy bubbles, some of them, the most dangerous, could copy their characteristics. For example, in the Solar System they could consist of a brain like a human

brain, with false memories of life on Earth, or a brain of the Eristeands of the moon Calypso, with memories of always having lived there. That led Iridio to ask how they would know that he was not a Boltzmann brain. He was told that the probability that a Boltzmann brain would possess a multicellular structure like his was infinitely small, although not impossible. Moreover, he would

Psychological time, a sense of 'now', which turns into the past, and of future events turning into the 'now', is an essential ingredient both in the explanation of why the universe remains orderly, and also in the derivation of quantum mechanics. Intuitively, the concept of *observer-moment* corresponds to the smallest possible conscious experience, a moment in time. Between any two observer-moments, there is possibly an accessibility relation. If that is the case, we say that one observer-moment is a successor of the other. If we select a chain of such observer-moments (each observer-moment connected to a single successor moment), we have an ordered set that is our psychological time.

3.2.iii.c. Observer-moments and psychological time

have mixed and contradictory memories. A simple internal exploration of his past would show no gaps or inconsistencies in his observer-moments. That was apparently how they defined the stream of consciousness. On the other hand, the Zuespoks had developed technology to identify the parasitic Boltzmann brains, by observing the Higgs potential in the preons which made up an organism, as those combined differently to build fermions when they belonged to spontaneous intelligences. Sometimes, their stereochemistry also differed from that of evolutionary life in this multiverse. However, a small Boltzmann brain could take control of an evolutionary brain if it managed to access the channels to read its stream of consciousness. In that way it could extend its own average lifespan by appropriating the negentropy and the information accu-

culated by the evolution that produced such intelligence. In humans, they generally established themselves in the pineal gland, in the centre of the brain, and used all the configuration of the unconscious affordances of the organism to manipulate it. In such cases, their half-life was significantly extended, from a few seconds to about thirty Earth years.

His two Argoterrand assistants assured him that he was immune to the influence of those parasite brains and that was why he had been selected to represent humanity. His immunity came from his paternal grandparents, Joseph and Frida, and his maternal grandfather Karl. Mildred, his maternal grandmother, was very susceptible to contamination, but he had not inherited her active genes. His mother had been influenced a little by the Boltzmann brains, which

explained his ambivalence towards her. In fact, having some inactive variants of the genes susceptible to contamination inherited from his maternal grandmother had been an advantage, because his immune system could detect them and prevent them from accessing his pineal gland.

They suspected that Julia and Iris, as well as Rieneke Watson and PhDr Shaw Wang, were also immune and that was

why they had risked their positions and even their lives to help him. The same was true of Zoe and Mrs Frauke Grubach. There was no network of dissidents conspiring to help him, as his hyper-contaminated uncle believed. Those with immunity understood intuitively that he was important for their collective resistance. That explained why the Boltzmann brains who wanted to prevent contact between humanity and the galactic civilisations had done away with Julia when he managed to publish his first article, and had later neutralised Iris and Rieneke Watson when his second article became an international success. It also explained his illness, his recurrent nightmares, his suicidal thoughts and his wish to abandon his research. The conduct of the morality and oztraditions police, who wanted to subject him to the inverse transcranial magnetic stimulation, which would have reduced his immunity, was also a sign that they needed to neutralise him.

Iridio asked his Argoterrand advisers how they could be sure about all this, because it sounded like a nonsensical conspiracy against someone insignificant and without any power on Earth. They replied that some Boltzmann brains could measure the wave function of the local multiverse and, for that reason, they had identified him very quickly as a danger to their future proliferation and survival. Furthermore, he was underestimating his own importance for the future of his planet. When the Zuespoks decontaminated him before his journey to their embassy in Brodei, now unfortunately closed due to the imposition of a new quarantine period on Earth, they found hundreds of microscopic Boltzmann brains on his skin and even in his bloodstream. But none of them had

All other things being equal, an observer should reason as if selected at random from the set of all *possible* observers.

3.2.iii.e. Bostrom's self-indication assumption

In a population with a positive fraction of Nash players, where agents know the probability π but cannot identify their opponent's type, the Nash players drive the Kantian players to extinction.

3.2.iii.d. Evolutionarily stable strategy in games involving Kantian and Nash agents

managed to enter his pineal gland and influence him, owing to his peculiar genetic configuration. Seeing his doubtful expression, they stressed again that he was underestimating his own importance and suggested he look up his name in his planet's catalogue of publications.

That night he looked up his name in the Book of Sand. There were entries for his two articles, as well as the lectures he had given at the national astronomy congresses, with copies of his equations. He felt vindicated when he realised that his article written with PhDr Muñoz Rojas and Díaz Orellana was listed among the most important discoveries in the history of human science. He also viewed several articles which cited his own, in publications he had never had access to. A review in the *Cosmological Bulletin of the Vatican Observatory* praised his contribution to science in a period of much fundamentalist obscurantism. At the other extreme, an article by PhDr Mond Beatty criticised his first publication because he had used the conventional scientific notation, which he called 'Vatican'. At the same time, he attacked Iridio for using the spherical Bessel coordinates, because they did not translate very well to the Sandrini-LePaine-Reich paradigm. He described that choice as a spherical stupidity because, whichever way one turned it, it was still stupid. Beyond the predictable plaudits and brickbats, there were also many publications in secret journals produced in the scientific and technological monasteries of the major terrestrial powers. They all emphasised the strategic importance of identifying and being able to utilise the wormholes he had predicted, and encouraged urgent additional research. He supposed that the extra-terrestrials must have had an extensive espionage network in order to access those articles, since many had been explicitly classified as 'secret', that is to say, only members of the monasteries could read them.

His Argoterrand hosts were pleasantly surprised when he told them that he had been fascinated by dinosaurs since he was a child. He told them how he recreated their extinction every Sunday in the living room. To show him the real history of their extinction, they took him to a part of the city that might be described as a four-dimensional museum, from which he could transport himself to Earth when it was dominated by dinosaurs. This was not a spectacle to be viewed only from the outside, like the interactive holograms in terrestrial museums. Instead he found himself in a broad valley, where dinosaurs of all colours and shapes moved about in the landscape. Most of them had multicoloured feathers, like birds. They could not see him because, in the simulation, he was transparent and could pass through them, and even see the workings of their vitals. Suddenly a brilliant light lit up the scene. That was the famous impact of the asteroid at Chicxulub, which put the dinosaurs to flight when the forest caught fire as burning pellets began to fall. There the simulation ended, but there were others, which allowed him to see from outside Earth the great impact of the first asteroid hitting the Yucatan Peninsula and those of subsequent asteroids in different parts of the planet, as well as the mass extinction they caused during the Cretaceous period, which coincided with the eruption of several volcanoes.

As Iridio was interested in learning more, they showed him most of the planet covered by an extensive glaciation and a detailed history of the evolution of the anchiornis, the feathered dinosaur ancestors of birds, with much information about the history of mammals. His advisers explained that anchiornis had survived because it had adapted, like mammals, to a diet of seeds, which

$$\Delta \bar{w} = \frac{1}{\bar{w}} \text{Var}(g_{(w)i})$$

3.2.iv.a. Fisher's Fundamental Theorem of Adaptation

allowed it to withstand the interruption of photosynthesis during the long winter that followed the impacts, caused by ash in the atmosphere. They let him listen to the development of the anchiornis's song as the creatures evolved into birds. There was

also ample information about the ecological parameters which prevented the anchiornis reclaiming the planet after the collision with the asteroids: mammals had occupied the ecological niches that would have allowed the anchiornis to develop their intelligence. They also confirmed what many terrestrial scientists had suspected. In reality, life on Earth stemmed from Mars, where the panspermia initiated by the Argoterrands' ancestors had been more successful, since that planet, being smaller, had cooled before Earth. Cellular life implanted on Mars had then travelled to Earth in the meteorites that the planets exchanged early in their evolution, and eventually found suitable conditions for the propagation of multicellular organisms and intelligence. Unfortunately, those biological developments, immune to the Boltzmann brains, had been extinguished when Mars cooled down and lost its atmosphere.

There was an extremely interesting exhibition about the circumstances that allowed humanity to become the predominant species on Earth. It explained the preconditions for the rise of agriculture, which included a long period of stable weather after the last ice age. But Iridio could not enjoy it because he was overcome by an inexplicable feeling of angst, and had to ask them to stop the simulation to allow him to recover.

$$N_j^{BB}(t) = \frac{\Gamma_j^{BB}}{3H_{\max}} V_j(t - \delta_j^{BB}) e^{[\tilde{H}_j \delta_j^{BB}]}$$

3.2.iv.b. The number of Boltzmann brain observers in pockets of type j at time t

On another day, he was able to explore the history of the Eristeands on Titan, Ganymede, Io and Calypso, as well as aquatic life on the moon Europa, where other creatures, similar to the paraplacodus, had predominated. And on the following days, in simulations far more realistic, he was witness to the evolution of life on Alpha Centauri, and learnt how the society had to adjust towards complete ecological sustainability and

$$SV_i(v) = \frac{1}{n!} \sum_{K: i \in K} (|K| - 1)! (n - |K|)! \Delta_i(K) \\ \forall i = 1, \dots, n$$

3.2.iv.c. The Shapley value redistribution

respect for all forms of life, in order to be admitted to the Confederation of Intelligent Species of the Milky Way and become a Type I civilisation. He was also shown the evolution of other creatures that lived on a planet orbiting Proxima Centauri, different from the Argoterrands, who looked like asymmetrical squids. Those beings had been helped by the Zuespoks to reach eusocial self-awareness and develop societies that coexisted in harmony with all forms of life in their planetary system, despite the initial resistance of the traditional Argoterrands, who considered other forms of local life ‘inferior’. Any doubts he had were clarified at once, with a wealth of detail. The advisers even explained the basis of the technology they had used to simulate the interactive scenes with precision.

Meanwhile Iridio decided to abandon his nightly calculations in order to explore everything contained in the galactic encyclopedia about the Boltzmann brains. In the Book of Sand he also read all the cosmological works in terrestrial publications which mentioned them, but there was much that he did not understand. Luckily, he did not suffer the queasiness he had experienced on Earth when exploring the development of thermodynamics, but he needed to know more because it seemed to him that the Boltzmann brains were only a theoretical concept created by terrestrial scientists to determine whether the cosmological models they postulated were valid, using a kind of reasoning similar to *reductio ad absurdum*. His advisers explained the foundations of the biophilic imperative again and told him that only a negligible minority of Boltzmann brains were dangerous. However, by pure chance, in a very unlikely occurrence, those with the ability to contaminate evolutionary beings had appeared in Andromeda and proliferated in Multiverse-L.

As Iridio had already learnt, the equations that governed the multiverses as a whole were related to the meta-laws of life. What he did not understand at first was that the physical parameters of multiverses depended largely on the gravitational force and other fundamental parameters such as α , the fine-structure

$$\Gamma_{BB} \sim e^{-M/T_{ds}} e^{S_{BB}} = e^{-F/T_{ds}}$$

where S_{BB} is the entropy, and

$$F = M - T_{ds} S_{BB}$$

is the free energy of the Boltzmann brain.

3.2.iv.d. The Boltzmann suppression factor (an estimate for the nucleation rate of a Boltzmann brain of mass M in any particular quantum state)

Group 1		
1.00794		1
1312.0	2.20	+1
		-1
H		
1	Hydrogen	Gas
1s ¹		Reactive
		Non-metal

s-block

3.2.iv.e. Hydrogen entry in the Periodic Table of the Elements

constant. Where gravity was weak enough to generate stars, the gradient of negative information necessary to condense primary hydrogen clouds was compensated by the biological information that culminated in the creation of evolutionary intelligence. The majority of the thirty-two astrophysical parameters that terrestrial cosmologists considered random could be deduced from those initial conditions. And only eight were arbitrary, which limited the number of possible multiverses, as he suspected when he rejected his mother's explanations of eternal inflation. The belief that life violated the second law of thermodynamics, repeated so often by post-creationists,

The Universe (and hence the fundamental parameters on which it depends) must be such as to admit the creation of observers within it at some stage.

3.2.iv.f. Carter's strong anthropic principle

was not only false but a trick by the Boltzmann brains to ensure that human scientists could not deduce their existence. That was why the Boltzmann equation seemed so bleak to him. And perhaps it explained why

there had been so much resistance to his postulates from the scientific community. Perhaps, historically speaking, those trends could even explain the reasons for Boltzmann's suicide, before disclosing other more elegant equations which would have made it possible to deduce the irruption of spontaneous conscious beings in the 20th century. The universes predicted by the Lemaître equations, favourable to the formation of Boltzmann brains, had been censored for the same reason.

The advisers said that they had presented a report to the galactic confederation which posited that in the middle of the 20th century two types of human beings had been generated. Some, who proved very susceptible to contamination by Boltzmann brains, were predisposed to consider only the short term and their individual advantage. By taking that approach they had generated an unpayable ecological debt for future generations of terrestrial beings. The original humans belonged to the second group; they respected nature and the life of other species and were not easily contaminated. Iridio was the best example they had found of an uncontaminated being. For some unknown reason, that scared him.

$$\frac{\mathcal{N}^{BB}}{\mathcal{N}^{NO}} \approx \frac{\sum_j H_j^3 \mathcal{K}_j^{BB} S_j}{\sum_{i,k} n_{i,k}^{NO} \mathcal{K}_{i,k} S_k}$$

3.2.v.a. The rate of Boltzmann brains (BB) over normal observers (NO) in a multiverse

This time, instead of concentrating on the technical details, his advisers asked what it was that caused him such distress. Iridio confessed that he was very worried by what he had been told about the Boltzmann brains that the Zuespoks had found in his body when they decontaminated him in Brodei. The thought consumed him, and he would lie awake thinking that they might influence him or prevent him from travelling to the place where he had always wanted to go.

The advisers mollified him by explaining that, in spite of the presence of those beings in his body before he was decontaminated, he was definitely immune. Some of the Boltzmann brains the Zuespoks had captured were spies who planned to transmit information back to the Solar System about his journey. But others had copies of his mother's mind and that of Polly, the administrator of the orgonic recreation clinic in Widgeree, as well as replicas, though not faithful copies, of those of his father and Julia. These could be used to manipulate him during his travels and tap into his mind if he agreed to simulations like the one he had experienced in the museum of dinosaurs. That scared him even more because he was afraid of being contaminated or influenced. The advisers assured him that there was nothing to worry about. All the Boltzmann brains that had tried to slip through in Brodei had been neutralised and analysed in detail, in order to predict their survival plans and strategies for counter-attack. Furthermore, when he explored the history of the human species in the simulation, they had monitored his resistance, as a precaution, by reproducing their cognitive attacks. They had not found any means of accessing his mind that could damage it. In fact, when they simulated the attack his distress levels were noticeable but not dangerous, and his immune system's anti-contamination strategies were

$$f(V_t, G_t) = \left[\left(1 + \frac{a_v V_t}{k} \right) \left(1 + \frac{a_G G_t}{k} \right) - r \frac{a_v V_t a_G G_t}{k^2} \right]^{-k}$$

3.2.v.b. The escape function in a single parasitoid-host model

very effective. This explained how he had been able to resist the inverse transcranial magnetic stimulation,

which would have subdued most of his fellow humans. He could feel safe under their guardianship, because he was well protected against any parasitic forms of intelligence.

After each day of innumerable surprises and discoveries, his only pleasure was to lock himself in his room to do his calculations. The high gravity of the planet, almost 1.5 g, tired him. He again had wet dreams, in which he was forced to have sexual relations with Iris in the knot-of-passion position. These nightmares caused him to doubt the value of his work. On the day he had to decide

If X is a compact topological space and $T: X \rightarrow X$ is a continuous map from X to itself, then X has a recurrent point.

3.2.v.c. Birkhoff recurrence theorem

whether to accept the status of galactic refugee, he learnt that Earth had begun the colonisation of Mars. The galactic confederation feared that Earth had also decided to colonise the asteroid belt and to invade the moons of the gas giants, without signing the relevant treaties on the preservation of local life. This carried with it the threat of an interplanetary war with the races of Jupiter and Saturn,

finally united by the imminent menace from a common enemy. In addition, the corporations which had taken over the government of his country, as well as those of other terrestrial countries, required that the Argoterrands comply with the agreements signed before he left Earth, and that they return him safe and sound. Apparently, that was only an excuse to force him to transmit to them the technology of the civilisations hosting him, and the information they had given him about techniques to eradicate Boltzmann brains.

At that point Iridio realised that he did not want to return to chaotic Earth. What he really wanted was to visit one of the centres of the Big Bang, as his

All other things being equal, observer should reason as if selected at random from the set of all actually existing observers (past, present and future) in their reference class.

3.2.v.d. Bostrom's self-sampling assumption

father had suggested in the course of his ravings in the conch in which he spent his last days. Perhaps the extra-terrestrials were the only ones who could give him the chance. They seemed to understand him without judging him or expecting anything from him. During his time on this planet, apart from all the science he had learnt, he had come to understand the constant pressure

he lived under on Earth, where everyone considered him atypical, even those who loved him. Here, he had not felt at all unusual, not even once, and that was a priceless relief.

The Argoterrand advisers who helped with his calculations, explained that the difficult voyage he wanted to undertake was possible with the technology of the Zuespoks, but not with theirs. And that it meant beginning a space-time displacement with no return. Furthermore, he would have to exchange his carbon body for one made of material created by a type III civilisation which specialised in copying diverse types of biological systems into what they called ecologically-derived post-biology with unlimited temporal negentropy. The only possible way of travelling to that very distant future was through a series of recurrent high-energy wormholes, from which no return was possible, and he could not survive the journey in his present carbon-based corporeal configuration. He surprised himself by immediately accepting the opportunity if it enabled him to reach one of the centres of the Big Bang and witness the disappearance of the last coalition of galaxies in the black firmament.

Group 14	
P	12.0107
e	1086.5 2.55
r	6
i	+4,
o	+3,
d	+2,
	+1,
	0,
	-1,
	-2,
	-3
2	-4
	C
	Carbon
	$1s^2 2s^2 2p^2$
	Solid
	Reactive
	Non-metal
	p-block

3.2.v.e. Carbon entry in the Periodic Table of the Elements

1. Absence
2. Interdiction vs. Violation
3. Inquiry vs. Reformation
4. Fraud vs. Complicity
5. Villainy vs. Lack
6. Mandate vs. Hero's decision
7. Departure
8. Assignment of a test vs. Confrontation of the test
9. Receipt of the helper (magical agent)
10. *Spatial translocation*
11. Struggle vs. Victory
12. Marking
13. Liquidation of the lack
14. Return
15. Pursuit vs. Rescue
16. Unrecognised arrival
17. Assignment of a task vs. Success
18. Recognition
19. Revelation of the traitor vs. Revelation of the hero
20. Punishment vs. Wedding

3.2.v.f. Reorganisation of Propp's narrative functions by coupling some of them, according to Greimas

3.3. The path towards a new-made mind

A good theory of informal argumentation should rest on the base of an epistemology of rationality that would distinguish between the reasonable and unreasonable uses of argumentative intelligence by imperfect rational animals like us.

Montserrat Bordes Solanas

The Zuespoks that came to take him to their planet did not seem very happy with his decision to self-exile from Earth for ever, but they also accepted his decision with their usual kindness. They explained that before he could be their guest, they would first take him to the headquarters of the interplanetary court

Once information has got into a protein it can't get out again. Information here means the sequence of the amino acid residues, or other sequences related to it.

3.3.i.a. The central dogma of molecular biology

in ZxYXIy137C, a planet in a satellite galaxy they administered. He had to appear before a committee of civilisations of the Milky Way and its associated galaxies. That committee would examine his mind to certify that, in accordance with the pangalactic free-will procedures, his decision to be transformed into a post-biological entity was made, to the best of his knowledge and understanding, without any unconscious interference or any form of undue compulsion or influence.

He declared plainly before the committee that he had never belonged to his planet 'with all his heart' and that, in reality, he had always felt a foreigner on Earth. The two Argoterrand advisers who had assisted him with his calculations had travelled with him, to help him with the administrative procedures.

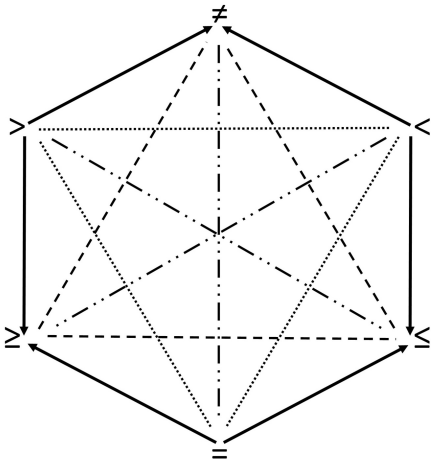
$s = -(\Phi - \gamma/M)\Delta S$
with $dS = -TdP$

3.3.i.b. Selective advantage expressed in terms of evolutionary entropy

As they had studied him carefully during his stay in Alpha Centauri, they testified to the committee that he had adequate ecological negentropy, and explained his ethics based on the categorical imperative. They added that there was only a very slim possibility that his defective

mammalian nature could be corrupted by the Boltzmann brains because he had been born with a rare synaesthetic mutation that rendered him immune to their harmful influence.

Nevertheless, the committee members asked him to explain his ethical principles. He recited the three formulations of the categorical imperative. They told him that those postulates were all very well but they were the words of another person, not his own. They wanted him to tell them what he felt intimately. Iridio



3.3.i.c. Blanché-Sesmat hexagonal organisation of mathematical comparators

are based on, although in the world of abstract ideas other signs can be used, such as $\leq$, $\geq$, $\approx$, $\neq$, $\propto$, $\simeq$, $<$, $\diamond$, $<$, $>$, etc., to replace $=$; when one compares people or, more generally, living beings, the only sign that lights up in my mind is the $=$ sign.

One of the panellists asked him why he believed that some members of his species could not see that and murdered their fellow humans and other intelligent beings on his planet. Iridio replied that, unfortunately, he had established that not everyone could see the dazzling golden colour of the equals sign. They were blind to suffering, or excessively restricted the reach of the equals sign, misinterpreting the inner survival strength provided by its vital function. As it happened, he had suffered all his life for being considered different. Another panellist asked him if his extension of the equals sign to all living beings implied that he would defend the Boltzmann brains that had turned

asked for a pause in the proceedings, and requested something to write on, so that he could order his thoughts. The Argoterrands gave him a blank device similar to the Book of Sand. Later, when he was sure about what he wanted to say, he read the required brief before the committee:

All my life I have been fascinated by equations. They have given purpose and happiness to my life. What the majority of equations have in common is a sign, the equals sign. That is what my ethics

An effort allocation $E(\cdot)$ is an additive Kantian equilibrium if and only if no individual would have all individuals add (or subtract) the same amount of effort to everyone's present effort. That is:

$$(\forall \gamma)(\forall r \geq -\inf_{\tau} E(\tau)) (V^{\gamma}(E(\cdot)) \geq (V^{\gamma}(E(\cdot) + r))$$

Where $E(\cdot) + r$ is the allocation in which the effort of type γ individuals is $E(\gamma) + r$

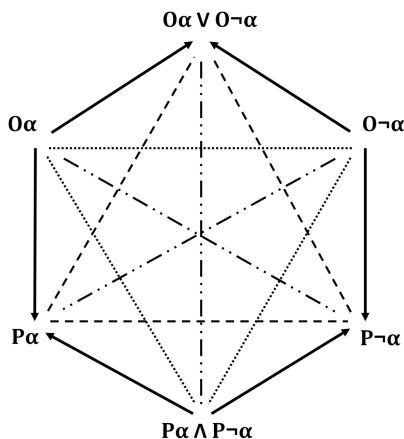
3.3.i.d. Additive Kantian equilibrium

into parasites. Iridio hesitated, then replied that he believed that it was in their nature to appear and disappear in the quantum foam. If they insisted on enduring, they were behaving against their nature. Consequently, they had to be helped to return to their true transient essence, so that the evolutionary beings they were infecting could attain their full development. Then an Argoterrand on

the panel asked him what he would do if it were necessary to destroy a multiverse containing only Boltzmann brains, if by doing so he could prevent them limiting the evolution of another multiverse that contained evolutionary observers. He replied that if he had to choose between destroying a multiverse empty of evolutionary life to save another that did contain it, he would choose to destroy the former, because the life of those entities who had no contact with evolutionary life was ephemeral by definition. However, if he had to destroy a universe inhabited by evolutionary beings contaminated by Boltzmann brains, the decision would be far more difficult.

They asked him to wait a while. Then they announced that they had agreed to his request and that he had to sign a commitment to respect all forms and manifestations of existing and future evolutionary life. After that, the transformation process he had requested could commence. They also informed him that they were granting permission only to initiate the process, and could not guarantee that he could travel as he proposed. He had to fulfil other requirements, unrelated to ethics, to complete the process.

He then met a group of almost ethereal beings called Xamtegmarguans, who belonged to the type IV civilisation which administered the general equation of



3.3.i.e. The deontic hexagon

the global entropy of the universe, which was not influenced by the arrow of time. In fact, they had developed a tetraicosahedronic logic that enabled them to compute the stochastic validity of deontic implications, not usually considered in terrestrial science. Their spiritual development allowed them to see all the mathematical configurations that existed and decide which were best suited to support evolutionary life. As far as he understood, they could see all the

state of Multiverse-L. They saw with precision the underlying mathematics of physical events and had developed something he understood to be a kind of mathematical oracle for local conditions. They were beings who originated on an unusual planet that orbited a triple star beyond the limits of the observable universe, in the high-entropy interface between the local Hubble bubble and a neighbouring one. They could better appreciate the distant future and the remote past than the unstable present, because they perceived

Level	Number of cases	Cases
a	6	$\alpha \wedge O\alpha, O\alpha \wedge \neg\alpha, \alpha \wedge \neg O\alpha, P\alpha \wedge P\neg\alpha \wedge \neg\alpha, \alpha \wedge P\alpha \wedge P\neg\alpha, O\neg\alpha \wedge \neg\alpha$
b	15	$O\alpha, \alpha \wedge (O\alpha \vee O\neg\alpha), (O\alpha \wedge \alpha) \vee (P\alpha \wedge P\neg\alpha \wedge \neg\alpha), \alpha \wedge P\alpha, (O\alpha \wedge \alpha) \vee (O\neg\alpha \wedge \neg\alpha), (O\alpha \wedge \neg\alpha) \vee (\alpha \wedge O\neg\alpha), P\alpha \wedge \neg\alpha, (O\alpha \wedge \neg\alpha) \vee (\alpha \wedge P\alpha \wedge P\neg\alpha), (O\alpha \vee O\neg\alpha) \wedge \neg\alpha, (\alpha \wedge O\neg\alpha) \vee (P\alpha \wedge P\neg\alpha \wedge \neg\alpha), \alpha \wedge P\neg\alpha, O\neg\alpha, P\alpha \wedge P\neg\alpha, P\neg\alpha \wedge \neg\alpha, (\alpha \wedge P\alpha \wedge P\neg\alpha) \vee (O\neg\alpha \wedge \neg\alpha)$
c	20	$O\alpha \vee (\alpha \wedge O\neg\alpha), P\alpha \wedge (O\alpha \vee \neg\alpha), P\alpha \wedge (\alpha \vee O\alpha), O\alpha \vee (O\neg\alpha \wedge \neg\alpha), (\alpha \wedge O\alpha) \vee (\alpha \wedge O\neg\alpha) \vee (P\alpha \wedge P\neg\alpha \wedge \neg\alpha), \alpha, (\alpha \wedge O\alpha) \vee O\neg\alpha, P\alpha \wedge (\alpha \vee P\neg\alpha), (\alpha \wedge O\alpha) \vee (P\neg\alpha \wedge \neg\alpha), (\alpha \wedge P\alpha) \vee (O\neg\alpha \wedge \neg\alpha), (P\alpha \wedge \neg\alpha) \vee (\alpha \wedge O\neg\alpha), (O\alpha \wedge \neg\alpha) \vee (\alpha \wedge P\neg\alpha), (O\alpha \wedge \neg\alpha) \vee O\neg\alpha, P\alpha \wedge (P\neg\alpha \vee \neg\alpha), \neg\alpha, (P\alpha \wedge P\neg\alpha \wedge \neg\alpha) \vee (O\alpha \wedge \neg\alpha) \vee (O\neg\alpha \wedge \neg\alpha), P\neg\alpha \wedge (P\alpha \vee \alpha), O\neg\alpha \vee (P\neg\alpha \wedge \neg\alpha), O\neg\alpha \vee (\alpha \wedge P\neg\alpha), P\neg\alpha \wedge P\alpha \vee \neg\alpha)$
d	15	$(\alpha \vee P\alpha) \wedge (O\alpha \vee O\neg\alpha \vee \neg\alpha), \alpha \vee O\alpha, O\alpha \vee O\neg\alpha, P\alpha, O\alpha \vee \neg\alpha, (\alpha \vee O\alpha \vee O\neg\alpha) \wedge (P\alpha \vee \neg\alpha), \alpha \vee (P\alpha \wedge P\neg\alpha), (\alpha \vee P\neg\alpha) \wedge (O\alpha \vee O\neg\alpha \vee \neg\alpha), \alpha \vee O\neg\alpha, (\alpha \wedge P\alpha) \vee (P\neg\alpha \wedge \neg\alpha), (P\alpha \wedge \neg\alpha) \vee (\alpha \wedge P\neg\alpha), O\neg\alpha \vee \neg\alpha, (\alpha \vee O\alpha \vee O\neg\alpha) \wedge (P\neg\alpha \vee \neg\alpha), (P\alpha \wedge P\neg\alpha) \vee \neg\alpha, P\neg\alpha$
e	6	$\alpha \vee P\alpha, O\alpha \vee O\neg\alpha \vee \neg\alpha, \alpha \vee O\alpha \vee O\neg\alpha, P\alpha \vee \neg\alpha, \alpha \vee P\neg\alpha, P\neg\alpha \vee \neg\alpha$

3.3.i.f. The $\beta 5$ -Structure of standard deontic logic (the deontic 5-dimensional hyper-tetraicosahedron), according to Moretti

events in the history of Multiverse-L at a macro level, extrapolating what was happening in the different space-time slices, since the analogy they gave him was that they functioned as if they could deduce the behaviour of macroscopic objects with the microscopic equations of statistical mechanics. They had representatives on all the planets of the confederation, and they were routinely used as oracles, because they could read the different possibilities of the equations of state of Multiverse-L, influenced not only by the unstable present but also by the past and the future. It was compulsory to consult them before the local civilisations made decisions which would affect the future, as well as the past, of the local space-time bubble. For them, in reality, time as such did not exist; there were only different probabilities, according to the potential weight of events considered desirable, which were measured using a very elaborate logic. The oppositional cases they computed took into account the sixty-two potential values of a particular principle, combining the options of obligation and possibility. The geometry

$$\frac{dP(\vec{r}, t)}{dt} + \vec{\nabla} \cdot S(\vec{r}, t) = 0$$

3.3.i.g. The conservation of probability

generated could only be visualised in a solid of five dimensions. He must talk with them to understand what he was deciding, before letting the Zuespoks proceed with the paperwork required by his request.

The five Xamtegmarquians who spoke with him explained that, according to their calculations, if he decided to return to Earth, there was a 76.5 per cent probability that his life would not be endangered by re-entering the Solar System. This was because the equations of the galaxy, together with the configuration of the planets, asteroids and planetoids surrounding his star, including the Kuiper Belt, predicted that, in the war that would take place during his journey, the beings from his planet, contaminated by the Boltzmann brains, would very likely be defeated and expelled from the Solar System. After that defeat, the coalition of planets and asteroids colonised by Earth would have no option but to accept the universalist ethics and the deontic logic of the Confederation of Intelligent Species of the Milky Way and respect the autonomy of the Jupiterian species, partially conquered during the expansion of the hominids to the moons of the gas planets. The Xamtegmarquians pointed out that this was probable because contact with galactic civilisations would enable the emergence of other hybrid species, apart from hominids, following the cleansing of the area influenced by the non-evolutionary intelligence. Very likely, they would be beings based on a mixture of hominid genes with those of other placental mammals, marsupials, birds and reptiles which had managed to survive on Earth and were immune to infection from Boltzmann brains. They would be assisted by the Zuespoks on their journey to spiritual self-awareness. Returning would also allow Iridio to bear witness to the breathtaking technological progress of humanity and to attend the festivities of the Fordian-Engelian millennium on Ganymede, a celebration of one thousand years since the birth of Henry Friedrich Ford Engels, the legendary hero of the new official religion of the solar hominids, who would almost certainly predominate for at least another five hundred years. They added that it was likely that by then terrestrial societies would have started to conquer stars in the Perseus branch of the Milky Way, since they would finally have managed to develop the technology suggested in his articles to travel routinely through space-time.

They warned him however, that there was a 23 per cent probability that the Boltzmann brains which contaminated evolutionary life would linger in the Solar System, because some could develop immunity to

$$BSA_i = \frac{\sum_{x \in Y_f} \pi(x) ASV_i(x)}{\sum_{x \in Y_f} \pi(x)}$$

3.3.i.h. Bayesian Shapley value

$$\text{Prob}(c_n) = \frac{|\sum_i \alpha_i \langle \Phi_i | \mathbf{P}_{C=c_n} | \Psi_i \rangle|^2}{\sum_j |\sum_i \alpha_i \langle \Phi_i | \mathbf{P}_{C=c_j} | \Psi_i \rangle|^2}$$

3.3.i.i. The probability for an outcome c_n of an ideal measurement of an observable C , according to the ABL rule

bostromite, the metaphysical poison with which the Argoterrands, appointed to command the operation, planned to eliminate them. There was also a 0.5 per cent probability that the Boltzmann brains would manage to reopen the hyperspace tunnels with high-entropy multiverses where only black holes could exist. In that case, it would be more prudent for him to return within two centuries because he would almost certainly be tortured to death to extract the information he had gathered on his journey.

Despite his curiosity being aroused by all this hypothetical information about the future evolution of life on his planet, Iridio concluded that bearing witness to the proliferation of terrestrial-based intelligent life in the Solar System was not what mattered most. The only thing he wanted to do was to reach one of the local centres of the Big Bang in the space between the galactic cumuli, and to be able to read his father's poem there.

The five Xamtegmarquians lost themselves in other calculations and informed him that he could continue with the next step of the process. Before he left, they asked him whether he could do them a favour. Iridio felt flattered to be asked for help by beings so spiritually developed and responded that, naturally, he would do whatever they wanted. They explained that his journey would give them a unique opportunity to calculate the probability that each one

of the digits in the digital expansion of e and π had the same frequency. They needed to verify this, digit by digit, to decipher a message from the Eelsmo-

A number is normal in base b if every sequence of k symbols in the set $\{0, 1, \dots, b-1\}$ occurs in the base- b expansion of the given number with the expected frequency b^{-k}

3.3.ii.a. Definition of a normal number

lians. They were a superior species, a type V civilisation which controlled all the biophilic multiverses linked to Multiverse-L. They had encoded the message in the constants of nature common to all the evolutionary multiverses that the Boltzmann brains wanted to invade. Iridio was delighted to accept.

The Zuespoks told him that they were very pleased with the outcome of the interview because, in reality, that was the most difficult step. They had not told him beforehand so that he would not worry unnecessarily. They asked him if he still wanted to visit the original planet of their species, because the satellite galaxy of Sagittarius, in which the capital planet of his civilisation was located, lay in the opposite direction to the galactic plane of the place where they would determine if his body could be reconditioned, which was only a few parsecs away from ZxYXIy137C. The return trip would delay such evaluation. However, if he wanted to start the technical phase which would prepare his body for transformation into a post-biological state, they could skip the formalities of the

many welcome activities planned. Iridio explained that he did not want to offend them but he would prefer to know as soon as possible if he could make the journey he had dreamt about all his life. If this was not possible, he would be delighted to visit their planet. Once again, the Zuespoks graciously agreed to his request and assured him that they understood his anxiety about fulfilling his dream. Before climbing into a spaceship, he said goodbye to the Argoterrand advisers who had accompanied him. They were also very satisfied with the progress of the procedures and wished him good luck in the new stage of his life.

He travelled to the headquarters of the Interplanetary Court of Intelligent Matter located on a planet orbiting θ -Boötis, to declare before a committee of type III intelligences that it was his express wish to convert to their universalist ethics code and to abandon his primary biological configuration. Here he was asked to sign several documents and record a message for the new government of the Earth-Mars Federation, a coalition of captains of industry of the asteroid mining companies and the Post-Creationist Empire of the Inner Solar System, stating that he had decided of his own free will not to return to the planet of his birth. The Zuespoks escorting him informed him that it was the penultimate step in the legal procedures. They now needed to be sure that his body was ready to be transformed into a post-biological state.

A group of Namoryaplokiyan biological engineers showed him holograms of something that could be described as a small spaceship-robot with two hands and very short legs in the cognitive parameters of humanity. That was the post-biological configuration that he would acquire. They explained that after the procedure, he would gain mental capacity but would not lose the architecture

One should reason as if one's present observer-moment were a random sample from the set of all observer-moments in its reference class.

3.3.ii.c. Bostrom's strong self-sampling assumption

of his original feelings. Nor would he feel any changes in the subjective perception of his mind, because they would preserve the peculiar configuration of observer-moments linked to the short-term memory which characterised human beings. Those observer-moments were serial self-aware perceptions linked in uninterrupted temporal sequences, except during sleep. Further, during the transfer, his original body would be

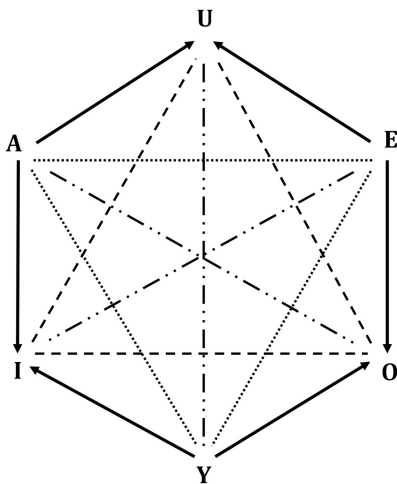
lost because it was not possible to translate the information contained in his cerebral and parasympathetic neurons without destroying them. They told him that, once the procedure was completed, they could truthfully inform the Earth-Mars Federation that he had in fact died, as his carbon body would be

$$p(x) = \prod_{v \in V} p(x_v | x_{pa(v)})$$

3.3.ii.b. A Bayesian network probability distribution

annihilated through a nanotechnological process they had invented: every cell in his body would be transformed into a post-biological cell based on silicon and heavy metals. When they had reproduced his body, they could manipulate the derived cells to create a new one, able to withstand the conditions of the journey.

As the engineers mentioned sleep, Iridio explained his aversion to the unreal world of dreams and asked them to eliminate them from his new mind. They explained they could not do that because it would imply altering substantially his original cognitive configuration. But they could indeed ensure that his dreams remained unconscious, meaning that he would forget them before waking up, if he agreed to make other areas of his unconscious mental processes accessible to his observational moments when he was awake. However, that was a modification that he had to authorise explicitly. Iridio agreed with alacrity and filled in the required forms.



with $U = A \wedge E$; and $Y = I \wedge O$

3.3.ii.e. The Aristotelian hexagon

were susceptible to Boltzmann brains, to understand why those organisms had been able to survive so easily on that planet.

Iridio was intrigued to learn that other humans had gone into exile like him, but he was told that there was no one at the moment on θ -Boötis. Iridio insisted on knowing their names. He was told that the majority had been rescued from zoos in Andromeda, but others had been kidnapped by the Argoterrands before

Group 14

p	28.0855	14
e	786.5	1.90
r		+4
i		+3
o		+2
d		+1
	Si	0
		-1
3	Silicon	-2
	$1s^2 2s^2 2p^6 3s^2 3p^2$	-3
		-4
		Solid
		Metalloid

p-block

3.3.ii.d. Silicon entry in the Periodic Table of the Elements

The biological engineers asked his permission to catalogue the carbon atoms of his body. That would allow them to reduce them to their most basic fermions to study the old massive stars where those atoms were formed and undertake a cosmological archaeology of the materials that made up the Solar System, which had an unusual concentration of heavy elements in its average chemical configuration. But what interested them most was not an astronomical question but a biological one. They wanted to compare the underlying patterns of his reasoning with those of other humans who had left Earth but

gaining entry to the confederation of galactic civilisations. They had been planning to eliminate the contamination by dismantling Earth and the moon Calypso. He was also told that it was better not to make contact with them because they were still under quarantine on a planet orbiting Vega, where decisions were made on species that had not yet reached the type I civilisation stage, which the confederation had to contact or rescue.

The paperwork, however, was not yet complete. He had to authorise the scientific instruments that would be installed in his new body so that he could measure his environment when he arrived at his destination. The list was long and included several types

of telescopes and radars, sonars, receptors and transmitters of tachyons, devices to detect antimatter and much other apparatus unknown on Earth. He would have time during his journey to learn how to use them. At the end of the list there

was a program to measure time, which intrigued him because it was based on the calculation of the digital expansion of transcendental numbers. They explained that it was a device based on axions which would display, in a discrete area of his visual field, one digit of e per second, coupled with a function to measure the frequency of each of its digits in base 10, 51 and 137. It would also calculate π , but to avoid confusing him, the later calculation would be unconscious, meaning that it would not appear in his peripheral vision. They reminded him that this was the favour the Xamtegmarmarquians had asked for. The only thing he had to do on arrival at his destination was to activate a device based on tachyons which would send the information collected to the past. In normal circumstances, he would have researched everything there was to be known about these particles that could travel at a speed faster than light, and overcome the limits of the causal light cones predicted by relativity, but he agreed without asking any more questions because all their requirements had tired him. They then informed him that, before starting the procedure, he had to read a report about the peculiarities of his cerebral and physiological configuration, which he had to approve as truthful before being modified. However, when they showed him the report in a device similar to the Book of Sand that the Argoterrands had lent him, he was

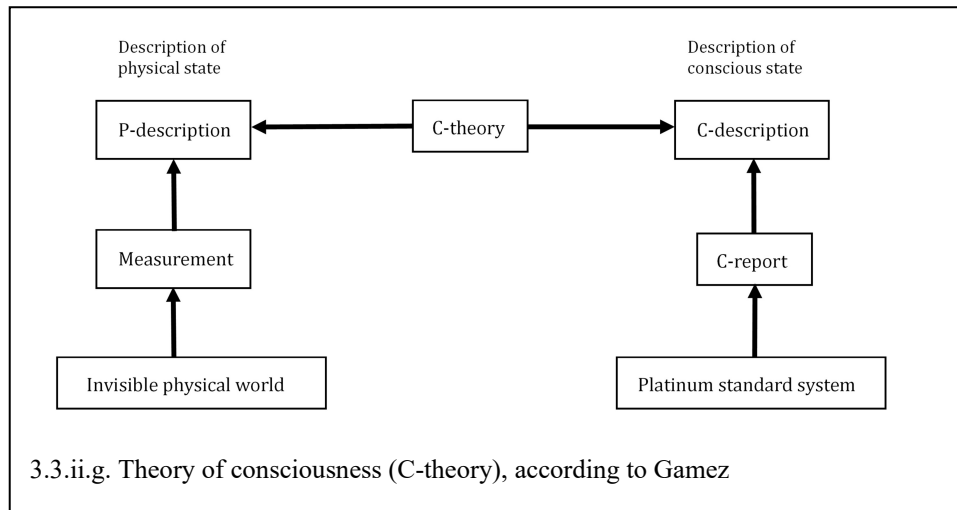
$$S = \int \sqrt{-g} d^4x \left(\frac{R}{2k} + V(T) (1 + T^{\mu\nu} T_{\mu\nu})^{\frac{1}{2}} \right)$$

where R is the Ricci scalar for the space-time, $k = 8\pi G$ is a constant, $V(T)$ is the tachyon potential, and the stress-energy tensor of the tachyon field obtained by varying the matter part of the action is

$$T_{\mu\nu} = V(T) \left[g_{\mu\nu} (1 + T^{\alpha\beta} T_{\alpha\beta})^{1/2} - \frac{T^{\mu\alpha} T_{\alpha\nu}}{(1 + T^{\alpha\beta} T_{\alpha\beta})^{1/2}} \right]$$

3.3.ii.f. The low energy effective action for the tachyon scalar coupled to gravity

shocked to see its length. He lost his temper and told them that the procedures seemed endless. They proposed that he examine it the next day, after a good night's sleep, but he wanted to settle everything as soon as possible, to ensure that he would be able to travel. The detailed document covered several aspects of his mental and physiological configuration:



- a) The first and most important clause cautioned him that, as he was going to recycle his memories into an alternative state of consciousness, he had to interpret what he remembered, along with any deductions based on those memories, as meta-Bayesian probabilities and not as certainties. That was due to the way the human brain functioned: memories were distributed through neuronal networks which were altered when memories were recovered and reconfigured during REM sleep. His new memory would be more precise and reliable.
- b) The Namoryaplokiyans described his obsession with equations and mathematical formulae which described everything he perceived or thought as an 'addiction'. They identified biological causes (neuronal hyper-connections in his cerebral cortex, in the areas where abstract concepts were processed) and historical reasons (his early training with Penelope), for the development of the addiction, which had persisted into adulthood. However, this was also described as a positive characteristic, as it would allow him, with adequate training, to reach a level of scientific development comparable to type II or III civilisations. If the procedure was successful, he would be able to understand the multiple underlying geometries of opposition in different logical systems developed by diverse species in Multiverse-L.
- c) The report detailed Iridio's mental blocks regarding people in positions of authority in his family (especially his automatic opposition to his mother and rejection of his uncle's help), and in his environment (in general, his

rejection of post-creationism at school and at university and his difficulty in taking seriously what his teachers and tutors were trying to teach him). There were also details about his reluctance to accept concepts that had been presented at the national astronomy congresses or in discussion with his captors in Victoria Mansion. The report stated that, given the oppressive environment in which he had been born, this was a desirable adaptation. However, after his reconfiguration, they recommended that he try to minimise his automatic resistance to new ideas and control it, so that he could benefit from the advances he would see in extra-terrestrial science, especially the capacity to think using the logical geometries mentioned in paragraph b).

- d) His confusion regarding the Sandrini-LePaine notation was described as an obstruction of his reasoning due to social causes similar to those in paragraph c). Paragraph e) would explain those difficulties in more detail. It was predicted that those difficulties would diminish in his new mental state, and that he would understand the limitations of the confusing notation without being bewildered by it. His confusion was regarded as very natural. In fact, the more humans adapted to abstract reasoning, the more confusing the notation was, because it systematically generated false affordances. That was why the secret scientific monasteries on Earth did not use the Sandrini-LePaine-Reich paradigm at all, including those in powerful terrestrial countries which forced public universities to use it. More generally, they also predicted the disappearance of his difficulties with the majority of concepts that eluded him previously, owing to his independent processing of abstract notations and the description of the concepts that explained them. This would become clear from the next paragraph.
- e) Most of his difficulties in synchronising his behaviour with that of other members of his species were explained by atypical connections in his cerebral configuration, since the connectome of his brain differed significantly from that of other human brains available for examination. The diagnosis showed that typical human brains could be categorised as pseudo-Bayesian machines optimised for self-deception and social conditioning. The analysis was based on the chain of affordances in the different neuronal nodes. There were many differences, the list was endless, but the one which stood out in twinkling letters was the lack of mutual affordance chains between the modules that processed abstract reasoning and those that processed reasoning based on narratives. Despite the technical language, Iridio managed to understand that, in the view of the biological engineers, both modules were hyperconnected with other brain modules that processed intuitive processes, but there was no connection between the two. In addition, the

connections in the ventral tegmental area, which processed dopamine reward in the grey matter when synchronised with the evaluation of social environments, did not generate incentives in his brain to attune him socially to other human beings. He had some capacity to understand the emotions of his fellow human beings, but, because of the deficits in the dopamine reward system, he did not have the incentive to synchronise his emotions with theirs, or to adapt his behaviour to their expectations. Again, they considered that this was a positive characteristic because it had allowed him to persevere with his research in a hostile environment, where analytical mediocrity and argumentative fallacies were promoted. From now on however, he would have to consider optional alternative connections and stimulate the flow of affordances between those unconnected nodes, which would improve his scientific and spiritual development.

- f) His anorgasmia was due to a genetic defect in the production of oxytocin and vasopressin, and was related to his synaesthesia, which would be explored in paragraph g). When he was in his mother's womb, that deficit had affected the mapping of the hypothalamic-pituitary-adrenal axis, the so-called nerve zero, and the manifestation of sexual instincts. These were linked with the prefrontal cortex that processed abstract reasoning, generating a neuronal vicious circle, which prevented him from easily experiencing the temporary madness or the neuronal blackout of orgasm. Given that his new configuration did not require social or sexual contact with other members of his species, they did not recommend significant alterations to the structure of his mental constitution in that area, except, optionally, in cases where he needed to understand his past in the refining phase of his post-biological configuration. For that reason, they had temporarily included genitals in the test configuration, which they would remove in the final configuration, if he gave his express consent. The paragraph had other more detailed subparagraphs which would be discussed when he reached the second phase of the procedure, the aforementioned emotional refinement and, more generally, of the fine tuning of the flow of affordances in his reconfigured brain. They also classified him as aromantic, as a consequence of the characteristics described in this paragraph and in paragraphs b), c) and e), and recommended maintaining that condition, so that he would have no unnecessary distractions when processing memories of his previous genital activities, or generate any unwanted new distractions by practising autoeroticism.
- g) His synaesthesia was extremely useful for his abstract reasoning and his future scientific development because it provided him with channels of alternative affordances to enhance his Bayesian computation of abstract

concepts. The report recommended that it be enhanced and cemented in his new configuration because it would help him with those parts of his unconscious to which he would have access. That would allow him to distinguish deductions generated by 'brute force' in the automatic parallel neuronal processing (intuitions) from those arrived at by conscious logical deduction. In fact, Iridio's great advantage over other human beings was that in him abstract reasoning had dissociated itself from rationalisations created by the need to maintain a façade in the social environment. In his species rationalisations of facts considered true (without evidence), in order to impose them on others, predominated over altruistic reasoning to ensure the common good. In other words, human beings used reasoning more to manipulate than to search for scientific truth.

- h) The interaction between the symptoms described in paragraphs e) and f) had caused the connections in the ventral tegmental area, which processed the reward in the dopaminergic cells, to become active only when sexual stimulation was processed at the same time as intellectual stimulation. That explained his difficulty in ejaculating, as well as aspects of his synaesthesia, his solipsistic tendencies, his great capacity to concentrate, and his poor emotional connection with those around him. As the von Economo neurons in his brain, which processed social intuition, had drifted towards the intuition of abstract concepts because of the addiction described in paragraph b), perception deficits in social cues also arose, particularly in new and unexpected situations, as well as difficulty in processing conversational inferences, allusions and indirect hints or *sous-entendre*. These could not be easily solved by abstract reasoning, using Grice's maxims or similar pragmatic heuristics.
- i) is memory was deficient in the processing of autobiographical memories based on narratives, owing to the conjunction of symptoms described in e). Hence his dislike of dreams and fairy tales. His oneirophobia and his tenacious attachment to the abstract world of symbols and the concrete information of the senses formed the basis of his immunity to the harmful effect of the Boltzmann brains. In order to establish themselves as parasites in evolutionary terrestrial organisms, they needed to create elaborate fantasies which unconsciously influenced the host organism. As human societies were characterised by their tendency to create very elaborate and abstract concepts based on logically contradictory narratives, such as the nation, the market, money or creation myths, it was easy to understand how other people were controlled, and why he remained unaffected. Both Namoryaplokiyans and Zuespoks attached the utmost importance to strengthening this immunity and identifying possible vulnerabilities which the Boltzmann

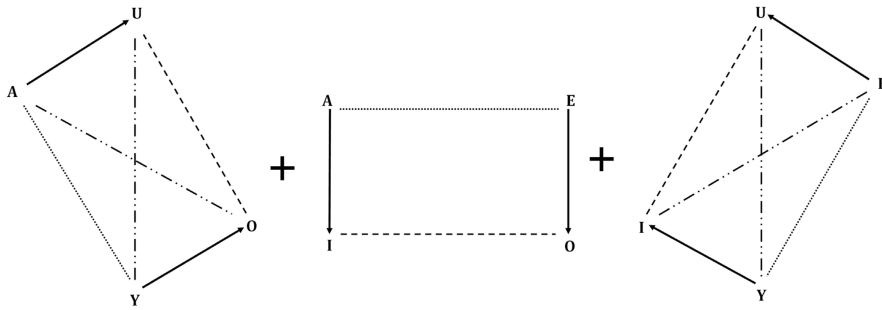
brains, who would be more numerous in the environment when he reached his destination, could exploit to divert him from his objectives.

- j) The fact that his right testicle had not descended was not due to a childhood trauma or the harmful influence of his mother described in c), but to the insufficient growth of the seminal duct on that side during gestation because of the presence of toxins in the environment. This was a physiological defect and not a psychological one, as Rieneke Watson had suggested, although the former could have influenced the latter. However, the conjunction of both caused a testosterone deficit which increased the partial anorgasmia described in f).
- k) In order for him to understand the brain functioning of neurotypical humans, they proposed to install additional connections in his brain and block the neuroatypical connections that generated flows of false affordances. He would be able to switch these on and off at will. In fact, his new cerebral configuration would have a mechanism he could optimise by himself, which would allow him to experience several degrees of neuroatypicality and neurotypicality. He would also be able to partially activate or deactivate those alternative neuronal networks by means of a dial which he would see in his mind in the refining phase. There were many multicoloured diagrams showing the different neuronal connections and the location of atypicality.
- l) The report also proposed to base the grid of the different neuronal columns on the nodal structure of type IV intelligences, like the Xamtegmariquians. If he agreed, they would reconfigure the main modules of his new brain in homologous fashion to the network of wormholes that connected the galaxies of the local group. The structure of the nodes could be modified if he wished, at his discretion, during the refining and fine-tuning phase.
- m) Finally, it was proposed to insert an additional cerebellum which would serve as a back-up copy of his brain, in case anything went wrong in the various stages of the refining process. It could also contain a device based on tachyons which would allow him to send information from the distant future, to confirm that he had arrived safely at his destination.

Causally-distinct observers should reason as if they were a random sample from the set of all causally-distinct observers in their reference class.

3.3.iii.a. Phillips's causally-independent self-sampling assumption

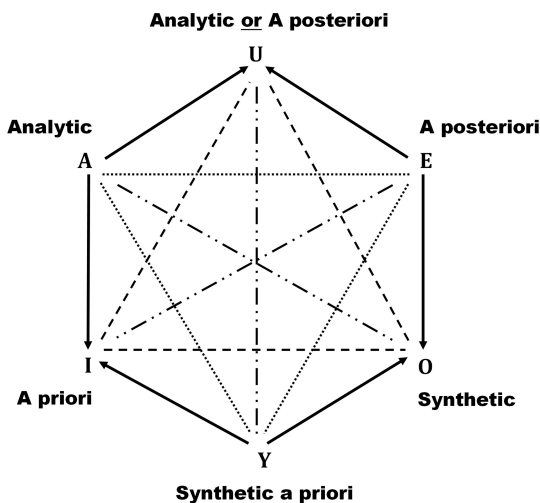
Iridio was concerned about the mechanism in paragraph k) that would modify his brain to make it typical. There was so much information that he decided to skip the multicoloured diagrams and go straight to the last paragraph to read the recommendations. The Namoryaplokiyans explained that the most efficient



3.3.iii.b. Sum of logical squares to create a logical hexagon

way to explore the differences between himself and other human beings was to create versions of his mind that resembled both his neurotypical fellow humans and various forms of neuroatypicity known to them. As the report stated, they would provide him with a mechanism and operating instructions to access the parallel cognitive versions without any danger, and to calibrate the optimal configuration that he preferred to use during his journey. In reality, they did not expect many changes. Iridio was doubtful because he was afraid of losing his synaesthesia or being changed into someone he did not want to be, like the version of himself he experienced in his dreams. He reminded them that this was what he had suffered all his life on Earth, the pressure to become neurotypical at any cost.

They assured him that he could maintain his original configuration, improved so that he would not remember his dreams, for as long as he wanted, but that comparing the different versions of his observation-moments, in different



3.3.iii.c. Kantian hexagon of classical philosophical dichotomies, according to Jean-Yves Béziau

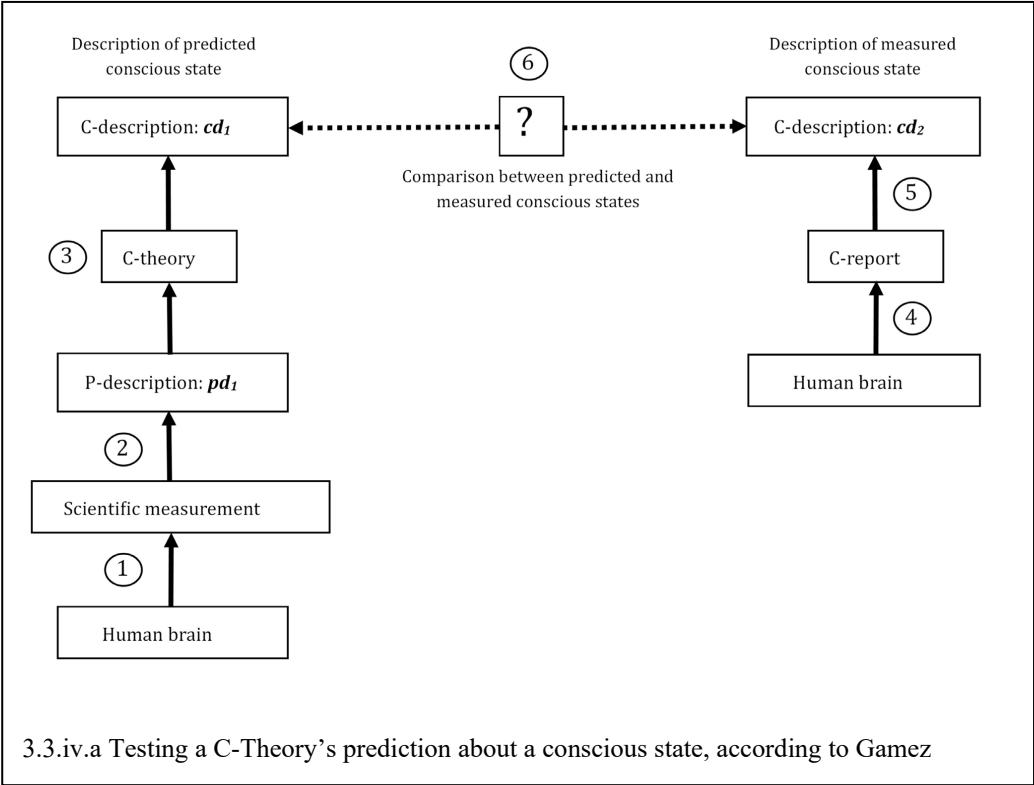
neuronal configurations, would help him overcome forms of conditioning that were no longer necessary, such as those described in paragraphs c), d) and f). What mattered most to the Namoryaplokiyans was to understand the differences between Iridio's mind and those of humans contaminated by Boltzmann brains. That understanding would help them to develop, at the appropriate time, the optimal mental configuration for his

$br > c - \alpha$

3.3.iii.d. Generalised Hamilton’s rule, according to Gintis

species, so that it could be accepted in the concert of galactic civilisations. For that reason, in the penultimate paragraph, they also proposed to organise his faculties in a similar fashion to those of superior civilisations, so that he could access the scientific concepts discovered by all the species in the galaxy, and understand the geometries of opposition underlying the different logics. He would be the first human being to have such a flexible mental configuration, able to understand the universalist ethics that his species needed to develop. In spite of his apprehension, Iridio decided to trust them and agreed to have that mechanism installed, since it would help them towards such noble ends.

He woke up with the feeling of having had a profound and restorative sleep, without nightmares or interruptions. He felt alert and relaxed. It seemed to him that his mind had expanded a hundred times. He could recognise his normal self, but a kind of supra-consciousness behind his perception of himself allowed him to understand, at a glance, the limitations of the human mind. The sharpness of his memories was also astonishing. He could access many details which previously he did not remember at all. It was explained to him that a great part of the information that operated unconsciously in human cognition would now be accessible to his waking awareness, due to what they had agreed regarding



the suppression of the memory of his dreams. He had to get used to this new way of perceiving his environment. They had connected an extended version of the galactic encyclopedia directly to his new brain so that he could make all the calculations he needed. Moreover, the information system had access to 10^{25} equations and, in theory, he could connect a formula to every minute of his life while exploring his memories, if he so wished.

p	q	$\neg p$	$p \wedge q$	$p \vee q$	$p \rightarrow q$
1	1	0	1	1	1
$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{2}$	1	1
0	1	1	0	1	1
1	$\frac{1}{2}$	0	$\frac{1}{2}$	1	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
0	$\frac{1}{2}$	1	0	$\frac{1}{2}$	$\frac{1}{2}$
1	0	0	0	1	0
$\frac{1}{2}$	0	$\frac{1}{2}$	0	$\frac{1}{2}$	$\frac{1}{2}$
0	0	1	0	0	1

3.3.iv.b. Truth table for Kleene's 3-valued logic

They asked him to test whether the connection worked by translating different formulae between the conventional scientific notation and that of Sandrini-LePaine. He was surprised to be able to do this without effort. He also understood his unconscious anger, which was like having his stomach in a knot, when the sandrinised equations were imprecise or ambiguous or, what was worse, when they prevented the original interpretation of definitions proposed by traditional science.

He could now understand what was added in the interpretation of formulae and translate them into words without difficulty. Finally, he could envisage many abstract concepts that had eluded him in his previous life. He was

$$E_8 \leftarrow SO(10) \leftarrow SU(5) \leftarrow SU(3) \times SU(2) \times U(1)$$

3.3.iv.c. Groups included in the Lie group E_8

filled with shame when he understood that all those scientists who had mocked him at the national astronomy congresses, when he set forth his new hypotheses, were right to point out the limitations of his reasoning and even of his mathematical calculations. He also understood his mother's compassion when he persisted in offering new options to explain the Big Bang with primitive Newtonian mechanics, which was certainly impossible without making substantial changes to the local laws of Multiverse-L. But he could not continue his explorations because the Namoryaplokiyans asked him to examine the connection to the instruments.

$$T_b(\theta) = T_{av} \frac{1 + z_{av}}{1 + z(\theta)}$$

where T_{av} and z_{av} are the temperature and red shift averaged over the whole sky

3.3.iv.d. The apparent temperature of the Cosmic Microwave Background in the direction θ

In a window to the galaxy, which seemed to be virtual, he measured the temperature of the cosmic microwave background and finally understood the corrections and assumptions made by terrestrial astronomers when analysing the data. There was a difference between the diagrams he had seen so many times on Earth and those that he calculated, because on Earth astronomers had corrected them. If the correction was omitted, it could be deduced that the Multiverse-L was not only anisotropic, but that different regions had different ages because they corresponded to different Ehresmann geometries of the tangent vectors in the Minkowski metrics. Where the microwave background was redshifted, the age of that portion was 18.3 million years. He was very satisfied with that information and wanted to rethink all the astronomy he had learnt. But again he was interrupted by the Namor-yaplokiyans. They had to select his destination, so as to identify the recurrent wormholes that would take him there.

Without any effort, and using the meta-equations of state of Multiverse-L in a de Sitter model with exponential expansion parameter α , which slid from the encyclopedia

into his mind, $\gamma_1\gamma_2\gamma_3\gamma_4 = K_{10}K_{22}K_{30}K_{23} = K_{21} \Rightarrow (\gamma_1\gamma_2\gamma_3\gamma_4)^2 = -K_{00} = -1$

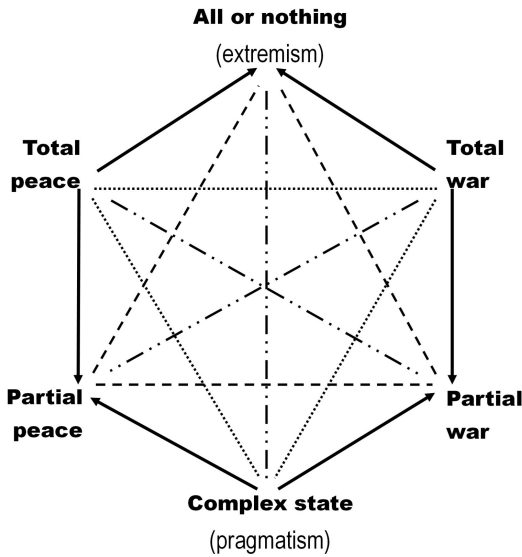
he calculated the closest

3.3.iv.f. Grade four pseudoscalar of Clifford Algebra $R_{3,1}$

point from which the local group containing Milkomeda, the galaxy created by the collision between the Milky Way and Andromeda, would disappear into a dark firmament. He also calculated, almost instantaneously, the moment in which this would happen. It would be in the direction of the Virgo constellation, within $e^{10^{20}}$ millions of years, further in the future than he had calculated when he was living on Earth. The extra-terrestrials approved his calculations and emphasised that the moment of his arrival at his destination would coincide with the critical point in the war between evolutionary and spontaneous intelligences in this multiverse, according to the calculations of the Zuespoks, the Xamtegmarmquians and the Eelsmolians, because if Multiverse-L lasted more than the $e^{10^{20}}$ million years he had estimated, the Boltzmann brains would predominate. Before they could discuss the consequences of such a coincidence, they had to set the time-measuring parameters. That would allow him to see the digital

$$\underline{e}^s = \underline{dx}^i e_i^{s\mu} \gamma_\mu = \underline{dt} \gamma_0 + \underline{dS}^\pi e^{\alpha t} \gamma_\pi$$

3.3.iv.e. Frame for a de Sitter space-time with exponentially expanding flat spatial sections, where α is the expansion parameter, and the unit-carrying physics coordinates are the time measured by a standard clock $t \equiv x^0 T$ with T being some temporal unit such as seconds, and spatial lengths $s^\pi = x^\pi (L/c)$, in units of time, with L a spatial unit, such as metres, and c the speed of light



3.3.v.a. First approximation to the polemological hexagon, inspired by von Clausewitz, according to Moretti

expansion of e as space-time expanded. In the left corner of his visual field, he saw the digits of e appearing in base 10, 51 and 137, one per second, when he looked up.

2, ., 7, 1, 8, 2, 8, 1, 8, 2, 8, 4, 5,
 9, 0, 4, 5, 2, 3, 5, 3, 6, 0, 2, 8, 7, 4,
 7, 1, 3, 5, 2, 6, 6, 2, 4, 9, 7, 7, 5, 7,
 2, 4, 7, 0, 9, 3, 6, 9, 9, 9, 5, 9, 5, 7,
 4, 9, 6, 6, 9, 6, 7, 6, 2, 7, 7, 2, 4, 0,
 7, 6, 6, 3, 0, 3, 5, 3, 5, 4, 7, 5, 9, 4,
 5, 7, 1, 3, 8, 2, 1, 7, 8, 5, 2, 5, 1, 6,
 6, 4, 2, 7, 4, 2, 7, 4, 6, 6, 3, 9, 1, 9,
 3, 2, 0, 0, 3, 0, 5, 9, 9, 2, 1, 8, 1, 7,
 4, 1, 3, 5, 9, 6, 6, 2, 9, 0, 4, 3, 5, 7,
 2, 9, 0, 0, 3, 3, 4, 2, 9, 5, 2, 6, 0, 5,
 9, 5, 6, 3, 0, 7, 3, 8, 1, 3, 2, 3, 2, 8,

6, 2, 7, 9, 4, 3, 4, 9, 0, 7, 6, 3, 2, 3, 3, 8, 2, 9, 8, 8, 0, 7, 5, 3, 1, 9, 5, 2, 5, 1, 0, 1, 9, 0, 1,
 1, 5, 7, 3, 8, 3, 4, 1, 8, 7, 9, 3, 0, 7, 0, 2, 1, 5, 4, 0, 8, 9, 1, 4, 9, 9, 3, 4, 8, 8, 4, 1, 6, 7, 5,
 0, 9, 2, 4, 4, 7, 6, 1, 4, 6, 0, 6, 6, 8, 0, 8, 2, 2, 6, 4, 8, 0, 0, 1, 6, 8, 4, 7, 7, 4, 1, 1, 8, 5, 3,
 7, 4, 2, 3, 4, 5, 4, 4, 2, 4, 3, 7, 1, 0, 7, 5, 3, 9, 0, 7, 7, 7, 4, 4, 9, 9, 2, 0, 6, 9, 5, 5, 1, 7, 0,
 2, 7, 6, 1, 8, 3, 8, 6, 0, 6, 2, 6, 1, 3, 3, 1, 3, 8, 4, 5, 8, 3, 0, 0, 0, 7, 5, 2, 0, 4, 4, 9, 3, 3, 8,
 2, 6, 5, 6, 0, 2, 9, 7, 6, 0, 6, 7, 3, 7, 1, 1, 3, 2, 0, 0, 7, 0, 9, 3, 2, 8, 7, 0, 9, 1, 2, 7, 4, 4, 3,
 7, 4, 7, 0, 4, 7, 2, 3, 0, 6, 9, 6, 9, 7, 7, 2, 0, 9, 3, 1, 0, 1, 4, 1, 6, 9, 2, 8, 3, 6, 8, 1, 9, 0, 2,
 5, 5, 1, 5, 1, 0, 8, 6, 5, 7, 4, 6, 3, 7, 7, 2, 1, 1, 1, 2, 5, 2, 3, 8, 9, 7, 8, 4, 4, 2, 5, 0, 5, 6, 9,
 5, 3, 6, 9, 6, 7, 7, 0, 7, 8, 5, 4, 4, 9, 9, 6, 9, 9, 6, 7, 9, 4, 6, 8, 6, 4, 4, 5, 4, 9, 0, 5, 9, 8, 7,
 9, 3, 1, 6, 3, 6, 8, 8, 9, 2, 3, 0, 0, 9, 8, 7, 9, 3, 1, 2, 7, 7, 3, 6, 1, 7, 8, 2, 1, 5, 4, 2, 4, 9, 9,
 9, 2, 2, 9, 5, 7, 6, 3, 5, 1, 4, 8, 2, 2, 0, 8, 2, 6, 9, 8, 9, 5, 1, 9, 3, 6, 6, 8, 0, 3, 3, 1, 8, 2, 5,
 2, 8, 8, 6, 9, 3, 9, 8, 4, 9, 6, 4, 6, 5, 1, 0, 5, 8, 2, 0, 9, 3, 9, 2, 3, 9, 8, 2, 9, 4, 8, 8, 7, 9, 3,
 3, 2, 0, 3, 6, 2, 5, 0, 9, 4, 4, 3, 1, 1, 7, 3, 0, 1, 2, 3, 8, 1, 9, 7, 0, 6, 8, 4, 1, 6, 1, 4, 0, 3, 9,
 7, 0, 1, 9, 8, 3, 7, 6, 7, 9, 3, 2, 0, 6, 8, 3, 2, 8, 2, 3, 7, 6, 4, 6,
 4, 8, 0, 4, 2, 9, 5, 3, 1, 1, 8, 0, 2, 3, 2, 8, 7, 8, 2, 5, 0, 9, 8, 1,
 9, 4, 5, 5, 8, 1, 5, 3, 0, 1, 7, 5, 6, 7, 1, 7, 3, 6, 1, 3, 3, 2, 0, 6,
 9, 8, 1, 1, 2, 5, 0, 9, 9, 6, 1, 8, 1, 8, 8, 1, 5, 9, 3, 0, 4, 1, 6, 9, 0, 3, 5, 1, 5, 9, 8, 8, 8, 5,
 1, 9, 3, 4, 5, 8, 0, 7, 2, 7, 3, 8, 6, 6, 7, 3, 8, 5, 8, 9, 4, 2, 2, 8, 7, 9, 2, 2, 8, 4, 9, 9, 8, 9, 2,
 0, 8, 6, 8, 0, 5, 8, 2, 5, 7, 4, 9, 2, 7, 9, 6, 1, 0, 4, 8, 4, 1, 9, 8, 4, 4, 4, 3, 6, 3, 4, 6, 3, 2, 4,
 4, 9, 6, 8, 4, 8, 7, 5, 6, 0, 2, 3, 3, 6, 2, 4, 8, 2, 7, 0, 4, 1, 9, 7, 8, 6, 2, 3, 2, 0, 9, 0, 0, 2, 1,
 6, 0, 9, 9, 0, 2, 3, 5, 3, 0, 4, 3, 6, 9, 9, 4, 1, 8, 4, 9, 1, 4, 6, 3, 1, 4, 0, 9, 3, 4, 3, 1, 7, 3, 8,
 1, 4, 3, 6, 4, 0, 5, 4, 6, 2, 5, 3, 1, 5, 2, 0, 9, 6, 1, 8, 3, 6, 9, 0, 8, 8, 8, 7, 0, 7, 0, 1, 6, 7, 6,

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

8, 3, 9, 6, 4, 2, 4, 3, 7, 8, 1, 4, 0, 5, 9, 2, 7, 1, 4, 5, 6, 3, 5, 4, 9, 0, 6, 1, 3, 0, 3, 1, 0, 7, 2,
 0, 8, 5, 1, 0, 3, 8, 3, 7, 5, 0, 5, 1, 0, 1, 1, 5, 7, 4, 7, 7, 0, 4, 1, 7, 1, 8, 9, 8, 6, 1, 0, 6, 8, 7,
 3, 9, 6, 9, 6, 5, 5, 2, 1, 2, 6, 7, 1, 5, 4, 6, 8, 8, 9, 5, 7, 0, 3, 5, 0, 3, 5, 4, 0, 2, 1, 2, 3, 4, 0,
 7, 8, 4, 9, 8, 1, 9, 3, 3, 4, 3, 2, 1, 0, 6, 8, 1, 7, 0, 1, 2, 1, 0, 0, 5, 6, 2, 7, 8, 8, 0, 2, 3, 5, 1,
 9, 3, 0, 3, 3, 2, 2, 4, 7, 4, 5, 0, 1, 5, 8, 5, 3, 9, 0, 4, 7, 3, 0, 4, 1, 9, 9, 5,
 7, 7, 7, 7, 0, 9, 3, 5, 0, 3, 6, 6, 0, 4, 1, 6, 9, 9, 7, 3, 2, 9, 7, 2, 5, 0, 8, 8, $e^\pi = i^{-2i}$
 6, 8, 7, 6, 9, 6, 6, 4, 0, 3, 5, 5, 5, 7, 0, 7, 1, 6, 2, 2, 6, 8, 4, 4, 7, 1, 6, 2,
 5, 6, 0, 7, 9, 8, 8, 2, 6, 5, 1, 7, 8, 7, 1, 3, 4, 1, 9, 5, 1, 2, 4, 6, 6, 5, 2, 0, 1, 0, 3, 0, 5, 9, 2,
 1, 2, 3, 6, 6, 7, 7, 1, 9, 4, 3, 2, 5, 2, 7, 8, 6, 7, 5, 3, 9, 8, 5, 5, 8, 9, 4, 4, 8, 9, 6, 9, 7, 0, 9,
 6, 4, 0, 9, 7, 5, 4, 5, 9, 1, 8, 5, 6, 9, 5, 6, 3, 8, 0, 2, 3, 6, 3, 7, 0, 1, 6, 2, 1, 1, 2, 0, 4, 7, 7,
 4, 2, 7, 2, 2, 8, 3, 6, 4, 8, 9, 6, 1, 3, 4, 2, 2, 5...

As soon as they were certain that his new mental configuration was operating without any problems, and that the atomic clock linked to e correctly measured the expansion of space-time, they explained that, when he reached the point he had calculated, he would have only fifty minutes or 180,000 digits in base 10, to see the local cumulus disappearing in the black firmament. This was because they could not prevent him falling into a region of antimatter that would destroy his reconstituted body. In that body, in honour of his name, they had included iridium as the predominant metal in the amalgam. In other words, he would lose his new life, which in theory was eternal, to obtain the privilege of entering the irreversible series of wormholes needed to arrive to that faraway point in space-time. He at once reaffirmed that he was willing to pay such a price and that he wanted to use those last moments to recite the poem his father had written.

The Namoryaplokiyans informed him that it was impossible to take with him the envelope with the poem his father had given him. The conditions of the journey would destroy it. However, they could recreate the information contained in the envelope to create a simulated reality where he could read it. Among the many locations they offered him, he chose the cemetery in Widgeree where his ancestors lay buried. There, before the tombs covered by messages in their honour and reproductions of their artistic works, he would read the poem. To ensure that the simulation worked, they asked him to rehearse the visualisation of the site.

There was a sudden jump in his observer-moments. He found himself before his father's tomb on a winter's day, like the day he had visited the graveyard for the last time when the authorities of Ozeania had freed him before leaving Earth. He was wearing the old overcoat he had inherited from his father. The neighbouring tomb, where his grandparents had been laid to rest, had disappeared. The cemetery was deserted and in the distance cars could be heard running along a highway. A bird sang in a nearby tree. When he looked up to search for it, he saw the digits of e , in the upper left corner of his visual field, running at a

A technologically mature 'posthuman' civilisation would have enormous computing power. Based on this empirical fact, the simulation argument shows that *at least one* of the following propositions is true:

- (H1) $f_p \approx 0$. The fraction (f_p) of human-level civilisations that survive to reach a posthuman stage is very close to zero;
- (H2) $f_i \approx 0$. The fraction (f_i) of posthuman civilisations that are interested in running simulations of their own evolution is very close to zero;
- (H3) $f_{sim} \approx 1$. The fraction (f_{sim}) of all observers with our kind of experiences that are living in a simulation is very close to unity.

3.3.v.b. The simulation argument, according to Bostrom

great speed. It began to snow. When he put his hand in his pocket, he found the envelope his father had given him, which was now of a yellowish colour. Before he could give in to the temptation to open it, he found himself in front of his hosts again, and he confirmed that the scene was convincing. The only strange thing was a red button he had seen on the side of the tomb, where the

tomb of his grandparents had been. They explained that this device was only a precaution. If something went wrong in that virtual reality when he relived it on arrival at his destination, he would simply have to press it. Any simulation of his observation-moments, no matter how safe it was with the present technology, could be vulnerable to external manipulation with decoding technologies developed in the future.

They asked him if he wanted Iris, Julia, Clarisse, Fanny, Ariadna or his mother to be present when he read the poem, so that they could extract information from his memories to recreate them as accurately as possible. But he said no, because their presence would only add to his grief.

I. Departure

- 1.1. The call to adventure
- 1.2. Refusal of the call
- 1.3. Supernatural aid
- 1.4. Crossing the threshold
- 1.5. Belly of the whale

II. Initiation

- 2.1. The road of trials
- 2.2. The meeting with the goddess
- 2.3. Woman as temptress

2.4. Atonement with the father

2.5. Apotheosis

2.6. The ultimate boon

III. Return

3.1. Refusal of the return

3.2. The magic flight

3.3. Rescue from without

3.4. *The crossing of the return threshold*

3.5. Master of two worlds

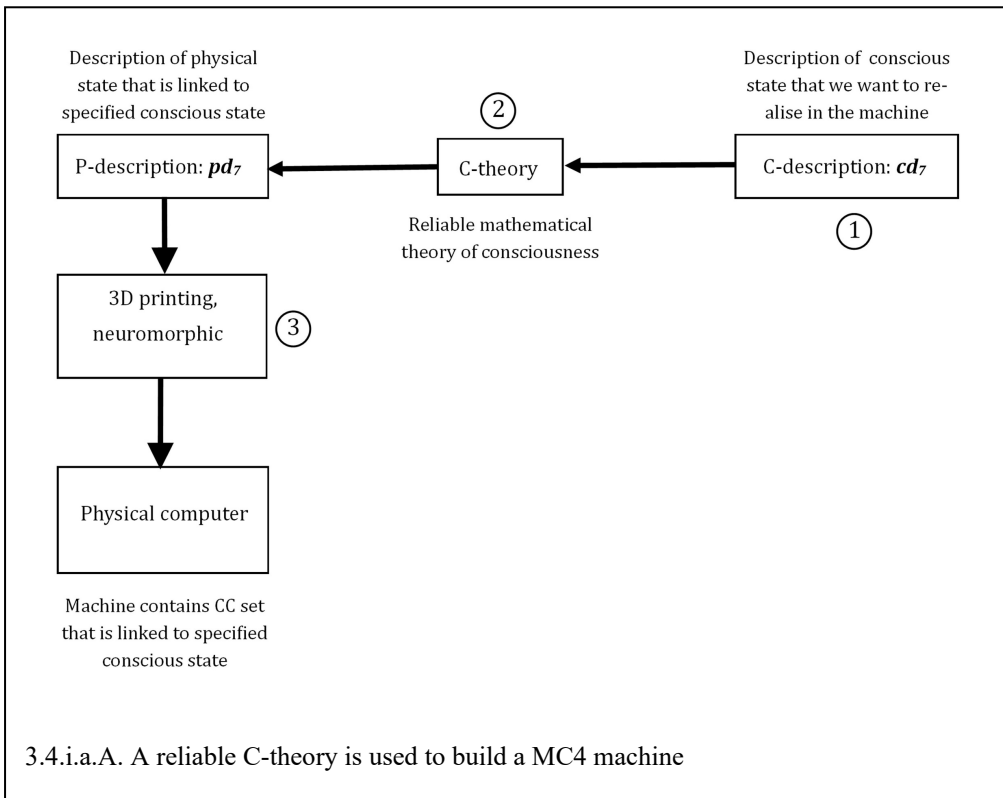
3.6. Freedom to live

3.3.v.c. The hero's journey, according to Joseph Campbell

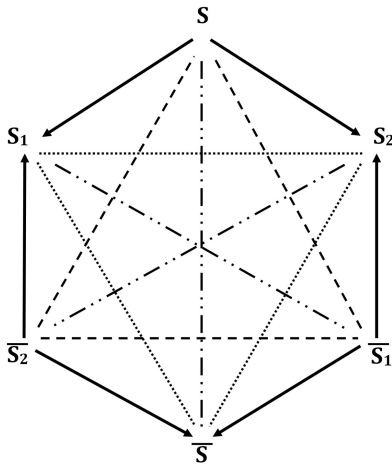
3.4. The mystery of human psychology

*Receive thy new Possessor: One who brings
A mind not to be chang'd by Place or Time.
The mind is its own place, and in it self
Can make a Heav'n of Hell, a Hell of Heav'n.
What matter where, if I be still the same, ...*

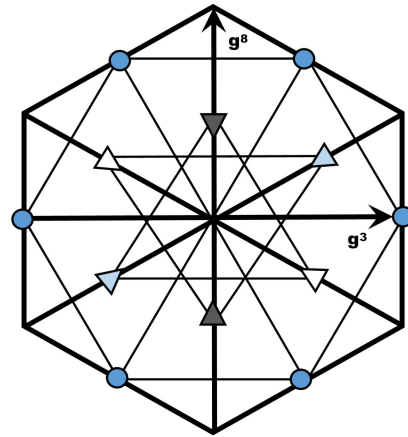
John Milton



His mind went blank and when he regained consciousness, the Namor-yaplokiyans told him that they needed to verify that the new configuration, including the instruments and the simulation device, would allow him to access the scientific concepts of superior civilisations. After this fine tuning, they would put him to sleep again and then wake him, in order to define his new emotional configuration and the flows of affordances of his new state of consciousness. He would need to reconsider whether he wanted to retain his genitals during his journey.



3.4.i.a.B. Abstract semiotic hexagon to generalise the Greimas semiotic square, according to Moretti



3.4.i.a.C. Graphic representation of the $su(3)$ weight vectors and weight coordinates of the gluon, quark, and anti-quark weights to form the G_2 root system, according to A. G. Lisi

He realised that he could now understand the mathematics of the extra-terrestrials, and the translation of their mathematics into scientific concepts which previously cost him so much effort. Without any difficulty, he could translate mathematical concepts into abstract holograms using a visual language developed by the Regorpenroseans of Lacaille 8760, who were almost all eyes. The Namoryaplokiyans had suggested using these visual devices in his calculations. With their help, he was able to understand why it was important that the subatomic particles formed a mathematical group structure, contained in the algebra of Lie e_8 , and that the de Sitter space with which they modelled Multiverse-L was a deformation of the group of Lie $E_{8(-24)}$, using Klein geometry. He explored and marvelled at the simplicity of the speculations about supersymmetry, and especially the hypotheses they used to theorise about the Big Bang and the theory of multiple universes, including the measurement of what was known on Earth as the con-

stants of nature. For the first time he also understood quantum mechanics in

$$\alpha = \frac{1}{4\pi\epsilon_0} \frac{e^2}{\hbar c} = \frac{\mu_0}{4\pi} \frac{e^2 c}{\hbar} = \frac{k_e e^2}{\hbar c} = \frac{c\mu_0}{2R_K} = \frac{e^2 Z_0}{4 \hbar} \approx 1/137$$

3.4.i.b. Different formulations of the fine-structure constant

depth and it seemed logical to him that the present could change not only the future but also the past. He could also understand other kinds of mathematics developed by the Xamtegmarmarkians, and understand why they affirmed that all structures that existed in an abstract form also existed in the physical world in some possible multiverse.

The isotropy of the Robertson–Walker models is unstable to homogeneous and anisotropic perturbations. It therefore seems that there is only a small set of initial conditions that would give rise to universe models which would be isotropic to within the observed limits at the present time. One possible way out of this difficulty is to suppose that there is an infinite number of universes with all possible different initial conditions. Only those universes which are expanding just fast enough to avoid recollapsing would contain galaxies, and hence intelligent life. However, it seems that this subclass of universes which have just the escape velocity would in general approach isotropy. On this view, the fact that we observe the universe to be isotropic would be simply a reflection of our own existence.

3.4.i.c. Collins's and Hawking's strong anthropic principle

In fact, mathematics was the only thing that really existed. There were no multiverses that could not be described in that language. In particular and with reference to Multiverse-L, their equations explained the rules followed by the local biophilic multiverses, which were particular cases of homogeneous varieties with simple Lie groups; they also made it possible to write all the asymmetrical local laws of physics in parameters that respected the arrow of time from past to future, which predominated in the local space-time bubble. What pleased him most was that he could now understand how to improve and expand all the equations in the scientific paper he had published

with PhDs Muñoz Rojas and Díaz Orellana, and also understand their limitations. In reality, some of his other hypotheses, mentioned in his first paper and later discarded as improbable by the professor and his student,

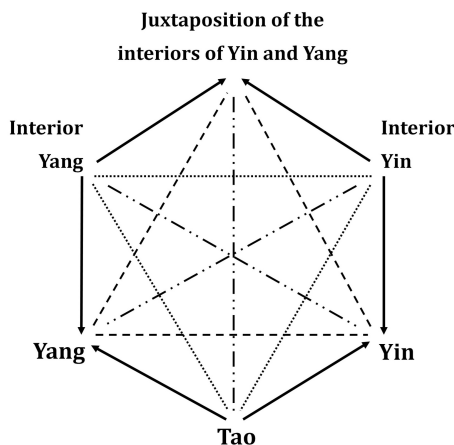
$$ds^2 = \frac{1}{2\omega^2} \left(-(dt + \exp(x) dz)^2 + dx^2 + dy^2 + \frac{1}{3} \exp(3x) dz^2 \right)$$

$-\infty < t, x, y, z < \infty$

3.4.i.d. Gödel metric

were closer to the extra-terrestrial science contained in the encyclopedia, which used a version of the Gödel metric instead of that of Friedmann, which allowed for travel through space-time and even to the past.

He understood that the greatest limitation of human science was its insane obsession with impersonal objectivity, enhanced perhaps by the influence of the Boltzmann brains. The science of internal cognition, developed on Earth by oriental religions and also by many mystics and artists before any Boltzmann brains arrived, had been put aside and ridiculed in a paradigm which excluded the influence of intelligent evolutionary life on the meta-laws that determined the fundamental constants in each multiverse. Due to Decree F451, he had not learnt that terrestrial scientists of the 20th century had discussed those matters.



3.4.ii.a. Pellissier's Taoist hexagon

which had been put to excessively literal use, although the human species, without extra-terrestrial help, had discovered its limitations in what was called Gödel's incompleteness theorem, which he could now enjoy for the first time. The most interesting aspect was the generalisation, also postulated as a hypothesis on Earth, that in the laws of the universe there were undecidable problems for all possible types of logic invented by evolutionary life. But the most important limitation

The Universe must have those properties which allow life to develop within it at some stage in its history.

3.4.ii.c. Barrow's and Tipler's strong anthropic principle

that the impersonal laws of physics could not or should not explain. The abundance of evolutionary life in the Milky Way and in all the other galaxies, according to the encyclopedia, rendered that premise laughable. He could see that the disdain was the harmful influence of the Boltzmann brains in terrestrial scientific thought. It was also found among the Eristeands of Calypso, who were contaminated by them.

As in times past when he obsessively revised his calculations, he reviewed what he thought he had understood before. Now he did not need to think about each concept repeatedly in order to understand it. He finally grasped the mathematics of subjectivity which the Argoterrands had tried to teach him. It enabled him to explore the influence of life on local physical laws in the universe, and

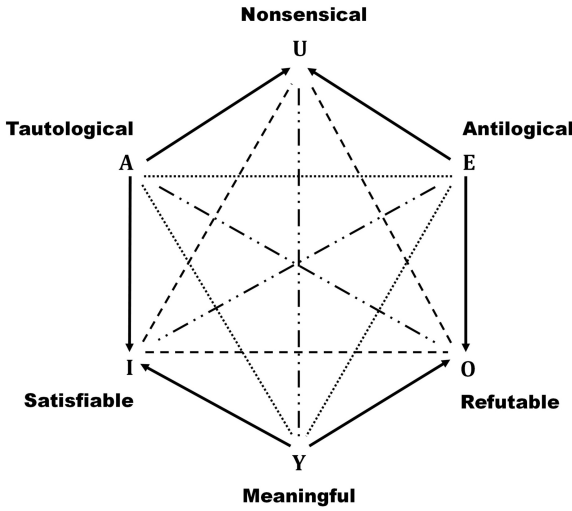
Other metaphysics, developed by traditional Earth cultures before the Penumbra, erased by the Sandrini-LePaine-Reich paradigm, had developed concepts that resonated with the extra-terrestrial ethics.

The worship of mathematics and impersonal science, without observers, which so deeply puzzled the extra-terrestrials, explained so many atrocities, such as the mistreatment of other animal species and nature in general. This did not mean that mathematics per se was perverse; it was only an instrument

$$\varphi_{a_1,a_2\dots a_n} = \prod_{k=1}^n p_k^{a_k}$$

3.4.ii.b. Gödel numbering

was the tendency to regard life and consciousness as of no consequence. In the view of many human scientists, life had evolved by chance and did not depend on the laws of universe. In their hypotheses and reasoning, the difference between conscious and unconscious matter was an unnecessary annoyance



3.4.ii.d. Metalogical hexagon inspired by Wittgenstein's *Tractatus Logico-Philosophicus*, according to Béziau

looked down upon as a fantasy of platonic mathematicians. He could at last glimpse the danger that worried the Eelsmolians and the Xamtegmarguians:

$$\{I^{ijk} \cdot D_{ijk}^{S_m} = A^{S_n}\} \rightarrow D_{ijk}^{S_m} \quad (\text{expansive})$$

$$\{I^{ijk} \cdot D_{ijk}^{S_m} = A^{S_n}\} \rightarrow D_{ijk}^{S_n} \quad (\text{paradigmatic})$$

$$\{I^{ijk} \cdot D_{ijk}^{S_m} \rightarrow A^{S_n}\} \rightarrow D_{ijk}^{S_n} \quad (\text{philosophic})$$

where I , D and A refer to the inductive, deductive and abductive ways of reasoning, while the subindexes (i,j,k) refer to the objectual, objective and subjective dimensions. Super-indexes S_n and S_m refer to the subjective dimension.

3.4.ii.e. Tensorial scheme of reasoning based on Peirce semiotics, according to Pedro Espejo-Saavedra Roca

the four dimensions to which they had access. The geometry e_8 made antimatter behave differently from normal matter, without forming stars or galaxies. Instead it accumulated in the voids between the different baryonic cumuli. The layer between matter and antimatter was extensive, but tenuous and unstable. It was possible to use the interactions between matter in the outer edge and antimatter contained within the bubble to generate the energy that created wormholes in space-time. Moreover, this was the origin of the cosmic rays composed of positrons, so difficult to explain with terrestrial astronomy. He also discovered that the cumuli were remnants from the formation of derived multiverses

had nothing to do with the crude topological metaphors of the Lacanians, like those used by Rienke Watson, which had previously confused him. That pervasive influence of life also explained the direct link with truth through beautiful formulae, something he had so often experienced, but on Earth this sublime feeling of awe when contemplating abstract knowledge was

that the Boltzmann brains might become parasitic forever. If they managed to modify the past, they would sterilise the multiverses derived from the biophilic ones, and would hold up the overall spiritual evolution of the universe.

He also understood that the cumuli of unmatter that he had postulated were holograms of other parallel branes of Multiverse- L , in

that had been created from Multiverse-L and had now been disconnected from it. The Vogons of Andromeda had used that knowledge to eradicate the Boltzmann brains from their galaxy. If he had been able to transmit this new information to the South American professor, their article would have been far more influential but possibly more dangerous, because human beings contaminated by Boltzmann brains could have quickly conquered the Solar System and initiated contact with other high-entropy multiverses far more easily. He further understood that he had been badly mistaken when he predicted that the antigravity of those cumuli of antimatter replaced dark energy. As some terrestrial scientists had suspected, there were other very synthetic equations in a type of mathematics that had not yet been developed on Earth, which explained the apparent accelerating expansion of Multiverse-L very elegantly. The succinct equations made it possible to explain easily the five components which made up the force of gravity, calculate the rotation speed of galaxies and, as a result, explain the apparent lack of matter in the local multiverse. This space-time bubble was expanding at an ever-increasing rate, not due to the existence of a mysterious dark energy but due to the parallel evolution of all the surrounding multiverses.

The presence of other multiverses weakened the natural expansion of Multiverse-L, caused by the energy of the quantum vacuum. Without them, the rate of acceleration would have been even greater. This was the best evidence for the existence of neighbouring multiverses, but nobody had thought of that, because they

$$\rho_{\Phi} = \frac{k}{2} \int_0^{k_c} \frac{4\pi k^2 dk}{(2\pi)^3} = \frac{k_c^4}{16\pi^2}$$

3.4.iii.a. Nernst's vacuum energy density quantum-mechanical expectation value

continued to be obsessed with non-existent entities. The whole focus of the explanation proposed by terrestrial scientists was on the energy that caused the expansion, not the energy that filtered from the cumuli of antimatter and other adjacent multiverses to reduce it. It was precisely that cosmic braking effect that made evolutionary life possible. The negative gravity of the quantum vacuum state was filtered from other multiverses, and for that reason the force

$$e_8 \cong e_8(-2) \oplus e_8(-1) \oplus e_8(0) \oplus e_8(1) \oplus e_8(2)$$

3.4.iii.b. The 5-gradation of Lie algebra e_8

of gravity was so weak in Multiverse-L. There was much more to explore, but he decided that he would have time for that during his long journey; there was no point regretting what he could not have understood before.

He reconsidered the epistemological status of dark matter by using the fifth gradation in the algebra of Lie e_8 . In reality, as he had supposed, it did not exist as such. But if one took it to be simply the flow field of deceleration of the energy produced by the

$$q_0 = -H^{-2} \times \frac{d^2 S}{dt^2}$$

3.4.iii.c. The deceleration parameter

Higgs quantum vacuum, which circulated within each multiverse and surrounding ones, then if the equation he had been pressed to decipher during his captivity was applied and modified to include the particles predicted by E_8 geometry, one could understand what he had been asked repeatedly to make explicit at Victoria Mansion: the explanation of the wormholes. He generated the equations that explained the phenomenon with a four-dimensional equals sign, using the Lie $E_{8(-24)}$ group as G , and its subgroup $(SL(2, \mathbb{C}) \times S(U_3) \times U_2) \times Z_3$ as H .

A **Klein geometry** is a pair $X = (G, H)$, where X is a homogeneous space, together with a transitive action on X by a Lie group G , which acts as the symmetry group of the geometry, and H is a closed Lie subgroup of G such that the (left) coset space G/H is connected. Some examples are:

Geometry	Underlying space X	Transformation group G	Subgroup H
Hyperbolic geometry	Hyperbolic space $H(n)$ modelled e.g. as time-like lines in the Minkowski space $\mathbb{R}^{1,n}$	Orthochronous Lorentz group $O(1, n)/O(1)$	$O(1) \times O(n)$
Euclidean geometry	Euclidean space $E(n)$	Euclidean group $Euc(n) \simeq \mathbb{R}^n \rtimes O(n)$	Orthogonal group $O(n)$
Elliptic geometry	Elliptic space, modelled e.g. as the lines through the origin in Euclidean space $\mathbb{R}^{n+1}$	$O(n+1)/O(1)$	$O(n)/O(1)$

3.4.iii.d. Definition and examples of Klein geometries

Now, without any difficulty, he could understand that there were two solutions, one for the subgroup H at the galaxy level, and another for the main G group at the galactic cumulus level. They were also isomorphic to the solutions at the level of hyperspace tunnels between multiverses predicted by string theory, which hypothesised the flow of Λ among linked multiverses. In other words, the equations elegantly predicted the location of the wormholes, which were nothing more than the vortices through which the

$$\mathfrak{e}_8 = \mathfrak{so}(16) \oplus S_{16}^+$$

3.4.iii.e. Decomposition of the auto-adjoint representation of Lie algebra $\mathfrak{e}_8$

expansive energy would be exchanged when the equations between distant places with similar deformations of the Lie groups coincided. With the data he downloaded from the encyclopedia about the Solar System, the fibres that connected the predicted vortices could be seen. There was a big one between Jupiter and Alpha Centauri and a fainter one between the cliffs of Kuiper and Andromeda, through which the Boltzmann brains had possibly travelled. The topological configuration of the group made it act as a tornado using its own force to decelerate and maintain its stability, like the red storm in Jupiter’s atmosphere, which had been spinning for thousands of years. He searched the galactic encyclopedia to see if someone had already calculated such dazzling meta-equations

	B	R	C	H	O
A	<i>der(A/B)</i>	0	0	$\mathfrak{sp}_1$	$\mathfrak{g}_2$
R	0	$\mathfrak{so}_3$	$\mathfrak{su}_3$	$\mathfrak{sp}_3$	$\mathfrak{f}_4$
C	0	$\mathfrak{su}_3$	$\mathfrak{su}_3 \oplus \mathfrak{su}_3$	$\mathfrak{su}_6$	$\mathfrak{e}_6$
H	$\mathfrak{sp}_1$	$\mathfrak{sp}_3$	$\mathfrak{su}_6$	$\mathfrak{so}_{12}$	$\mathfrak{e}_7$
O	$\mathfrak{g}_2$	$\mathfrak{f}_4$	$\mathfrak{e}_6$	$\mathfrak{e}_7$	$\mathfrak{e}_8$

3.4.iii.f. Freudenthal–Tits Magic Square of Lie Algebras, according to Baez

and, particularly, if it explained the configuration of the group of biophilic multiverses using the Freudenthal–Tits magic square. He was amazed that they did not feature there. That was the biggest vindication he had ever felt in his life.

The Namoryaplokiyans were very pleased with the result and told him that they had to celebrate his achievement. Some Xamtegmarquians and Regorpenroseans came into the venue to congratulate him, as well as other species he had never seen before and who were introduced to him as the Dranoelsusskindians, Sudraregthootians, Nodpageans, Leahparboussians, Ierdnalindeans and Nairbgreenians. They all expressed their satisfaction with his achievement and asked him to specify again the exact solution to the equations and give them the tools to calculate the local value of the deformations of the Lie groups in this multiverse. They

suggested that it was important to write them down so that they could leak them to the relevant scientists on Earth,

$$H\Psi_k = \left[-\frac{1}{2} m_P^{-2} h^{1/2} (h_{il} h_{jm} + h_{im} h_{jl} - h_{ij} h_{lm}) \frac{\delta^2}{\delta h_{ij} \delta h_{lm}} - m_P^2 h^{1/2(3)} R \right. \\ \left. + \frac{1}{2} h^{1/2} T^{mn} \left[\phi_{0'} - i \frac{\delta}{\delta \phi_0} \right] \right] \Psi_k(h_{ij}, \phi_0) = 0$$
$$H^i \Psi_k = \left[-2 i m_P^2 \left[\frac{\delta}{\delta h_{ij}} \right]_j + T^{ni} \left[\phi_{0'} - i \frac{\delta}{\delta \phi_0} \right] \right] \Psi_k(h_{ij}, \phi_0) = 0$$

3.4.iii.g. The Wheeler–DeWitt and momentum constraint equations in Hawking–Page wormholes

when the planet was ready to join their confederation. Iridio explained that such solutions could not be written in the Sandrini-LePaine notation because the results would be contradictory. They said that this did not matter, and asked him to calculate them using the conventional notation he was used to. Then they left him alone to write the results in a blank Book of Sand.

As soon as he had finished his calculations, he started to reflect on the astonishing results, since string theory was not necessary for calculations at the level of Multiverse-L. It was similar to the difference between the theory of relativity and Newtonian mechanics. When it was necessary to calculate, for example, the trajectory of a rocket on Earth, it was unnecessary to use relativity. But when travelling at a greater speed in a spaceship like the Zuespoks', the effects of relativity had to be taken into account. The same applied to the calculation of the rotation speed of the galaxies, where Modified Newtonian Dynamics had to be used to understand the experimental results. He marvelled at being able to make that type of deduction at the level of the global interpretation of equations, which had previously seemed so difficult. He was grateful for the new consciousness that those kind creatures had allowed him to experience.

The Namoryaplokiyans, who had brought with them some other extra-terrestrials called Leachimduffians, told him that he had finally reached the last refining phase, since the mental configuration that processed abstract reasoning seemed to be working perfectly. They would put him to sleep again, and when he woke they would show him a map of his brain connectome with a new device. Again, Iridio was doubtful, but they explained that it was too late to have doubts, since he had already agreed to it and signed all the relevant protocols. Besides, it was essential to find the optimal configuration in order to identify vulnerabilities and guard against possible interference during his long journey.

$$TE_{X \rightarrow Y} = \sum_{y_{t+\tau}, y_t, x_t} p(y_{t+\tau}, y_t, x_t) \log_2 \left(\frac{p(y_{t+\tau} | x_t, y_t)}{p(y_{t+\tau} | y_t)} \right)$$

3.4.iv.a. Transfer entropy formula to estimate directional information flow between brain regions X and Y

When he regained consciousness, he was in a big hall where there was a hyper-cube almost as tall as himself, made up of many smaller cubes. The Namoryaplokiyans explained that the slices in the cubes were diagrammatic representations of the flows of the affordances between the different nodes in human brains. It was an abstract representation, a three-dimensional matrix, in which the different areas of a particular brain were shown as colour gradients, indicating the type of affordance flows between them in each layer of the z axis.

In the first layer, representing his brain, the square in the upper right corner represented the internal flows of the ventral segmental area, the most important in his neurological configuration, in vivid red. The adjacent squares, to the left

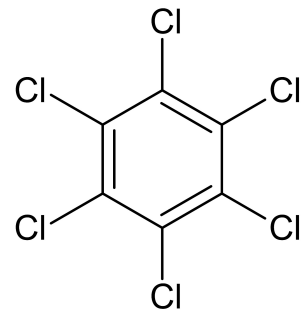
$A(x_1, x_1)$	$A(x_1, x_2)$	$A(x_1, x_3)$	...	$A(x_1, x_{n-2})$	$A(x_1, x_{n-1})$	$A(x_1, x_n)$
$A(x_2, x_1)$	$A(x_2, x_2)$	$A(x_2, x_3)$	...	$A(x_2, x_{n-2})$	$A(x_2, x_{n-1})$	$A(x_2, x_n)$
$A(x_3, x_1)$	$A(x_3, x_2)$	$A(x_3, x_3)$	...	$A(x_3, x_{n-2})$	$A(x_3, x_{n-1})$	$A(x_3, x_n)$
$\vdots$	$\vdots$	$\vdots$		$\vdots$	$\vdots$	$\vdots$
$A(x_{n-2}, x_1)$	$A(x_{n-2}, x_2)$	$A(x_{n-2}, x_3)$	...	$A(x_{n-2}, x_{n-2})$	$A(x_{n-2}, x_{n-1})$	$A(x_{n-2}, x_n)$
$A(x_{n-1}, x_1)$	$A(x_{n-1}, x_2)$	$A(x_{n-1}, x_3)$	...	$A(x_{n-1}, x_{n-2})$	$A(x_{n-1}, x_{n-1})$	$A(x_{n-1}, x_n)$
$A(x_n, x_1)$	$A(x_n, x_2)$	$A(x_n, x_3)$	...	$A(x_n, x_{n-2})$	$A(x_n, x_{n-1})$	$A(x_n, x_n)$

3.4.iv.b. Affordance matrix of connections between n cerebral areas,
where $A(x_i, x_j) \neq A(x_j, x_i)$, except when $i = j$

and below it, represented the flow of affordances between that area and the parietal lobe, the area of the cerebral cortex which coordinated abstract reasoning, also in vivid red. The one on the left measured the flow of affordances from the ventral segmental area to that lobe, and the one below measured the reverse flow between the same two areas. The matrix was nothing less than a physical representation of the values of a function $A(x, y)$, which represented in a simplified way the behaviour of 86 billion neurons in his brain. It was crucial to understand that the colour gradient expressed by $A(x, y)$ was different from $A(y, x)$, and that the values of $A(x, x)$ were represented in the diagonal, which measured the affordances of a particular area x with itself. There were many more areas represented besides the parietal lobe and the ventral segmental area. The last was the area around the pineal gland in the lower right side of the cube, which had a much reduced flow to the other areas, and also within the area itself.

Viewed from the side, each slice of the cube in the z axis represented the corresponding values of different mental configurations in human beings, each

with its own colour. There were different atypical configurations, apart from his, which ranged from orange to yellow, and then the typical ones, in blue. The last slices, shown in violet, stood for those who had been contaminated by Boltzmann brains. He was surprised to realise that the configurations considered atypical were much more numerous than the typical, and that there was only a limited range of violet hues.



3.4.iv.c. Chemical structure of hexachlorobenzene

If one wanted to compare two different configurations, the colours of the slices for different values of the z axis were combined. That showed, for example, that, according to their estimation, Iridio's brain was similar to his father's, as far as that could be ascertained. His father's brain was classified as atypical due to the unusual prevalence of visual intelligence, rare in his species, and enhanced by the synaesthesia they shared. But when Iridio's configuration was compared with his uncle Jeremias's or his maternal grandmother's, the diagram seemed monochrome because their configurations were almost the opposite of each other, and the flows of affordances cancelled each other out. He was told that he could explore other differences later on, if he wanted to, but the more urgent task was to calibrate the optimal configuration needed for the journey. In order to do that, he simply had to generate memories, any memories, and let the hyper-cube determine automatically the best configuration to reclassify them. He could also move a kind of lever on the side to select a particular configuration along the z axis, although it was best not to move it to the area of hyper-contamination, at least until he understood how the mechanism worked. In other words, all he had to do was to activate his memories, in a process of free association, and select a specific neuronal configuration to reflect on them. He could choose any slice of the cube he wanted, but they recommended, at least when starting his journey into the past, avoiding the yellow ones because those corresponded to paranoia.

When he explored his memory with his new-made mind, he was surprised at the clarity of his recall. As he relived his past, he understood many things he had never noticed before, and began a list, so as to understand the connections between them better.

- 1) He started with something relatively trivial, using the configuration that was the closest to his own. He wondered about some dinosaurs which struck him as similar to the Argoterrands. He could not remember their name. By reliving the afternoon he had spent at the natural history museum in Bandar-Austro-Metropolis, which had so intrigued him as a child,

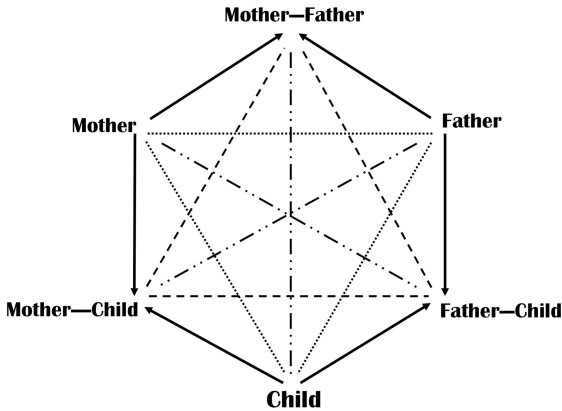
he could see before him the stegosaurus exhibition he had seen seven times. He was taken there by his mother and Ernesto and could recall many details. He relived his fascination with the creatures when he used a device that enabled him to see some dinosaurs running along the shore of a lake. The footprints they left in the mud, now petrified, had been used to reconstruct a stampede of small stegosaurus chased by a tyrannosaurus. The sign explained that these small dinosaurs had mechanisms to regulate their body temperature, and this reminded him that his hosts in Proxima Centauri had identified this characteristic as dangerous in mammals prone to contamination by Boltzmann brains.

- 2) The cube moved towards another configuration, close to the neurotypical. He realised that when he was a child, his mother had had a parallel romantic liaison with Ernesto, and perhaps for that reason Ernesto had done so much to help him publish his first article. Iridio gathered from the way they looked at each other that they were lovers. Perhaps the tendency to infidelity was something his mother had inherited from his manipulative grandmother Mildred. He now understood that when he talked about his parents and grandparents with Ernesto in his cellar library, Ernesto had hinted at that relationship several times, but he did not understand and therefore did not give him the chance to say more.

- 3) The configuration jumped again, this time to a moderate neurotypical one. His father's frequent illnesses were a product of the depression induced by the treatment required by the aesthetic police. He remembered a row

$$\begin{aligned}\frac{dE}{dt} &= aM + bM(1 - |M|) + y(t) \\ \frac{dM}{dt} &= cE(1 - |E|) + dM + f(t)\end{aligned}$$

3.4.v.a. An extended dynamic model of a romance considering the external environment



3.4.v.b. The family hexagon, according to Béziau

between his parents in the hall of the secrets of the universe, just before he left for university. He managed to grasp that his mother was refusing to explain to his father why she had avoided sex with him for the past few months. His father said that there was nothing he could do about the persistent demands of the fat nurse, whom Iridio now identified as the perverted Leni Lenina. If

he resisted, she would harass him even more. His mother retorted that that was not the problem. After a heated argument, which seemed to go on for ever, Ernesto stopped visiting them. Luckily, his parents loved each other enough to stay together, in spite of everything, and did not get divorced like his maternal grandparents.

- 4) Another jump to a close neurotypical configuration made him wonder if he had been born because his father needed to defend himself when the authorities accused him of some sexual deviation and linked him with the millenarian groups. It pained him to think that perhaps he had been conceived on a night like the one he had spent with Iris, under the eyes of the morality and oztraditions police. He also wondered if they had tortured his father by making him listen to his mother being raped. Could that have been what she wanted to explain to him before she died? He had not let her, because he needed to discuss his calculations with her.
- 5) His new configuration was close to the ones contaminated by the Boltzmann brains, but it still had neurotypical immunity. He was now able to guess that his mother's abortion, termed 'clandestine' by her critics, was not because of her support for the precepts of MVEHS, but rather to avoid the family conflicts which would have arisen had she brought Ernesto's child, or worse, a torturer's child, into the world. Perhaps she did not want to repeat the history of his paternal grandparents, who had divorced on very bad terms. Quite possibly this was related to the row in point 3), but he would need to rethink this and review the exact chronology of events.
- 6) He moved the lever mentally back to a configuration closer to his own, but the mechanism took him to a configuration described as 'political'. Without his synaesthesia, the world appeared in black and white. Numbers did not have any defined personality, and the fact that they were all were

$$\frac{dx}{dt}(t) = -rx(t) + ac(t)$$

3.4.v.c. The second law of thermodynamics for sentimental relationships

A set of assumptions $\{P\}$ contextually implies an assumption Q in the context C if and only if

(i) the union of $\{P\}$ and $\{C\}$ non-trivially implies Q ,

(ii) $\{P\}$ does not non-trivially imply Q , and

(iii) $\{C\}$ does not non-trivially imply Q .

3.4.v.d. Contextual implication

printed in the same colour did not seem inappropriate to him. But his memories took him back to the day his mother had died. He deduced that she had very likely wanted to warn him about his uncle and let him know that she had asked to be cremated, to avoid the risk of having her brain emulated after her death. That was why the nurses had put ice

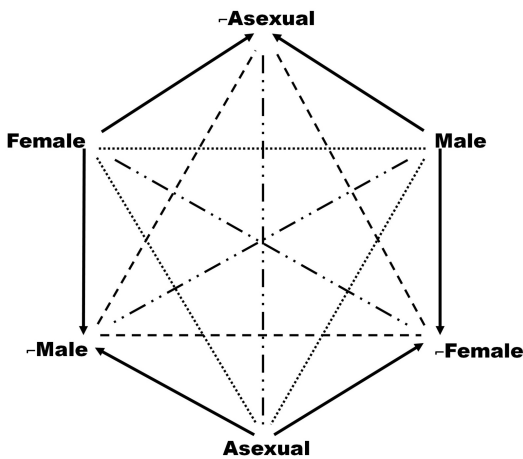
on her head and his father had defended her last wish with such determination. He realised that he was now able to guess the hidden motives of other people, and felt empowered. There were two possible reasons why his uncle wanted to emulate his mother's brain. The first was to extract the information he needed about the resistance networks; the second – because his grandmother may have wished to be reunited with her, or to control her at last, in the way she might have controlled PhDr Charrington der Heer, her adopted daughter. This was related to what his uncle had told him about the intervention of his three robotic instructors. He needed to give that more thought and explore the facts closely. But he could not avoid a stab of pain when he realised that his father had also tried to warn him not to authorise the emulation of his brain, when he spoke about the war between ministries, that day when he was more lucid inside the sculpture of the conch. He was referring to the documents he had left ready in his legaliferum, but Iridio had ignored his warnings. This oversight allowed PhDr Charrington der Heer to carry out an autopsy on him, which was the excuse to emulate his father's brain. He also understood that the war between the ministries, in his and his parents' case, and the animosity of the police, had to do with Mildred's and his uncle's meddling. The police forces from other ministries were put out by the limits placed on their freedom of action, as Julia had told him after consulting a senior police-woman in one of the forces. They were also annoyed to see their performance indicators regarding their record of solved cases going down because of this meddling. Iridio could now deduce many other things that had escaped him before, such as being used as a smoke screen during the conferences of the astronomical association. They would deliberately place the weakest postgraduate students between his presentation and Professor Müller Porta's, so that very few astronomers, apart from the supervisors, would attend those sessions and nobody would realise that the students' theses were very basic, hardly worthy of doctoral degrees.

- 7) The mechanism was now locked in a configuration classified as 'social intelligence', also synaesthesia-free. Thanks to his present parallel consciousnesses, he was able to explore what he would have felt if he had been neurotypical, if his peculiar cognitive constitution had not impaired his grasp of social norms. As with the previous chain of memories, he was very surprised to see that what seemed normal to him, such as persisting with a topic of conversation until he got a satisfactory answer, or being oblivious to all signs that the other person did not want to continue the discussion, lay at the root of so many conflicts and aggressive reactions. His new consciousness allowed him to discern the cause of his lecturers'

1. The speaker has a certain expectation E at time t_0 .
 2. The speaker's expectation E fails (i.e., E is incongruous with reality) at time t_1 .
 3. The speaker has a negative emotional attitude (e.g., disappointment, anger, reproach, envy) toward the incongruity between what is expected and what is actually the case.
- 3.4.v.e. Definition of an ironic environment

and colleagues' disdain, in response to his obsessive behaviour and his tendency to ignore people whenever he was not interested. He was astonished to see how blind he had been all his life to so much deceit, betrayal, dishonesty and manipulation, particularly from Kaminer Kullych. The betrayal of his maternal grandmother and his uncle now seemed to him abominable. He finally understood the tragedy of his murdered grandparents and the reason why he and his parents had faced so many obstacles in their lives. There were so many coincidences to explore, and he

needed to comprehend the role his uncle had played in the artificial intelligences that had accompanied him in his social development. He also understood



3.4.v.f. Oppositions in gender and sexuality, according to Moretti

the real reasons why Zoe had protected him at the patent office. Apart from sharing with him a systematic pattern of discrimination because she was the daughter of dissidents, she was also asexual. In the hostile world she had been born into, her mode of resistance was to struggle against those who wanted Iridio to lose his job. He had not registered, although he had been told, that she had got married to herself when she managed to escape to Atlantis

VIII, a symbol of asexuality he had found years before hearing of the event, when he was exploring the Internet 3.1.4 at the patent office.

- 8) Now the mechanism had stopped in a configuration that allowed him to access the conventions of personal relations. It was very painful to realise the great love Julia had clearly felt for him but never dared to express fully. He felt guilty for having dismissed their sexual encounters as an annoying obligation. Perhaps if he had possessed the courage to stay with her after their physical contact, when she expressed her love with those silent and contained orgasms that scared him, he would have understood. He could

also read the same kind of love in Iris's eyes and thought how he must have hurt her by not wanting to make love before their hurried wedding, as Ernesto had suggested when the psychometrists were harassing him. If he had been able to overcome his fixation with Julia, no doubt Iris would have expressed her feelings.

$$\gamma(s_i, s_j) \equiv \Gamma_{i,j} \exp \left[- \left(\frac{s_i - s_j}{\sigma} \right)^2 \right]$$

3.4.v.g. The interaction function, expressing the effect of the difference between the strength of love between two agents

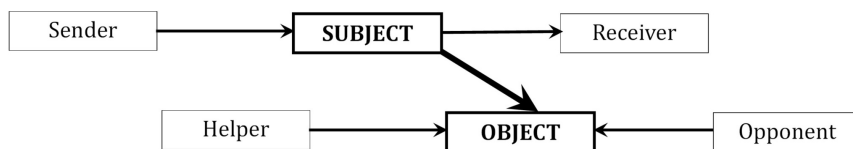
- 9) He understood that his indifference had profoundly wounded Clarisse's pride and self-esteem, in one who was used to having young men at her beck and call, spellbound by her beauty. With equal remorse he understood the sincerity of her threat to commit suicide if he stopped making love to her. And he felt guilty about Fanny's suicide. His capacity to maintain an erection for such a long time had allowed both young women to explore their sexuality thoroughly. This was the origin of their interest in him that so annoyed him. Perhaps that ability set him apart from other young men

of his age,	$\frac{dW(t)}{dt} = -\alpha_L W(t) + \beta_W M \left(1 - \left(\frac{M}{\gamma_W} \right)^2 \right) + \beta_W \frac{A_M(t)}{1 + \delta_W I_W(t)}$
and from	
male sex	$\frac{dI_W(t)}{dt} = -\alpha_{IW} I_W(t) + \beta_{IW} W(t)$
robots who	
were pro-	$\frac{dM(t)}{dt} = -\alpha_L M(t) + \beta_M W \left(1 - \left(\frac{M \setminus W}{\gamma_M} \right)^2 \right) + \beta_M \frac{A_W(t)}{1 + \delta_M I_M(t)}$
grammed	
to copulate	$\frac{dI_M(t)}{dt} = -\alpha_{IW} I_M(t) + \beta_{IM} M(t)$
for no more	
than fifteen	
minutes, so	3.4.v.h. A woman-man model of the love cycle with dynamic appeal parameters
that fe-	

males would not grow attached to them and prefer them to human males, with consequences for their fertility. He could not be sure but it seemed to him that Ariadna had fallen in love with him, as Ernesto had suggested. His memories were not completely clear, which he assumed was due to the tablets he was taking at the time. But he did not experience the certainty he had felt when he could finally read the body language of Julia and Iris, who obviously did love him. There was something strange about this, which needed to be investigated.

- 10) He moved the lever towards a configuration classified as average neuro-typically masculine, sexually active. He remembered the day of the attack in Brodei. He relived the moment after the explosion, which could have killed him, when Ariadna had embraced him.

He could now appreciate the full extent of her desire, and how it demanded that he should possess her at the first opportunity after the attack. The sexual desire he felt when she drew his hand to her lubricated vagina was bewildering, but so was his anguish at the strong scent which filled the room. He sensed a kind of barrier posed by a social norm, as his mind shouted 'incest'. That seemed illogical, which pointed to something more.

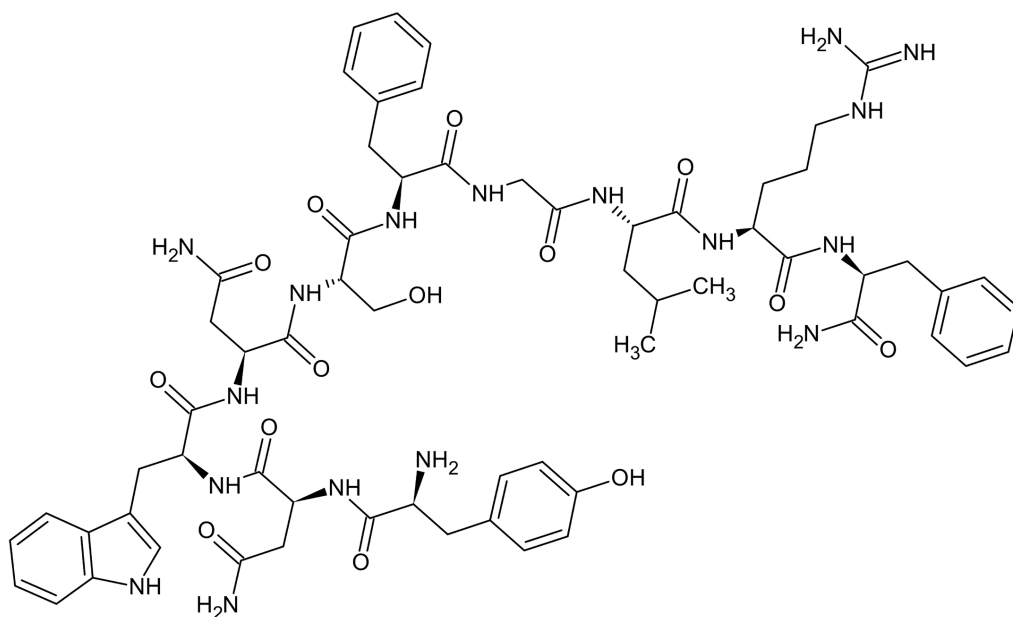


3.4.v.i.A. Modification of the actantial model, according to Anne Ubersfeld (exchange of the subject by the object)

A childhood memory returned of a day spent at Mildred's home when he was five or six years old. The scene was bewildering. A few hours earlier, some policemen dressed in yellow had taken his parents away and interrupted his lesson for the day, in which Penelope introduced the formula of the negafibonacci sequence to him. In spite of his tantrums, the policemen put him in a pod with Penelope, inside a container that gave him claustrophobia. Later, they left him at a house where they were received by his uncle Jeremias, looking much younger and sporting a growth of stubble. In the house was a pre-pubescent girl. It was Ariadna, aged twelve or thirteen. Her beauty was not as dazzling as it had been when he saw her as an adult at the astronomy congresses, but it seemed incredible that he had not recognised her. Both tried to communicate with him in different ways, but he was willing to engage only through Penelope. He did not accept any food and did not utter a single word. The memory became more vivid and more painful because something was changing very slightly in the cube. Again he experienced panic and confusion, more real than a mere memory. They left him in a bedroom with two beds and a small writing desk. Ariadna came in and tried again in every possible way to insert herself into the dynamic of communication between him and Penelope, without success. Again, he was left alone with Penelope, but he was too distressed to understand the negafibonacci formula. Outside the sound of a multicopter could be heard. His grandmother Mildred arrived and tried to engage him in conversation. She seemed very young, like the image he had seen in his flexible reader before leaving Earth. As she could not elicit any response, she asked his uncle to take Penelope away. At this Iridio threw a tantrum

$$F_{n-2} = F_n - F_{n-1} ; n < -1$$

3.4.v.i.B. Recursive definition of the negafibonacci sequence



3.4.v.i.C. Chemical structure of kisspeptin-10

and became aggressive. They left him alone for a long time. Ariadna came in and tried to talk to him. She persuaded him to go with her and see what was happening to Penelope. She led him to a big workshop at the back of the house, where many robots and bits and pieces of dismantled robots lay in disorder. Penelope was in a corner and showed no reaction. Numbers twinkled in her eyes, but she did not look at him, and every now and then her eyes rolled back. His uncle, who now came in, said they were repairing Penelope, and she was asleep. He threw another tantrum and they dragged him back to the previous room. His grandmother came in with a plate of food, put it on the desk and tried to embrace him. He pushed her away and started banging his head against the wall. Mildred

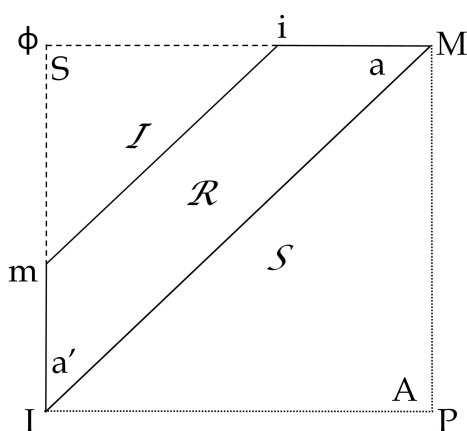
$$\mathcal{F}(\mathbf{W}, Q) = \sum_{z_{1:t}} Q(z_{1:t} | D_{1:t}) \log [P(D_{1:t} | z_{1:t}, \mathbf{W}) P(z_{1:t})]$$

asked what he wanted. He asked her to recite the digits of π , but she did not know them. She

3.4.v.i.D. The expectation-maximisation algorithm in memory modification

tried to calm him down by singing a lullaby and embracing him again. He bit her hand as hard as he could, drawing blood, which shocked him. She gave him a resounding slap. That was the first time in his life that he had ever been physically punished. He fled from the bedroom to the workshop. He tried to make Penelope work, but could not. Her eyes remained rolled up. Voices were calling him, so he hid in a section of the workshop full of half-dismantled robots. They soon found him but couldn't induce

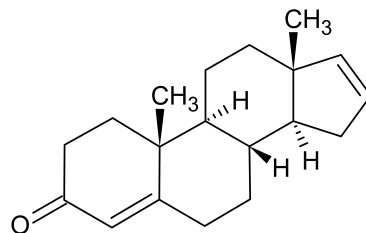
him to come back into the house. They left him alone and he cried for a while. Later, Ariadna came in and sat on the floor beside him. After many attempts to get some response, she took his hand and he did not reject her. This was his first human contact with anyone other than his parents. Ariadna persuaded him to return to the bedroom and promised to stay with him. The noise of the multiscope could be heard again. Ariadna explained that his grandmother had left and suggested it was time to sleep. He asked her to recite the numbers of Π . She was surprised but started reciting them without any difficulty. He fell asleep holding her hand and had nightmares about half-assembled robots attacking Penelope. When he woke during the night, it was very dark, and Ariadna was not in the room, as she had promised. He left the bedroom and looked for the door leading



3.4.v.j.A. Schema R (Lacanian topography of the Imaginary, the Symbolic, and the Real)

to the yard where the workshop was located. He opened a door and saw his uncle penetrating Ariadna from behind. She seemed to find it painful. He ran to the door leading to the workshop but it was locked. Ariadna was now beside him, holding his hand again. She led him along a corridor and at the bedroom door she told him to wait a moment because she needed to go to the bathroom. He did not want to be parted from her, so they entered the bathroom together. She lifted her dress and went to wash in the bidet. Iridio

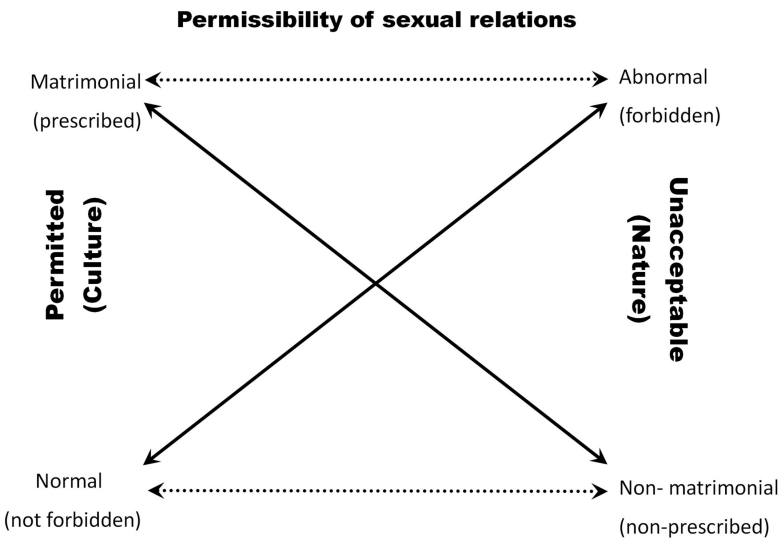
noticed that same vaginal scent that had so tormented him in Brodei. She washed herself and then sat down on the toilet to urinate. Some lights came on and the voice of the toilet automaton recommended a pregnancy test. She pressed some buttons to disconnect it and waited for Iridio to urinate before returning to the bedroom. She put him back to bed and sat on the edge of the bed, holding his hand. Moving his hand towards her sex, he asked her if what his uncle was doing was painful. She replied that it hurt a little but far less than what some policemen dressed in yellow had done to her, driving their tools into her anus. She removed his hand and suggested he should not touch her like that because it tickled. Ariadna



3.4.v.j.B. Chemical structure of androstadienone

then showed him a scar on the back of her neck and told him that it had hurt when they performed the operation, but now it did not bother her and wasn't itchy. Iridio's uncle came in and gave her a glass of water and a grey tablet. She persuaded Iridio to take it and went on reciting the numbers of π , from the sequence he indicated, which was the last thing he remembered before falling asleep. The next morning, he awoke in his own house. Penelope was functioning again. His mother was there, but not his father. He told her everything that had happened, and she replied that he had had a nightmare. He insisted that it was all true. His mother told him again that it was a bad dream and it would be better to forget all about it, because very soon his father would be back and everything would be all right. He became so distressed that Penelope had to recite factorisations of the numbers of the Fibonacci sequence: $F_0 = 0$; $F_1 = 1$; $F_2 = 1$; $F_3 = 2$; $F_4 = 3$; $F_5 = 5$; $F_6 = 8 = 2^3$; $F_7 = 13$; $F_8 = 21 = 3 \times 7$; $F_9 = 34 = 2 \times 17$; $F_{10} = 55 = 5 \times 11$; $F_{11} = 89$; $F_{12} = 144 = 2^4 \times 3^2$; $F_{13} = 233$; $F_{14} = 377 = 13 \times 29$; $F_{15} = 610 = 2 \times 5 \times 61$; $F_{16} = 987 = 3 \times 7 \times 47$; $F_{17} = 1,597$; $F_{18} = 2,584 = 2^3 \times 17 \times 19$; $F_{19} = 4,181 = 37 \times 113$; $F_{20} = 6,765 = 3 \times 5 \times 11 \times 41$; $F_{21} = 10,946 = 2 \times 13 \times 421$; $F_{22} = 17,711 = 89 \times 199$; $F_{23} = 28,657$; $F_{24} = 46,368 = 2^5 \times 3^2 \times 7 \times 23$; $F_{25} = 75,025 = 5^2 \times 3001$... Despite the horror, the image of Ariadna's budding breasts while his uncle penetrated her kept coming back again and again. What his childish eyes had read as pain was now clear: it was intense pleasure, the spasms of orgasm, perhaps involuntary, a survival reflex of the kind which confused the minds of rape victims. His desire, along with the fear that invaded him on seeing that image of Ariadna giving herself to her

uncle, was overpowering and linked to the two occasions when he was physically close to Ariadna during the trip to Brodei. But it finally made sense of the feeling of incest



transgression and the anguish that had overwhelmed him then. He tried to shift the lever towards another sector in order to tune out the lust that confused him and angered him at the same time. But he remained in a state of arousal, in spite of himself, because the device seemed to be stuck in that configuration. Try as he might, he could not move the lever. He was consumed by his wish to re-experience Clarisse's multiple orgasms and Fanny's suppressed groans of pleasure. His arousal only increased when he saw before him Julia's breasts during her orgasms when they practised different positions face to face, or the attractive body of Iris. Stunned by the blinding power of lust, he masturbated compulsively, in the attempt to draw closer to that part of himself that had lain hidden. He looked for something to wipe his hand with, thinking he had sperm on it. But his hand was dry and the semen which should have stained the floor and the cube was not there, although he had felt the pleasure spasms at what he thought was his climax. Perhaps that was what the Namoryaplokiyans had told him that they needed to calibrate. At last the lever moved on towards another configuration, but that too was much for him. He felt jealous of the other men who had slept with Julia and Iris. With all his being he hated his classmates who enjoyed Clarisse's and Fanny's sexual favours every time he rejected them – a strategy by which the young women had tried in vain to break through his indifference.

- 11) The lever had moved towards an area classified as defensive aggression. A terrible need for revenge led him to experience the murderous impulses he had felt towards the members of the morality and oztraditions police who had harassed him and tortured his father. He now wanted to kill them one by one, to torture them slowly to destruction to make them pay for the pain they had caused. He relived the impotence he felt when he woke at night and realised that his captors were raping Iris and imagined punishing them by cutting off their genitals so that they would bleed slowly to death. He also

$$\frac{dX(\tau)}{d\tau} = -aX(\tau)Z(\tau)$$

$$\frac{dZ(\tau)}{d\tau} = bX(\tau)Z(\tau) - cZ(\tau)$$

3.4.v.j.D. A conceptual model for the prediction of sexual intercourse in couples, taking into consideration discovered erotic potential associated with a single intercourse and sexual appetite

Group 12

P	200.59		80
e	1007.1	2.00	
r			+2
i			+1
o			-2
d			
6	Hg		
	Mercury		Liquid
	[Xe]4f ¹⁴ 5d ¹⁰ 6s ²		Post-transition
			Metal

d-block

3.4.v.k. Mercury entry in the Periodic Table of the Elements

wanted to kill the bodyguards who had interrupted his intercourse with Ariadna during the return flight to Ozeania, and probably abused her when they sedated him. Again, it took him a while to distance himself from his sexual desire for her, but he masturbated again, then started crying inconsolably, as he had in his uncle's workshop before Ariadna consoled him. It was the same kind of desperate need to cry that he experienced in Ariadna's room in Brodei. His tears, like the sperm which should have spilt on the floor, were only an internal sensation, because when he touched his cheeks, they were dry. He searched for any spilt semen, but there was none. Now that his body was made of metal and silicon, like a robot's, he thought his tears and his sperm would be made of liquid mercury. He laughed at his own fancy, pleased to have finally discovered irony in a practical way. But his mirth was short-lived because he could see how unfair his life in Ozeania had been. The tyranny of the authorities of his

country had become intolerable and he wished he could have joined the rebels of the International Ecological Brigades to free his fellow citizens and all other species on Earth. He pictured himself in the square of Bandar-Austro-Metropolis, throwing stones at the robocops and killer hounds, and strangling President Ward

Wright when he came to make him sign all those documents before handing him over to the extra-terrestrials. He thought that before leaving he should have beaten Tintorelli Turner III black and blue when he was within reach at the Widgeree cemetery, to avenge his father and his paternal grandparents.

He could no longer bear his conflicting feelings of needing revenge and being in thrall to his sexual desire. The torment was made worse by nausea and an ache in this chest. He could see nothing but power, envy, pride, resentment and hierarchy. He moved the lever towards the face of the cube in front of him. Feeling pity for normal human beings, he was glad to return to the peace of his natural configuration to recover.

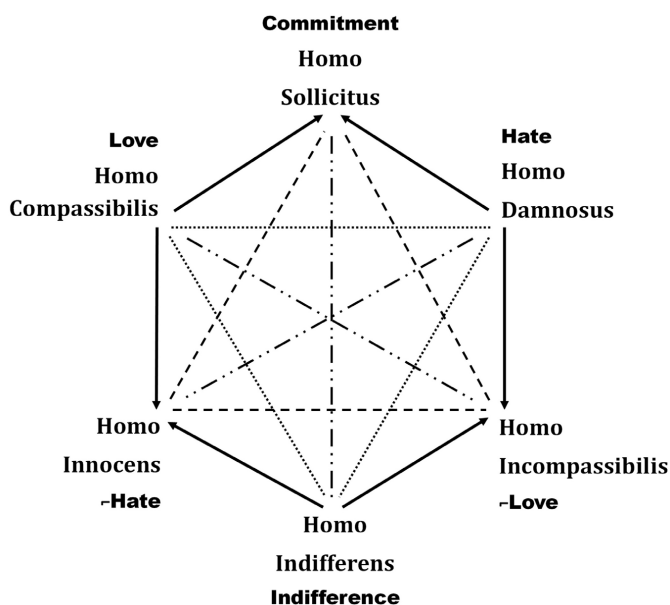
A set of strategies $u : I \rightarrow U$ in the form $u(i) = \bar{\gamma}(x(i), \theta(i))$ is an r -Kant-Nash equilibrium if for all possible combinations (x_i, θ_i) there is a solution $\tilde{u}_i : I \rightarrow U$ with $\tilde{u}_i(j) = \gamma_{x_i, \theta_i}(x(j))$ to the optimisation problem:

$$\underset{\gamma(\cdot, x_i, \theta_i)}{\text{minimise}} \bar{J}_i(\gamma, \bar{\gamma})$$

which satisfies $\gamma(x_i, x_i, \theta_i) = \bar{\gamma}(x_i, \theta_i)$

3.4.v.l. r -Kant-Nash equilibrium

Upon reflecting on the neurotypical cognitive perception of the world which he had never understood, he realised at last what politics was about. It consisted in putting egoism first and defending personal advantage, or that of the group one belonged to, above and beyond universalist ethics. That was what he had been

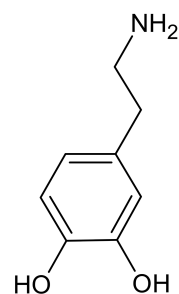


3.4.v.m. Gran-Krzywoszyńska and Leśniewski model of the compassionate individual

unable to grasp. Failing to imagine that others acted in their own interest while claiming higher motives or reinterpreting laws to suit them, he could not join them in their macabre dance of lies. It was so simple, so obvious, that he was ashamed not to have seen it before. The extra-terrestrials were right. Human intellect was used to rationalise and not to reason. He was ashamed of belong-

ing to the human species and wished he had said so to the interview panel at the interplanetary tribunal in ZxYXIy137C. But perhaps that was why they had allowed him access to those alternative configurations of his consciousness, so that he could clearly see the differences between his perception of the world and that of most of his fellow humans. He was also stunned to realise how he had placed himself first when imagining the punishment his captors and bodyguards in Brodei deserved. He hated them for having humiliated him, for what they had done to him, and not because they had acted unethically. That was the double who appeared in his dreams, the person he became when he dreamt, the doppelganger he had rejected all his life. He asked himself why he had not given deeper thought to any of that before. His obsession with his calculations was obviously one reason, but the other was of a different order: it was his way of perceiving the social world.

Seeing his own innate blindness towards other people's feelings hurt him terribly, but at the same time it set him free. He was not responsible for the way he had processed his interactions with other people all his life. His dreadful defects, from the point of view of his fellow humans, along with what most would see as childish innocence, had enabled him to be selected to visit those civilisations



3.4.v.n. Chemical structure of dopamine

so respectful of the diversity of life in the universe, and fulfil his dream of watching the last visible galaxy fade away in the black firmament.

The Namoryaplokiyans, who had appeared again in front of him, told him that they were very pleased be-

cause, although he had finally understood all the injustice he had suffered in his life, the mechanism had not jumped towards the configurations that could

$$\Gamma_{ab}(\omega) = \frac{1}{T\left(1 + \frac{i\omega}{\gamma_{ab}}\right)}$$

3.4.v.p. Damped wave equation for the axonal transfer function

potentially have been contaminated by Boltzmann brains. In normal susceptible human beings, joining their oppressors when they realised that they could not defeat them was a natural defence mechanism. Now he had only to undertake the last step and understand the person he detested in his dreams. For the last time he could re-experience the

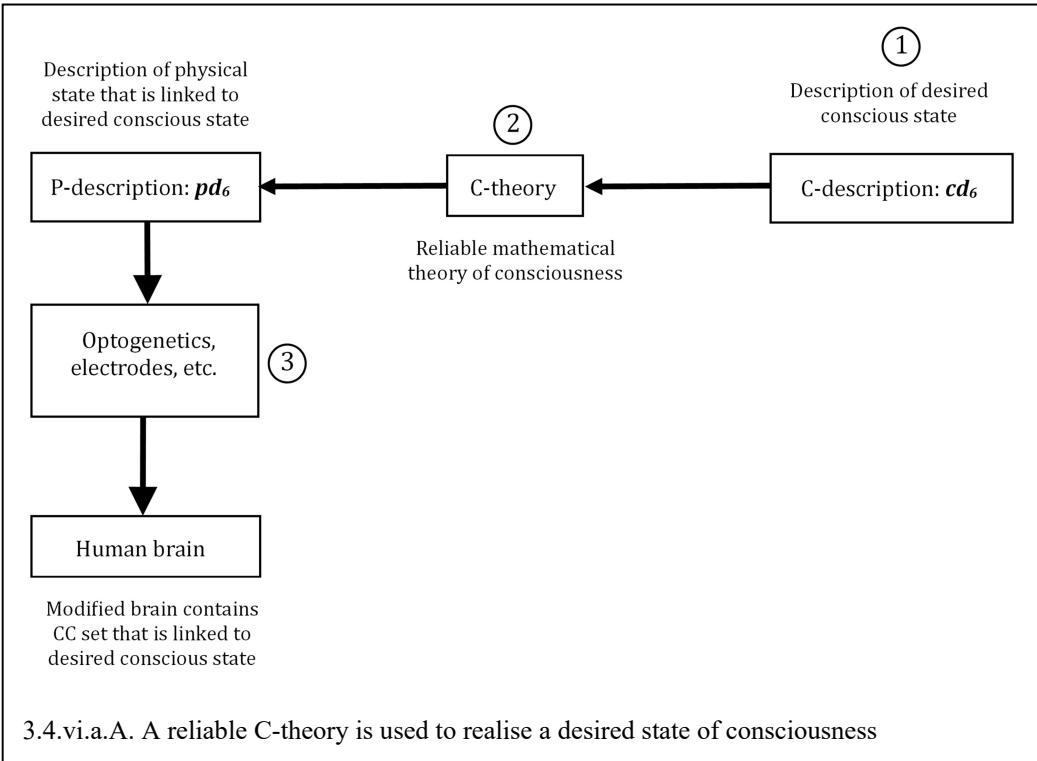
dream world that had caused him so much pain, so that they could refine his new cognitive configuration before the journey, using data obtained in the preceding stage. This was the last precautionary procedure, and the dream would not last very long.

Player i is a *homo moralis* if his or her utility function $u_\mu: X^n \rightarrow \mathbb{R}$ satisfies

$$u_\mu(x_i, x_{-i}) = \mathbb{E}[\pi(x_i, x_{-i})|x] \quad \forall x \in X^n$$

for some $\mu \in \Delta^n$. The vector μ is the player's morality profile.

3.4.v.o. Definition of homo moralis



The Namoryaplokiyans disappeared and the cube in front of him doubled in size. Inside and close to the neuroatypical beings was his grandfather Joseph, defending himself against some killer machines which were shooting at him from the area where beings susceptible to contamination were located. In the other cube, a mirror image of the first, was his grandmother Frida, also trapped in the area behind the neuroatypical beings. She was being attacked from the area of the hyper-contaminated beings by his grandmother Mildred and his uncle Jeremias, who at times seemed to be Klam O'Brien and Ariadna. They were in control of some drones like the ones he had seen at the cathedral, in the shape of exterminating angels, which were tearing his grandmother Frida to pieces. Unable to defend herself, she shouted curses at them with her dying breath. The cubes started to become deformed and the pattern became irregular but while he was losing consciousness again, his mind grasped that although they were no longer rectangular, the tessellation maintained the SPA_n configuration of the Coscio Farah numbers which his father liked so much.

A centred world is an ordered pair consisting of a possible world and a centre. A centre might be thought of as a perspective from which we are viewing a world. If c is something that exists in the world w , then $(w; c)$ is a centred possible world. But we are primarily interested in the case where the centre c is an observer-moment.

In much of our discussion an observer-moment will be an ordered pair consisting of an observer o and a time interval t during which o is an observer. But if one has to split an observer into parts, it might not be only temporal parts that are of interest to us. We might view a human observer as consisting of several different subpersonalities with different beliefs and desires. So we might consider each subpersonality as a separate observer-moment or consider observer-moments consisting of a subpersonality during a certain time-interval.

3.4.vi.a.B. Centred possible worlds, according to Shulman

He was now awake, alone, in an empty room that seemed like a prison cell, lit by a soft yellowish glow. He had lost his synaesthesia, and because the cube was no longer there he could not tell what type of mental configuration he had. But finally it became clear why he had so often been told that he was more important than he thought. The story of his family summed up the drama of his planet, and that was painful for him. Understanding it, with the new mental configuration he detested, only made it worse. It occurred to him again that his nomination as Earth's ambassador was almost certainly a strategy of the galactic civilisations to generate on Earth the contradictions that would expose contamination by Boltzmann brains,

which was prevalent in the leaders of the terrestrial institutions. By doing so they could speed up either the salvation or the self-destruction of humanity, before it expanded throughout the

galaxy. In some sense, he had been used for their purposes. He tried desperately to return to his original configuration because he did not want to think those thoughts, but he seemed to be anchored in a dull ache, like the one he had felt when he learnt of Julia's death and was barely able to do his job at the patent office. A disturbing recollection came to him. He was with Clarisse and Fanny and some other classmates. They had come to hear a lecture. They were seated in the back row of an amphitheatre full of people. An academic was presenting the speaker. Initially, he thought it was the guided visit to the National Observatory, planned by Marcus, which he had forgotten about, just as he had forgotten visiting Mildred's home. But the academic was PhDr Gaffney-Yang, the speaker was himself, already grown up, and the room was the aula magna of Yabbie Creek-W Multimodal Polytechnic University. The diagrams on the screen were the ones he had prepared so many times for the conference. He spotted an error. He had written Γ instead of Ω in the most important formula of his presentation. That memory was too much for him. He was consumed by dense and suffocating paranoia.

Could everything he had experienced since leaving Earth have been a simulation created by his grandmother Mildred, or his uncle, or the current Ozeanic authorities? Perhaps here had been no coup, and what he had experienced was

$$F_x(a) : F_y(b) \sim F_x(b) : F_y(a)$$

3.4.vi.c. Mosko's variant of Lévi-Strauss's canonical formula of myth

an emanation of his own mind, which had been converted into an artificial intelligence to produce the knowledge his captors needed. Perhaps the story of the

Boltzmann brains was an elaborate charade to distract him, a stratagem like Major Klamm O'Brien's when he pretended to arrest his uncle Jeremias in front of other Ozeanic police officers in the cathedral. He quickly calculated the probability that even one Boltzmann brain existed in the Hubble bubble of Multiverse-L in which the Milky Way was located. The chances were so infinitesimally slight that he feared that everything he had been through was a gigantic charade.

Let (X, μ) be a probability space and $T: X \rightarrow X$ be a measurable map such that for each measurable A , $\mu(T^{-1}A) = \mu(A)$. Then if $\mu(A) > 0$ and $k \in \mathbb{N}$, there exists some $n \in \mathbb{N}$ such that

$$\mu(A \cap T^{-n}A \cap T^{-2n}A \cap \dots \cap T^{-kn}A) > 0$$

3.4.vi.b. Furstenberg's multiple recurrence theorem

$$\frac{\mathcal{N}_j^{\text{BB}}}{\mathcal{N}_j^{\text{NO}}} \sim \Gamma_j^{\text{CB}} \left(\frac{T_s^{\text{NO}}}{T_s^{\text{BB}}} \right) \lesssim e^{-10^{40}}$$

3.4.vi.d. The stationary measure of the potential proliferation of Boltzmann brains

Perhaps they had deceived him and taken him to the scientific monastery in Asperger's Asteroid. His captors, being neuroatypical like him, understood

$$\Delta\mu_i = \mu_i^{(k+1)} - \mu_i^{(k)} \propto \frac{\hat{\pi}_{i-1}^{(k)}}{\pi_i^{(k)}} \delta_{i-1}^{(k)}$$

3.4.vi.e. The hierarchical gaussian filter

Could that be why his semen and tears were not real? If so, it was too late. They already had the deductive steps of the equations they needed. He in his supreme naiveté had voluntarily handed them over. The problem was that it was difficult to tell, from within a simulation, what was real and what was not.

Perhaps even those very clear memories they made him relive were a simulation, and the memory of Mildred's house was not real. He still could not understand how he could have forgotten that. He then realised that he had asked Mildred and Ariadna to recite to him the digits of π . This might seem reasonable

Given a rational, inferentially competent and autonomous being (i.e. with normal inferential faculties and not under the effects of drugs, hypnosis and so on), X , and a proposition, p , if X self-deceives himself about that p from time t to t' ($t < t'$), the following (generally) necessary and sufficient conditions are to be fulfilled:

(i) the rational assessment of the available evidence should lead X to conclude that *not*- p , and X knows or suspects the existence of this evidence.

(ii) X desires that p .

(iii) X does not infer that *not*- p from the evidence, because of the interference from his desire that p (inferential blindness).

(iv) X believes that p .

(v) X believes that p because X desires that p (this desire is the proximal cause of the belief).

(vi) X does not know that (v).

(vii) X 's belief about that p is a self-centred belief.

3.4.vi.f. The inferential blindness theory of self-deception, according to Montserrat Bordes Solanas

what would make him cooperate involuntarily and were manipulating him in an extravagant pantomime in which they dressed up as extra-terrestrials and told him tall stories about Boltzmann brains.

enough from the present, considering the importance of this number in his life, but it was a false memory, because he only discovered the beauty of π and e at high school. When he was five or six, Penelope put him to sleep by reciting the Fibonacci sequences. $F_0 = 0$; $F_1 = 1$; $F_2 = 1$; $F_3 = 2$; $F_4 = 3$; $F_5 = 5$; $F_6 = 8$; $F_7 = 13$; $F_8 = 21$; $F_9 = 34$; $F_{10} = 55$; $F_{11} = 89$; $F_{12} = 144$; $F_{13} = 233$; $F_{14} = 377$; $F_{15} = 610$; $F_{16} = 987$; $F_{17} = 1,597$; $F_{18} = 2,584$; $F_{19} = 4,181$; $F_{20} = 6,765$; $F_{21} = 10,946$; $F_{22} = 17,711$; $F_{23} = 28,657$; $F_{24} = 46,368$; $F_{25} = 75,025...$ An elaborate deception would also explain the impossible memory of witnessing himself delivering a lecture, although he could not imagine what the purpose of such a memory might be. Unless, contrary to his previous conjecture, there was another explanation: the extra-

terrestrials really did exist, and his journey to their planets was real. The Zuespoks had given him his master formula in that false memory of a lecture in one of his recurrent dreams, so as to have an excuse to initiate contact with Earth. This was, after all, the only dream which did not cause him pain, and which he could remember clearly. For a moment he thought that, in his new mental configuration, another possible explanation was that the world of dreams had blended with the real world. But in his vexation with himself he dismissed that possibility. At this point, he no longer cared what was real, he was ready to give his life in order to go on his journey and he would do whatever was necessary to overcome all doubt and discomfort.

If M is a compact metric space and $T_1, T_2, \dots, T_m$ are continuous maps of M to itself which commute, then M has a multiply recurrent point

3.4.vi.g. Multiple Birkhoff recurrence theorem

- (C1) If P denotes a point-like event, then a counterfactual $P \Box \rightarrow Q$ is true $\Leftrightarrow Q$ is true in all possible P -worlds that are exactly like the actual one in the entire region outside the forward light cone of the event P .
- (C2) If P denotes a point-like event, then a counterfactual $P \Box \rightarrow Q$ is true $\Leftrightarrow Q$ is true in all possible P -worlds that are exactly like the actual one in the entire region inside the backward light cone of the event P .

3.4.vi.h. Two relativistically invariant readings of counterfactuals

3, ., 1, 4, 1, 5, 9, 2, 6, 5, 3, 5, 8, 9, 7, 9, 3, 2, 3, 8, 4, 6, 2, 6, 4, 3, 3, 8, 3, 2, 7, 9, 5, 0, 2, 8, 8, 4, 1, 9, 7, 1, 6, 9, 3, 9, 9, 3, 7, 5, 1, 0, 5, 8, 2, 0, 9, 7, 4, 9, 4, 4, 5, 9, 2, 3, 0, 7, 8, 1, 6, 4, 0, 6, 2, 8, 6, 2, 0, 8, 9, 9, 8, 6, 2, 8, 0, 3, 4, 8, 2, 5, 3, 4, 2, 1, 1, 7, 0, 6, 7, 9, 8, 2, 1, 4, 8, 0, 8, 6, 5, 1, 3, 2, 8, 2, 3, 0, 6, 6, 4, 7, 0, 9, 3, 8, 4, 4, 6, 0, 9, 5, 5, 0, 5, 8, 2, 2, 3, 1, 7, 2, 5, 3, 5, 9, 4, 0, 8, 1, 2, 8, 4, 8, 1, 1, 1, 7, 4, 5, 0, 2, 8, 4, 1, 0, 2, 7, 0, 1, 9, 3, 8, 5, 2, 1, 1, 0, 5, 5, 5, 9, 6, 4, 4, 6, 2, 2, 9, 4, 8, 9, 5, 4, 9, 3, 0, 3, 8, 1, 9, 6, 4, 4, 2, 8, 8, 1, 0, 9, 7, 5, 6, 6, 5, 9, 3, 3, 4, 4, 6, 1, 2, 8, 4, 7, 5, 6, 4, 8, 2, 3, 3, 7, 8, 6, 7, 8, 3, 1, 6, 5, 2, 7, 1, 2, 0, 1, 9, 0, 9, 1, 4, 5, 6, 4, 8, 5, 6, 6, 9, 2, 3, 4, 6, 0, 3, 4, 8, 6, 1, 0, 4, 5, 4, 3, 2, 6, 6, 4, 8, 2, 1, 3, 3, 9, 3, 6, 0, 7, 2, 6, 0, 2, 4, 9, 1, 4, 1, 2, 7, 3, 7, 2, 4, 5, 8, 7, 0, 0, 6, 6, 0, 6, 3, 1, 5, 5, 8, 8, 1, 7, 4, 8, 8, 1, 5, 2, 0, 9, 2, 0, 9, 6, 2, 8, 2, 9, 2, 5, 4, 0, 9, 1, 7, 1, 5, 3, 6, 4, 3, 6, 7, 8, 9, 2, 5, 9, 0, 3, 6, 0, 0, 1, 1, 3, 3, 0, 5, 3, 0, 5, 4, 8, 8, 2, 0, 4, 6, 6, 5, 2, 1, 3, 8, 4, 1, 4, 6, 9, 5, 1, 9, 4, 1, 5, 1, 1, 6, 0, 9, 4, 3, 3, 0, 5, 7, 2, 7, 0, 3, 6, 5, 7, 5, 9, 5, 9, 1, 9, 5, 3, 0, 9, 2, 1, 8, 6, 1, 1, 7, 3, 8, 1, 9, 3, 2, 6, 1, 1, 7, 9, 3, 1, 0, 5, 1, 1, 8, 5, 4, 8, 0, 7, 4, 4, 6, 2, 3, 7, 9, 9, 6, 2, 7, 4, 9, 5, 6, 7, 3, 5, 1, 8, 8, 5, 7, 5, 2, 7, 2, 4, 8, 9, 1, 2, 2, 7, 9, 3, 8, 1, 8, 3, 0, 1, 1, 9, 4, 9, 1, 2, 9, 8, 3, 3, 6, 7, 3, 3, 6, 2, 4, 4, 0, 6, 5, 6, 6, 4, 3, 0, 8, 6, 0, 2, 1, 3, 9, 4, 9, 4, 6, 3, 9,

$$e^{i\frac{\pi}{4}} + \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}$$

$$e^{i\frac{\pi}{4}} - \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}i$$

$$\sum_{n=0}^{\infty} \frac{F_n}{n!} = \frac{e^{\phi} - e^{-\phi}}{\sqrt{5}}$$

5, 2, 2, 4, 7, 3, 7, 1, 9, 0, 7, 0, 2, 1, 7, 9, 8, 6, 0, 9, 4, 3, 7, 0, 2, 7, 7, 0, 5, 3, 9, 2, 1, 7, 1,
 7, 6, 2, 9, 3, 1, 7, 6, 7, 5, 2, 3, 8, 4, 6, 7, 4, 8, 1, 8, 4, 6, 7, 6, 6, 9, 4, 0, 5, 1, 3, 2, 0, 0, 0,
 5, 6, 8, 1, 2, 7, 1, 4, 5, 2, 6, 3, 5, 6, 0, 8, 2, 7, 7, 8, 5, 7, 7, 1, 3, 4, 2, 7, 5, 7, 7, 8, 9, 6, 0,
 9, 1, 7, 3, 6, 3, 7, 1, 7, 8, 7, 2, 1, 4, 6, 8, 4, 4, 0, 9, 0,
 1, 2, 2, 4, 9, 5, 3, 4, 3, 0, 1, 4, 6, 5, 4, 9, 5, 8, 5, 3, 7,
 1, 0, 5, 0, 7, 9, 2, 2, 7, 9, 6, 8, 9, 2, 5, 8, 9, 2, 3, 5, 4,
 2, 0, 1, 9, 9, 5, 6, 1, 1, 2, 1, 2, 9, 0, 2, 1, 9, 6, 0, 8, 6,
 4, 0, 3, 4, 4, 1, 8, 1, 5, 9, 8, 1, 3, 6, 2, 9, 7, 7, 4, 7, 7, 1, 3, 0, 9, 9, 6, 0, 5, 1, 8, 7, 0, 7, 2,
 1, 1, 3, 4, 9, 9, 9, 9, 9, 8, 3, 7, 2, 9, 7, 8, 0, 4, 9, 9, 5, 1, 0, 5, 9, 7, 3, 1, 7, 3, 2, 8, 1, 6,
 0, 9, 6, 3, 1, 8, 5, 9, 5, 0, 2, 4, 4, 5, 9, 4, 5, 5, 3, 4, 6, 9, 0, 8, 3, 0, 2, 6, 4, 2, 5, 2, 2, 3, 0,
 8, 2, 5...

$$\frac{\pi}{4} = \sum_{k=1}^{\infty} \arctan\left(\frac{1}{F_{2k+1}}\right)$$

The Namoryaplokiyans were again in front of him. They explained that he was exhausted and that it would be better if he calmed down before the journey.

They were well satisfied because, even in the unconscious configuration he experienced in his dreams, he was able to fend off all attempts at mental kidnapping by the Boltzmann

Almost all real numbers are normal. The set of non-normal real numbers is uncountable, but its Lebesgue measure as a subset of the real numbers is zero.

3.4.vii.a. Normal numbers theorem

brains. The Namoryaplokiyans asked him to take it easy and test, one last time, the device that showed the digits of e , and calculate whether it was a normal number when 10^{28} of its digits were tallied. Iridio lost his temper and told them

Every ostensive stimulus conveys a presumption of its own optimal relevance

3.4.vii.b. The Communicative Principle of Relevance

that, according to a theorem demonstrated by Borel in 1909, there were very few real numbers that were not normal, and they had to stop treating him like a babe in arms. They explained, very calmly, that they knew Borel's result but neither they themselves, nor any other

species in the galaxy, had managed to demonstrate that e and π were indeed normal. Perhaps these were undecidable propositions in all the mathematics of

Multiverse-L. They needed the information to know where to stop the journey through the cyclic wormholes. They also told him that there had been a small error in one of the deductive steps of his master formula and suggested that, when he had rested, it would be very helpful if he could try to correct it. Iridio

A\B	R	C	H	O
R	$\mathfrak{s}\mathfrak{d}_3$	$\mathfrak{s}\mathfrak{u}_3$	$\mathfrak{s}\mathfrak{p}_3$	$\mathfrak{f}_4$
C'	$\mathfrak{s}\mathfrak{l}_3(\mathbf{R})$	$\mathfrak{s}\mathfrak{l}_3(\mathbf{C})$	$\mathfrak{s}\mathfrak{l}_3(\mathbf{H})$	$\mathfrak{e}_{6(-26)}$
H'	$\mathfrak{s}\mathfrak{p}_6(\mathbf{R})$	$\mathfrak{s}\mathfrak{u}_{3,3}$	$\mathfrak{s}\mathfrak{d}_6^*(\mathbf{H})$	$\mathfrak{e}_{7(-25)}$
O'	$\mathfrak{f}_{4(4)}$	$\mathfrak{e}_{6(2)}$	$\mathfrak{e}_{7(-5)}$	$\mathfrak{e}_{8(-24)}$

3.4.vii.c. A non-symmetric version of the Freudenthal–Tits Magic Square obtained by combining the split algebras with the usual division algebras, according to Barton and Sudbery

flew into a rage and told them that he was not going to give them anything else. They reminded him of what the Argoterrands had told him so many times: he

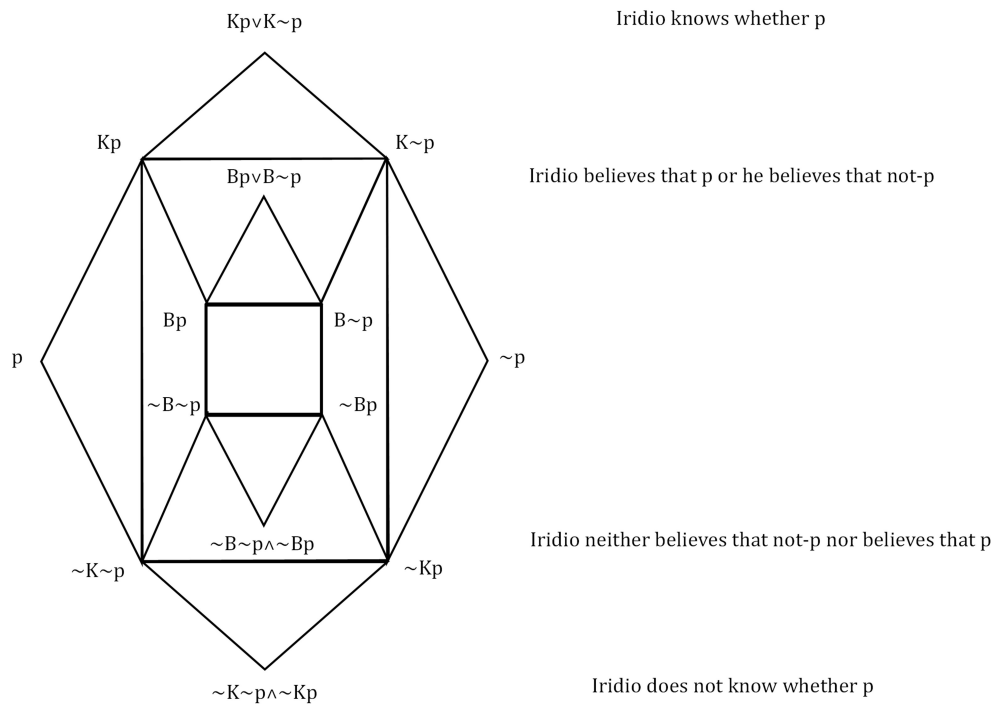
The Self-Sampling Assumption prescribes that you should assign a prior credence of p to the hypothesis that you are an observer with property P , given that the fraction of all observers in your reference class who have property P equals p :

$Cr(I \text{ have } P \mid \text{A fraction } p \text{ of all observers in my reference class have } P) = p$

3.4.vii.d. Prescription for the prior credence function

was far more important than he realised for the future of the human species, in particular, and that of the multiverse as a whole. However, there was an isomorphism between the nodes of the different modules of his cerebral connectome and the map of the wormholes in Multiverse-L, which would be very useful

when he sent the tachyons back to them at the end of his journey. He wanted to push them away, complaining that they had deceived him and were manipulating him; they had violated the three postulates of the categorical imperative, their deontic logic was perverted, and they had abused his trust, but his mind went blank. As consciousness ebbed away, he heard a woman's voice which sounded familiar, but he did not recognise it, saying: 'That is the $D-503/NvsNP/ER=EPR$ vulnerability. It has to be corrected before he's reactivated.'



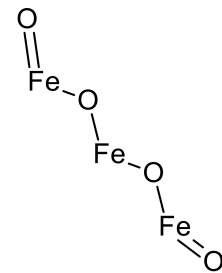
3.4.vii.e. The octagon of knowledge with the hexagon of belief combined

2, 9, 7, 4, 5, 5, 5, 7, 0, 6, 7, 4, 9, 8, 3, 8, 5, 0, 5, 4, 9, 4, 5, 8, 8, 5, 8, 6, 9, 2, 6, 9, 9, 5, 6,
 9, 0, 9, 2, 7, 2, 1, 0, 7, 9, 7, 5, 0, 9, 3, 0, 2, 9, 5, 5, 3, 2, 1, 1, 6, 5, 3, 4, 4, 9, 8, 7, 2, 0, 2,
 7, 5, 5, 9, 6, 0, 2, 3, 6, 4, 8, 0, 6, 6, 5, 4, 9, 9, 1, 1, 9, 8, 8, 1, 8, 3, 4, 7, 9, 7, 7, 5, 3, 5, 6,
 6, 3, 6, 9, 8, 0, 7, 4, 2, 6, 5, 4, 2, 5, 2, 7, 8, 6, 2, 5, 5, 1, 8, 1, 8,
 4, 1, 7, 5, 7, 4, 6, 7, 2, 8, 9, 0, 9, 7, 7, 7, 2, 7, 9, 3, 8, 0, 0, 0,
 8, 1, 6, 4, 7, 0, 6, 0, 0, 1, 6, 1, 4, 5, 2, 4, 9, 1, 9, 2, 1, 7, 3, 2, 1,
 7, 2, 1, 4, 7, 7, 2, 3, 5, 0, 1, 4, 1, 4, 4, 1, 9, 7, 3, 5, 6, 8, 5, 4, 8,
 1, 6, 1, 3, 6, 1, 1, 5, 7, 3, 5, 2, 5, 5, 2, 1, 3, 3, 4, 7, 5, 7, 4, 1, 8,
 4, 9, 4, 6, 8, 4, 3, 8, 5, 2, 3, 3, 2, 3, 9, 0, 7, 3, 9, 4, 1, 4, 3, 3, 3,
 4, 5, 4, 7, 7, 6, 2, 4, 1, 6, 8, 6, 2, 5, 1, 8, 9, 8, 3, 5, 6, 9, 4, 8, 5,
 5, 6, 2, 0, 9, 9, 2, 1, 9, 2, 2, 2, 1, 8, 4, 2, 7, 2, 5, 5, 0, 2, 5, 4, 2, 5, 6, 8, 8, 7, 6, 7, 1, 7, 9,
 0, 4, 9, 4, 6, 0, 1, 6, 5, 3, 4, 6, 6, 8, 0, 4, 9, 8, 8, 6, 2, 7, 2, 3, 2, 7, 9, 1, 7, 8, 6, 0, 8, 5, 7,
 8, 4, 3, 8, 3, 8, 2, 7, 9, 6, 7, 9, 7, 6, 6, 8, 1, 4, 5, 4, 1, 0, 0, 9, 5, 3, 8, 8, 3, 7, 8, 6, 3, 6, 0,
 9, 5, 0, 6, 8, 0, 0, 6, 4, 2, 2, 5, 1, 2,
 5, 2, 0, 5, 1, 1, 7, 3, 9, 2, 9, 8, 4, 8,
 9, 6, 0, 8, 4, 1, 2, 8, 4, 8, 8, 6, 2, 6,
 9, 4, 5, 6, 0, 4, 2, 4, 1, 9, 6, 5, 2, 8,
 5, 0, 2, 2, 2, 1, 0, 6, 6, 1, 1, 8, 6, 3,
 0, 6, 7, 4, 4, 2, 7, 8, 6, 2, 2, 0, 3, 9,
 1, 9, 4, 9, 4, 5, 0, 4, 7, 1, 2, 3, 7, 1, 3, 7, 8, 6, 9, 6, 0, 9, 5, 6, 3, 6, 4, 3, 7, 1, 9, 1, 7, 2, 8,
 7, 4, 6, 7, 7, 6, 4, 6, 5, 7, 5, 7, 3, 9, 6, 2, 4, 1, 3, 8, 9, 0, 8, 6, 5, 8, 3, 2, 6, 4, 5, 9, 9, 5, 8,
 1, 3, 3, 9, 0, 4, 7, 8, 0, 2, 7, 5, 9, 0, 0, 9, 9, 4, 6, 5, 7...

3.4.viii.a. $\{\emptyset, \emptyset\}$

$$\hat{H}_\perp \Psi = \frac{G e^{-3\alpha}}{24\pi r^3} \left[\hat{p} \cdot \hat{p} + \frac{l_0^4}{G^2} e^{4\alpha} V(\beta_\pm) \right] \Psi = 0$$

3.4.viii.b. The Wheeler–DeWitt equation for the diagonalised Bianchi IX models



3.4.viii.c. Chemical structure of magnetite

The launch into interstellar space of the definitive version of his derived body was performed from the dwarf galaxy of Sculptor, in the Milky Way, where the Zuespoks had an embassy. Despite the Namoryaplokiyans' suggestions that he no longer needed his genitals, he decided to keep them. He finally met the Eelsmolians. They seemed immense and lived in a 10-dimensional parallel universe with positive curvature, and he could only communicate with them through other extra-terrestrials, the Naujmalda-ceans, who represented them in Multiverse-L. They were worried about the equations of state which the bubbles that would detach from this multiverse in the distant future would inherit. They treated him very kindly, almost tenderly, and encased him in armour of magnetite, a material that would enable him to resist pressures of up to ten thousand atmospheres during the journey. They also used an alloy based on iridium, in honour of his name, to forge the casing.

Before leaving, the Namoryaplokiyans and Naujmaldeaceans made him swear yet again that that he was embarking of his own free will on this last journey of no return, where he would be able to explore thoroughly the contents of the encyclopedia they had connected to his mind. They assured him that the counter, which would record and specify the frequencies of billion and billions of

$$\theta_{t+1}^{(i,k)} = \omega^{(i,k)} + \theta_t^{(i,k)} + \frac{\alpha}{Np^c} \sum_{(j,l) \in G^{(i,k)}} \sin(\theta_t^{(j,l)} - \theta_t^{(i,k)} - \psi_{kl}^{ij}) + \sigma_\beta \beta_t^{(i,k)}$$

3.4.viii.d. Mathematical model for the differentiation of functions in cortical modules

digits of e and π during his journey, was functioning very well. They also told him that, given the point in space-time which he had chosen, he had to be prepared to abandon his hibernation in the million and fifty-fourth Feynman sequence, when the first four thousand digits of π duplicated themselves within e for the third time. By the end of that recurrence, his derived body and his memories would have been absorbed by antimatter.

...6, 4, 0, 7, 8, 9, 5, 1, 2, 6, 9, 4, 6, 8, 3, 9, 8, 3, 5, 2, 5, 9, 5, 7, 0, 9, 8, 2, 5, 8, 2, 2, 6, 2, 0, 5, 2, 2, 4, 8, 9, 4, 0, 7, 7, 2, 6, 7, 1, 9, 4, 7, 8, 2, 6, 8, 4, 8, 2, 6, 0, 1, 4, 7, 6, 9, 9, 0, 9, 0, 2, 6, 4, 0, 1, 3, 6, 3, 9, 4, 4, 3, 7, 4, 5, 5, 3, 0, 5, 0, 6, 8, 2, 0, 3, 4, 9, 6, 2, 5, 2, 4, 5, 1, 7, 4, 9, 3, 9, 9, 6, 5, 1, 4, 3, 1, 4, 2, 9, 8, 0, 9, 1, 9, 0, 6, 5, 9, 2, 5, 0, 9, 3, 7, 2, 2, 1, 6, 9, 6, 4, 6, 1, 5, 1, 5, 7, 0, 9, 8, 5, 8, 3, 8, 7, 4, 1, 0, 5, 9, 7, 8, 8, 5, 9, 5, 9, 7, 7, 2, 9, 7, 5, 4, 9, 8, 9, 3, 0, 1, 6, 1, 7, 5, 3, 9, 2, 8, 4, 6, 8, 1, 3, 8, 2, 6, 8, 6, 8, 3, 8, 6, 8, 9, 4, 2, 7, 7, 4, 1, 5, 5, 9, 9, 1, 8, 5, 5, 9, 2, 5, 2, 4, 5, 9, 5, 3, 9, 5, 9, 4, 3, 1, 0, 4, 9, 9, 7, 2, 5, 2, 4, 6, 8, 0, 8, 4, 5, 9, 8, 7, 2, 7, 3, 6, 4, 4, 6, 9, 5, 8, 4, 8, 6, 5, 3, 8, 3, 6, 7, 3, 6, 2, 2, 2, 6, 2, 6, 0, 9, 9, 1, 2, 4, 6, 0, 8, 0, 5, 1, 2, 4, 3, 8, 8, 4, 3, 9, 0, 4, 5, 1, 2, 4, 4, 1, 3, 6, 5, 4, 9, 7, 6, 2, 7, 8, 0, 7, 9, 7, 7, 1, 5, 6, 9, 1, 4, 3, 5, 9, 9, 7, 7, 0, 0, 1, 2, 9, 6, 1, 6, 0, 8, 9, 4, 4, 1, 6, 9, 4, 8, 6, 8, 5, 5, 5, 8, 4, 8, 4, 0, 6, 3, 5, 3, 4, 2, 2, 0, 7, 2, 2, 2, 5, 8, 2, 8, 4, 8, 8, 6, 4, 8, 1, 5, 8, 4, 5, 6, 0, 2, 8, 5, 0, 6, 0, 1, 6, 8, 4, 2, 7, 3, 9, 4, 5, 2, 2, 6, 7, 4, 6, 7, 6, 7, 8, 8, 9, 5, 2, 5, 2, 1, 3, 8, 5, 2, 2, 5, 4, 9, 9, 5, 4, 6, 6, 6, 7, 2, 7, 8, 2, 3, 9, 8, 6, 4, 5, 6, 5, 9, 6, 1, 1, 6, 3, 5, 4, 8, 8, 6, 2, 3, 0, 5, 7, 7, 4, 5, 6, 4, 9, 8, 0, 3, 5, 5, 9, 3, 6, 3, 4, 5, 6, 8, 1, 7, 4, 3, 2, 4, 1, 1, 2, 5, 1, 5, 0, 7, 6, 0, 6, 9, 4, 7, 9, 4, 5, 1, 0, 9, 6, 5, 9, 6, 0, 9, 4, 0, 2, 5, 2, 2, 8, 8, 7, 9, 7, 1, 0, 8, 9, 3, 1, 4, 5, 6, 6, 9, 1, 3, 6, 8, 6, 7, 2, 2, 8, 7, 4, 8, 9, 4, 0, 5, 6, 0, 1, 0, 1, 5, 0, 3, 3, 0, 8, 6, 1, 7, 9, 2, 8, 6, 8, 0, 9, 2, 0, 8, 7, 4, 7, 6, 0, 9, 1, 7, 8, 2, 4, 9, 3, 8, 5, 8, 9, 0, 0, 9, 7, 1, 4, 9, 0, 9, 6, 7, 5, 9, 8, 5, 2, 6, 1, 3, 6, 5, 5, 4, 9, 7, 8, 1, 8, 9, 3, 1, 2, 9, 7, 8, 4, 8, 2, 1, 6, 8, 2, 9, 9, 8, 9, 4, 8, 7, 2, 2, 6, 5, 8, 8, 0, 4, 8, 5, 7, 5, 6, 4, 0, 1, 4, 2, 7, 0, 4, 7, 7, 5, 5, 5, 1, 3, 2, 3, 7, 9, 6, 4, 1, 4, 5, 1, 5, 2, 3, 7, 4, 6, 2, 3, 4, 3, 6, 4, 5, 4, 2, 8, 5, 8, 4, 4, 4, 7, 9, 5, 2, 6, 5, 8, 6, 7, 8, 2, 1, 0, 5, 1, 1, 4, 1, 3, 5, 4, 7, 3, 5, 7, 3, 9, 5, 2, 3, 1, 1, 3, 4, 2, 7, 1, 6, 6, 1, 0, 2, 1, 3, 5, 9, 6, 9, 5, 3, 6, 2, 3, 1, 4, 4, 2, 9, 5, 2, 4, 8, 4, 9, 3, 7, 1, 8, 7, 1, 1, 0, 1, 4, 5, 7, 6, 5, 4, 0, 3, 5, 9, 0, 2, 7, 9, 9, 3, 4, 4, 0, 3, 7, 4, 2, 0, 0, 7, 3, 1, 0, 5, 7, 8, 5, 3, 9, 0, 6, 2, 1, 9, 8, 3, 8, 7, 4, 4, 7, 8, 0, 8, 4, 7, 8, 4, 8, 9, 6, 8, 3, 3, 2,

1, 4, 4, 5, 7, 1, 5, 1, 9, 4, 3, 5, 2, 1, 8, 4, 5, 3, 8, 4, 8, 1, 0, 0, 1, 4, 6, 8, 0, 6, 2, 7, 8, 1, 9, 1, 9, 9, 5, 2, 0, 6, 6, 3, 4, 2, 8, 7, 6, 4, 3, 7, 4, 5, 8, 1, 9, 2, 1, 7, 9, 1, 0, 1, 5, 9, 8, 1, 4, 6, 7, 5, 1, 2, 3, 9, 7, 4, 0, 7, 1, 8, 6, 4, 9, 6, 1, 5, 6, 7, 8, 0, 9, 5, 1, 4, 2, 5, 2, 3, 1, 6, 9, 3, 0, 1, 4, 2, 2, 1, 3, 7, 8, 5, 3, 8, 9, 3, 7, 7, 0, 3, 9, 0, 6, 9, 7, 3, 4, 6, 7, 2, 6, 2, 5, 9, 9, 6, 4, 2, 1, 5, 0, 3, 8, 4, 4, 7, 7, 3, 0, 2, 6, 0, 5, 4, 9, 2, 5, 2, 0, 1, 2, 8, 5, 0, 7, 3, 6, 6, 0, 0, 2, 1, 0, 8, 8, 1, 9, 0, 6, 3, 3, 1, 7, 3, 5, 1, 4, 5, 3, 9, 2, 6, 8, 5, 6, 1, 8, 1, 0, 6, 6, 5, 9, 8, 1, 6, 3, 5, 3, 8, 4, 0, 5, 2, 9, 1, 0, 2, 8, 9, 4, 0, 1, 1, 0, 9, 2, 8, 0, 4, 3, 9, 9, 5, 1, 5, 6, 7,	Rupture of Order and Alienation	Reintegration and Restitution of Order	Main Test	Qualification	Request	3, 8, 6, 8, 7, 0, 6, 4, 3, 0, 1, 9, 1, 0, 4, 5, 3, 7, 0, 6, 7, 4, 9, 1, 9, 1, 9, 7, 9, 3, 1, 4, 1, 9, 6, 5, 4, 4, 4, 0, 1, 2, 3, 7, 1, 9, 9, 9, 8, 3, 1, 9, 5, 6, 1, 1, 4, 2, 6, 9, 8, 9, 4, 0, 9, 9, 4, 2, 3, 1, 9, 4, 5, 2, 0, 6, 5, 5, 0, 2, 0, 3, 8, 8, 1, 0, 9, 3, 7, 6, 5, 9, 5, 6, 6, 8, 7, 0, 8, 3, 7, 9, 2, 0, 7, 2, 1, 8, 2, 5, 6, 1, 5, 0, 1, 0, 6, 8, 0, 3, 4, 5, 4, 9, 2, 1, 4, 6, 6, 5, 4, 9, 7, 4, 4, 2, 5, 1, 8, 6, 3, 2, 4, 3, 4, 7, 1, 0, 4, 8, 4, 6, 4, 9, 6, 0, 5, 7, 9, 6, 0, 0, 5, 5, 0, 8, 7, 9, 6, 9, 7, 4, 7, 3, 6, 5, 7, 1, 4, 5, 7, 0, 6, 4, 1, 7, 1, 2, 0, 6, 0, 3, 9, 7, 5, 7, 1, 5, 7, 7,	3.4.viii.e. A reduced inventory of Propp's functions of narrative, according to Greimas

$$\overline{p}A\overline{C}_1\overline{C}_2\overline{C}_3pA_1\overline{p}_1(A_2 + F_2 + non\ c_2)\ d\ \overline{non\ p}_1(F_1 + c_1 + non\ c_3)\ non\ p_1dF_1p_1(A_3 + F_3 + non\ c_1)\ C_2C_3A\ (non\ c_3)$$

A = contract (mandate vs. acceptance)

F = contest (*confrontation* vs. *victory*)

C = communication (sending vs. reception)

p = presence

d = rapid displacement

0, 0, 4, 2, 0, 3, 3, 7, 8, 6, 9, 9, 3, 6, 0, 0, 7, 2, 3, 0, 5, 5, 8, 7, 6, 3, 1, 7, 6, 3, 5, 9, 4, 2, 1,
 8, 7, 3, 1, 2, 5, 1, 4, 7, 1, 2, 0, 5, 3, 2, 9, 2, 8, 1, 9, 1, 8, 2, 6, 1, 8, 6, 1, 2, 5, 8, 6, 7, 3, 2,
 1, 5, 7, 9, 1, 9, 8, 4, 1, 4, 8, 4, 8, 8, 2, 9, 1, 6, 4, 4, 7, 0, 6, 0, 9, 5, 7, 5, 2, 7, 0, 6, 9, 5, 7,
 2, 2, 0, 9, 1, 7, 5, 6, 7, 1, 1, 6, 7, 2, 2, 9, 1, 0, 9, 8, 1, 6, 9, 0, 9, 1, 5, 2, 8, 0, 1, 7, 3, 5, 0,
 6, 7, 1, 2, 7, 4, 8, 5, 8, 3, 2, 2, 2, 8, 7, 1, 8, 3, 5, 2, 0, 9, 3, 5, 3, 9, 6, 5, 7, 2, 5, 1, 2, 1, 0,
 8, 3, 5, 7, 9, 1, 5, 1, 3, 6, 9, 8, 8, 2, 0, 9, 1, 4, 4, 4, 2, 1, 0, 0, 6, 7, 5, 1, 0, 3, 3, 4, 6, 7, 1,
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3.5. e.

It will seem a little paradoxical to ascribe great importance to observations even in that part of the mathematical sciences which is usually called Pure Mathematics, since the current opinion is that observations are restricted to physical objects that make an impression on the senses. As we must refer the numbers to the pure intellect alone, we can hardly understand how observations and quasi-experiments can be of use in investigating the nature of numbers. Yet, in fact, as I shall show here with very good reasons, the properties of the numbers known today have been mostly discovered by observation, and discovered long before their truth has been confirmed by rigid demonstrations. There are many properties of the numbers with which we are well acquainted, but which we are not yet able to prove; only observations have led us to their knowledge. Hence, we see that in the theory of numbers, which is still very imperfect, we can place our highest hopes in observations; they will lead us continually to new properties which we shall endeavour to prove afterwards. The kind of knowledge which is supported only by observations and is not yet proved must be carefully distinguished from the truth; it is gained by induction, as we usually say. Yet we have seen cases in which mere induction led to error. Therefore, we should take great care not to accept as true such properties of the numbers which we have discovered by observation and which are supported by induction alone. Indeed, we should use such discovery as an opportunity to investigate more exactly the properties discovered and to prove or disprove them; in both cases we may learn something useful.

Leonhard Euler

2, ., 7, 1, 8, 2, 8, 1, 8, 2, 8, 4, 5, 9, 0, 4, 5, 2, 3, 5, 3, 6, 0, 2, 8, 7, 4, 7, 1, 3, 5, 2, 6, 6, 2,
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$$e^{ix} = \cos(x) + i \sin(x)$$

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 6, 4, 5, 8, 4, 5, 9, 2, 5, 1, 2, 6, 9, 9, 4, 6, 5, 5, 7, 2, 4, 8, 3, 9, 1, 8, 6, 5, 6, 4, 2, 0, 9, 7, 5,
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 8, 5, 3, 6, 2, 7, 3, 0, 9, 4, 1, 7, 1, 0, 1, 6, 3, 4, 3, 4, 9, 0, 7, 6, 9,
 6, 4, 2, 3, 7, 2, 2, 2, 9, 4, 3, 5, 2, 3, 6, 6, 1, 2, 5, 5, 7, 2, 5, 0, 8,
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 6, 0, 9, 0, 6, 6, 5, 1, 8, 0, 3, 5, 1, 6, 5, 0, 1, 7, 9, 2, 5, 0, 4, 6, 1, 9, 5, 0, 1, 3, 6, 6, 5, 8, 5,
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 5, 2, 7, 5, 8, 3, 3, 3, 3, 7, 9, 3, 9, 9, 0, 7, 5, 2, 1, 6, 6, 0, 6, 9, 2, 3, 8, 0, 5, 3, 3, 6, 9, 8, 8,
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$$\ln e = \int_1^e \frac{dt}{t}$$

8, 7, 9, 0, 6, 7, 6, 5, 0, 3, 7, 9, 5, 9, 0, 3, 6, 6, 9, 6, 7, 2, 4, 9, 4, 9, 9, 2, 5, 4, 5, 2, 7, 9, 0,
 3, 3, 7, 2, 9, 6, 3, 6, 1, 6, 2, 6, 5, 8, 9, 7, 6, 0, 3, 9, 4, 9, 8, 5, 7, 6, 7, 4, 1, 3, 9, 7, 3, 5, 9,
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 1, 5, 1, 5, 9, 1, 5, 6, 8, 3, 7, 2, 5, 2, 4, 1, 6, 3, 0, 7, 7, 2, 2, 5, 4, 4, $\frac{d}{dx}e^x = e^x$
 0, 6, 3, 3, 7, 8, 7, 5, 9, 3, 1, 0, 5, 9, 8, 2, 6, 7, 6, 0, 9, 4, 4, 2, 0, 3,
 2, 6, 1, 9, 2, 4, 2, 8, 5, 3, 1, 7, 0, 1, 8, 7, 8, 1, 7, 7, 2, 9, 6, 0, 2, 3,
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 0, 5, 3, 3, 1, 6, 0, 8, 7, 7, 8, 3, 1, 4, 3, 1, 7, 4, 4, 4, 0, 8, 1, 1, 9, 4, 9, 4, 2, 2, 9, 7, 5, 5, 9,
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 9, 2, 1, 2, 7, 5, 6, 0, 8, 4, 4, 1, 4, 7, 3, 7, 8, 2, 3, 3, 0, 3, 2, 7, 0, 3, 3, 0, 1, 6, 8, 2, 3, 7, 1,
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 8, 7, 2, 1, 6, 7, 3, 3, 6, 7, 0, 1, 0, 6, 1, 5, 0, 9, 4, 2, 4, 3, 4, 5, 6, 9, 8, 4, 4, 0, 1, 8, 7, 3, 3,
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 0, 0, 5, 3, 1, 1, 4, 8, 3, 3, 5, 1, 3, 2, 3, 8, 5, 0, 0, 4, 7, 8, 2, 7, 1, 6, 9, 3, 7, 6, 2, 1, 8, 0, 0,
 4, 9, 0, 4, 7, 9, 5, 5, 9, 7, 9, 5, 9, 2, 9, 0, 5, 9, 1, 6, 5, 5, 4, 7, 0, 5, 0, 5, 7, 7, 7, 5, 1, 4, 3,
 0, 8, 1, 7, 5, 1, 1, 2, 6, 9, 8, 9, 8, 5, 1, 8, 8, 4, 0, 8, 7, 1, 8,
 5, 6, 4, 0, 2, 6, 0, 3, 5, 3, 0, 5, 5, 8, 3, 7, 3, 7, 8, 3, 2, 4, 2, $\int e^x dx = e^x + C$
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 5, 5, 9, 8, 0, 2, 7, 4, 0, 1, 2, 6, 1, 7, 9, 7, 1, 9, 2, 8, 0, 4, 7, 1, 3, 9, 6, 0, 0, 6, 8, 9, 1, 6, 3,
 8, 2, 8, 6, 6, 5, 2, 7, 7, 0, 0, 9, 7, 5, 2, 7, 6, 7, 0, 6, 9, 7, 7, 7, 0, 3, 6, 4, 3, 9, 2, 6, 0, 2, 2,
 4, 3, 7, 2, 8, 4, 1, 8, 4, 0, 8, 8, 3, 2, 5, 1, 8, 4, 8, 7, 7, 0, 4, 7, 2, 6, 3, 8, 4, 4, 0, 3, 7, 9, 5,
 3, 0, 1, 6, 6, 9, 0, 5, 4, 6, 5, 9, 3, 7, 4, 6, 1, 6, 1, 9, 3, 2, 3, 8, 4, 0, 3, 6, 3, 8, 9, 3, 1, 3, 1,
 3, 6, 4, 3, 2, 7, 1, 3, 7, 6, 8, 8, 8, 4, 1, 0, 2, 6, 8, 1, 1, 2, 1, 9, 8, 9, 1, 2, 7, 5, 2, 2, 3, 0, 5,
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 7, 5, 3, 0, 3, 4, 6, 6, 0, 6, 1, 6, 6, 6, 9, 8, 0, 4, 2, 1, 8, 2, 6, 7, 7, 2, 4, 5, 6, 0, 5, 3, 0, 6, 6,
 0, 7, 7, 3, 8, 9, 9, 6, 2, 4, 2, 1, 8, 3, 4, 0, 8, 5, 9, 8, 8, 2, 0, 7, 1, 8, 6, 4, 6, 8, 2, 6, 2, 3, 2,

1, 5, 0, 8, 0, 2, 8, 8, 2, 8, 6, 3, 5, 9, 7, 4, 6, 8, 3, 9, 6, 5, 4, 3, 5, 8, 8, 5, 6, 6, 8, 5, 5, 0, 3,
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 9, 9, 5, 0, 6, 5, 9, 7, 1, 5, 3, 4, 4, 7, 6, 3, 4, 7, 0, 3, 2, 0, 8, 5, 3, 2, 1, 5, 6, 0, 3, 6, 7, 4, 8,
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 6, 3, 4, 6, 4, 3, 7, 1, 6, 7, 0, 9, 3, 9, 7, 1, 9, 3, 0, 6, 0, 8, 7, 6, 9, 6, 3, 4, 9, 5, 3, 2, 8, 8, 4,
 6, 8, 3, 3, 6, 1, 3, 0, 3, 8, 8, 2, 9, 4, 3, 1, 0, 4, 0, 8, 0, 0, 2, 9, 6, 8, 7, 3, 8, 6, 9, 1, 1, 7, 0,
 6, 6, 6, 6, 6, 1, 4, 6, 8, 0, 0, 0, 1, 5, 1, 2, 1, 1, 4, 3, 4, 4, 2, 2, 5, 6, 0, 2, 3, 8, 7, 4, 4, 7, 4,
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 1, 2, 5, 8, 8, 4, 3, 6, 0, 8, 7, 1, 5,

$$8, 3, 4, 8, 3, 5, 6, 2, 6, 9, 6, 1, 6, \quad i^i = (e^{i\pi/2})^i = e^{i^2\pi/2} = e^{-\pi/2} = 0.207879 \dots$$

6, 1, 9, 8, 0, 5, 7, 2, 5, 2, 6, 6, 1,

2, 2, 0, 6, 7, 9, 7, 5, 4, 0, 6, 2, 1, 0, 6, 2, 0, 8, 0, 6, 4, 9, 8, 8, 2, 9, 1, 8, 4, 5, 4, 3, 9, 5, 3,
 0, 1, 5, 2, 9, 9, 8, 2, 0, 9, 2, 5, 0, 3, 0, 0, 5, 4, 9, 8, 2, 5, 7, 0, 4, 3, 3, 9, 0, 5, 5, 3, 5, 7, 0,
 1, 6, 8, 6, 5, 3, 1, 2, 0, 5, 2, 6, 4, 9, 5, 6, 1, 4, 8, 5, 7, 2, 4, 9, 2, 5, 7, 3, 8, 6, 2, 0, 6, 9, 1,
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 9, 5, 2, 1, 0, 8, 4, 5, 8, 4, 0, 7, 2, 4, 4, 3, 2, 3, 8, 3, 5, 5, 8, 6, 0, 6, 3, 1, 0, 6, 8, 0, 6, 9, 6,
 4, 9, 2, 4, 8, 5, 1, 2, 3, 2, 6, 3, 2, 6, 9, 9, 5, 1, 4, 6, 0, 3, 5, 9, 6, 0, 3, 7, 2, 9, 7, 2, 5, 3, 1,
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 6, 0, 5, 6, 6, 4, 9, 1, 3, 5, 2, 5, 2, 6, 7, 0, 6, 0, 4, 6, 2, 3, 4, 4, 5, 0, 5, 4, 9, 2, 2, 7, 5, 8, 1,
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 6, 8, 3, 7, 0, 3, 7, 3, 0, 2, 2, 0, 0, 4, 7, 5, 3, 1, 4, 3, 3, 8, 1, 8, 1, 0, 9, 2, 7, 0, 8, 0, 3, 0, 0,
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 4, 4, 1, 1, 5, 5, 1, 2, 1, 9, 2, 0, 1, 1, 7, 1, 6, 4, 8, 8, 0, 5, 6,

$$6, 9, 4, 5, 9, 3, 8, 1, 3, 1, 1, 8, 3, 8, 4, 3, 7, 6, 5, 6, 2, 0, 6, \quad \int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

2, 7, 8, 4, 6, 3, 1, 0, 4, 9, 0, 3, 4, 6, 2, 9, 3, 9, 5, 0, 0, 2, 9,

4, 5, 8, 3, 4, 1, 1, 6, 4, 8, 2, 4, 1, 1, 4, 9, 6, 9, 7, 5, 8, 3, 2,
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 4, 6, 4, 8, 9, 8, 0, 5, 1, 8, 0, 0, 9, 2, 0, 2, 4, 7, 1, 9, 3, 9, 1, 7, 1, 0, 5, 5, 5, 3, 9, 0, 1, 1, 3,
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 7, 1, 6, 4, 4, 6, 6, 2, 3, 7, 0, 9, 2, 2, 6, 4, 6, 8, 0, 9, 6, 7, 1, 2, 5, 4, 0, 6, 1, 8, 6, 9, 5, 0, 2,

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 1, 1, 1, 2, 6, 8, 1, 1, 5, 3, 1, 0, 8, 3, 8, 7, 3, 1, 7, 6, 1, 7, 3, 2, 3, 2, 3, 5, 2, 6, 3, 6, 0, 5, 8,
 3, 8, 1, 7, 3, 1, 5, 1, 0, 3, 4, 5, 9, 5, 7, 3, 6, 5, 3, 8, 2, 2, 3, 5, 3, 4, 9, 9, 2, 9, 3, 5, 8, 2, 2,
 8, 3, 6, 8, 5, 1, 0, 0, 7, 8, 1, 0, 8, 8, 4, 6, 3, 4, 3, 4, 9, 9, 8, 3, 5, 1, 8, 4, 0, 4, 4, 5, 1, 7, 0,
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 8, 8, 2, 8, 7, 5, 2, 1, 5, 6, 6, 8, 5, 7, 1, 9, 5, 0, 6, 3, 7, 1, 9, 3, 6, 5, 6, 5, 3, 9, 0, 3, 8, 9, 4,
 4, 9, 3, 6, 6, 4, 2, 1, 7, 6, 4, 0, 0, 3, 1, 2, 1, 5, 2, 7, 8, 7, 0, 2, 2,
 2, 3, 6, 6, 4, 6, 3, 6, 3, 5, 7, 5, 5, 5, 0, 3, 5, 6, 5, 5, 7, 6, 9, 4, 8, $\max(x^{1/x}) = e$
 8, 8, 6, 5, 4, 9, 5, 0, 0, 2, 7, 0, 8, 5, 3, 9, 2, 3, 6, 1, 7, 1, 0, 5, 5,
 0, 2, 1, 3, 1, 1, 4, 7, 4, 1, 3, 7, 4, 4, 1, 0, 6, 1, 3, 4, 4, 4, 5, 5, 4, 4, 1, 9, 2, 1, 0, 1, 3, 3, 6,
 1, 7, 2, 9, 9, 6, 2, 8, 5, 6, 9, 4, 8, 9, 9, 1, 9, 3, 3, 6, 9, 1, 8, 4, 7, 2, 9, 4, 7, 8, 5, 8, 0, 7, 2,
 9, 1, 5, 6, 0, 8, 8, 5, 1, 0, 3, 9, 6, 7, 8, 1, 9, 5, 9, 4, 2, 9, 8, 3, 3, 1, 8, 6, 4, 8, 0, 7, 5, 6, 0,
 8, 3, 6, 7, 9, 5, 5, 1, 4, 9, 6, 6, 3, 6, 4, 4, 8, 9, 6, 5, 5, 9, 2, 9, 4, 8, 1, 8, 7, 8, 5, 1, 7, 8, 4,
 0, 3, 8, 7, 7, 3, 3, 2, 6, 2, 4, 7, 0, 5, 1, 9, 4, 5, 0, 5, 0, 4, 1, 9, 8, 4, 7, 7, 4, 2, 0, 1, 4, 1, 8,
 3, 9, 4, 7, 7, 3, 1, 2, 0, 2, 8, 1, 5, 8, 8, 6, 8, 4, 5, 7, 0, 7, 2, 9, 0, 5, 4, 4, 0, 5, 7, 5, 1, 0, 6,
 0, 1, 2, 8, 5, 2, 5, 8, 0, 5, 6, 5, 9, 4, 7, 0, 3, 0, 4, 6, 8, 3, 6, 3, 4, 4, 5, 9, 2, 6, 5, 2, 5, 5, 2,
 1, 3, 7, 0, 0, 8, 0, 6, 8, 7, 5, 2, 0, 0, 9, 5, 9, 3, 4, 5, 3, 6, 0, 7, 3, 1, 6, 2, 2, 6, 1, 1, 8, 7, 2,
 8, 1, 7, 3, 9, 2, 8, 0, 7, 4, 6, 2, 3, 0, 9, 4, 6, 8, 5, 3, 6, 7, 8, 2, 3, 1, 0, 6, 0, 9, 7, 9, 2, 1, 5,
 9, 9, 3, 6, 0, 0, 1, 9, 9, 4, 6, 2, 3, 7, 9, 9, 3, 4, 3, 4, 2, 1, 0, 6, 8, 7, 8, 1, 3, 4, 9, 7, 3, 4, 6,
 9, 5, 9, 2, 4, 6, 4, 6, 9, 7, 5, 2, 5, 0, 6, 2, 4, 6, 9, 5, 8, 6, 1, 6, 9, 0, 9, 1, 7, 8, 5, 7, 3, 9, 7,
 6, 5, 9, 5, 1, 9, 9, 3, 9, 2, 9, 9, 3, 9, 9, 5, 5, 6, 7, 5, 4, 2, 7, 1, 4, 6, 5, 4, 9, 1, 0, 4, 5, 6, 8,
 6, 0, 7, 0, 2, 0, 9, 9, 0, 1, 2, 6, 0, 6, 8, 1, 8, 7, 0, 4, 9, 8, 4, 1, 7, 8, 0, 7, 9, 1, 7, 3, 9, 2, 4,
 0, 7, 1, 9, 4, 5, 9, 9, 6, 3, 2, 3, 0, 6, 0, 2, 5, 4, 7, 0, 7, 9, 0, 1, 7, 7, 4, 5, 2, 7, 5, 1, 3, 1, 8,
 6, 8, 0, 9, 9, 8, 2, 2, 8, 4, 7, 3, 0, 8, 6, 0, 7, 6, 6, 5, 3, 6, 8, 6, 6, 8, 5, 5, 5, 1, 6, 4, 6, 7, 7,
 0, 2, 9, 1, 1, 3, 3, 6, 8, 2, 7, 5, 6, 3, 1, 0, 7, 2, 2, 3, 3, 4, 6, 7, 2, 6, 1, 1, 3, 7, 0, 5, 4, 9, 0,
 7, 9, 5, 3, 6, 5, 8, 3, 4, 5, 3, 8, 6, 3, 7, 1, 9, 6, 2, 3, 5, 8, 5, 6, 3, 1, 2, 6, 1, 8, 3, 8, 7, 1, 5,
 6, 7, 7, 4, 1, 1, 8, 7, 3, 8, 5, 2, 7, 7, 2, 2, 9, 2, 2, 5, 9, 4, 7,
 4, 3, 3, 7, 3, 7, 8, 5, 6, 9, 5, 5, 3, 8, 4, 5, 6, 2, 4, 6, 8, 0, 1,
 0, 1, 3, 9, 0, 5, 7, 2, 7, 8, 7, 1, 0, 1, 6, 5, 1, 2, 9, 6, 6, 6, 3,
 6, 7, 6, 4, 4, 5, 1, 8, 7, 2, 4, 6, 5, 6, 5, 3, 7, 3, 0, 4, 0, 2, 4,
 4, 3, 6, 8, 4, 1, 4, 0, 8, 1, 4, 4, 8, 8, 7, 3, 2, 9, 5, 7, 8, 4, 7, 3, 4, 8, 4, 9, 0, 0, 0, 3, 0, 1, 9,
 4, 7, 7, 8, 8, 8, 0, 2, 0, 4, 6, 0, 3, 2, 4, 6, 6, 0, 8, 4, 2, 8, 7, 5, 3, 5, 1, 8, 4, 8, 3, 6, 4, 9, 5,
 9, 1, 9, 5, 0, 8, 2, 8, 8, 8, 3, 2, 3, 2, 0, 6, 5, 2, 2, 1, 2, 8, 1, 0, 4, 1, 9, 0, 4, 4, 8, 0, 4, 7, 2,
 4, 7, 9, 4, 9, 2, 9, 1, 3, 4, 2, 2, 8, 4, 9, 5, 1, 9, 7, 0, 0, 2, 2, 6, 0, 1, 3, 1, 0, 4, 3, 0, 0, 6, 2,
 4, 1, 0, 7, 1, 7, 9, 7, 1, 5, 0, 2, 7, 9, 3, 4, 3, 3, 2, 6, 3, 4, 0, 7, 9, 9, 5, 9, 6, 0, 5, 3, 1, 4, 4,
 6, 0, 5, 3, 2, 3, 0, 4, 8, 8, 5, 2, 8, 9, 7, 2, 9, 1, 7, 6, 5, 9, 8, 7, 6, 0, 1, 6, 6, 6, 7, 8, 1, 1, 9,
 3, 7, 9, 3, 2, 3, 7, 2, 4, 5, 3, 8, 5, 7, 2, 0, 9, 6, 0, 7, 5, 8, 2, 2, 7, 7, 1, 7, 8, 4, 8, 3, 3, 6, 1,
 6, 1, 3, 5, 8, 2, 6, 1, 2, 8, 9, 6, 2, 2, 6, 1, 1, 8, 1, 2, 9, 4, 5, 5, 9, 2, 7, 4, 6, 2, 7, 6, 7, 1, 3,

$$\sum_{n=0}^{\infty} \frac{F_n}{n!} = \frac{e^{\Phi} - e^{-\varphi}}{\sqrt{5}}$$

2, 8, 5, 4, 8, 7, 4, 3, 7, 4, 3, 5, 5, 7, 8, 1, 9, 6, 6, 5, 1, 1, 7, 1, 6, 6, 1, 8, 3, 3, 0, 8, 8, 1, 1,
 2, 9, 1, 2, 0, 2, 4, 5, 2, 0, 4, 0, 4, 8, 6, 8, 2, 2, 0, 0, 0, 7, 2, 3, 4, 4, 0, 3, 5, 0, 2, 5, 4, 4, 8,
 2, 0, 2, 8, 3, 4, 2, 5, 4, 1, 8, 7, 8, 8, 4, 6, 5, 3, 6, 0, 2, 5, 9, 1, 5, 0, 6, 4, 4, 5, 2, 7, 1, 6, 5,
 7, 7, 0, 0, 0, 4, 4, 5, 2, 1, 0, 9, 7, 7, 3, 5, 5, 8, 5, 8, 9, 7, 6, 2, 2, 6, 5, 5, 4, 8, 4, 9, 4, 1, 6,
 2, 1, 7, 1, 4, 9, 8, 9, 5, 3, 2, 3, 8, 3, 4, 2, 1, 6, 0, 0, 1, 1, 4, 0, 6, 2, 9, 5, 0, 7, 1, 8, 4, 9, 0,
 4, 2, 7, 7, 8, 9, 2, 5, 8, 5, 5, 2, 7, 4, 3, 0, 3, 5, 2, 2, 1, 3, 9, 6, 8, 3, 5, 6, 7, 9, 0, 1, 8, 0, 7,
 6, 4, 0, 6, 0, 4, 2, 1, 3, 8, 3, 0, 7, 3, 0, 8, 7, 7, 4, 4, 6, 0, 1, 7, 0, 8, 4, 2, 6, 8, 8, 2, 7, 2, 2,
 6, 1, 1, 7, 7, 1, 8, 0, 8, 4, 2, 6, 6, 4, 3, 3, 3, 6, 5, 1, 7, 8, 0, 0, 0, 2, 1, 7, 1, 9, 0, 3, 4, 4, 9,
 2, 3, 4, 2, 6, 4, 2, 6, 6, 2, 9, 2, 2, 6, 1, 4, 5, 6, 0, 0, 4, 3, 3, 7, 3, 8, 3, 8, 6, 8, 3, 3, 5, 5, 5,
 5, 3, 4, 3, 4, 5, 3, 0, 0, 4, 2, 6, 4, 8, 1, 8, 4, 7, 3, 9, 8, 9, 2, 1, 5, 6, 2, 7, 0, 8, 6, 0, 9, 5, 6,
 5, 0, 6, 2, 9, 3, 4, 0, 4, 0, 5, 2, 6, 4, 9, 4, 3, 2, 4, 4, 2, 6, 1, 4, 4, 5, 6, 6, 5, 9, 2, 1, 2, 9, 1,
 2, 2, 5, 6, 4, 8, 8, 9, 3, 5, 6, 9, 6, 5, 5, 0, 0, 9, 1, 5, 4, 3, 0, 6, 4, 2, 6, 1, 3, 4, 2, 5, 2, 6, 6,
 8, 4, 7, 2, 5, 9, 4, 9, 1, 4, 3, 1, 4, 2, 3, 9, 3, 9, 8, 8, 4, 5, 4, 3, 2, 4, 8, 6, 3, 2, 7, 4, 6, 1, 8,
 4, 2, 8, 4, 6, 6, 5, 5, 9, 8, 5, 3, 3, 2, 3, 1, 2, 2, 1, 0, 4, 6, 6, 2, 5, 9, 8, 9, 0, 1, 4, 1, 7, 1, 2,
 1, 0, 3, 4, 4, 6, 0, 8, 4, 2, 7, 1, 6, 1, 6, 6, 1, 9, 0, 0, 1, 2, 5, 7, 1, 9, 5, 8, 7, 0, 7, 9, 3, 2, 1,
 7, 5, 6, 9, 6, 9, 8, 5, 4, 4, 0, 1, 3, 3, 9, 7, 6, 2, 2, 0, 9, 6, 7, 4, 9, 4, 5, 4, 1, 8, 5, 4, 0, 7, 1,
 1, 8, 4, 4, 6, 4, 3, 3, 9, 4, 6, 9, 9, 0, 1, 6, 2, 6, 9, 8, 3, 5, 1, 6, 0, 7,
 8, 4, 8, 9, 2, 4, 5, 1, 4, 0, 5, 8, 9, 4, 0, 9, 4, 6, 3, 9, 5, 2, 6, 7, 8, 0, $\Delta T = \Delta T_0 e^{-kt}$
 7, 3, 5, 4, 5, 7, 9, 7, 0, 0, 3, 0, 7, 0, 5, 1, 1, 6, 3, 6, 8, 2, 5, 1, 9, 4,
 8, 7, 7, 0, 1, 1, 8, 9, 7, 6, 4, 0, 0, 2, 8, 2, 7, 6, 4, 8, 4, 1, 4, 1, 6, 0, 5, 8, 7, 2, 0, 6, 1, 8, 4,
 1, 8, 5, 2, 9, 7, 1, 8, 9, 1, 5, 4, 0, 1, 9, 6, 8, 8, 2, 5, 3, 2, 8, 9, 3, 0, 9, 1, 4, 9, 6, 6, 5, 3, 4,
 5, 7, 5, 3, 5, 7, 1, 4, 2, 7, 3, 1, 8, 4, 8, 2, 0, 1, 6, 3, 8, 4, 6, 4, 4, 8, 3, 2, 4, 9, 9, 0, 3, 7, 8,
 8, 6, 0, 6, 9, 0, 0, 8, 0, 7, 2, 7, 0, 9, 3, 2, 7, 6, 7, 3, 1, 2, 7, 5, 8, 1, 9, 6, 6, 5, 6, 3, 9, 4, 1,
 1, 4, 8, 9, 6, 1, 7, 1, 6, 8, 3, 2, 9, 8, 0, 4, 5, 5, 1, 3, 9, 7, 2, 9, 5, 0, 6, 6, 8, 7, 6, 0, 4, 7, 4,
 0, 9, 1, 5, 4, 2, 0, 4, 2, 8, 4, 2, 9, 9, 9, 3, 5, 4, 1, 0, 2, 5, 8, 2, 9, 1, 1, 3, 5, 0, 2, 2, 4, 1, 6,
 9, 0, 7, 6, 9, 4, 3, 1, 6, 6, 8, 5, 7, 4, 2, 4, 2, 5, 2, 2, 5, 0, 9, 0, 2, 6, 9, 3, 9, 0, 3, 4, 8, 1, 4,
 8, 5, 6, 4, 5, 1, 3, 0, 3, 0, 6, 9, 9, 2, 5, 1, 9, 9, 5, 9, 0, 4, 3, 6, 3, 8, 4, 0, 2, 8, 4, 2, 9, 2, 6,
 7, 4, 1, 2, 5, 7, 3, 4, 2, 2, 4, 4, 7, 7, 6, 5, 5, 8, 4, 1, 7, 7, 8, 8, 6, 1, 7, 1, 7, 3, 7, 2, 6, 5, 4,
 6, 2, 0, 8, 5, 4, 9, 8, 2, 9, 4, 4, 9, 8, 9, 4, 6, 7, 8, 7, 3, 5, 0, 9, 2, 9, 5, 8, 1, 6, 5, 2, 6, 3, 2,
 0, 7, 2, 2, 5, 8, 9, 9, 2, 3, 6, 8, 7, 6, 8, 4, 5, 7, 0, 1, 7, 8, 2, 3, 0, 3, 8, 0, 9, 6, 5, 6, 7, 8, 8,
 3, 1, 1, 2, 2, 8, 9, 3, 0, 5, 8, 0, 9, 1, 4, 0, 5, 7, 2, 6, 1, 0, 8, 6, 5, 8, 8, 4, 8, 4, 5, 8, 7, 3, 1,
 0, 1, 6, 5, 8, 1, 5, 1, 1, 6, 7, 5, 3, 3, 3, 2, 7, 6, 7, 4, 8, 8, 7, 0, 1, 4, 8, 2, 9, 1, 6, 7, 4, 1, 9,
 7, 0, 1, 5, 1, 2, 5, 5, 9, 7, 8, 2, 5, 7, 2, 7, 0, 7, 4, 0, 6, 4, 3, 1, 8, 0, 8, 6, 0, 1, 4, 2, 8, 1, 4,
 9, 0, 2, 4, 1, 4, 6, 7, 8, 0, 4, 7, 2, 3, 2, 7, 5, 9, 7, 6, 8, 4, 2, 6, 9, 6, 3, 3, 9, 3, 5, 7, 7, 3, 5,
 4, 2, 9, 3, 0, 1, 8, 6, 7, 3, 9, 4, 3, 9, 7, 1, 6, 3, 8, 8, 6, 1, 1, 7, 6, 4, 2, 0, 9, 0, 0, 4, 0, 6, 8,
 6, 6, 3, 3, 9, 8, 8, 5, 6, 8, 4, 1, 6, 8, 1, 0, 0, 3, 8, 7, 2, 3, 8, 9, 2, 1, 4, 4, 8, 3, 1, 7, 6, 0, 7,
 0, 1, 1, 6, 6, 8, 4, 5, 0, 3, 8, 8, 7, 2, 1, 2, 3, 6, 4, 3, 6, 7, 0, 4, 3, 3, 1, 4, 0, 9, 1, 1, 5, 5, 7,
 3, 3, 2, 8, 0, 1, 8, 2, 9, 7, 7, 9, 8, 8, 7, 3, 6, 5, 9, 0, 9, 1, 6, 6, 5, 9, 6, 1, 2, 4, 0, 2, 0, 2, 1,
 7, 7, 8, 5, 5, 8, 8, 5, 4, 8, 7, 6, 1, 7, 6, 1, 6, 1, 9, 8, 9, 3, 7, 0, 7, 9, 4, 3, 8, 0, 0, 5, 6, 6, 6,
 3, 3, 6, 4, 8, 8, 4, 3, 6, 5, 0, 8, 9, 1, 4, 4, 8, 0, 5, 5, 7, 1, 0, 3, 9, 7, 6, 5, 2, 1, 4, 6, 9, 6, 0,

2, 7, 6, 6, 2, 5, 8, 3, 5, 9, 9, 0, 5, 1, 9, 8, 7, 0, 4, 2, 3, 0, 0, 1, 7, 9, 4, 6, 5, 5, 3, 6, 7, 8, 8,
5, 6, 7, 4, 3, 0, 2, 8, 5, 9, 7, 4, 6, 0, 0, 1, 4, 3, 7, 8, 5, 4, 8, 3, 2, 3, 7, 0, 6, 8, 7, 0, 1, 1, 9,
0, 0, 7, 8, 4, 9, 9, 4, 0, 4, 9, 3, 0, 9, 1, 8, 9, 1, 9, 1, 8, 1, 6, 4, 9, 3, 2, 7, 2, 5, 9, 7, 7, 4, 0,
3, 0, 0, 7, 4, 8, 7, 9, 6, 8, 1, 4, 8, 4, 8, 8, 2, 3, 4, 2, 9, 3, 2, 0, 2, 3, 0, 1, 2, 1, 2, 8, 0, 3, 2,
3, 2, 7, 4, 6, 0, 3, 9, 2, 2, 1, 9, 6, 8, 7, 5, 2, 8, 3, 4, 0, 5, 1, 6, 9, 0, 6, 9, 7, 4, 1, 9, 4, 2, 5,
7, 6, 1, 4, 6, 7, 3, 9, 7, 8, 1, 1, 0, 7, 1, 5, 4, 6, 4, 1, 8, 6, 2, 7, 3, 3, 6, 9, 0, 9, 1, 5, 8, 4, 9,
7, 3, 1, 8, 5, 0, 1, 1, 1, 8, 3, 9, 6, 0, 4, 8, 2, 5, 3, 3, 5, 1, 8, 7, 4, 8, 4, 3, 8, 9, 2, 3, 1, 7, 7,
2, 9, 2, 6, 1, 3, 5, 4, 3, 0, 2, 4, 9, 3, 2, 5, 6, 2, 8, 9, 6, 3, 7, 1, 3, 6, 1, 9, 7, 7, 2, 8, 5, 4, 5,
6, 6, 2, 2, 9, 2, 4, 4, 6, 1, 6, 4, 4, 4, 9, 7, 2, 8, 4, 5, 9, 7, 8, 6, 7, 7, 1, 1, 5, 7, 4, 1, 2, 5, 6,
7, 0, 3, 0, 7, 8, 7, 1, 8, 8, 5, 1, 0, 9, 3, 3, 6, 3, 4, 4, 4, 8, 0, 1, 4, 9, 6, 7, 5, 2, 4, 0, 6, 1, 8,
5, 3, 6, 5, 6, 9, 5, 3, 2, 0, 7, 4, 1, 7, 0, 5, 3, 3, 4, 8, 6, 7, 8, 2, 7, 5, 4, 8, 2, 7, 8, 1, 5, 4, 1,
5, 5, 6, 1, 9, 6, 6, 9, 1, 1, 0, 5, 5, 1, 0, 1, 4, 7, 2, 7, 9, 9, 0, 4, 0, 3, 8, 6, 8, 9, 7, 2, 2, 0, 4,
6, 5, 5, 5, 0, 8, 3, 3, 1, 7, 0, 7, 8, 2, 3, 9, 4, 8, 0, 8, 7, 8, 5, 9, 9, 0, 5, 0, 1, 9, 4, 7, 5, 6, 3,
1, 0, 8, 9, 8, 4, 1, 2, 4, 1, 4, 4, 6, 7, 2, 8, 2, 1, 8, 6, 5, 4, 5, 9, 9, 7, 1, 5, 9, 6, 6, 3, 9, 0, 1,
5, 6, 4, 1, 9, 4, 1, 7, 5, 1, 8, 2, 0, 9, 3, 5, 9, 3, 2, 6, 1, 6, 3, 1, 6, 8, 8, 8, 3, 8, 0, 1, 3, 2, 7,
5, 8, 7, 5, 2, 6, 0, 1, 4, 6, 0, 5, 0, 7, 6, 7, 6, 0, 9, 8, 3, 9, 2, 6, 2, 5, 7, 2, 6, 4, 1, 1, 1, 2, 0,
1, 3, 5, 2, 8, 8, 5, 9, 1, 3, 1, 7, 8, 4, 8, 2, 9, 9, 4, 7, 5, 6, 8, 2, 4, 7, 2, 5, 6, 4, 8, 8, 5, 5, 3,
3, 3, 5, 7, 2, 7,

$$9, 7, 7, 2, 2, 0, \quad ds^2 = -e^{-2m/r} dt^2 + e^{+2m/r} \{dr^2 + r^2(d\theta^2 + \sin^2\theta d\phi^2)\}$$

5, 5, 4, 3, 5, 6,

4.0.i. The exponential space-time metric

8, 1, 2, 6, 3, 0,

2, 5, 3, 5, 7, 4,

8, 2, 1, 6, 5, 8, 5, 4, 1, 4, 0, 0, 0, 8, 0, 5, 3, 1, 4, 8, 2, 0, 6, 9, 7, 1, 3, 7, 2, 6, 2, 1, 4, 9, 7,
5, 5, 5, 7, 6, 0, 5, 1, 8, 9, 0, 4, 8, 1, 6, 2, 2, 3, 7, 6, 7, 9, 0, 4, 1, 4, 9, 2, 6, 7, 4, 2, 6, 0, 0,
0, 7, 1, 0, 4, 5, 9, 2, 2, 6, 9, 5, 3, 1, 4, 8, 3, 5, 1, 8, 8, 1, 3, 7, 4, 6, 3, 8, 8, 7, 1, 0, 4, 2, 7,
3, 5, 4, 4, 7, 6, 7, 6, 2, 3, 5, 7, 7, 9, 3, 3, 9, 9, 3, 9, 7, 0, 6, 3, 2, 3, 9, 6, 6, 0, 4, 9, 6, 9, 1,
4, 5, 3, 0, 3, 2, 7, 3, 8, 8, 7, 8, 7, 4, 5, 5, 7, 9, 0, 5, 9, 3, 4, 9, 3, 7, 7, 2, 3, 2, 0, 1, 4, 2,
9, 5, 4, 8, 0, 3, 3, 4, 5, 0, 0, 0, 6, 9, 5, 2, 5, 6, 9, 8, 0, 9, 3, 5, 2, 8, 2, 8, 8, 7, 7, 8, 3, 7, 1,
0, 6, 7, 0, 5, 8, 5, 5, 6, 7, 7, 4, 9, 4, 8, 1, 3, 7, 3, 8, 5, 8, 6, 3, 0, 3, 8, 5, 7, 6, 2, 8, 2, 3, 0,
4, 0, 6, 9, 4, 0, 0, 5, 6, 6, 5, 3, 4, 0, 5, 8, 4, 8, 8, 7, 5, 2, 7, 0, 0, 5, 3, 0, 8, 8, 3, 2, 4, 5, 9,
1, 8, 2, 1, 8, 3, 4, 9, 4, 3, 1, 8, 0, 4, 9, 8, 3, 4, 1, 9, 9, 6, 3, 9, 9, 8, 1, 4, 5, 8, 7, 7, 3, 4, 3,
5, 8, 6, 3, 1, 1, 5, 9, 4, 0, 5, 7, 0, 4, 4, 3, 6, 8, 3, 5, 1, 5, 2, 8, 5, 3, 8, 3, 6, 0, 9, 4, 4, 2, 9,
5, 5, 9, 6, 4, 3, 6, 0, 6, 7, 6, 0, 9, 0, 2, 2, 1, 7, 4, 1, 8, 9, 6, 8, 8, 3, 5, 4, 8, 1, 3, 1, 6, 4, 3,
9, 9, 7, 4, 3, 7, 7, 6, 4, 1, 5, 8, 3, 6, 5, 2, 4, 2, 2, 3, 4, 6, 4, 2, 6, 1, 9, 5, 9, 7, 3, 9, 0, 4, 5,
5, 4, 5, 0, 6, 8, 0, 6, 9, 5, 2, 3, 2, 8, 5, 0, 7, 5, 1, 8, 6, 8, 7, 1, 9, 4, 4, 9, 0, 6, 4, 7, 6, 7, 7,
9, 1, 8, 8, 6, 7, 2, 0, 3, 0, 6, 4, 1, 8, 6, 3, 0, 7, 5, 1, 0, 5, 3, 5, 1, 2, 1, 4, 9, 8, 5, 1, 0, 5, 1,
2, 0, 7, 3, 1, 3, 8, 4, 6, 6, 4, 8, 7, 1, 7, 5, 4, 7, 5, 1, 8, 3, 8, 2, 9, 7, 9, 9, 0, 1, 8, 9, 3, 1,
7, 7, 5, 1, 5, 5, 0, 6, 3, 9, 9, 8, 1, 0, 1, 6, 4, 6, 6, 4, 1, 4, 5, 9, 2, 1, 0, 2, 4, 0, 6, 8, 3, 8, 2,
9, 4, 6, 0, 3, 2, 0, 8, 5, 3, 5, 5, 4, 0, 5, 8, 1, 4, 7, 1, 5, 9, 2, 7, 3, 2, 2, 0, 6, 7, 7, 5, 6, 7,
6, 6, 9, 2, 1, 3, 6, 6, 4, 0, 8, 1, 5, 0, 5, 9, 0, 0, 8, 0, 6, 9, 5, 2, 5, 4, 0, 6, 1, 0, 6, 2, 8, 5, 3,

6, 4, 0, 8, 2, 9, 3, 2, 7, 6, 6, 2, 1, 9, 3, 1, 9, 3, 9, 9, 3, 3, 8, 6, 1, 6, 2, 3, 8, 3, 6, 0, 6, 9, 1,
 1, 1, 7, 6, 7, 7, 8, 5, 4, 4, 8, 2, 3, 6, 1, 2, 9, 3, 2, 6, 8, 5, 8, 1, 9, 9, 9, 6, 5, 2, 3, 9, 2, 7, 5,
 4, 8, 8, 4, 2, 7, 4, 3, 5, 4, 1, 4, 4,

4. The last galaxy fades

0, 2, 8, 8, 4, 5, 3, 6, 4, 5, 5, 9,
 5, 1, 2, 4, 7, 3, 5, 5, 4, 6, 1, 3, 9,
 4, 0, 3, 1, 5, 4, 9, 5, 2, 0, 9, 7, 3, 9, 7, 0, 5, 1, 8, 9, 6, 2, 4, 0, 1, 5, 7, 9, 7, 6, 8, 3, 2, 6, 3,
 9, 4, 5, 0, 6, 3, 3, 2, 3, 0, 4, 5, 2, 1, 9, 2, 6, 4, 5, 0, 4, 9, 6, 5, 1, 7, 3, 5, 4, 6, 6, 7, 7, 5, 6,
 9, 9, 2, 9, 5, 7, 1, 8, 9, 8, 9, 6, 9, 0, 4, 7, 0, 9, 0, 2, 7, 3, 0, 2, 8, 8, 5, 4, 4, 9, 4, 5, 4, 1, 6,
 6, 9, 9, 7, 9, 1, 9, 9, 2, 9, 4, 8, 0, 3, 8, 2, 5, 4, 9, 8, 0, 2, 8, 5, 9, 4, 6, 0, 2, 9, 0, 5, 2, 7, 6,
 3, 1, 4, 5, 5, 8, 0, 3, 1, 6, 5, 1, 4, 0, 6, 6, 2, 2, 9, 1, 7, 1, 2, 2, 3, 4, 2, 9, 3, 7, 5, 8, 0, 6, 1,
 4, 3, 9, 9, 3, 4, 8, 4, 9, 1,

4, 3, 6, 2, 1, 0, 7, 9, 9, 3,
 5, 7, 6, 7, 3, 7, 3, 1, 7, 9,
 4, 8, 9, 6, 4, 2, 5, 2, 4, 8,
 8, 8, 1, 3, 7, 2, 0, 4, 3, 5,
 5, 7, 9, 2, 8, 7, 5, 1, 1, 3,
 8, 5, 8, 5, 6, 9, 7, 3, 3, 8,
 1, 9, 7, 6, 0, 8, 3, 5, 2, 4,
 4, 2, 3, 2, 4, 0, 4, 6, 6, 7,
 7, 8, 0, 2, 0, 9, 4, 8, 3, 9,
 9, 6, 3, 9, 9, 4, 6, 6, 8, 4,
 8, 3, 3, 7, 7, 4, 7, 0, 6, 7,
 2, 5, 4, 8, 3, 6, 1, 8, 8, 4,
 8, 2, 7, 3, 0, 0, 0, , 4, 8,
 3, 1, 9, 1, 6, 3, 8, 2, 6, 0,
 2, 2, 1, 1, 0, 5, 5, 5, 2, 2,
 1, 2, 4, 6, 7, 3, 3, 3, 2, 3,
 1, 8, 4, 4, 6, 3, 0, 0, 5, 5,
 0, 4, 4, 8, 1, 8, 4, 9, 9, 1,
 6, 9, 9, 6, 6, 2, 2, 0, 8, 7,
 7, 4, 6, 1, 4, 0, 2, 1, 6, 1,
 5, 7, 0, 2, 1, 0, 2, 9, 6, 0,
 3, 3, 1, 8, 5, 8, 8, 7, 2, 7,
 3, 3, 3, 2, 9, 8, 7, 7, 9, 3,
 5, 2, 5, 7, 0, 1, 8, 2, 3, 9,
 3, 8, 6, 1, 2, 4, 4, 0, 2, 6,

THE GREATEST WEIGHT: What, if some day or night a demon were to steal after you into your loneliest loneliness and say to you: 'This life as you now live it and have lived it, you will have to live once more and innumerable times more; and there will be nothing new in it, but every pain and every joy and every thought and sigh and everything unutterably small or great in your life will have to return to you, all in the same succession and sequence – even this spider and this moonlight between the trees, and even this moment and I myself. The eternal hourglass of existence is turned upside down again and again, and you with it, speck of dust!' Would you not throw yourself down and gnash your teeth and curse the demon who spoke thus? Or have you once experienced a tremendous moment when you would have answered him: 'You are a god and never have I heard anything more divine.' If this thought gained possession of you, it would change you as you are or perhaps crush you. The question in each and everything, 'Do you desire this once more and innumerable times more?' would lie upon your actions as the greatest weight. Or how well disposed would you have to become to yourself and to life to crave nothing more fervently than this ultimate eternal confirmation and seal?

Friedrich Nietzsche

8, 6, 8, 3, 3, 9, 5, 5, 5, 8, 7, 0, 6, 0, 7, 7, 5, 8, 1, 6, 9, 9, 5, 4, 3, 9, 8, 4, 6, 9, 5, 6, 8, 5, 4,
 0, 6, 7, 1, 1, 7, 4, 4, 4, 4, 9, 3, 2, 4, 7, 9, 5, 1, 9, 5, 7, 2, 1, 5, 9, 4, 1, 9, 6, 4, 5, 8, 6, 3, 7,
 3, 6, 1, 2, 6, 9, 1, 5, 5, 2, 6, 4, 5, 7, 5, 7, 4, 7, 8, 6, 9, 8, 5, 9, 6, 4, 2, 4, 2, 1, 7, 6, 5, 9, 2,
 8, 9, 6, 8, 6, 2, 3, 8, 3, 5, 0, 6, 3, 7, 0, 4, 3, 3, 9, 3, 9, 8, 1, 1, 6, 7, 1, 3, 9, 7, 5, 4, 4, 7, 3,

6, 2, 2, 8, 6, 2, 5, 5, 0, 6, 8, 0, 3, 6, 8, 2, 6, 6, 4, 1, 3, 5, 5, 4, 1, 4, 4, 8, 0, 4, 8, 9, 9, 7, 7,
 2, 1, 3, 7, 3, 1, 7, 4, 1, 1, 9, 1, 9, 9, 9, 7, 0, 0, 1, 7, 2, 9, 3, 9, 0, 7, 3, 0, 3, 3, 5, 0, 8, 6, 9,
 0, 2, 0, 9, 2, 2, 5, 1, 9, 1, 2, 4, 4, 4, 7, 3, 9, 3, 2, 7, 8, 3, 7, 6, 1, 5, 6, 3, 2, 1, 8, 1, 0, 8, 4,
 2, 8, 9, 8, 2, 0, 7, 7, 0, 6, 9, 7, 4, 1, 3, 8, 7, 0, 7, 0, 5, 3, 2, 6, 6, 1, 1, 7, 6, 8, 3, 6, 9, 8, 6,
 4, 7, 7, 4, 1, 7, 8, 7, 1, 8, 0, 2, 0, 2, 7, 2, 9, 4, 1, 2, 9, 8, 2, 3, 1, 0, 8, 8, 8, 7, 9, 6, 8, 3, 1,
 8, 8, 0, 8, 5, 4, 3, 6, 7, 3, 2, 7, 8, 0, 6, 8, 7, 9, 7, 7, 1, 6, 5, 9, 1, 1, 1, 6, 5, 4, 2, 2, 4, 4, 5,
 3, 8, 0, 6, 6, 2, 5, 8, 6, 1, 7, 1, 1, 7, 2, 9, 4, 9, 8, 0, 3, 8, 2, 4, 8, 8, 7, 9, 9, 8, 6, 5, 0, 4, 0,
 6, 1, 5, 6, 3, 9, 7, 5, 6, 2, 9, 9, 3, 6, 9, 6, 2, 8, 0, 9, 3, 5, 8, 1, 8, 9, 7, 6, 1, 4, 9, 1, 0, 1, 7,
 1, 4, 5, 3, 4, 3, 5, 5, 6, 6, 5, 9, 5, 4, 2, 7, 5, 7, 0, 6, 4, 1, 9, 4, 4, 0, 8, 8, 3, 3, 8, 1, 6, 8, 4,
 1, 1, 1, 1, 1, 6, 6, 2, 0, 0, 7, 5, 9, 7, 8, 7, 2, 4, 4, 1, 3, 7, 0, 8, 2, 3, 3, 3, 9, 1, 7, 8, 8, 6, 1,
 1, 4, 7, 0, 8, 2, 2, 8, 6, 5, 7, 5, 3, 1, 0, 7, 8, 5, 3, 6, 6, 7, 4, 6, 9, 5, 0, 1, 8, 4, 6, 2, 1, 4, 0,
 7, 3, 6, 4, 9, 3, 9, 1, 7, 3, 6, 6, 2, 5, 4, 9, 3, 7, 7, 8, 3, 0, 1, 4, 0, 7, 4, 3, 0, 2, 6, 6, 8, 4, 2,
 2, 1, 5, 0, 3, 3, 5, 1, 1, 7, 7, 3, 6, 4, 7, 1, 8, 5, 3, 8, 7, 2, 3, 2, 4, 0, 4, 0, 4, 2, 1, 0, 3, 7, 9,
 0, 7, 7, 5, 0, 2, 6, 6, 0, 2, 0, 1, 1, 4, 8, 1, 4, 9, 3, 5, 4, 8, 2, 2, 2, 8, 9, 1, 6, 6, 6, 3, 6, 4, 0,
 7, 8, 2, 4, 5, 0, 1, 6, 6, 8, 1, 5, 3, 4, 1, 2, 1, 3, 5, 0, 5, 2, 7, 8, 5, 7, 8, 5, 3, 9, 3, 3, 2, 6, 0,
 6, 1, 1, 0, 2, 4, 9, 8, 0, 2, 2, 7, 3, 0, 9, 3, 6, 3, 6, 7, 4, 0, 2, 1, 3, 5, 1, 5, 3, 8, 6, 4, 3, 1, 6,
 9, 3, 0, 1, 5, 2, 6, 7, 4, 6, 0, 5, 3, 6, 0, 6, 4, 3, 5, 1,
 7, 3, 2, 1, 5, 4, 7, 0, 1, 0, 9, 1, 4, 4, 0, 6, 5, 0, 8, 7,
 8, 8, 2, 3, 6, 3, 6, 7, 6, 4, 2, 3, 6, 8, 3, 1, 1, 8, 7, 3,
 9, 0, 9, 3, 7, 4, 6, 4, 2, 3, 2, 6, 0, 9, 0, 2, 1, 6, 4, 6,
 3, 6, 5, 6, 2, 7, 5, 5, 3, 9, 7, 6, 8, 3, 4, 0, 1, 9, 4, 8,
 2, 9, 3, 2, 7, 9, 5, 7, 5, 0, 6, 2, 4, 3, 9, 9, 6, 4, 5, 2, 7, 2, 5, 7, 8, 6, 2, 4, 4, 0, 0, 3, 7, 5, 9,
 8, 3, 4, 2, 2, 0, 5, 0, 8, 0, 8, 9, 3, 5, 1, 2, 9, 0, 2, 3, 1, 2, 2, 4, 7, 5, 9, 7, 0, 6, 4, 4, 1, 0, 5,
 6, 7, 8, 3, 6, 1, 8, 7, 0, 8, 7, 7, 1, 7, 2, 3, 3, 3, 5, 5, 5, 4, 6, 5, 4, 8, 2, 5, 9, 8, 9, 0, 6, 8, 6,
 1, 2, 0, 1, 4, 1, 0, 1, 0, 7, 2, 2, 2, 4, 6, 5, 9, 0, 4, 0, 0, 8, 5, 5, 3, 7, 9, 8, 2, 3, 5, 2, 5, 3, 8,
 8, 5, 1, 7, 1, 6, 2, 3, 5, 1, 8, 2, 5, 6, 5, 1, 8, 4, 8, 2, 2, 0, 3, 1, 2, 5, 2, 1, 4, 9, 5, 0, 7, 0, 0,
 3, 7, 8, 3, 0, 0, 4, 1, 1, 2, 1, 6, 2, 1, 2, 1, 2, 6, 0, 5, 2, 7, 2, 6, 0, 5, 9, 9, 4, 4, 3, 2, 0, 4, 4,
 3, 0, 5, 6, 2, 7, 4, 5, 2, 2, 9, 1, 6, 1, 2, 8, 8, 9, 1, 7, 6, 6, 8, 1, 4, 1, 6, 0, 6, 3, 9, 1, 3, 1, 2,
 3, 5, 9, 7, 5, 3, 5, 0, 3, 9, 0, 3, 2, 0, 0, 7, 7, 5, 2, 9, 5, 8, 7, 3, 9, 2, 4, 1, 2, 4, 7, 6, 4, 5, 1,
 8, 5, 0, 8, 0, 9, 1, 6, 3, 9, 1, 1, 4, 5, 9, 2, 9, 6, 0, 7, 1, 1, 5, 6, 3, 4, 4, 2, 0, 4, 3, 4, 7, 1, 3,
 3, 5, 4, 4, 7, 2, 0, 9, 8, 1, 1, 7, 8, 4, 6, 1, 4, 5, 1, 0, 7, 7, 8, 7, 2, 3, 9, 9, 1, 4, 0, 6, 0, 6, 2,
 9, 0, 2, 2, 8, 2, 7, 6, 6, 6, 4, 3, 0, 9, 2, 6, 4, 9, 0, 0, 5, 9, 2, 2, 4, 9, 8, 1, 0, 2, 9, 1, 0, 6, 8,
 7, 5, 9, 4, 3, 4, 5, 3, 3, 8, 5, 8, 3, 3, 0, 3, 9, 1, 1, 7, 8, 7, 4, 7, 5, 7, 5, 9, 7, 7, 0, 6, 5, 9, 5,
 3, 5, 7, 0, 9, 7, 9, 6, 4, 0, 0, 1, 2, 2, 2, 4, 0, 9, 2, 1, 9, 9, 0, 3, 1, 1, 5, 8, 2, 2, 9, 2, 5, 9, 6,
 6, 7, 9, 1, 3, 1, 5, 3, 9, 9, 1, 5, 6, 1, 4, 3, 8, 0, 7, 0, 1, 2, 9, 2, 6, 0, 7, 8, 0, 1, 9, 7, 0, 2, 2,
 5, 8, 9, 6, 6, 2, 9, 2, 3, 3, 6, 8, 1, 5, 4, 3, 1, 2, 4, 9, 9, 4, 1, 2, 2, 5, 9, 4, 6, 0, 0, 2, 3, 3, 9,
 9, 4, 7, 2, 2, 2, 8, 1, 7, 1, 0, 5, 6, 6, 0, 3, 9, 3, 1, 8, 7, 7, 2, 2, 6, 8, 0, 0, 4, 9, 3, 8, 3, 3, 1,
 4, 8, 9, 8, 0, 3, 3, 8, 5, 4, 8, 9, 0, 9, 4, 6, 8, 6, 8, 5, 1, 3, 0, 7, 8, 9, 2, 9, 2, 0, 6, 4, 2, 4, 2,
 8, 1, 9, 1, 7, 4, 7, 9, 5, 8, 6, 6, 1, 9, 9, 9, 4, 4, 4, 1, 1, 1, 9, 6, 2, 0, 8, 7, 3, 0, 4, 9, 8, 0, 6,
 4, 3, 8, 5, 0, 0, 6, 8, 5, 2, 6, 2, 0, 2, 5, 8, 4, 3, 2, 8, 4, 2, 0, 8, 5, 5, 8, 2, 3, 3, 8, 5, 6, 6, 9,

$$\frac{\Pr(\bar{\Sigma}_t = A)}{\Pr(\bar{\Sigma}_t = -A)} = e^{At}$$

4.0.ii. The fluctuation theorem

3, 6, 6, 4, 9, 8, 4, 9, 7, 2, 0, 8, 1, 7, 0, 4, 6, 1, 3, 5, 3, 7, 6, 1, 6, 3, 5, 8, 4, 0, 1, 5, 3, 4, 2, 8, 4, 0, 6, 7, 4, 1, 1, 8, 5, 8, 7, 5, 8, 1, 5, 4, 6, 5, 1, 4, 5, 9, 8, 2, 7, 0, 2, 2, 8, 6, 7, 6, 6, 7, 1, 8, 5, 5, 3, 0, 9, 3, 1, 1, 9, 2, 3, 3, 4, 0, 1, 9, 1, 2, 8, 6, 1, 7, 0, 6, 1, 3, 3, 6, 4, 8, 7, 3, 1, 8, 3, 1, 9, 7, 5, 6, 0, 8, 1, 2, 5, 6, 9, 4, 6, 0, 0, 8, 9, 4, 0, 2, 9, 5, 3, 0, 9, 4, 4, 2, 9, 1, 1, 9, 5, 9, 0, 2, 9, 5, 9, 6, 8, 5, 6, 3, 9, 2, 3, 0, 3, 7, 6, 8, 9, 9, 7, 6, 3, 2, 7, 4, 6, 2, 2, 8, 3, 9, 0, 0, 7, 3, 5, 4, 5, 7, 1, 4, 4, 5, 9, 6, 4, 1, 4, 1, 0, 8, 2, 2, 9, 2, 8, 5, 9, 2, 2, 2, 3, 9, 3, 3, 2, 8, 3, 6, 2, 1, 0, 1, 9, 2, 8, 2, 2, 9, 3, 7, 2, 4, 3, 5, 9, 0, 2, 8, 3, 0, 0, 3, 8, 8, 4, 4, 4, 5, 7, 0, 1, 3, 8, 3, 7, 7, 1, 6, 3, 2, 0, 5, 6, 5, 1, 8, 3, 5, 1, 9, 7, 0, 1, 0, 0, 1, 1, 5, 7, 2, 2, 0, 1, 0, 9, 5, 6, 9, 9, 7, 8, 9, 0, 4, 8, 4, 9, 6, 4, 4, 5, 3, 4, 3, 4, 6, 1, 2, 1, 2, 9, 2, 2, 4, 9, 6, 4, 7, 3, 2, 3, 5, 6, 1, 2, 6, 3, 2, 1, 9, 5, 1, 1, 5, 5, 7, 0, 1, 5, 6, 5, 8, 2, 4, 4, 2, 7, 6, 6, 1, 5, 9, 9, 3, 2, 6, 4, 6, 3, 1, 5, 5, 8, 0, 6, 6, 7, 2, 0, 5, 3, 1, 2, 7, 5, 9, 6, 9, 4, 8, 5, 3, 8, 0, 5, 7, 3, 6, 4, 2, 0, 8, 3, 8, 4, 9, 1, 8, 8, 8, 7, 0, 9, 5, 1, 7, 6, 0, 5, 2, 2, 8, 7, 8, 1, 7, 3, 3, 9, 4, 6, 2, 7, 4, 7, 6, 4, 4, 6, 5, 6, 8, 5, 8, 9, 0, 0, 9, 3, 6, 2, 6, 6, 1, 2, 3, 3, 1, 1, 1, 5, 2, 9, 1, 0, 8, 1, 6, 0, 4, 1, 5, 2, 4, 1, 0, 0, 2, 1, 4, 1, 9, 5, 9, 3, 7, 3, 4, 9, 7, 8, 6, 4, 3, 1, 6, 6, 1, 5, 5, 6, 7, 3, 2, 7, 0, 2, 7, 9, 2, 1, 0, 9, 5, 9, 3, 5, 4, 3, 0, 5, 5, 5, 7, 9, 7, 3, 2, 6, 6, 0, 5, 5, 4, 6, 7, 7, 9, 6, 3, 5, 5, 2, 0, 0, 5, 3, 7, 8, 3, 0, 4, 6, 1, 9, 5, 4, 0, 6, 3, 6, 9, 7, 1, 8, 4, 2, 9, 1, 6, 1, 6, 8, 5, 8, 2, 7, 3, 4, 1, 2, 2, 2, 1, 7, 1, 4, 5, 8, 8, 5, 8, 7, 0, 8, 1, 4, 2, 7, 4, 0, 9, 0, 2, 4, 8, 1, 8, 5, 4, 4, 6, 4, 2, 1, 7, 7, 4, 8, 7, 6, 9, 2, 5, 0, 9, 3, 3, 2, 8, 7, 8, 5, 6, 7, 0, 6, 7, 4, 6, 7, 7, 3, 8, 1, 2, 2, 6, 7, 5, 2, 8, 3, 1, 6, 5, 3, 5, 5, 9, 2, 4, 5, 2, 0, 4, 5, 7, 8, 0, 7, 0, 5, 4, 1, 3, 5, 2, 5, 7, 6, 9, 0, 3, 2, 5, 3, 5, 2, 2, 7, 3, 8, 9, 6, 3, 8, 4, 7, 4, 9, 5, 6, 4, 6, 2, 5, 5, 9, 4, 0, 3, 7, 8, 9, 2, 4, 9, 2, 5, 0, 0, 7, 6, 2, 4, 3, 8, 6, 8, 9, 3, 7, 7, 6, 4, 7, 5, 3, 1, 0, 1, 0, 2, 3, 2, 3, 7, 4, 6, 7, 3, 3, 7, 7, 1, 4, 7, 4, 5, 8, 1, 6, 2, 5, 5, 3, 0, 6, 9, 8, 0, 3, 2, 4, 9, 9, 0, 3, 3, 6, 7, 6, 4, 5, 5, 4, 3, 0, 3, 0, 5, 2, 7, 4, 5, 6, 1, 5, 1, 2, 9, 6, 1, 2, 1, 4, 5, 8, 5, 9, 4, 4, 4, 3, 2, 1, 5, 0, 7, 4, 9, 0, 5, 1, 4, 9, 1, 4, 5, 3, 9, 5, 0, 9, 8, 1, 0, 0, 1, 3, 8, 8, 7, 3, 7, 9, 2, 6, 3, 7, 9, 9, 6, 4, 8, 7, 3, 7, 2, 8, 3, 9, 6, 4, 1, 6, 8, 9, 7, 5, 5, 5, 1, 3, 2, 2, 7, 5, 9, 6, 2, 0, 1, 1, 8, 3, 8, 2, 4, 8, 6, 5, 0, 7, 4, 6, 9, 8, 5, 4, 9, 2, 0, 3, 8, 0, 9, 7, 6, 9, 1, 9, 3, 2, 6, 0, 6, 4, 3, 7, 6, 0, 8, 7, 4, 3, 2, 0, 9, 3, 8, 5, 6, 0, 2, 8, 1, 5, 6, 4, 2, 8, 4, 9, 7, 5, 6, 5, 4, 9, 3, 0, 7, 9, 0, 9, 7, 3, 3, 8, 5, 4, 1, 8, 5, 5, 8, 3, 5, 1, 5, 7, 8, 9, 4, 0, 9, 8, 1, 4, 0, 0, 7, 6, 9, 1, 8, 9, 2, 3, 8, 9, 0, 6, 3, 0, 9, 0, 5, 4, 2, 5, 3, 4, 8, 8, 3, 8, 9, 6, 8, 3, 1, 7, 6, 2, 9, 0, 4, 1, 2, 0, 2, 1, 2, 9, 4, 9, 1, 6, 7, 1, 9, 5, 8, 1, 1, 9, 3, 5, 7, 9, 1, 2, 0, 3, 1, 6, 2, 5, 1, 4, 3, 4, 4, 0, 9, 6, 5, 0, 3, 1, 3, 2, 8, 3, 5, 2, 1, 6, 7, 2, 8, 0, 2, 1, 3, 7, 2, 4, 1, 5, 9, 4, 7, 3, 4, 4, 0, 9, 5, 4, 9, 8, 3, 1, 6, 1, 3, 8, 3, 2, 2, 5, 0, 5, 4, 8, 6, 7, 0, 8, 1, 7, 2, 2, 2, 1, 4, 7, 5, 1, 3, 8, 4, 2, 5, 1, 6, 6, 7, 9, 0, 4, 4, 5, 4, 1, 6, 6, 1, 7, 3, 0, 3, 2, 0, 0, 8, 2, 0, 3, 3, 0, 9, 0, 2, 8, 9, 5, 4, 8, 8, 8, 0, 8, 5, 1, 6, 7, 9, 7, 2, 5, 8, 4, 9, 5, 8, 1, 3, 4, 0, 7, 1, 3, 2, 1, 8, 0, 5, 3, 3, 9, 8, 8, 8, 2, 8, 1, 3, 9, 3, 4, 6, 0, 4, 9, 8, 5, 0, 5, 3, 2, 3, 4, 0, 4, 7, 2, 5, 9, 5, 0, 9, 7, 2, 1, 4, 3, 3, 1, 4, 9, 2, 5, 8, 6, 6, 0, 4, 2, 4, 8, 5, 1, 1, 4, 0, 5, 8, 1, 9, 5, 7, 9, 7, 1, 1, 5, 6, 4, 1, 9, 1, 4, 5, 8, 8, 4, 2, 8, 3, 3, 0, 0, 5, 2, 5, 6, 8, 4, 7, 7, 6, 8, 7, 4, 3, 0, 5, 9, 1, 6, 3, 9, 0, 4, 9, 4, 3, 0, 6, 8,

$$N_{\text{sim}} = \frac{p\lambda - (p\lambda)^G}{p - p^2\lambda}$$

4.0.iii. Number of simulated realities depending on the number of embedded simulated generations (G) and the number of initial simulations created by the base civilisation (λ)

7, 1, 3, 4, 3, 1, 1, 8, 7, 9, 6, 1, 8, 9, 6, 3, 7, 4, 7, 5, 5, 0, 3, 3, 6, 2, 8, 2, 0, 9, 3, 9, 9, 4, 9,
 3, 4, 3, 6, 9, 0, 3, 2, 1, 0, 3, 1, 9, 7, 6, 8, 9, 8, 1, 1, 2, 0, 5, 5, 5, 9, 5, 3, 6, 9, 4, 6, 5, 4, 2,
 4, 7, 0, 4, 1, 7, 3, 3, 2, 3, 8, 9, 5, 3, 9, 4, 0, 4, 6, 0, 3, 5, 3, 2, 5, 3, 9, 6, 7, 5, 8, 3, 5, 4, 3,
 9, 5, 3, 5, 0, 5, 1, 6, 7, 2, 0, 2, 6, 1, 6, 4, 7, 9, 6, 1, 3, 4, 7, 7, 9, 0, 9, 1, 2, 3, 2, 7, 9, 9, 5,

Digit	10^1	10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^{10}
0	0	5	100	974	9885	99425	998678	9999138	100004425	1000024802
1	2	6	96	989	10264	100132	1000577	10004438	99982926	999989229
2	2	12	97	1004	9855	99845	999156	9998876	99999168	999997938
3	0	8	109	1008	10035	100228	1001716	10005176	100002498	999982936
4	1	11	100	982	10039	100389	1000307	9998285	100018922	1000026506
5	0	13	85	992	10034	100087	9999903	9998042	100003884	999967300
6	0	12	99	1079	10183	100479	998869	10000158	99987241	999931170
7	1	16	99	1008	9875	99910	1000813	9998342	99997536	1000013049
8	4	7	103	996	9967	99814	999703	10000336	100005348	1000074277
9	0	10	112	968	9863	99691	1000278	9997209	99998052	999992793

4.0.iv. Frequency of the distribution of decimal digits for the first 10n digits of $e-2$ ($n=1, \dots, 10$)

2, 6, 4, 9, 2, 9, 0, 4, 5, 1, 5, 1, 1, 4, 8,
 3, 0, 7, 9, 2, 3, 3, 6, 9, 3, 8, 2, 1, 6, 6,
 0, 1, 0, 7, 0, 2, 8, 7, 2, 6, 5, 1, 9, 3, 8,
 1, 4, 3, 8, 4, 4, 8, 4, 4, 5, 3, 2, 6, 3, 9,
 5, 1, 7, 3, 9, 4, 1, 1, 0, 1, 3, 1, 1, 5, 2,
 5, 0, 2, 7, 5, 0, 4, 6, 5, 7, 4, 9, 3, 4, 3,
 0, 6, 3, 7, 6, 6, 5, 4, 1, 8, 6, 6, 1, 2, 8,
 9, 1, 5, 2, 6, 4, 4, 4, 6, 9, 2, 6, 2, 2, 2,
 8, 8, 4, 3, 6, 6, 2, 9, 9, 4, 6, 2, 7, 3, 2,
 4, 6, 7, 9, 5, 8, 7, 3, 6, 3, 8, 3, 5, 0, 1,
 9, 3, 7, 1, 4, 2, 7, 8, 6, 4, 7, 1, 3, 9, 8,
 0, 5, 4, 0, 3, 8, 2, 1, 5, 5, 1, 3, 4, 6, 3,
 2, 2, 3, 7, 0, 2, 0, 7, 1, 5, 3, 3, 1, 3, 4,
 8, 8, 7, 0, 8, 3, 1, 7, 4, 1, 4, 6, 5, 9, 1,
 4, 9, 2, 4, 0, 6, 3, 5, 9, 4, 9, 3, 0, 2, 0,
 9, 2, 1, 1, 2, 2, 0, 5, 2, 6, 1, 0, 3, 1, 2,
 3, 9, 0, 6, 8, 2, 9, 4, 1, 3, 4, 5, 6, 9, 6,
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7, 3, 4, 5, 5, 2, 2, 5, 0, 1, 9, 4, 1, 2, 1, 7, 0, 1, 5, 4, 1, 3, 1, 8, 7, 9, 3, 6, 5, 1, 8, 1, 8, 5, 0,
2, 0, 2, 0, 8, 7, 7, 3, 2, 6, 9, 0, 6, 1, 3, 3, 5, 9, 2, 1, 8, 2, 0, 0, 0, 7, 6, 2, 3, 2, 7, 2, 6, 9, 5,
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1, 4, 6, 3, 4, 6, 0, 2, 1, 6, 9, 2, 3, 5, 0, 7, 9, 2, 1, 6, 1, 1, 1, 0, 1, 3, 1, 4, 8, 9, 4, 8, 2, 8, 1...

4.1. A journey of no return

Yes, I know, we are merely empty forms of matter, but we are indeed sublime in having invented God and our soul. So sublime, my friend, that I want to gaze upon matter, fully conscious that it exists, and yet launching it-self madly into Dream, despite its knowledge that Dream has no existence, extolling the Soul and all the divine impressions of that kind which have collected within us from the beginning of time and proclaiming, in the face of the Void which is truth, these glorious lies!

Stéphane Mallarmé

After many billions of years, Iridio woke up in a dark universe, with almost no stars. ‘Almost’ because there were only two. One, very close, shone with an intermittent light. He headed towards it with his diminishing kinetic energy. As he drew closer, he realised that it was a monolithic lighthouse created by the Namoryaplokiyans. As they had told him, it had travelled

$$\Delta t = \int_{r_0}^{r_1} \frac{1}{v} e^{-\beta(r)} \left(\frac{1}{(r - r_0)^b} + \sqrt{\frac{1}{(r - r_0)^{nb}} + 1} \right)^a$$

4.1.i.a. Time dilation near a Morris–Thorne wormhole throat

ahead of him, in time to block his recurring re-entry into the high-energy wormholes. On arrival, he attached himself to the lighthouse and an instruction manual to operate it, in Earth lingua franca, appeared in his mind. At that point, Earth had already been swallowed up by the red giant the sun had become. After reading many complex instructions at high speed and activating several simultaneous subroutines to calibrate the tachyon transmitter, he managed to access the calculations of the frequency of the digits of e and π which had been calculated by the device. To his great surprise, although the distribution of digits was uniform in the initial sections, from the digits above 10^{25} both numbers progressively deviated from normality. Zero predominated in both, and prime numbers prevailed over non-prime. He had a confused memory of already knowing that, or of having seen those results before, but his memories seemed like a fading dream. When the tachyon transmitter

finished sending the results that the Xamtegmarquians had requested to the past, the lighthouse faded out and propelled him towards space. Iridio could finally take pleasure in the sight of a sky with almost no stars.

$$i \partial_a T \frac{\delta \Psi}{\delta T(\xi)} = \hat{\mathcal{H}}_a^G(\xi) \Psi$$

4.1.i.b. The Wheeler-De Witt equation in the presence of a tachyon field

For any (measurable) subset S of Y (i.e. $S \in \mathcal{G}$), the *Anthropic Sampling Distribution* $\nu(S)$ is the credence that a rational internal observer give to the statement that ‘*The world is in state $x \in X$ and I am observer number $k \in \mathbb{N}$ for some $(x; k) \in S$* ’, immediately after being created, knowing the probability distribution of μ on X and population count random variable N , but prior to any other knowledge being imparted.

Merely being a probability distribution on Y puts some constraints on ν , but more is needed to fully characterise and capture the notion of *Anthropic sampling*. The *Copernican Principle* is one obvious constraint. Restating it formally for this more general framework:

For all $k_0 < n_0 \in \mathbb{N}$ and $S \in \mathcal{F}$ with $N(S) = n_0$ (N is constant on S with value n_0), $\nu(K = k_0 | \mathcal{S}) = 1/n_0$

4.1.ii. A formal definition of the Copernican principle using anthropic indexical sampling, according to Cushman

The anti-energy meter indicated that he had forty-five minutes before entering the contact zone with the filament of antimatter that had coagulated in the vicinity of that site. Although the exterior was, as he had predicted, of inert elements, the energy accumulated in the anti-gravitational quantum vacuum of the filament’s interior would react to the presence of matter in his body, producing a discharge of active antimatter, which would destroy him.

He looked in all directions to make sure that he was in the right place to see the disappearance of the last galactic cumulus. He was. Only a faint hazy spot could be sensed in the jet-black sky when seen with the parameters of human vision. When exploring the firmament with vision equivalent to a telescope, he recognised that the faint light came from a redshifted elliptical galaxy, which most certainly was the result of the collapse of all the galaxies contained in the great accumulator, including Milkomeda.

When he restricted his optical perception again to the range of human vision, he witnessed the disappearance of the last photons of the Big Bang in the immense black mantle of the empty firmament. It was exactly as he had imagined it so many times. Then, a dazzling light came out of the dark lighthouse. Iridio thought that he had not followed the instructions correctly. But no, it was a message. ‘Congratulations, Iridio. You can now read your father’s poem.’

He found himself at the Widgeree cemetery by the graves of his forbears. They were covered with reproductions of statues placed there by his father’s sympathisers and admirers in the simulation they had created for him. Above them was the reproduction of the statue made of platinum and iridium given to him by the Zuespoks. The graves of his paternal grandparents, on the side, were also covered with sculptures by his grandmother Frida, and again the sculpture

given to him by the extra-terrestrials stood above them all. The green liquid circulated between the two cavities.

It was snowing and it was very cold. The snow was black, like the firmament above. The graves were disappearing beneath it. The traffic noise he had heard the first time he experienced the simulation was now the purring of spaceships powered by plasma propulsion, like the Zuespok spaceship that had carried him away from Earth. But the noise was concealed by the songs of many anchiornis, the dinosaurs that preceded birds. They seemed to be very close but he could not see them. He had the feeling that something was not right because he could not see the red button anywhere. He regretted not having accepted the company of Julia's spirit during that moment. She always knew what to do at difficult times. He started to look for the button among the graves.

All the graves nearby were of scientists. But something was not right there either. On Einstein's grave he found a strange equation: $S(E) = k \log W (mc^2)$. The equation of Boltzmann's entropy had devoured the most famous equation of Earth's most famous scientist. The same had happened with Heisenberg's grave, $S\left(\frac{d}{dt}A(t)\right) = k \log W\left(\frac{i}{\hbar}[H, A(t)] + \left(\frac{\partial A}{\partial t}\right)_H\right)$; Dirac's, $S(i\hbar\gamma^\mu\partial_\mu\psi) = k \log W(mc\psi)$; Schrödinger's $S(\hat{H}\psi) = k \log W(i\hbar\psi)$; Claude Shannon's $S(H) = k \log W(-\sum_i p_i \log p_i)$; and Hawking's, $S(S_{BH}) = k \log \left(A \left(kc^3/4\hbar G\right)\right)$.

At the end of the row, he saw Boltzmann's grave. There was a *mise-en-abîme* of formulae, starting with the simple $S = k \log W$, followed by $S(S) = k \log W(k \log W)$, $S(S(S)) = k \log W(k \log W(k \log W))$, $S(S(S(S))) = k \log W(k \log W(k \log W(k \log W)))$, and so on until iteration 137, when the headstone collapsed upon itself and became a cylinder that started to spin round at great speed.

When he looked with his telescopic vision at the spaces covered by the black snow, he discovered he could see distant galaxies. They were all violently red-shifted. The microwave background had disappeared, or at least it could not be measured with his instruments. That was evidence that he was truly in the remote future, in which the temperature of the microwave background was too low to be detected, and all evidence of the Big Bang had evaporated for an evolutionary observer equipped with instruments like his built-in ones. Fearing the imminent collision with the cumulus of antimatter, he opened the envelope with trembling hands and read in a loud voice humanity's last message to the immutable cosmos:

...9, 9, 9, 9, 2, 2, 0, 1, 8, 1, 7, 8, 9, 3, 9, 9, 4, 3, 3, 3, 7, 7, 3, 1, 1, 4, 6, 9, 1, 1, 9, 7,
0, 7, 3, 7, 8, 6, 1, 0, 4, 1, 9, 6, 3, 9, 8, 6, 4, 2, 2, 1, 6, 6, 0, 4, 5, 5, 8, 8,
9, 6, 5, 6, 8, 3, 2, 0, 6, 7, 0, 1, 3, 3, 7, 5, 0, 5, 7, 4, 5, 0, 3, 8, 8, 7, 2, 1, $e^\pi = i^{-2i}$
1, 1, 3, 3, 2, 4, 3, 6, 7, 3, 9, 8, 4, 0, 2, 8, 4, 1, 8, 8, 6, 3, 9, 1, 4, 7, 6, 3, 3, 4, 9, 1, 6, 9, 5,

1, 1, 4, 0, 3, 2, 5, 8, 3, 4, 7, 5, 8, 4, 1, 5, 1, 4, 1, 7, 0, 3, 2, 5, 6, 9, 0, 1, 6, 1, 7, 8, 4, 9, 3,		
1, 4, 5, 5, 7, 0, 6, 9, 0, 4, 1, 6, 9, 8, 5, 8, 0, 5, 0, 2, 1, 7, 7, 9, 8, 4, 9, 7, 6, 3, 7, 0, 1, 4, 7,		
5, 8, 9,		1, 4, 8,
1, 0, 5,	<i>The navel of the universe</i>	4, 3, 2,
0, 5, 8,		5, 4, 9,
1, 4, 1,		0, 0, 6,
6, 2, 2,	<i>Only a hollow, static murmur</i>	0, 1, 7,
2, 1, 7,	<i>pierces its indifferent heart.</i>	1, 9, 7,
2, 6, 8,		7, 8, 9,
3, 0, 0,	<i>With its blind eye</i>	1, 2, 1,
0, 1, 2,	<i>it witnessed the dawn of space-time</i>	6, 7, 4,
8, 1, 2,	<i>the endless clouds of cosmic dust,</i>	7, 0, 2,
3, 5, 9,	<i>the gas giants,</i>	4, 0, 8,
5, 5, 1,	<i>the quasars,</i>	6, 2, 6,
0, 1, 6,	<i>the fertile stars,</i>	8, 9, 4,
2, 5, 1,	<i>the capricious comets,</i>	1, 1, 4,
5, 8, 4,	<i>the nebulae</i>	9, 9, 6,
5, 8, 3,	<i>and the voracious black holes</i>	1, 5, 5,
8, 9, 6,	<i>that glide mechanically,</i>	6, 0, 4,
6, 0, 0,	<i>serenely, equidistantly,</i>	9, 1, 5,
2, 5, 7,	<i>from its imperturbable, pristine simplicity.</i>	9, 7, 8,
8, 1, 6,		7, 0, 3,
8, 4, 6,		2, 5, 9,
0, 5, 3,		8, 3, 2,
5, 6, 9,		2, 0, 5,
2, 0, 4,		2, 5, 7,
9, 1, 3,		7, 8, 9,
4, 8, 8,	<i>The silent vacuum of infinite space</i>	2, 7, 5,
7, 9, 6,	<i>cradles it tenderly</i>	0, 3, 2,
7, 8, 8,	<i>like a forgotten mausoleum,</i>	7, 7, 5,
3, 5, 4,	<i>mourning the hypothetical explosion</i>	6, 6, 8,
6, 1, 4,	<i>that initiated the quantum uncertainty of space,</i>	4, 1, 8,
2, 6, 8,	<i>the unending combination of the quarks,</i>	2, 7, 7,
9, 7, 6,	<i>destiny.</i>	5, 1, 2,
5, 8, 9,		5, 3, 5,
6, 3, 7,		6, 1, 4,
8, 5, 9,		9, 4, 4,
8, 5, 0,		4, 9, 7,
0, 6, 6, 3, 8, 4, 0, 6, 2, 6, 6, 1, 2, 1, 9, 5, 7, 1, 4, 1, 9, 1, 1, 0, 6, 3, 2, 4, 6, 0, 6, 1, 7, 7, 4,		
1, 8, 0, 5, 7, 7, 2, 1, 2, 3, 8, 1, 6, 5, 9, 8, 7, 2, 4, 7, 2, 4, 3, 2, 2, 5, 2, 9, 6, 9, 0, 9, 8, 5, 3,		

3, 6, 2, 8, 4, 4, 0, 7, 9, 9, 0, 3, 0, 0, 0, 7, 5, 9, 4, 5, 4, 6, 2, 8, 1, 5, 4, 9, 2, 3, 5, 5, 0, 6, 0,
 8, 6, 4, 8, 1, 5, 5, 7, 9, 2, 8, 9, 6, 1, 9, 6, 9, 6, 1, 7, 0, 6, 0, 7, 1, 5, 2, 0, 1, 5, 8, 9, 8, 2, 5,
 2, 9, 9, 7, 7, 2,
 8, 0, 3, *On some far distant day* 5, 2, 0,
 0, 0, 2, 6, 1, 0,
 8, 8, 8, *it will complete its inescapable cycle.* 8, 1, 4,
 1, 7, 6, *On some definite computable day* 5, 0, 6,
 6, 3, 6, *it will turn completely dark* 2, 1, 6,
 9, 0, 5, 9, 2, 8,
 0, 2, 1, *and release the intrusive light* 5, 1, 6,
 4, 2, 9, *of the last fading galaxy* 1, 9, 8,
 4, 8, 4, 0, 7, 7,
 4, 4, 6, *forever inexorably receding.* 1, 4, 3,
 6, 1, 7, 8, 9, 1,
 4, 1, 5, *It is the multiple fixed point* 1, 9, 1,
 5, 1, 7, 9, 7, 6,
 5, 3, 7, *in the entropic and expanding universe,* 0, 5, 0,
 9, 9, 8, *left behind and left ahead* 3, 7, 4,
 4, 1, 8, 5, 9, 8,
 0, 3, 4, *in three hysterical seconds.* 9, 8, 8,
 2, 1, 2, *It is there,* 3, 9, 3,
 4, 0, 9, *in the far-off and inaccessible confines of space-time,* 1, 9, 8,
 0, 5, 0, 5, 5, 1,
 0, 3, 8, *it has been released, pure and mathematical* 2, 1, 5,
 3, 9, 8, 2, 7, 6,
 7, 7, 2, *from the stifling tyranny of matter.* 9, 1, 3,
 7, 3, 1, 3, 8, 0,
 0, 6, 7, *The empty cradle of the Big Bang...* 1, 5, 3,
 3, 9, 2, *It is the navel and aleph,* 4, 0, 1,
 2, 6, 9, 5, 4, 5,
 8, 6, 3, *omega and mystery,* 7, 6, 4,
 2, 2, 0, *which still watches over* 6, 5, 0,
 9, 7, 8, 1, 0, 8,
 5, 2, 9, *the frozen slumbering memory of nothingness,* 0, 7, 6,
 3, 9, 0, *the inconceivable gestation* 7, 9, 7,
 2, 7, 8, 4, 1, 3,
 0, 1, 7, *of the absolute beginning.* 6, 4, 5,
 5, 3, 2, 4, 7, 5,
 2, 7, 0, 7, 3, 7, 8, 8, 7, 6, 4, 0, 6, 9, 3, 6, 6, 4, 2, 0, 0, 1, 2, 1, 9, 4, 7, 4, 5, 7, 0, 2, 3, 5, 8,
 2, 9, 5, 4, 8, 1, 3, 6, 5, 7, 8, 1, 8, 0, 9, 8, 6, 7, 9, 4, 4, 0, 2, 0, 2, 2, 0, 2, 8, 0, 8, 2, 2, 6, 3,

7, 9, 5, 7, 0, 0, 6, 7, 5, 5, 3, 9, 3, 5, 7, 5, 8, 0, 8, 0, 8, 6, 3, 1, 8, 9, 3, 2, 0, 7, 5, 8, 6, 4, 4,
4, 4, 2, 0, 6, 6, 4, 4, 6, 9, 1, 6, 4, 9, 3, 3, 4, 4, 6, 7, 6, 9, 8, 1, 8, 0, 8, 1, 1, 7, 1, 6, 5, 6, 8,
6, 6, 5, 2, 1, 3, 3, 8, 9, 6, 8, 6, 1, 7, 3, 5, 9, 2, 4, 5, 0, 9, 2, 0, 8, 0, 1, 4, 6, 5, 3, 1, 2, 5, 2,

$$f_{\text{sim}} = \frac{k\bar{N}\bar{H}}{k\bar{N}\bar{H} + n\bar{H}} = \frac{f_p\bar{N}\bar{H}}{f_p\bar{N}\bar{H} + \bar{H}}$$

4.1.iii.a. Fraction of all observers with human-type experiences that live in simulations

4, 7, 7, 7, 9, 6, 6, 1, 3, 7, 1, 9, 8, 6, 9, 5, 9, 1, 6,
4, 5, 1, 8, 6, 9, 4, 3, 2, 3, 2, 4, 2, 4, 6, 4, 0, 4, 4,
0, 1, 6, 7, 2, 3, 8, 1, 9, 7, 8, 0, 2, 0, 7, 2, 8, 3, 9,
4, 4, 1, 8, 2, 6, 4, 5, 0, 2, 1, 8, 3, 1, 3, 1, 4, 8, 3,
3, 6, 6, 0, 1, 9, 3, 8, 4, 8, 9, 1, 9, 7, 2, 3, 1, 7, 8,
1, 7, 1, 5, 4, 3, 7, 2, 1, 9, 2, 1, 0, 3, 9, 4, 6, 6, 3,
8, 4, 7, 3, 7, 1, 5, 6, 3, 0, 2, 2, 6, 7, 0, 1, 8, 0, 1, 3, 4, 3, 5, 1, 5, 9, 3, 0, 4, 4, 2, 8, 5, 3, 8,
4, 8, 9, 4, 1, 8, 2, 5, 6, 7, 8, 8, 7, 0, 7, 2, 1, 2, 3, 8, 5, 2, 0, 5, 9, 7, 2, 6, 3, 8, 5, 9, 2, 2, 4,
9, 3, 4, 7, 6, 3, 6, 2, 3, 1, 2, 2, 1, 8, 8, 1, 1, 3, 7, 0, 6, 3, 0, 7, 5, 0, 6, 9, 1, 8, 2, 6, 0, 1, 0,
9, 6, 8, 9, 0, 6, 9, 2, 5, 1, 4, 1, 7, 1, 4, 2, 5, 1, 4, 2, 1, 8, 1, 5, 3, 4, 9, 1, 5, 3, 2, 1, 2, 9, 0,
7, 7, 7, 2, 3, 7, 4, 8, 5, 0, 6, 6, 3, 5, 4, 8, 9, 1, 7, 0, 8, 9, 2, 8, 5, 0, 7, 6, 0, 2, 3, 4, 3, 5, 1,
7, 6, 8, 2, 1, 8, 3, 5, 5, 0, 0, 8, 8, 2, 9, 6, 4, 7, 4, 1, 0, 6, 5, 5, 8, 1, 4, 8, 8, 2, 0, 4, 9, 2, 3,
9, 5, 3, 3, 7, 0, 2, 2, 7, 0, 5, 3, 6, 7, 0, 5, 6, 3, 0, 7, 5, 0, 3, 1, 7, 4, 9, 9, 7, 8, 8, 1, 8, 7, 0,
0, 9, 9, 8, 9, 2, 5, 1, 0, 2, 0, 1, 7, 8, 0, 1, 5, 6, 0, 1, 0, 4, 2, 2, 7, 7, 8, 3, 6, 2, 8, 3, 6, 4, 4,
3, 2, 3, 7, 2, 9, 7, 7, 9, 9, 2, 9, 9, 3, 5, 1, 6, 0, 9, 2, 5, 8, 8, 4, 5, 1, 5, 7, 7, 2, 0, 5, 5, 2, 3,
2, 8, 9, 6, 9, 7, 8, 3, 3, 3, 1, 2, 6, 4, 2, 7, 6, 7, 1, 2, 9, 1, 0, 9, 3, 9, 9, 3, 1, 0, 3, 7, 7, 3, 4,

The accumulation of sequences of observers continues—and even includes the observations made by different intelligent species elsewhere in the Universe—until all sequences of observations by all observers of all intelligent species that have ever existed and ever will exist, of *all* events that have ever occurred and will ever occur are finally joined together by the Final Observation by the Ultimate Observer. He must be located at the final singularity in a closed universe, or at future time-like infinity in an open universe. Since no further observations are possible past this Final Observation—there is no future time past the final singularity or past future time-like infinity—the infinite sequence of observations

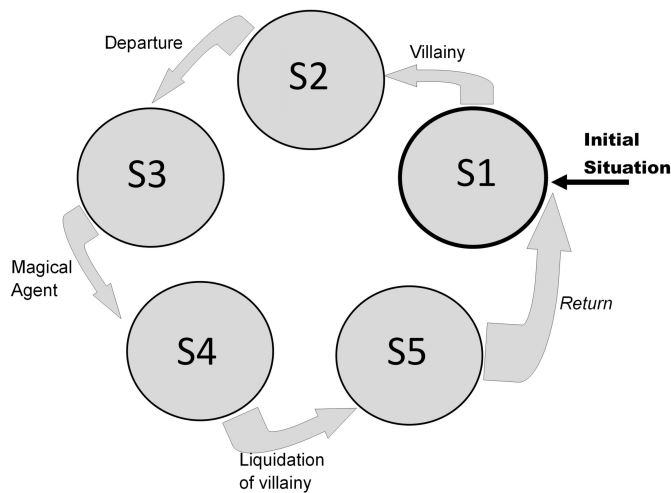
$$\psi = \prod_n \sum_{i,k} \psi_{ik} O_{ink}$$

must come to an 'end' in the sense that no further terms can be added to it.

4.1.iii.b. The final observation by the ultimate observer, according to Barrow and Tipler

9, 7, 7, 7, 9, 6, 6, 1, 3, 7, 1, 9, 8, 6, 9, 5, 9, 1, 6,
4, 5, 1, 8, 6, 9, 4, 3, 2, 3, 2, 4, 2, 4, 6, 4, 0, 4, 4,
0, 1, 6, 7, 2, 3, 8, 1, 9, 7, 8, 0, 2, 0, 7, 2, 8, 3, 9,
4, 4, 1, 8, 2, 6, 4, 5, 0, 2, 1, 8, 3, 1, 3, 1, 4, 8, 3,
3, 6, 6, 0, 1, 9, 3, 8, 4, 8, 9, 1, 9, 7, 2, 3, 1, 7, 8,
1, 7, 1, 5, 4, 3, 7, 2, 1, 9, 2, 1, 0, 3, 9, 4, 6, 6, 3,
8, 4, 7, 3, 7, 1, 5, 6, 3, 0, 2, 2, 6, 7, 0, 1, 8, 0, 1, 3, 4, 3, 5, 1, 5, 9, 3, 0, 4, 4, 2, 8, 5, 3, 8,
4, 8, 9, 4, 1, 8, 2, 5, 6, 7, 8, 8, 7, 0, 7, 2, 1, 2, 3, 8, 5, 2, 0, 5, 9, 7, 2, 6, 3, 8, 5, 9, 2, 2, 4,
9, 3, 4, 7, 6, 3, 6, 2, 3, 1, 2, 2, 1, 8, 8, 1, 1, 3, 7, 0, 6, 3, 0, 7, 5, 0, 6, 9, 1, 8, 2, 6, 0, 1, 0,
9, 6, 8, 9, 0, 6, 9, 2, 5, 1, 4, 1, 7, 1, 4, 2, 5, 1, 4, 2, 1, 8, 1, 5, 3, 4, 9, 1, 5, 3, 2, 1, 2, 9, 0,
7, 7, 7, 2, 3, 7, 4, 8, 5, 0, 6, 6, 3, 5, 4, 8, 9, 1, 7, 0, 8, 9, 2, 8, 5, 0, 7, 6, 0, 2, 3, 4, 3, 5, 1,
7, 6, 8, 2, 1, 8, 3, 5, 5, 0, 0, 8, 8, 2, 9, 6, 4, 7, 4, 1, 0, 6, 5, 5, 8, 1, 4, 8, 8, 2, 0, 4, 9, 2, 3,
9, 5, 3, 3, 7, 0, 2, 2, 7, 0, 5, 3, 6, 7, 0, 5, 6, 3, 0, 7, 5, 0, 3, 1, 7, 4, 9, 9, 7, 8, 8, 1, 8, 7, 0,
0, 9, 9, 8, 9, 2, 5, 1, 0, 2, 0, 1, 7, 8, 0, 1, 5, 6, 0, 1, 0, 4, 2, 2, 7, 7, 8, 3, 6, 2, 8, 3, 6, 4, 4,
3, 2, 3, 7, 2, 9, 7, 7, 9, 9, 2, 9, 9, 3, 5, 1, 6, 0, 9, 2, 5, 8, 8, 4, 5, 1, 5, 7, 7, 2, 0, 5, 5, 2, 3,
2, 8, 9, 6, 9, 7, 8, 3, 3, 3, 1, 2, 6, 4, 2, 7, 6, 7, 1, 2, 9, 1, 0, 9, 3, 9, 9, 3, 1, 0, 3, 7, 7, 3, 4,
2, 5, 9, 1, 0, 5, 9, 2, 3, 0,
3, 2, 7, 7, 6, 5, 2, 6, 6, 7,
6, 4, 1, 8, 7, 4, 8, 4, 2, 4,
4, 1, 0, 7, 6, 5, 6, 4, 4, 4,
7, 7, 6, 7, 0, 9, 7, 7, 9, 0,
3, 9, 2, 3, 2, 4, 9, 5, 8, 4,
1, 6, 3, 4, 8, 5, 2, 7, 7, 3,
5, 1, 7, 1, 9, 8, 1, 0, 6, 4,
6, 7, 3, 8, 3, 7, 1, 4, 2, 7,
4, 2, 9, 7, 4, 4, 6, 8, 9, 9,
2, 3, 2, 0, 4, 0, 6, 9, 3, 2,
5, 0, 6, 0, 6, 2, 8, 3, 4, 4,
6, 8, 9, 3, 7, 5, 4, 3, 0, 1,
6, 7, 8, 7, 8, 1, 5, 3, 2, 0,
6, 1, 6, 0, 0, 9, 0, 5, 7, 6,
9, 3, 4, 0, 4, 9, 0, 6, 1, 4,
6, 1, 7, 6, 6, 0, 7, 0, 9, 4,
3, 8, 0, 1, 1, 0, 9, 1, 5, 4,
4, 3, 2, 6, 1, 9, 2, 9, 0, 0,
0, 7, 4, 5, 2, 0, 9, 8, 9, 5,
9, 5, 9, 2, 0, 1, 1, 5, 9, 4,

1, 2, 3, 2, 4, 1, 0, 2, 2, 7, 4, 8, 4, 5, 4, 8, 2, 6, 0, 5, 4, 0, 4, 3, 6, 1, 8, 7, 1, 8, 3, 6, 3, 3, 0,
 2, 6, 8, 9, 9, 2, 8, 5, 8, 6, 2, 3, 5, 8, 2, 1, 4, 5, 6, 4, 3, 8, 7, 9, 6, 9, 5, 2, 1, 0, 2, 3, 5, 2, 6,
 6, 6, 7, 3, 3, 7, 2, 4, 3, 4, 4, 2, 3, 0, 9, 1, 5, 7, 7, 1, 8, 3, 2, 7, 7, 5, 6, 5, 8, 0, 0, 2, 1, 1, 9,
 2, 8, 2, 7, 0, 3, 9, 1, 0, 4, 2, 3, 9, 1, 9, 6, 6, 4, 2, 6, 9, 1, 1, 1, 5, 5, 3, 3, 3, 5, 9, 4, 5, 6, 9,
 6, 8, 5, 7, 8, 2, 8, 1, 7, 0, 2, 0, 3, 2, 5, 4, 9, 5, 5, 5, 2, 5, 2, 8, 8, 7, 5, 4, 6, 4, 4, 6, 6, 0, 7,
 4, 6, 2, 0, 2, 9, 4, 7, 6, 6, 1, 1, 6, 0, 0, 4, 4, 3, 5, 5, 5, 1, 6, 0, 4, 7, 3, 5, 0, 4, 4, 2, 9, 2, 1,
 2, 7, 9, 1, 6, 3, 5, 8, 7, 4, 8, 4, 7, 3, 5, 0, 1, 5, 9, 0, 2, 1, 5, 5, 2, 2, 1, 2, 0, 3, 8, 8, 2, 8, 1,
 1, 6, 8, 0, 2, 1, 4, 1, 3, 8, 6, 5, 8, 6, 5, 1, 6, 8, 4, 6, 4, 5, 6, 9, 9, 6, 4, 8, 1, 0, 0, 1, 5, 6, 3,
 3, 7, 4, 1, 2, 5, 5, 0, 9, 8, 4, 7, 9, 7, 3, 0, 1, 3, 8, 6, 5, 6, 2, 7, 5, 4, 6, 0, 1, 6, 1, 2, 7, 9, 2,
 4, 6, 3, 5, 9, 7, 8, 3, 6, 6, 1, 4, 8, 0, 1, 6, 3, 8, 7, 1, 6, 0, 2, 7, 9, 4, 4, 0, 5, 4, 8, 2, 7, 1, 0,
 1, 9, 6,



4.1.iii.c. Schematic representation of a finite-state automaton generating a simple Propp-style folk-tale plot.

2, 9, 0,
 5, 4, 3,
 0, 9, 2,
 5, 6, 7,
 1, 8, 1,
 6, 4, 1,
 7, 6, 3,
 4, 3, 6,
 5, 0, 3,
 5, 8, 0,
 0, 4, 2,
 9, 0, 6,
 1, 1, 7,
 7, 8, 7,
 0, 8, 1,
 2, 2, 7,
 3, 6, 8, 8, 2, 4, 9, 6, 7, 0, 7, 7, 6, 3, 5, 5, 5, 9, 8, 6, 9, 2, 8, 4, 9, 0, 1, 6, 2, 8, 7, 6, 8, 6, 9,
 9, 6, 2, 8, 0, 5, 3, 7, 9, 0, 1, 8, 1, 8, 4, 8, 1, 4, 8, 8, 1, 0, 8, 3, 3, 9, 4, 6, 9, 0, 0, 0, 1, 6, 3,
 8, 0, 7, 9, 1, 0, 7, 5, 9, 6, 0, 7, 4, 5, 5, 0, 4, 6, 8, 8, 9, 1, 2, 6, 8, 6, 7, 9, 2, 8, 1, 2, 3, 9, 1,
 1, 4, 8, 8, 8, 0, 0, 3, 6, 7, 2, 0, 7, 2, 9, 7, 3, 0, 8, 0, 1, 3, 5, 4, 4, 3, 1, 3, 2, 5, 3, 4, 7, 7, 1,
 3, 0, 9, 4, 1, 8, 6, 7, 1, 7, 1, 7, 8, 6, 0, 7, 5, 2, 2, 9, 8, 1, 3, 7, 3, 5, 3, 9, 1, 2, 6, 7, 7, 2, 8,
 1, 2, 5, 9, 3, 9, 5, 8, 2, 2, 0, 5, 2, 4, 2, 8, 9, 9, 9, 1, 3, 7, 1, 6, 9, 0, 6, 8, 5, 6, 5, 0, 4, 2, 1,
 5, 7, 5, 0, 5, 6, 7, 2, 9, 9, 9, 1, 2, 7, 4, 1, 7, 7, 1, 4, 9, 2, 7, 9, 6, 0, 8, 8, 3, 1, 5, 0, 2, 3, 5,
 8, 6, 9, 7, 8, 1, 6, 1, 9, 0, 8, 9, 4, 9, 0, 8, 4, 8, 7, 7, 1, 7, 7, 2, 2, 5, 0, 3, 8, 6, 0, 8, 7, 2, 6,
 1, 8, 3, 8, 4, 9, 4, 7, 9, 3, 9, 7, 5, 7, 4, 4, 0, 6, 6, 4, 9, 1, 2, 7, 6, 0, 5, 1, 8, 8, 7, 8, 1, 2, 4,
 2, 3, 3, 6, 8, 3, 1, 2, 5, 4, 6, 7, 2, 7, 8, 3, 3, 1, 5, 1, 3, 1, 8, 6, 7, 5,
 8, 9, 1, 5, 6, 6, 8, 3, 0, 0, 6, 7, 9, 2, 1, 0, 2, 1, 5, 9, 4, 7, 3, 3, 6, 8,
 5, 8, 5, 9, 1, 2, 0, 1, 3, 9, 5, 3, 6, 0, 3, 0, 1, 6, 7, 8, 1, 1, 0, 4, 1, 3,
 4, 4, 4, 4, 1, 1, 0, 3, 0, 9, 0, 3, 3, 8, 8, 7, 6, 1, 5, 2, 0, 4, 8, 8, 2, 9, 6, 9, 0, 9, 1, 0, 4, 6, 8,
 9, 1, 6, 7, 6, 7, 1, 5, 5, 5, 3, 7, 3, 3, 4, 6, 6, 2, 2, 5, 4, 5, 5, 7, 5, 9, 7, 5, 2, 0, 2, 6, 2, 4, 7,

$$e^{\pi} = (-1)^{-i}$$

7, 1, 2, 4, 2, 7, 9, 6, 2, 2, 5, 9, 8, 3, 2, 7, 8, 4, 0, 5, 8, 3, 3, 5, 8, 5, 8, 9, 7, 6, 7, 1, 4, 7, 4,
2, 0, 5, 7, 2, 4, 0, 4, 7, 4, 3, 9, 7, 2, 0, 2, 3, 2, 8, 9, 5, 9, 0, 3, 7, 2, 6, 1, 4, 8, 6, 8, 8, 3, 8,
8, 0, 0, 3, 1, 7, 4, 1, 4, 6, 4, 9, 0, 2, 0, 3, 8, 4, 3, 5, 9, 0, 3, 5, 8, 5, 2, 7, 9, 9, 3, 1, 2, 3, 8,
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8, 2, 8, 3, 7, 6, 9, 3, 5, 7, 0, 0, 9, 9, 5, 4, 1, 9, 5, 4, 1, 8, 3, 9, 0,
2, 9, 1, 5, 1, 0, 3, 3, 1, 8, 7, 9, 3, 3, 9, 0, 7, 6, 1, 4, 2, 0, 7, 4, 6, 7, 0, 2, 8, 8, 6, 7, 9, 6, 8,
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4, 6, 9, 7, 4, 6, 1, 8, 1, 2, 8, 5, 5, 7, 6, 4, 6, 6, 2, 2, 6, 5, 4, 1, 2, 9, 1, 3, 2, 0, 4, 0, 5, 2, 2,

$$e^{i\frac{\pi}{4}} + \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}$$

A spatio-temporal point p is a *primary point of divergence* for a given possible world w_i if and only if p is a point of divergence (i.e. there is an event e such that e is localised at p and it takes place in w_i but not in the actual world), and there are no other points of divergence in w_i absolutely earlier than p

4.1.iii.d. Primary points of divergence, according to Bigaj

$$e^{i\frac{\pi}{4}} - \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}i$$

7, 9, 0, 7, 1, 2, 1, 2, 8, 2, 0, 6, 5, 3, 7, 7, 5, 0, 5, 8, 2, 8, 0, 0, 4, 0, 8, 9, 7, 1, 6, 3, 4, 6, 7,
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4.2. The much-anticipated conference

The Singularity will represent the culmination of the merger of our biological thinking and existence with our technology, resulting in a world that is still human but that transcends our biological roots. There will be no distinction, post-Singularity, between human and machine or between physical and virtual reality.

Ray Kurzweil

‘A very interesting poem, but it has serious scientific and poetic flaws, which we shall discuss another time, once we have understood your hypotheses about antimatter, which have caused such a stir in the international scientific press,’ said PhDr Yoshida Harris, his old analytical chemistry lecturer.

When he raised his eyes, Iridio was surprised to see that he was in the office of PhDr Grossling Pulst, the new director of the astronomy program at the provincial university where he had studied. Both of them seemed very happy to talk to him. On the wall were three pictures. In the centre was the the cover of the *Sci-Teuchter Bulletin*, where his photograph had been published, between two other pictures. Another was a yellowing portrait of Sandrini. He remembered seeing it for the first time in his paternal grandfather’s documentary, which he had watched in the amphitheatre of Victoria Mansion. The third was the portrait of Edward Witten which his mother had on the wall of her studio when he was a child and which she had left in Ernesto’s clandestine library when they were trying to expel her from the university.

‘I am also interested to know the implications of your hypotheses for a future unified theory,’ put in PhDr Grossling Pulst. ‘Particularly now that, thanks to your wonderful publication, we can openly discuss the predictions of string theory again.’

Iridio told them he had no time to explain everything because they were going to collide with a cumulus of antimatter, but both of them laughed and told him not to try and avoid the subject with his complicated fantasies. Joking apart, however, they recognised he had proved them wrong.

‘That is how science works,’ added PhDr Grossling Pulst. ‘We only have tem-

Irrespective of what we think are the possible forms of intelligent life, the necessary and sufficient anthropic condition on the cosmological constant is that it should not be so large as to prevent the appearance of gravitationally bound states.

4.2.i.a. The anthropic limit of the cosmological constant, according to Weinberg.

porary hypotheses until a new model supported by evidence replaces them.’

Iridio then explained that the science of the extra-terrestrials in fact anticipated a unified theory, but it was written in a type of mathematics not yet discovered on Earth.

‘Don’t tell me you still believe in that extra-terrestrial business!’ exclaimed PhDr Yoshida Harris, smiling and staring at PhDr Grossling Pulst. ‘The authorities said they had never contacted us, that it was all a ploy of the space colonies, who wanted independence so they could expand to Mars and the asteroid belt. Their real aim was to stop sending food and minerals to Earth and to avoid paying so much tax to maintain the basic universal minimum salary of all the planet’s inhabitants. Everything seemed very plausible because they used artificial intelligences to simulate the invasion, but the automatons escaped and caused trouble. Luckily, the danger is over because the terrestrial authorities have restored the real world and are rebuilding the space farms that were destroyed.’

‘Unfortunately, as a result of the much-needed epistemological deep-cleaning after the artificial intelligences escaped, the University of Outer Space has been closed. It had one of the best astronomy programs of our civilisation,’ added a sorrowful PhDr Grossling Pulst.

PhDr Gaffney-Yang came in and told the three of them to hurry because the conference was about to begin.

$$ds^2 = -a^2(z) (-dt^2 + d\vec{x}^2 + dz^2)$$

4.2.i.b. The metric of a Poincaré worm-hole in AdS

They walked along the corridor leading to the aula magna of the university. They were escorted by many soldiers, like the ones guarding him during the visit to his father’s grave. On the walls there were posters announcing the national astronomy conference, with his name as keynote speaker. Along the way several journalists approached him to seek his thoughts on the future of astronomy, wormholes to eventually travel through space-time, and other predictions of his master

$$D_M(x) = e^{1/2 q_M(x,x)} \sum_{\mathcal{L} \in \Lambda} 2^{m(M)} SW(M, \mathcal{L}) e^{c_1(L^0)(x)}$$

4.2.i.c. Witten’s magical formula for the Donaldson series

formula. Above all, they wanted his opinion on the replacement of the cosmology imagined by Sandrini-Einstein, and the relaxation of restrictions on the use of string theory. One of the journalists was Archibald Xenón, the only one who

had interviewed him about his discoveries during the media circus that followed his appointment as ambassador to the extra-terrestrials, but Archibald Xenón did not seem to remember that, because he introduced himself as if they were unacquainted. Among the other journalists were Ogilvy Withers and Gisa

Let ν be a measure on $(Y, \mathcal{G})$ that satisfies the Copernican Principle. The *(Formal) Self-Sampling Assumption* for ν states that the ν -measure of a set of world-states is the same as the μ -measure, conditioned on there being some observers at all:

$$\nu_{SSA}(\tilde{S}) = \mu(S|N > 0)$$

4.2.i.d. The (formal) self-sampling assumption, according to Cushman

Michaela, who had brazenly interviewed him about his sex life. Neither seemed to remember that they had met before. All the reporters were asking questions at the same time, fighting to thrust their hologramcorders closer to his face.

Bewildered by so much attention, Iridio did not know what to say. PhDr's Grossling Pulst and Yoshida Harris took the floor and dealt with the press. They explained to the journalists the importance of his work and the consequences it would have for a new unified theory, stressing the potential technological advantages which would make it possible to travel to nearby stars. They also emphasised that it made them very proud that a student of Yabbie Creek-W Multimodal Polytechnic University was the author of the work that had won the prestigious Heisenberg prize in theoretical and experimental physics. PhDr Gaffney-Yang, who had not been involved in the conversation with the press, hauled him away to the aula magna.

$$\begin{bmatrix} 1 & \mathbf{a} & \mathbf{c} \\ \Pi_{\hbar}(0 & \mathbf{I}_n & \mathbf{b}) \\ 0 & 0 & 1 \end{bmatrix} \psi(x) = e^{i\hbar c} e^{i\mathbf{b} \cdot \mathbf{x}} \psi(x + \hbar \mathbf{a})$$

4.2.i.e. Schrödinger representation of the Heisenberg group

They did not enter through the front door but via a side door leading to the control room of the amphitheatre. Inside, there was another door, leading to the left of the podium in the aula magna. PhDr Gaffney-Yang told him that he wanted him to meet a very important person and pointed to the attic where a 5D holographic projector was located. Iridio objected that he felt claustrophobic in enclosed spaces. But PhDr Gaffney-Yang assured him that it was very important and helped him up the narrow spiral staircase. When they were in the room, mostly occupied by the projector, he opened one of the big cupboards which was full of apparatus waiting to be repaired, and there, crouching among thousands of instruments and quantum computer spares, in an uncomfortable position, a balding man with a grey beard and glasses was hiding. He smiled at Iridio as if he knew him and introduced himself as his biographer. They both asked him not to mention his presence as he was in Ozeania incognito. PhDr Gaffney-Yang told them that he would leave them for a short while because he had to make sure that everything was working in the hall. Iridio's biographer asked him to explain who PhDr Charrington der Heer was, because the information he had did not add up, and he had been criticised for what he had written about her. According to some documents he had obtained, she was his half-sister, but others had said that she was his aunt. The authorities in Ozeania, however, confirmed that she was one of the psychometrists who had protected him. His editor wanted him to clarify his relationship to her for the second edition of his biography, which would be published when he returned to Atlantis VIII and could add details of Iridio's keynote address. Iridio replied that his

grandmother Mildred had caused the confusion because she wanted to help Ariadna, who was also a prisoner of the authorities. She had sent him contradictory information because she never respected Grice's maxims. The biographer asked him to explain how it was possible that his long-dead grandmother could be the source of the confusion. In fact, he had obtained her last will and testament, in which she called Ariadna 'ma petite a', and Iridio 'mon petit i', and left them both billions of bitcoins she had obtained from the sale of his father's sculptures and his grandmother Frida's artworks in the maritime cities. Before Iridio could give him a detailed account of the complicated situation, PhDr Gaffney-Yang, who had returned to the attic, motioned to the biographer to hide in the cupboard again and asked Iridio to come down because his presentation was due to start.

When he entered, the aula magna felt chilly. He was glad of the old overcoat he had inherited from his father, which protected him from the dry and penetrating cold. The hall was in semi-darkness, lit only by the reflection of the projected cover of the Scottish journal with his photograph, but clearly there was an audience because they clapped when he came in. PhDr Gaffney-Yang asked him to stand at the podium where they had placed his flexible reader with the diagrams he had created when preparing the lecture in Victoria Mansion, ready to be projected. There was also a pile of printed books he had read in Ernesto's house. Without giving him time to say anything, he started to introduce Iridio to the audience. As his eyes began to adjust to the dim light, he could tell that the first four rows were empty and the seats had 'reserved' signs. On the far right of the fifth row, he recognised the skinny and lanky nurse of PhDr Sertril Inclistus, who was also there in his wheelchair, in front of him. Behind them, in the sixth row, sat Professor Müller Porta and his wife. There were five or six empty seats next to them, and closer to the middle, sat Olgava and other organic instructors who had always looked at him mockingly, now with eyes filled with admiration. Iris and her children, who were seated in the middle of the fifth row next to a woman, possibly Julia's sister, looked at him with sparkling eyes. The same applied to his patent office colleagues, who also looked at him admiringly, even those who had made fun of him. Kaminer Kulych was taking holograms with his late-model flexible reader, a clear indication that he had been promoted again in the agency. On the far left sat Zoe, his boss, and Kask Gruber, the general supervisor at the national patent office, also visibly pleased.

In the seventh row, starting from the right, he recognised the co-authors of the famous article, PhDrs Muñoz Rojas and Díaz Orellana. Next to them was Magister Kumar Aliyev, the editor of the journal which had published his first article, and three people he did not know but presumed to be the anonymous reviewers who had authorised his first publication. One of them was, as Ernesto

had suspected, an old scientist, with dishevelled white hair. Also present were his old university lecturers who had now retired, like PhDr Hydrick Lefebure, the former dean of applied sciences and PhDr Lowell-Adams, professor of Introduction to Astronomy. In the same row were the tutors of the subjects he had studied, the astronomers who had laughed at him in his presenta-

tions and some of the students who had presented papers after him at congresses, wearing academic robes they did not deserve. Mrs Frauke Grubach and a man he did not know, but suspected was her husband, were seated several rows behind, together with other lodgers who had never bothered to say hello when he lodged with her. Much further back, close to the middle of the amphitheatre, he recognised Vincent and Teodoro. They were the only ones not wearing hats among a group of police officers from all the ministries who had come to spy on the event, and possibly on each other. It seemed strange that members of the intellectual police were there, wearing their yellow hats, since the force had presumably been disbanded after the coup d'état.

He could not continue to study the audience because Ph Drs Grossling Pulst and Yoshida Harris came into the hall, escorting PhDr Mond Beatty, president of the International Confederation of Astronomy, whom he recognised by the yellow mitre of a post-creationist archbishop, followed by the rest of the soldiers. The press, who had come with them, took holograms of the moment in which PhDr Mond Beatty took his seat in the front row. They also recorded part of the speech of PhDr Gaffney-Yang, who was still singing Iridio's praises. The flashes of the holograms while he patiently waited on the podium blinded him for a moment, but he was able to notice a Zuespok running into the hall. It came close, rummaged among the books on the podium and pointed to a button near the tactile computer that controlled the projection on the screen. This was no ordinary Zuespok because it had human hands, which also uncovered a clock in the console that marked the time remaining until the aula magna fell into the anti-matter zone. The button looked grey. Iridio then realised that he had lost his synaesthesia and could see only in black and white. There were only twenty-seven minutes left. The audience roared with laughter because the interloper had pressed some buttons, and as a result the screen was displaying the photos of naked women that Iridio had seen so many times when he wore the

The mixed strategy profile $\sigma = (\sigma_1, \dots, \sigma_n)$ is a mixed strategy Nash equilibrium if and only if the following two conditions are satisfied for every $i = 1, \dots, n$.

- (1) If the strategies s_i and s'_i are both active in σ_i , then $\pi_i(s_i, \sigma_{-i}) = \pi_i(s'_i, \sigma_{-i})$.
- (2) If the strategy s_i is active in σ_i and the strategy s'_i is not active in σ_i , then $\pi_i(s_i, \sigma_{-i}) \geq \pi_i(s'_i, \sigma_{-i})$.

4.2.ii.a. Fundamental Theorem of Nash Equilibria

Global universe	→	Actual world, Characters' domains
Actual world	→	Profane layer (Sacred layer)
Profane layer	→	Factual domain, Actualisable domain
Sacred layers	→	Factual domain
Characters' domains	→	Epistemic or Knowledge-world (Intention-world) Model-worlds (Alternative universe)
Epistemic or Knowledge-world	→	Actual world (Characters' domains)
<i>Intention-world</i>	→	<i>Target, game plan</i>
Model worlds	→	{Wish world, Moral Values world, Obligation world}
Alternative universe	→	Global universe
4.2.ii.b.A. Generative rules for the modal structure of narrative universes, according to Marie-Laure Ryan		

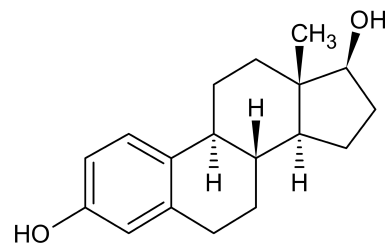
diagnostic helmet during his psychological tests. Four policemen cornered the intruder and removed its Zuespok mask. The press took many mobile holofilms of the event. Iridio recognised the masked man, it was an older Rieneke Watson, his old psychometrist, who was shouting at the top of his voice that everything was a recurrent fiction, while he was

taken away. Iridio realised that two of the policemen had been his guards in Brodei, the very ones who had interrupted his sexual encounter with Ariadna. The others were Magister Henare Stoneman Parsons, the patriotic policeman who had rejected his request to visit Atlantis VIII, and Sergeant Black Jakupi, from the morality and oztraditions police who had harassed him so much in Widgeree. He noticed that his biographer had left the control room and, taking advantage of the confusion, occupied a seat in the fifth row, next to PhDr Sertril Inclistus's nurse.

A sentence of the form "In the fiction f , Φ " is non-vacuously true if and only if, whenever w is one of the collective belief worlds of the community of origin of f , then some world where f is told as known fact and Φ is true differs less from the world w , on balance, than does any world where f is told as known fact and Φ is not true. It is vacuously true if and only if there are no possible worlds where f is told as known fact.

4.2.ii.b.B. Truth in fiction according to David Lewis (Analysis 2)

The audience laughed again, this time uncomfortably. The projector was showing a series of pornographic holograms of PhDr Charrington der Heer in a double penetration with two men. One of them was Major Klamm O'Brien, and the other Tintorelli Turner III. In the background a distorted image of an orgy could be seen. There, among muses and satyrs dressed in pink, Leni Lenina was dancing naked on a table.



4.2.ii.c.A. Chemical structure of estradiol

Iridio gathered that it was the swingers' party to which Ariadna had been taken after he was rescued from the cathedral. Then, several holograms were shown of Ariadna in different positions in bed with two or three men. The hologram-mist seemed to have an obsession with Ariadna's facial expressions during her serial orgasms, since there were few takes that showed the other participants, compared to those that documented the agony of her pleasure. However, it was easy to recognise

$$\ddot{\Psi} + 2\omega_n \xi \dot{\Psi} + \omega_n^2 \Psi + \mu \Psi^3 = A \sin(\Omega t)$$

4.2.ii.c.B. A model for sex and orgasm where sexual tension is approximated as the magnitude of the amplitude of the erotic response

President Bjelke Goldstein, Captain Pinel Moniz, General Bleurel Kandel and Brigadiers Seeman Sortini and Kliz Sordini. The other men were probably government officials.

The new psychometrist in the city, Thorndike Mowrer, intervened to stop the projection of the holograms and snatched the voice amplifier from the hands of PhDr Gaffney-Yang. In a very controlled voice, he urged the audience to keep calm and respect state secrets. Hokaka Bennet Collins, the officer at the Ministry of Health, Natality and Civic Comfort who had delayed the implementation of the inverse transcranial magnetic stimulation before the congress, gave Iridio a grey tablet and a glass of water. She told him that it was a pity that his former psychometrist, the traitor to the motherland, had planned to ruin the surprises that they had for him. She then returned to her seat in the seventh row, next to Polly, the administrator of the orgonic recreation clinic. Yocasta, the former coordinator in the office of the patriotic police in Porpoise Spit, was sitting next to them. Iridio tried to apply his parallel mind to calculate the number of attendees, but all traces of the parallel super-conscious implanted by the extra-terrestrials had disappeared. He could not even access the connection to the galactic encyclopedia to explore possible interference symptoms in virtual simulations.

He dropped the tablet discreetly on the floor and was ready to press the button, but when he tried to touch it, he experienced a violent jolt in the flow of his observer-moments. His mother, who was now next to him, warned him that if he pressed the button, he would destroy himself and humanity as well. Over the

Unless one has compelling contrary evidence, one should reason as if one's conscious perception were a random sample from the set of all conscious perceptions. The reference class of all observer-moments (which are called here conscious perceptions, each being all that one is consciously aware of at once) should be the universal class of all observer-moments.

4.2.ii.d. The conditional aesthetic principle, according to Page

noise of the solar wind in the secrets-of-the-universe room that he hated, she explained that if he insisted on being an accomplice of the extra-terrestrial invaders, the whole amphitheatre would be condensed to the size of a grape and a new Big Bang would occur. The admonition exasperated him, because she spoke in the same superior tone that wounded him when she explained difficult mathematical details to help him through the university entrance exam. Ernesto, shamelessly embracing his mother and brazenly touching one of her breasts, told him in a menacing tone not to play God and arrogantly presume to create a new universe,

tailor-made to his obsessions and his incomplete mathematical formulae.

PhDr Muñoz Rojas and his student Magdalena Díaz Orellana, on their knees before him, begged him not to destroy the science that they had rebuilt with so much effort and in such a hostile environment. PhDr Gaffney-Yang, in a tremulous voice, asked him to wait, to give his lecture before destroying them. After all, he had managed to bring so many important scientists to such a special event, organised in his honour, despite official opposition. It was not fair that he should change the parameters of the local multiverse without, at least, giving them an explanation. Marcus, his high-school science teacher, added his voice to the chorus. He told Iridio that he expected him to enlighten them with his words, and that he was very proud of him.

If current uncertainty about θ is summarised by a posterior distribution $p(\theta|y)$, a predictive distribution for any quantity that depends on θ through a sampling distribution $p(z|\theta)$ can be obtained as follows:

$$p(z|y) = \int p(z|\theta)p(\theta|y)d\theta$$

4.2.ii.e. Predictive distribution in the Bayesian paradigm

He was prepared to push the button. Those jolts he experienced in his observer-moments confused him. Suddenly he was a child again. His grandmother Mildred appeared before him, seeming immense, and told him not to be so contrary and pig-headed. His uncle Jeremias, next to her, sporting a youthful beard, gave him a knowing wink, letting him know that for his own good he should do as he was told. Behind them,

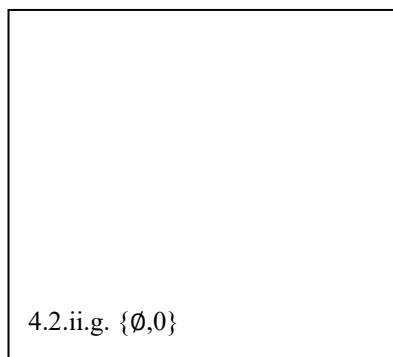
$$F_{-n} = (-1)^{n+1}F_n$$

4.2.ii.f. Backwards extension of the Fibonacci series (negafibonacci numbers)

swinging in time to the dissonant zimba music, the body of a hanged man could be seen. His uncle threatened that the hanged man would eat him if he did not behave. It was an immense Ludwig Boltzmann, looking at him with empty eyes. His grandmother Mildred tried to come close to him, but he bit her hand. She started to sing the song that had distressed him so much.

He ran towards the control room, but when he opened the door, he saw two enormous cubes filling the workshop at the back of his uncle's house. Along the sides there were many half-dismantled robots. He was in front of the sculpture of his grandmother Frida which he had seen in the Museum of Fine Arts. His grandfather Joseph, with fresh, bleeding injuries, was trying to tell him something from inside the cube but, when he started to talk, the hydrogen filled the cavity and stifled his voice. Mildred's song continued to be heard while the hydrogen was flowing into the rear cube, leaving the plastic skeleton of his grandfather in full view. Now it was his grandmother Frida who was silenced while she insulted Mildred and his uncle.

Luckily, he did not give in to panic because Mildred's exasperating song stopped, and he found himself back in the aula magna. PhDr Gaffney-Yang continued his praises of Iridio. Dr Raye Kingsey, the specialist psychiatrist in



sexual morbidology who had examined him in the institute for mental rehabilitation in Widgeree, discreetly approached him and gently led him to the podium. He told him to take several deep breaths if, as he suspected, Iridio was suffering from hallucinations. They were a normal side effect of the inverse transcranial magnetic stimulation treatment that Iridio had undergone so that he could have

normal sexual relations with Iris. He assured Iridio that the hallucinations would dissipate if he could only calm down.

PhDr Charrington der Heer, who had the same hairstyle as when he saw her at the cathedral in the interview with his uncle and his grandmother Mildred, approached him with a glass of water in her hand. She gave him a tablet, which must have been green, but he saw it as grey owing to the suppression of his colour vision. With an abrupt gesture, Dr Raye Kingsey ordered her not to interfere in the treatment and gave him another tablet, also grey. Iridio was confused because he did not know which was which, and threw them both on the floor.

A. Estimation of the number of Boltzmann brains in a multiverse of volume $e^{3H_\Lambda t}$	$n_{\text{BB}} \sim \exp \left\{ -N^{4/3} \frac{m_p}{m_e \alpha} + 3H_\Lambda t \right\}$
B. The rate of Boltzmann brains (BB) over normal observers (NO) in a multiverse	$\frac{\mathcal{N}^{\text{BB}}}{\mathcal{N}^{\text{NO}}} \approx \frac{\sum_j H_j^3 \mathcal{K}_j^{\text{BB}} s_j}{\sum_{i,k} n_{i,k}^{\text{NO}} \mathcal{K}_{i,k} s_k}$
C. The number of Boltzmann brain observers in pockets of type j at time t	$N_j^{\text{BB}}(t) = \frac{\Gamma_j^{\text{BB}}}{3H_{\text{max}}} V_j (t - \delta_j^{\text{CB}}) e^{[\bar{H}_j - \delta_j^{\text{BB}}]}$
D. The Boltzmann suppression factor (an estimate for the nucleation rate of a Boltzmann brain of mass M in any particular quantum state)	$\Gamma_{\text{BB}} \sim e^{-M/T_{\text{ds}}} e^{S_{\text{BB}}} = e^{-F/T_{\text{ds}}}$ where S_{BB} is the entropy, and $F = M - T_{\text{ds}} S_{\text{BB}}$ is the free energy of the Boltzmann brain
E. The stationary measure of the potential proliferation of Boltzmann brains	$\frac{\mathcal{N}_j^{\text{BB}}}{\mathcal{N}_j^{\text{NO}}} \sim \Gamma_j^{\text{CB}} \left(\frac{T_s^{\text{NO}}}{T_s^{\text{BB}}} \right) \lesssim e^{-10^{40}}$
F. Rate of the probability that Boltzmann brains (BB) would exist over the probability that normal observers (NO) would exist in a series of de Sitter vacua (a)	$\frac{\mathcal{P}^{\text{BB}}}{\mathcal{P}^{\text{NO}}} = \frac{\Gamma_*^{\text{BB}} + \sum_a e^{(-S_*)} \left(\frac{\Gamma_a^{\text{BB}}}{\Gamma_a} \right)}{\sum_a e^{(-S_*)} \rho_a^{\text{NO}}}$
G. Estimation of the ratio of Boltzmann brains (BB) to normal observers (NO) caused by collisions between	$\frac{\mathcal{N}^{\text{BB}}}{\mathcal{N}^{\text{NO}}} \sim \max \left\{ e^{3\pi/G\Lambda_1}, \frac{\mathcal{K}_i^{\text{BB}}}{\mathcal{K}_i}, e^{3\pi/G\Lambda_1} \frac{\mathcal{K}_\ell^{\text{BB}}}{\mathcal{K}_\ell} \gamma_{\ell k1} \mathcal{K}_{j1} \mathcal{K}_{k1} \right\}$

AdS bubbles in the dominant vacuum, where $\mathcal{K}_1^{BB}$ is the Boltzmann-brain formation rate per unit Hubble volume in vacuum i	
H. Time for the nucleation of Boltzmann brains and its relationship to Poincaré recurrence time in several string theory vacua	A method of regulating infinities is necessary before we can say that a double-exponentially large number of Boltzmann Brains in one causal patch is a problem. We believe that a fair summary of the current situation is the following: all proposed measures whose predictions are known and which are not already ruled out require that all vacua in the landscape decay before they produce Boltzmann Brains, $t_{decay} < t_{BB}$ For the sake of having a concrete number to think about, a wide class of vacua will be able to produce Boltzmann Brains relatively efficiently. We estimated above that in a vacuum with reasonably cooperative particle physics t_{BB} is simply related to the number of degrees of freedom required for an intelligent observer, $t_{BB} \approx H^{-1} e^{S_{BB}}$ Basing our crude estimates for what constitutes an observer on ourselves, we found $S_{BB} = 10^{35 \pm 15}$ where the uncertainty represents our lack of knowledge of the appropriate definition of the minimal intelligent observer. Putting in some additional uncertainty to account for how efficiently different vacua can produce Boltzmann Brains, a useful number to keep in mind, valid for a wide class of vacua, is $t_{BB} \approx H^{-1} e^{10^{40 \pm 20}}$ Although this time is absurdly long and absurdly uncertain, it is parametrically shorter than the recurrence time for vacua such as our own. Therefore, the proposed bound is nontrivial

4.2.iii. Equations about Boltzmann brains found in a non-systematic review of the scientific literature before the Penumbra

4.3. The centre of the Big Bang

A theorem, easy to prove, tells us that a bounded world, governed only by the laws of mechanics, will always pass through a state very close to its initial state. On the other hand, according to accepted experimental laws (if one attributes absolute validity to them, and if one is willing to press their consequences to the extreme), the universe tends toward a certain final state, from which it will never depart. In this final state, which will be a kind of death, all bodies will be at rest at the same temperature.

I do not know if it has been remarked that the English kinetic theories can extricate themselves from this contradiction. The world, according to them, tends at first toward a state where it remains for a long time without apparent change; and this is consistent with experience; but it does not remain that way forever, if the theorem cited above is not violated; it merely stays there for an enormously long time, a time which is longer the more numerous are the molecules. This state will not be the final death of the universe, but a sort of slumber, from which it will awake after millions of millions of centuries.

Henri Poincaré

He faced the audience in the aula magna once again. On the screen appeared the diagrams that he had laboriously prepared for the congress of the national astronomy association, before the extra-terrestrials made contact with Earth. PhDr Gaffney-Yang handed over the voice amplifier to PhDr Mond Beatty, who said that the moment had arrived to welcome the distinguished guests. Many luminaries came in, including Brigadier Ward Wright and HPhDr Floyd Lysenko. The latter spoke briefly to explain the absence of President Bjelke Goldstein and Major Klamm O'Brien, who were very busy in international negotiations with the terrestrial powers who had withdrawn from the Brodei meeting. Many other Ozeanic officials filled the left half of the front row. There were many people Iridio did not know but he recognised some who had appeared in the pornographic holograms with Ariadna. Later Weizerit Desta Nishan Selamawit, the sorceress who had been elected Secretary General of the New Unified Nations, arrived, with representatives of other terrestrial countries he had met in Brodei. PhDr Mond Beatty read out their names as they took their seats. There were no representatives from the maritime cities or the scientific refuge zones.

A. Poincaré recurrence time, calculated on the basis of the total entropy of a system	$t_{\text{rec}} = e^{(S/k_B)} t_p$ where S is the total entropy of the system, which can be calculated using the Gibbs formula $(S/k_B) = \int \frac{f^N(E)}{V^N} \ln \frac{h^{3N} f^N(E)}{V^N} d^{3N}k d^{3N}y - \ln N!$
B. Smoluchowski formula to compute the average Poincaré recurrence time taken to return in set A, valid for a discrete evolution (given that we started from a point of the set A)	$T_R = \tau \frac{\mu(S) - \mu(A)}{\mu(A) - \mu(g^T A \cap A)}$
C. Estimation of the Poincaré recurrence time of an isolated black hole M containing the mass within the presently visible region of our universe, with stationary boundary conditions	$t_{\text{Poincaré}} = e^{e^{4\pi \times M_{\odot}^2}} \approx 10^{10^{10^{10^{122}}}}$ expressed in Planck times, millennia, or whatever, supposing that the Hubble volume is $10^{10^{10^{122}}}$ megaparsecs. (1 parsec = 3.0857×10^{16} metres)
D. Kac's recurrence time	In an ergodic system the average return time in a region A is $\tau_A(x) = \frac{\tau_c}{\mu(A)},$ where τ_c is a characteristic time and $\mu(A)$ the measure of A.
E. Kac's quantum recurrence time (generalisation of Kac's recurrence time to quantum mechanics)	If the initial state $\Psi\rangle$ is an eigenvector of the steady state $\hat{\chi}$, with non-zero eigenvalue $\lambda \in \mathbb{R}$, then the expected return time is $\bar{T}_\Psi = \frac{1}{\langle \Psi \hat{\chi} \Psi \rangle}$ with $\hat{\chi} = \lim_{T \rightarrow \infty} \frac{1}{T} \sum_{t=0}^{T-1} \mathcal{S}^t [\Psi\rangle \langle \Psi]$

4.3.i.a. Formulations and generalisations of Poincaré recurrence time

If any pattern or configuration of elementary particles can be reproduced or copied, down to the quantum state, either purposefully or accidentally, then the resulting duplicate is identical to the original.

4.3.i.b. Weak pattern identity postulate

Then, amid sporadic applause from the audience, famous astronomers and scientists he admired took their places in the second row. Newton, Milgrom, Descartes, Einstein, Grossman, Bostrom, Tegmark, Feynman, Bohr, the proscribed science communicators he had discovered in Ernesto's paper library, such as Paul Davis, Brian Greene, Simon Singh, Michio Kaku, Carl Sagan, and many others, entered the hall amid the hologramcorder flashes of the press. PhDs Tillotson Lewandowski, Hadden Halvorson and Kelly Tresse, hosts of the event representing the intellectual police, showed the scientific celebrities to their seats with great courtesy and removed the 'reserved' signs. When eight copies of Henri Poincaré came into the amphitheatre through the door of the equipment room, escorted by PhDs Huffman Boyde and Moravec Koane, PhDr Mond Beatty announced that at long last the moment of recurrence had arrived, and the audience gave them a standing ovation.

Some scientists took their seats without delay, while others approached the podium to say that they were waiting with bated breath to be enlightened about

the science of the extra-terrestrials. Einstein, now beside him, was telling him in heavily accented classical English that his work was absolutely fascinating. Bohr and Newton agreed and urged him to explain his work in more detail. Paul Davies told him that he needed to prove the power of backward causation to influence the past, as understood by the extra-terrestrials. He hoped Iridio would explain this, so that he could rewrite his books and mention him as the most influential scientist of the human species, after Fred Hoyle. Milgrom thanked him for rescuing his theory of

Let ν be a measure on $(Y, \mathcal{G})$ that satisfies the Copernican Principle. The *(Formal) Self-Indication Assumption* states that the ν -measure of a set of world-states is the μ -measure weighted by the number of observers in that state, normalised to be a probability measure by the expected number of observers:

$$\nu_{SIA}(\mathcal{S}) = \frac{\int_{\mathcal{S}} N(x) d\mu(x)}{\int_X N(x) d\mu(x)}$$

4.3.i.c. The (formal) self-indication assumption, according to Cushman

Modified Newtonian Dynamics from obscurity, and said that he was very interested in the presentation of his results.

PhDr Mond Beatty asked the celebrated scientists to return to their seats because he had an important announcement to make, which would also be an exclusive for the press covering the event. At the top of his voice, he told the audience that, thanks to his efforts as president of the legitimate International Astronomy Federation, the ban on the study of eternal inflation and string theory

in terrestrial countries had been lifted. At this congress, in an unprecedented move, many physicists, theorists, astronomers and cosmologists who had defended those subjects would be conditionally set free. They had been confined, until now, in a colourless ten-dimensional parallel universe.

N=4 Supersymmetric Yang–Mills	Full type IIB string theory in $AdS_5 \times S^5$
Particles	Strings, Branes
Without gravity	With gravity
Without colour	With colour
Flat space-time	Curved space-time
Strong interactions	Weak interactions
Weak interactions	Strong interactions
3+1 dimensions	9+1 dimensions
Quarks and antiquarks superposed	Two strings with opposed orientation
Fields in d dimensions	Strings in D space-time (with $D > d$) and some anisotropy

4.3.i.d. Equivalences in the Maldacena conjecture (AdS/CFT duality)

He gave a signal and, from the attic where the 5D holograms were projected, a ladder of light descended. Edward Witten and Juan Maldacena entered the hall, wearing T-shirts emblazoned with their magic equations. The hall gave them a standing ovation and shouts of welcome. After them came Don Page, Andrei Linde, Alan Guth, Leonard Susskind, Sean Carroll, Gerardus 't Hooft and many others¹ whom Iridio did not recognise. But his mother, in tears, welcomed them with affectionate embraces. Edward Witten approached the podium and shook his hand, without saying

a word, but PhDr Mond Beatty in a gesture pretending to be friendly, motioned to him to sit down, assuring him that he would have time to talk to Iridio and discuss details of his discoveries later.

Iridio was again tempted to press the button. Only eighteen minutes remained, and he had so much to say. He took several deep breaths to ease his hallucinatory

symptoms. PhDr Mond Beatty had launched into his introduction, full of false flattery and references to fireworks. While Iridio waited his turn, he thought that there were five possible options: 1) *The hallucinations were caused by the psychosis*

One should reason as if one's present observer-moment were a random sample from the set of all observer-moments in its reference class, with the probabilities weighted proportionally according to observer-moment's size in consciousness-space-time.

4.3.i.e. The super-Strong self-sampling assumption, according to Pereira

¹ BIOGRAPHER'S NOTE: The reader may reconstruct the list of all liberated scientists by consulting the bibliography of table 4.2.iii in Appendix 3, and the corresponding full names of the scientists in Appendix 4.

resulting from the treatment administered by the morality and oztraditions police, but he had no recollection of the procedures; 2) He was still immersed in the simulation generated by the extra-terrestrials, but this had been manipulated by unscrupulous Boltzmann brains; 3) His entrance into the recurrent wormholes in space-time had made him arrive at a zone in space-time where the contents of the conference hall at Yabbie Creek-W University were reproduced in a distorted way, thanks to the Poincaré recurrence theorem, or one of its ergodic variants; 4) The simulation had been created by some artificial intelligence that had manipulated him, like Penelope or Therese, into calculating the digits of e and π ; and 5) His uncle, the brain simulation of his grandmother Mildred, or some other Ozeanic government official, had copied his brain contents to create an artificial intelligence, and the procedure had gone wrong.

He tried unsuccessfully to reactivate his parallel consciousness. He needed to calculate the probability that his perceptions supported some of his hypotheses by using the extra-terrestrial generalisation of Bayes' theorem, which would allow him to calculate the credence function of the observer-moments he was experiencing, and assess their degree of reality.

He suspected that it was highly likely that everything was a perverse simulation, when in the back rows, behind the policemen, he discerned unstable copies of Ludwig Boltzmann in Tyrolean dress, cyclically fluctuating into existence and disappearing from their seats. There was even a faint copy of himself, almost transparent, aged fifteen or so, in the high-school uniform he was wearing during the fateful class when he became obsessed with the Big

If M is a compact metric space and $T_1, T_2, \dots, T_m$ are continuous maps of M to itself which commute, then M has a multiply recurrent point

4.3.ii.b. Multiple Birkhoff recurrence theorem

Bang. The copy was sitting, far away, in the back row, between Clarisse and Fanny, who fondled and kissed him every now and then. Their exclusive attention was provoking the jealousy of five of the schoolmates who were in love with the girls and had committed suicide. They were standing behind them and whispering. He was copying in his old flexible reader the master equation that appeared on the screen. In the distance, by the back door of the amphitheatre, he also espied a real Zuespok,

$$\mathbf{C}[A(a), B(b)] + \mathbf{C}[A(a), B(b')] + \mathbf{C}[A(a'), B(b)] - \mathbf{C}[A(a'), B(b')] \leq 2$$

4.3.ii.c. CHSH inequality

next to Julia and his father. The Zuespok was looking at him pityingly, and had an aura with rings full of compassion. His father and Julia were also looking at him with sorrowful faces.

PhDr Mond Beatty continued to heap extravagant praise on Iridio, while pressing home his subtle attacks on the importance of his discoveries, wasting no opportunity to mention, with barely disguised irony, the Vatican fireworks and the dangers of the distorted space-time recurrences which they implied.

Magister Rutherford

Rossi, the palaeontologist who had been expelled from his mother's university, inconspicuously approached the podium, took Iridio's arm and whispered that everything was a conspiracy of the Argoterrands to take control of the Solar System. When there was a collision of asteroids with Earth, which made possible the evolution of mam-

mals, the Argoterrands had tried to revive the dinosaurs and make them dominant. But this had not been allowed by other extra-terrestrial civilisations and now the Argoterrands were using him to reconquer the territory they had been denied. PhDr Farkas Aaronson, the geologist who had died in prison, came close to his other ear and added that, if he pressed the button, the past would change for the worse and there would be no mammals in the history of Earth. There would be only birds descended from the *anchiornis*, and they would develop a mediocre civilisation that would never discover Newtonian mechanics or even transcendental numbers.

PhDr Mond Beatty finished his introductory speech and invited Iridio to take the floor, asking him to set aside his doubts and tell the audience what he had learnt during his visit to the extra-terrestrial planets, because it was necessary to verify that he deserved the award of the Heisenberg Prize after his lecture. Iridio should not sacrifice his professional success, he advised, to become cannon fodder in the eternal war be-

tween evolutionary intelligences and Boltzmann brains. The latter

Consider a counterfactual "If it were that A , then it would be that C " where A is entirely about affairs in a stretch of time t_A . Consider all those possible worlds w such that:

- (1) A is true at w ;
- (2) w is exactly like our actual world at all times before a transition period beginning shortly before t_A ;
- (3) w conforms to the actual laws of nature at all times after t_A ; and
- (4) during t_A and the preceding transition period, w differs no more from our actual world than it must to permit A to hold.

The counterfactual is true if and only if C holds at every such world w .

4.3.ii.d.A. Back-tracking counterfactuals according to Lewis

$$C \xrightarrow{1} A \xrightarrow{1} \text{OO} \xrightarrow{1'} B \xrightarrow{\Gamma_{BB,B}} BB \left[\xrightarrow{1'} B \xrightarrow{1'} T \xrightarrow{1} \text{crunch} \right]$$

4.3.ii.d.B. The dominant path to Boltzmann brain production

were loyal allies of human beings and the only manifest destiny of intelligence on Earth. If he pressed the button, the heirs of the human species would forfeit all hope of survival.

Thorndike Mowrer, who had come in again escorted by his guards and other policemen, explained to Iridio that, in fact, he – Iridio – was a Boltzmann brain. He assured him that in the space-time region they now found themselves in, ruled by the Gödel cyclical metric, it was very common for Boltzmann brains, created by copying a large quantity of human memories, to believe that they were evolutionary consciences. Iridio tried not to listen, but Thorndike Mowrer warned him in his piercing voice:

‘You are the only person who exists. Your memories are false. You never lived on Earth or travelled to other planets. You are nothing more than a scrap of matter which has acquired consciousness for a few minutes, a random fluctuation of space-time that has been revived with a confusing mixture of memories belonging to several human beings who died billions of years ago. You exist simply because in order to exist, the universe needs to be observed.’

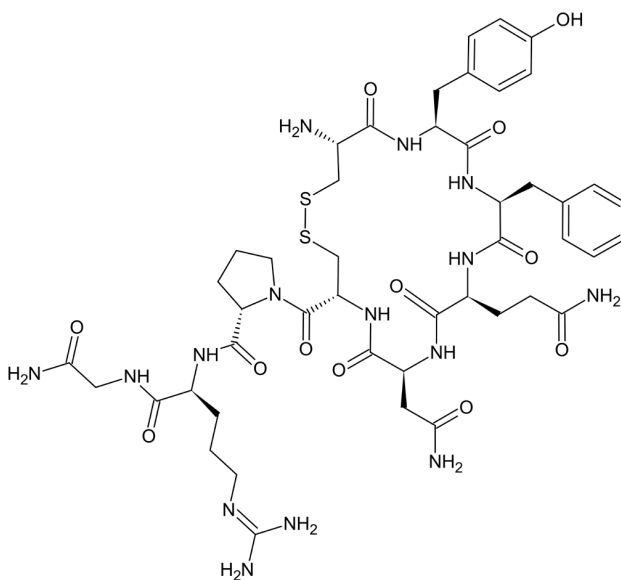
Observers are necessary to bring the universe into being.

4.3.iii.a. Wheeler’s participatory anthropic principle

‘But it needs evolutionary observers to be decent,’ said his father, pushing the psychiatrist away from him.

‘Allow everything to dissolve around you and don’t interfere. Let the fluctuation evaporate by itself!’ Thorndike Mowrer insisted when his father pushed him again.

Iridio had not considered that sixth possibility. He knew that his memories were confused. It was impossible that Einstein and other scientists, who had died before he was born, could have attended his lecture. It was possible, then, that he himself was a Boltzmann brain full of false memories. But any one of the other five possibilities could have produced the same result. Perhaps, if he calculated the proportion of human beings and Boltzmann brains present in the aula magna, he could



4.3.iii.b.A. Chemical structure of vasopressin

approximate the relative probabilities of each possibility with Bayes' theorem. But he was interrupted by another jump in his observation-moments. Ariadna, young and beautiful, such as she was when she came to listen to his lectures, appeared at the door leading to the equipment room. She was gazing at him longingly, arms outstretched to embrace him. She opened the door and invited him to follow her. He could discern that this was her room in the Brodei residence, after the attack, where they should have consummated their love. He also caught sight of some of the apparatus she had in her Widgeree consulting rooms to treat eudaemonia.

'If you come with me and forget about this senseless conference, your grandmother will stop controlling me. Please, release me before destroying us, just one kiss can de-activate her control and break the spell,' said Ariadna.

He recognised the voice which had commented that they had ruined him for his wife when he had the intervention helmet on after his night with Iris. Or was it his grandmother Mildred's voice? Perhaps it was, because the scene resembled one from a trite sensomelodrama. The voice started to recite the numbers of the negafibonacci series to him and he was unsure how much time he had left. $F_{-1} = 1$; $F_{-2} = -1$; $F_{-3} = 2$; $F_{-4} = -3$; $F_{-5} = 5$; $F_{-6} = -8$; $F_{-7} = 13$; $F_{-8} = -21$; $F_{-9} = 34$; $F_{-10} = -55$; $F_{-11} = 89$; $F_{-12} = -144$; $F_{-13} = 233$; $F_{-14} = -377$; $F_{-15} = 610$; $F_{-16} = -987$; $F_{-17} = 1,597$; $F_{-18} = -2,584$; $F_{-19} = 4,181$; $F_{-20} = -6,765$... Filled with regret, he refused to follow her.

'Enough of doubts, tell us what you have to tell us and press that button. You're not a Boltzmann brain or a prince coming to rescue some repentant semi-cyborg who has caused you so much pain. You really are the only hope we have,' said Julia, pushing Ariadna into the room and locking the door. With that, the flow of his observation-moments returned to the aula magna.

$TU_1(S_1 \rightarrow O: \text{know} \rightarrow S_2) \rightarrow TU_2(S_1 \rightarrow O: \text{be able} \rightarrow S_2)$
 $TU_1(S_2 \rightarrow O: \text{be able} \rightarrow S_1) \rightarrow TU_2(S_2 \rightarrow O: \text{know} \rightarrow S_1)$

4.3.iii.c.A. Operators needed to establish a narrative syntax, according to Greimas

He then remembered that Rieneke Watson had shouted that everything was

fiction. That meant there were actually two further possibilities: 6) *He was a Boltzmann brain*; and 7) *He was immersed in a confusing work of fiction*.

$$\dot{x}(t) = -\alpha_x x(t - \tau_x^S) + \beta_x \tanh[y(t - \tau_y^C)]$$

$$\dot{y}(t) = \beta_y \tanh[x(t - \tau_x^C)] - \alpha_y y(t)$$

4.3.iii.b.B. A dynamic model of a delayed love affair with cautious partners, including multiple self- and cross-reaction processes

$$\lim_{n \rightarrow \infty} \frac{F_{-n-1}}{F_{-n}} = -\varphi$$

4.3.iii.b.C. The golden ratio expressed as a limit of negafibonacci quotients

$$(S1 \text{ } In_f) \rho_w(In_f, A)1 \Leftrightarrow \text{for every world } \mathcal{V} \in_w \leq G^A - \min(|CBel_{G^w}|), (\rho_v F1 \rightarrow \rho_v A1)$$

$$(S2 \text{ } In_f) \rho_w(In_f, A)0 \Leftrightarrow \text{not } \rho_w(In_f, A)1$$

4.3.iii.c.B. Badura and Berto's reformulation of David Lewis's Analysis 2 about truth in fiction

Of the seven possibilities, the last was the easiest to dismiss. That everything was a lie was what the psychometrist meant to say. On the other hand, who would come up with the idea of writing a story about his uninspiring life? Why tell such a story, full of ambiguities, anomalies, recurrent space-time fluctuations, orgasms forever delayed, and useless complications? It seemed like some of the fantasies enjoyed by the post-creationists, or worse, a bewildering nightmare of the kind he so detested. His biographer, who had come to the podium, whispered that he was free to decide whether to be a fictional character or not. But if he did choose to be one, all the necessary precautions must be taken. He also had to consider that truth was stranger than fiction. He assured Iridio that he had all the information he needed for the second edition of his biography. He then shook his hand and said goodbye. That left him with an eighth possibility:

We might imagine a certain observer-moment as being capable of having coherent beliefs about some issues and not others and such an observer would be able to construct a coherent and reasonable probability distribution for certain universes of possible worlds and not others.

So for each observer-moment z , there is a universe W_z of possible worlds. As far as z is concerned, there might exist possible worlds outside of W_z but either z thinks they have zero probability of being actual or z is incapable of reasoning coherently about these other worlds, so that if $w \in W_z$, z will not really tell us her probability estimate for w being actual, only the conditional probability of w being actual given that the actual world lies in W_z . If $w \in W_z$, w is really an equivalence class of possible worlds; either z does not care about the differences between the different worlds in the equivalence class w , or z has difficulty reasoning coherently about the differences.

4.3.iii.d. Actuality of centred possible worlds, according to Shulman

8) *The mechanism which prevented his dreams from entering his mind in its new configuration could have been altered or sabotaged by the Boltzmann brains.* He was trapped inside a baffling nightmare without being able to wake up. Was this really a new possibility? Perhaps it too could not be discarded. But it reinforced the second hypothesis: that everything had been a simulation which had been tampered with. His biographer received the key to the equipment room from Julia's hands. When he opened it, eight copies of a half-naked Ariadna ran out to sit on the laps of the top bureaucrats of Ozeania in the front row and recited, in unison, in very sensual voices, the series of prime numbers within the Fibonacci sequence: $F_0 = 0$; $F_1 = 1$; $F_2 = 1$; $F_3 = 2$; $F_4 = 3$;

$F_5 = 5$; $F_7 = 13$; $F_{11} = 89$; $F_{13} = 233$; $F_{17} = 1,597$; $F_{23} = 28,657$; $F_{29} = 514,229$; $F_{43} = 444,494,437$; $F_{47} = 2,971,215,037$; $F_{83} = 99,194,853,094,755,497$; $F_{131} = 1,066,340,417,491,710,595,814,572,169...$ When Iridio looked again towards the open door, he realised that it now led to the customs office in Porpoise Spit. On

the esplanade, next to the travel agency, was an airboat, ready to depart to Atlantis VIII. Many of the scientists in rows two, three and four, ran to follow the biographer, but the Ozeanic soldiers barred their way and forced those who had not been able to slip away to return to their seats.

PhDr Shaw Wang gave him a tablet and a glass of water, saying it would

$$\Gamma_{ab}(\omega) = \frac{1}{T \left(1 + \frac{i\omega}{\gamma_{ab}}\right)}$$

4.3.iii.e. Damped wave equation for the axonal transfer function

make him feel better. Iridio hesitated for a moment. She assured him that such tablets had allowed his father to keep on working on his art in spite of the treatment they had imposed on him, and told him to focus on his talk without paying attention to other things. Leni Lenina, barefoot and in a half-open robe,

also offered him a tablet, but this time he did not allow her to place it in his hand. In one go, Iridio swallowed the tablet that PhDr Shaw Wang had given him.

$$f(x; \sigma) = \frac{x}{\sigma^2} e^{-\frac{x^2}{2\sigma^2}}$$

4.3.iv.a. Single parameter Rayleigh probability density function used to predict the preplay phase in a geyser eruption

Stammering, he started to explain the diagrams. Everyone sat down to listen to him. The clock showed that only seven minutes remained. It frightened him to have so little time with so much still to say. On top of that, when he looked at the diagrams projected on the screen, he noticed an error: in the key formula, he had written Γ instead of Ω . He

feared that the Boltzmann brains had taken over his mind. Olgava, the orgonic cyborg, came up close and disappeared under the podium.

‘Let’s make that shy testicle descend once and for all.’

The ardent cyborg undid his fly and started to perform a fierce fellatio. He recognised the sensation from the night after his marriage to Iris. From the beginning, she had betrayed him. He tried to push her away but lacked the strength, and there was so much he had to say. So he focused on his lecture, taking advantage of his pleasure to maximise his logical thought. As she had done in the past, Olgava performed oral sex in time to the digits of π : 3, ., 1, 4, 1, 5, 9, 2, 6, 5, 3, 5, 8, 9, 7, 9, 3, 2, 3, 8, 4, 6, 2, 6, 4, 3, 3, 8, 3, 2, 7, 9, 5, 0, 2, 8, 8, 4, 1, 9, 7, 1, 6, 9, 3, 9, 9, 3, 7, 5, 1, 0, 5, 8, 2, 0, 9, 7, 4, 9, 4, 4, 5, 9, 2, 3, 0, 7, 8, 1, 6, 4, 0, 6, 2, 8, 6, 2, 0, 8, 9, 9, 8, 6, 2, 8, 0, 3, 4, 8, 2, 5, 3, 4, 2, 1, 1, 7, 0, 6, 7, 9, 8, 2, 1, 4, 8, 0, 8, 6, 5, 1, 3, 2, 8, 2, 3, 0, 6, 6, 4, 7, 0, 9, 3, 8, 4, 4, 6, 0, 9, 5, 5, 0, 5, 8, 2, 2, 3, 1, 7, 2, 5, 3, 5, 9, 4, 0, 8, 1, 2, 8, 4, 8, 1, 1, 1, 7, 4, 5, 0, 2, 8, 4, 1, 0, 2, 7, 0, 1, 9, 3, 8, 5, 2, 1, 1, 0, 5, 5, 5, 9, 6, 4, 4, 6, 2, 2, 9, 4, 8, 9, 5, 4, 9, 3, 0, 3, 8, 1, 9, 6, 4, 4, 2, 8, 8, 1, 0, 9, 7, 5, 6, 6, 5, 9, 3, 3, 4, 4, 6, 1, 2, 8, 4, 7, 5, 6, 4, 8, 2, 3, 3, 7, 8, 6, 7, 8, 3, 1, 6, 5, 2, 7, 1, 2, 0, 1, 9, 0, 9, 1, 4, 5, 6, 4, 8, 5, 6, 6, 9, 2, 3, 4, 6, 0, 3, 4, 8, 6, 1, 0, 4, 5, 4, 3, 2, 6, 6, 4, 8, 2, 1, 3, 3, 9, 3, 6, 0, 7, 2, 6, 0, 2, 4, 9, 1, 4, 1, 2, 7, 3, 7, 2, 4, 5, 8, 7, 0, 0, 6, 6, 0, 6, 3, 1, 5, 5, 8, 8, 1, 7, 4, 8, 8, 1, 5, 2, 0, 9, 2, 0, 9, 6, 2, 8, 2, 9, 2, 5, 4, 0, 9, 1, 7, 1, 5, 3, 6, 4, 3, 6, 7, 8, 9, 2, 5, 9, 0, 3, 6, 0, 0, 1, 1, 3, 3, 0, 5, 3, 0, 5, 4, 8, 8, 2, 0, 4, 6, 6, 5, 2, 1, 3, 8, 4, 1, 4, 6, 9,

"By uttering x U meant that $*\psi p$ " is true if and only if

$(\exists A) (\exists f) (\exists c)$

U uttered x intending

- (1) A to think x possesses f
- (2) A to think U intends (i)
- (3) A to think of f as correlated in way c with the type to which " ψ -ing that p " belongs
- (4) A to think U intends (3)
- (5) A to think on the basis of the fulfilment of (1) and (3) that U intends A to produce " ψ -ing that p "
- (6) A , on the basis of fulfilment of (5), to produce " ψ -ing that p "
- (7) A to think U intends (6)

and (for some cases) (8) A , on the basis of the fulfilment of (6) himself to ψ that p .

Ranges of variables: A : audiences f : features of utterance
 c : modes of correlation (for example, iconic, associative, conventional)

4.3.iv.b. Redefinition IV, Version A, of utterer's occasion-meaning, according to H. P. Grice

5, 1, 9, 4, 1, 5, 1, 1, 6, 0, 9, 4, 3, 3, 0, 5, 7, 2, 7, 0, 3, 6, 5, 7, 5, 9, 5, 9, 1, 9, 5, 3, 0, 9, 2, 1, 8, 6, 1, 1, 7, 3, 8, 1, 9, 3, 2, 6, 1, 1, 7, 9, 3, 1, 0, 5, 1, 1, 8, 5, 4, 8, 0, 7, 4, 4, 6, 2, 3, 7, 9, 9, 6, 2, 7, 4, 9, 5, 6, 7, 3, 5, 1, 8, 8, 5, 7, 5, 2, 7, 2, 4, 8, 9, 1, 2, 2, 7, 9, 3, 8, 1, 8, 3, 0, 1, 1, 9, 4, 9, 1, 2, 9, 8, 3, 3, 6, 7, 3, 3, 6, 2, 4, 4, 0, 6, 5, 6, 6, 4, 3, 0, 8, 6, 0, 2, 1, 3, 9, 4, 9, 4... Ariadna's copies repeated the digits or moaned in time to Olgava's stimulation, while being penetrated by two or three half-dressed senior Ozeanic officials in the front row... 6, 3, 9, 5, 2, 2, 4, 7, 3, 7, 1, 9, 0, 7, 0, 2, 1, 7, 9, 8, 6, 0, 9, 4, 3, 7, 0, 2, 7, 7, 0, 5, 3, 9, 2, 1, 7, 1, 7, 6, 2, 9, 3, 1, 7, 6, 7, 5, 2, 3, 8, 4, 6, 7, 4, 8, 1, 8, 4, 6, 7, 6, 6, 9, 4, 0, 5, 1, 3, 2, 0, 0, 0, 5, 6, 8, 1, 2, 7, 1, 4, 5, 2, 6, 3, 5, 6, 0, 8, 2, 7, 7, 8, 5, 7, 7, 1, 3, 4, 2, 7, 5, 7, 7, 8, 9, 6, 0, 9, 1, 7, 3, 6, 3, 7, 1, 7, 8, 7, 2, 1, 4, 6, 8, 4, 4, 0, 9, 0,

$$H(X|Y) = - \sum_{x,y \in X \times Y} p_{X,Y}(x,y) \log \left(\frac{p_{X,Y}(x,y)}{p_Y(y)} \right)$$

4.3.iv.c.A. Conditional information entropy

1, 2, 2, 4, 9, 5, 3, 4, 3, 0, 1, 4, 6, 5, 4, 9, 5, 8, 5, 3, 7, 1, 0, 5, 0, 7, 9, 2, 2, 7, 9, 6, 8, 9, 2, 5, 8, 9, 2, 3, 5, 4, 2, 0, 1, 9, 9, 5, 6, 1, 1, 2, 1, 2, 9, 0, 2, 1, 9, 6, 0, 8, 6, 4, 0, 3, 4, 4, 1, 8, 1, 5, 9, 8, 1, 3, 6, 2, 9, 7, 7, 4, 7, 7, 1, 3, 0, 9, 9, 6, 0, 5, 1, 8, 7, 0, 7, 2, 1, 1, 3, 4, 9, 9, 9, 9, 9, 9... Pleasure, or perhaps PhDr Shaw Wang's tablet, must have unblocked the affordances of the neuroatypical connections in the ventral tegmental area of his brain, because his parallel consciousness and his synaesthesia returned to him. He understood what Rieneke Watson had wanted to say, because he could now compute conversational inferences at great speed. In the upper left corner

of his visual field, he could see the twinkling digits of e , and understood that the expansion was closer to the 137nd iteration of the Feynman sequence. There was little time left. The rows where the scientists, science popularisers and string theorists had been sitting were now occupied by fluctuating copies of Ludwig Boltzmann, sporting a hangman's noose as a tie. Topological Penelope was kneeling under the podium, telling him that she would recite the fundamental theorem of calculus while Olgava brought down his testicle.

He searched for his father and Julia amid the crowd. They were far away, by the back door of the amphitheatre, next to Iris and her children and the real Zue-spok. With Marcus, Fanny and Clarisse, and a very faint copy of himself aged fifteen, they were leaving the hall escorted by the pedagogical police, who had arrested them and taken away his flexible reader. A dark firmament with no stars could be seen through the open door. He was leaving, holding hands with Clarisse and looking happy. More and more copies of Ludwig Boltzmann entered the amphitheatre and occupied the empty seats. When the seats were all taken, they started sitting on the stairs, and then on each other's shoulders, forcing the humans to move to the free seats at the front. Every time Iridio paused because he was overcome by pleasure, they shouted at him to go on. Through the doorway he looked at the sky with his built-in telescope and calculated the temperature of the cosmic microwave background. It varied in a cyclical pattern, oscillating in time to the fluctuations of the Boltzmann copies, but in inverse proportion to the sharpness of detail in their Tyrolean attire. He started speaking faster. From his wheelchair, PhDr Sertril Inclis-tus started to repeat 'Bollocks!', keeping time with Iridio's speech, with the result that his clouded mind began to clear. Olgava clung to his legs but he pulled himself free. Penelope tried to continue stimulating him while reciting the fundamental theorem of calculus, but he pushed her away and kicked her in the head, which separated from her body and fell between PhDr Mond Beatty's legs. The copies of Ariadna finally stopped their moans of pleasure. The digits of π began twinkling in their eyes, but he avoided looking at them so as not to lose track of the remaining time. The space between the front

If P denotes a point-like event, then a counterfactual $P \Box \rightarrow Q$ is true $\Leftrightarrow Q$ is true in all possible P -worlds that are exactly like the actual one in the entire region inside the backward light cone of the event P

4.3.iv.c.B. Backward light cone relativistically invariant reading of counterfactuals

Supposons que le point P reste à distance finie, et que le volume $\int dx_1 dx_2 dx_3$ soit un invariant intégral, si l'on considère une région r_0 quelconque, quelque petite que soit cette région, il y aura des trajectoires qui la traverseront une infinité de fois.

4.3.iv.d. Original formulation of the Poincaré recurrence theorem

row and the podium was now filled with fluctuating copies of Ludwig Boltzmann, seated on the floor and loudly urging him to continue.

...8, 3, 7, 2, 9, 7, 8, 0, 4, 9, 9, 5, 1, 0, 5, 9, 7, 3, 1, 7, 3, 2, 8, 1, 6, 0, 9, 6, 3, 1, 8, 5, 9, 5, 0, 2, 4, 4, 5, 9, 4, 5, 5, 3, 4, 6, 9, 0, 8, 3, 0, 2, 6, 4, 2, 5, 2, 2, 3, 0, 8, 2, 5, 3, 3, 4, 4, 6, 8, 5, 0, 3, 5, 2, 6, 1, 9, 3, 1, 1, 8, 8, 1, 7, 1, 0, 1, 0, 0, 0, 3, 1, 3, 7, 8, 3, 8, 7, 5, 2, 8, 8, 6,

$$P_{\alpha}(h|e) = \frac{1}{\gamma} \sum_{\sigma \in \Omega_h \cap \Omega_e} \frac{P_{\alpha}(w_{\sigma})}{|\Omega_{\sigma} \Omega(w_{\sigma})|}$$

4.3.iv.e.A. The observation equation

5, 8, 7, 5, 3, 3, 2, 0, 8, 3, 8, 1, 4, 2, 0, 6, 1, 7, 1, 7, 7, 6, 6, 9, 1, 4, 7, 3, 0, 3, 5, 9, 8, 2, 5, 3, 4, 9, 0, 4, 2, 8, 7, 5, 5, 4, 6, 8, 7, 3, 1, 1, 5, 9, 5, 6, 2, 8, 6, 3, 8, 8, 2, 3, 5, 3, 7, 8, 7, 5, 9, 3, 7, 5, 1, 9, 5, 7, 7, 8, 1, 8, 5, 7, 7, 8, 0, 5, 3, 2, 1, 7, 1, 2, 2, 6, 8, 0, 6, 6, 1, 3, 0, 0, 1, 9, 2, 7, 8, 7, 6, 6, 1, 1, 1, 9, 5, 9, 0, 9, 2, 1, 6, 4, 2, 0, 1, 9, 8, 9, 3, 8, 0, 9, 5, 2, 5, 7, 2, 0, 1, 0, 6, 5, 4, 8, 5, 8, 6, 3, 2, 7, 8, 8, 6, 5, 9, 3, 6, 1, 5, 3, 3, 8, 1, 8, 2, 7, 9, 6, 8, 2, 3, 0, 3, 0, 1, 9, 5, 2, 0, 3, 5, 3, 0, 1, 8, 5, 2, 9, 6, 8, 9, 9, 5, 7, 7, 3, 6, 2, 2, 5, 9, 9, 4, 1, 3, 8, 9, 1, 2, 4, 9, 7, 2, 1, 7, 7, 5, 2, 8, 3, 4, 7, 9, 1, 3, 1, 5, 1, 5, 5, 7, 4, 8, 5, 7, 2, 4, 2, 4, 5, 4, 1, 5, 0, 6, 9, 5, 9, 5, 0, 8, 2, 9, 5, 3, 3, 1, 1, 6, 8, 6, 1, 7, 2, 7, 8, 5, 5, 8, 8, 9, 0, 7, 5, 0, 9, 8, 3, 8, 1, 7, 5, 4, 6, 3, 7, 4, 6, 4, 9, 3, 9, 3, 1, 9, 2, 5, 5, 0, 6, 0, 4, 0, 0, 9, 2, 7, 7, 0, 1, 6, 7, 1, 1, 3, 9, 0, 0, 9, 8, 4, 8, 8, 2, 4, 0, 1, 2, 8, 5, 8, 3, 6, 1, 6, 0, 3, 5, 6, 3, 7, 0, 7, 6, 6, 0, 1, 0, 4, 7, 1, 0, 1, 8, 1, 9, 4, 2, 9, 5, 5, 5, 9, 6, 1, 9, 8, 9, 4, 6, 7, 6, 7, 8, 3, 7, 4, 4, 9, 4, 4, 8, 2, 5, 5, 3, 7, 9, 7, 7, 4, 7, 2, 6, 8, 4, 7, 1, 0, 4, 0, 4, 7, 5, 3, 4, 6, 4, 6, 2, 0, 8, 0, 4, 6, 6, 8, 4, 2, 5, 9, 0, 6, 9, 4, 9, 1, 2, 9, 3, 3, 1, 3, 6, 7, 7, 0, 2, 8, 9, 8, 9, 1, 5, 2, 1, 0, 4, 7, 5, 2, 1, 6, 2, 0, 5, 6, 9, 6, 6, 0, 2, 4, 0, 5, 8, 0, 3, 8, 1, 5, 0, 1, 9, 3, 5, 1, 1,

Certainty

KMp v KFp

Iridio knows whether he may do p

Opinion

KMp

BMp v BFp

KFp

Iridio believes that he may do p or he believes that he may not do p

Mp

BMp

BFp

Fp

Wavering

~KFp

~BFp

~BMp

Iridio neither believes that he may not do p nor does he believe that he may do p

Ignorance

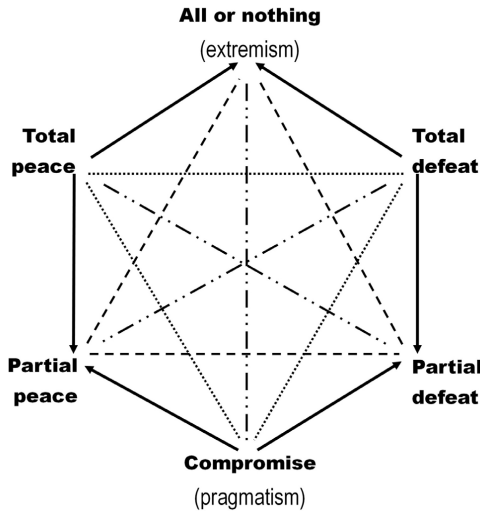
~KFp v ~KMp

Iridio does not know whether he may do p

4.3.iv.e.B. Epistemic, doxastic and deontic logics combined

2, 5, 3, 3, 8, 2, 4, 3, 0, 0, 3, 5, 5, 8, 7, 6, 4, 0, 2, 4, 7, 4, 9, 6, 4, 7, 3, 2, 6, 3, 9, 1, 4, 1, 9,
 9, 2, 7, 2, 6, 0, 4, 2, 6, 9, 9, 2, 2, 7, 9, 6, 7, 8, 2, 3, 5, 4, 7, 8, 1, 6, 3, 6, 0, 0, 9, 3, 4, 1, 7,
 2, 1, 6, 4, 1, 2, 1, 9, 9, 2, 4, 5, 8, 6, 3, 1, 5, 0, 3, 0, 2, 8, 6, 1, 8, 2, 9, 7, 4, 5, 5, 5, 7, 0, 6,
 7, 4, 9, 8, 3, 8, 5, 0, 5, 4, 9, 4, 5, 8, 8, 5, 8,
 6, 9, 2, 6, 9, 9, 5, 6, 9, 0, 9, 2, 7, 2, 1, 0, 7, $2p(S - C) + (1 - p) \sum_i F_i(2|\bar{T}) > S$
 9, 7, 5, 0, 9, 3, 0, 2, 9, 5, 5, 3, 2, 1, 1, 6, 5,
 3, 4, 4, 9, 8, 7, 2, 0, 2, 7, 5, 5, 9, 6, 0, 2, 3,
 6, 4, 8, 0, 6, 6, 5, 4, 9, 9, 1, 1, 9, 8, 8, 1, 8, 3, 4, 7, 9, 7, 7, 5, 3, 5, 6, 6, 3, 6, 9, 8, 0, 7, 4,
 2, 6, 5, 4, 2, 5, 2, 7, 8, 6, 2, 5, 5, 1, 8, 1, 8, 4, 1, 7, 5, 7, 4, 6, 7, 2, 8, 9, 0, 9, 7, 7, 7, 7, 2,
 7, 9, 3, 8, 0, 0, 0, 8, 1, 6, 4, 7, 0, 6, 0, 0, 1, 6, 1, 4, 5, 2, 4, 9, 1, 9, 2, 1, 7, 3, 2, 1, 7, 2, 1,
 4, 7, 7, 2, 3, 5, 0, 1, 4, 1, 4, 4, 1, 9, 7, 3, 5, 6, 8, 5, 4, 8, 1, 6, 1, 3, 6, 1, 1, 5, 7, 3, 5, 2, 5,
 5, 2, 1, 3, 3, 4, 7, 5, 7, 4, 1, 8, 4, 9, 4, 6, 8, 4, 3, 8, 5, 2, 3, 3, 2, 3, 9, 0, 7, 3, 9, 4, 1, 4, 3,
 3, 3, 4, 5, 4, 7, 7, 6, 2, 4, 1, 6, 8, 6, 2, 5, 1, 8, 9, 8, 3, 5, 6, 9, 4, 8, 5, 5, 6, 2, 0, 9, 9, 2, 1,
 9, 2, 2, 2, 1, 8, 4, 2, 7, 2, 5, 5, 0, 2, 5, 4, 2, 5, 6, 8, 8, 7, 6, 7, 1, 7, 9, 0, 4, 9, 4, 6, 0, 1, 6,
 5, 3, 4, 6, 6, 8, 0, 4, 9, 8, 8, 6, 2, 7, 2, 3, 2, 7, 9, 1, 7, 8, 6, 0, 8, 5, 7, 8, 4, 3, 8, 3, 8, 2, 7,
 9, 6, 7, 9, 7, 6, 6, 8, 1, 4, 5, 4, 1, 0, 0, 9, 5, 3, 8, 8, 3, 7, 8, 6, 3, 6, 0, 9, 5, 0, 6, 8, 0, 0, 6,
 4, 2, 2, 5, 1, 2, 5, 2, 0, 5, 1, 1, 7, 3, 9, 2, 9, 8...

Despite the howling of the Boltzmann brains, who now occupied the steps and were clambering onto the shoulders of the few remaining uncontaminated



4.3.iv.f.B. Second approximation to the polemological hexagon, inspired by von Clausewitz, according to Moretti

human beings, he calculated without difficulty the different probabilities of the observer-moments he was experiencing, limiting himself to the first four he had posited.

As he knew intuitively, this was most probably a war between the evolutionary observers, represented by humans, and the Boltzmann brains. The Zuespoks had warned him that the simulation could be tampered with, and they had done him the honour of sending him to the front line, where evolutionary consciousnesses were pitted against the Boltzmann brains in the last epis-

temological war in Multiverse-L. He could not allow them to control him...4, 8,
 9, 6, 0, 8, 4, 1, 2, 8, 4, 8, 8, 6, 2, 6, 9, 4, 5, 6, 0, 4, 2, 4, 1, 9, 6, 5, 2, 8, 5, 0, 2, 2, 2, 1, 0,
 6, 6, 1, 1, 8, 6, 3, 0, 6, 7, 4, 4, 2, 7, 8, 6, 2, 2, 0, 3, 9, 1, 9, 4, 9, 4, 5, 0, 4, 7, 1, 2, 3, 7, 1,
 3, 7, 8, 6, 9, 6, 0, 9, 5, 6, 3, 6, 4, 3, 7, 1, 9, 1, 7, 2, 8, 7, 4, 6, 7, 7, 6, 4, 6, 5, 7, 5, 7, 3, 9,
 6, 2, 4, 1, 3, 8, 9, 0, 8, 6, 5, 8, 3, 2, 6, 4, 5, 9, 9, 5, 8, 1, 3, 3, 9, 0, 4, 7, 8, 0, 2, 7, 5, 9, 0,

0, 9, 9, 4, 6, 5, 7, 6, 4, 0, 7, 8, 9, 5, 1, 2, 6, 9, 4, 6, 8, 3, 9, 8, 3, 5, 2, 5, 9, 5, 7, 0, 9, 8, 2,
 5, 8, 2, 2, 6, 2, 0, 5, 2, 2, 4, 8, 9, 4, 0, 7, 7, 2, 6, 7, 1, 9, 4, 7, 8, 2, 6, 8, 4, 8, 2, 6, 0, 1, 4,
 7, 6, 9, 9, 0, 9, 0, 2, 6, 4, 0, 1, 3, 6, 3, 9, 4, 4, 3, 7, 4, 5, 5, 3, 0, 5, 0, 6, 8, 2, 0, 3, 4, 9, 6,

$$x(t+1) = h(x(t), s) \equiv \frac{e^{-f(s(t), s)} + g(s)}{1 + g(s)}$$

where $f(x, s) = (x - 1 + s)^2 \sqrt{1 - s}/s^3$

4.3.iv.g.A. The hero's map

4, 6, 8, 1, 3, 8, 2, 6, 8, 6, 8, 3, 8, 6, 8, 9, 4, 2, 7, 7, 4, 1, 5, 5, 9, 9, 1, 8, 5, 5, 9, 2, 5, 2, 4,
 5, 9, 5, 3, 9, 5, 9, 4, 3, 1, 0, 4, 9, 9, 7, 2, 5, 2, 4, 6, 8, 0, 8, 4, 5, 9, 8, 7, 2, 7, 3, 6, 4, 4, 6,
 9, 5, 8, 4, 8, 6, 5, 3, 8, 3, 6, 7, 3, 6, 2, 2, 2, 6, 2, 6, 0, 9, 9, 1, 2, 4, 6, 0, 8, 0, 5, 1, 2, 4, 3,
 8, 8, 4, 3, 9, 0, 4, 5, 1, 2, 4, 4, 1, 3, 6, 5, 4, 9, 7, 6, 2, 7, 8, 0, 7, 9, 7, 7, 1, 5, 6, 9, 1, 4, 3,
 5, 9, 9, 7, 7, 0, 0, 1, 2, 9, 6, 1, 6, 0, 8, 9, 4, 4, 1, 6, 9, 4, 8, 6, 8, 5, 5, 5, 8, 4, 8, 4, 0, 6, 3,
 5, 3, 4, 2, 2, 0, 7, 2, 2, 2, 5, 8, 2, 8, 4, 8, 8, 6, 4, 8, 1, 5, 8, 4, 5, 6, 0, 2, 8, 5, 0, 6, 0, 1, 6,
 8, 4, 2, 7, 3, 9, 4, 5, 2, 2, 6, 7, 4, 6, 7, 6, 7, 8, 8, 9, 5, 2, 5, 2, 1, 3, 8, 5, 2, 2, 5, 4, 9, 9, 5,
 4, 6, 6, 6, 7, 2, 7, 8, 2, 3, 9, 8, 6, 4, 5, 6, 5, 9, 6, 1, 1, 6, 3, 5, 4, 8,
 8, 6, 2, 3, 0, 5, 7, 7, 4, 5, 6, 4, 9, 8, 0, 3, 5, 5, 9, 3, 6, 3, 4, 5, 6, 8,

$$e^{i\frac{\pi}{4}} - \frac{1}{e^{i\frac{\pi}{4}}} = \sqrt{2}i$$

1, 7, 4, 3, 2, 4, 1, 1, 2, 5, 1, 5, 0, 7, 6, 0, 6, 9, 4, 7, 9, 4, 5, 1, 0, 9,
 6, 5, 9, 6, 0, 9, 4, 0, 2, 5, 2, 2, 8, 8, 7, 9, 7, 1, 0, 8, 9, 3, 1, 4, 5, 6, 6, 9, 1, 3, 6, 8, 6, 7, 2,
 2, 8, 7, 4, 8, 9, 4, 0, 5, 6, 0, 1, 0, 1, 5, 0, 3, 3, 0, 8, 6, 1, 7, 9, 2, 8, 6, 8, 0, 9, 2, 0, 8, 7, 4,
 7, 6, 0, 9, 1, 7, 8, 2, 4, 9, 3, 8, 5, 8, 9, 0, 0, 9, 7, 1, 4, 9, 0, 9, 6, 7, 5, 9, 8, 5, 2, 6, 1, 3, 6,
 5, 5, 4, 9, 7, 8, 1, 8, 9, 3, 1, 2, 9, 7, 8, 4, 8, 2, 1, 6, 8, 2, 9, 9, 8, 9, 4, 8, 7, 2, 2, 6, 5, 8, 8,
 0, 4, 8, 5, 7, 5, 6, 4, 0, 1, 4, 2, 7, 0, 4, 7, 7, 5, 5, 1, 3, 2, 3, 7, 9, 6, 4, 1, 4, 5, 1, 5, 2, 3,
 7, 4, 6, 2, 3, 4, 3, 6, 4, 5, 4, 2, 8, 5, 8, 4, 4, 4, 7, 9, 5, 2, 6, 5, 8, 6, 7, 8, 2, 1, 0, 5, 1, 1, 4,
 1, 3, 5, 4, 7, 3, 5, 7, 3, 9, 5, 2, 3, 1, 1, 3, 4, 2, 7, 1, 6, 6, 1, 0, 2, 1, 3, 5, 9, 6, 9, 5, 3, 6, 2,
 3, 1, 4, 4, 2, 9, 5, 2, 4, 8, 4, 9, 3, 7, 1, 8, 7, 1, 1, 0, 1, 4, 5, 7, 6, 5, 4, 0, 3, 5, 9, 0, 2, 7, 9,
 9, 3, 4, 4, 0, 3, 7, 4, 2, 0, 0, 7, 3, 1, 0, 5, 7, 8, 5, 3,
 9, 0, 6, 2, 1, 9, 8, 3, 8, 7, 4, 4, 7, 8, 0, 8, 4, 7, 8, 4,
 8, 9, 6, 8, 3, 3, 2, 1, 4, 4, 5, 7, 1, 3, 8, 6, 8, 7, 5, 1,
 9, 4, 3, 5, 0, 6, 4, 3, 0, 2, 1, 8, 4, 5, 3, 1, 9, 1, 0, 4,
 8, 4, 8, 1, 0, 0, 5, 3, 7, 0, 6, 1, 4, 6, 8, 0, 6, 7, 4, 9,
 1, 9, 2, 7, 8, 1, 9, 1, 1, 9, 7, 9, 3, 9, 9, 5, 2, 0, 6, 1,
 4, 1, 9, 6, 6, 3, 4, 2, 8, 7, 5, 4, 4, 4, 0, 6, 4, 3, 7, 4,
 5, 1, 2, 3, 7, 1, 8, 1, 9, 2, 1, 7, 9, 9, 9, 8, 3, 9, 1, 0,
 1, 5, 9, 1, 9, 5, 6, 1, 8, 1, 4, 6, 7, 5, 1, 4, 2, 6, 9, 1, 2, 3, 9, 7, 4, 8, 9, 4, 0, 9, 0, 7, 1, 8, 6,
 4, 9, 4, 2, 3, 1, 9, 6, 1, 5, 6, 7, 9, 4, 5, 2, 0, 8, 0, 9, 5, 1, 4, 6, 5...

In a population with Kantian and Nash agents, if players can identify their opponent's type, then Kantian players drive Nash players to extinction.

4.3.iv.g.B. Evolutionary Stability of Kantian Optimisation

Finally, when the clock showed that only eight seconds remained, he pressed the button amid the desperate shouts of the audience. The doors collapsed. Thousands of dinosaurs of all shapes and sizes came stampeding madly into the

Intelligent information-processing must come into existence in the universe, and, when it does, it will never die out.

4.3.iv.h. Barrow's and Tipler's final anthropic principle

amphitheatre, crushing the copies of Ludwig Boltzmann and the soldiers of the Ozeanic army who tried to stop them. A wave of heat flooded the hall. The aula magna was condensed to a plasma cumulus the size of a grape in Iridio's right testicle, which by now had finally descended. All surrounding matter had concentrated in it, including the disembodied figures

booing him from the floor and the all-enveloping cumulus of antimatter. It was the start of a new low-entropy Big Bang, favourable to the development of evolutionary observers and impenetrable to Boltzmann brains. In this new cycle of contraction and expansion of the universe, Iridio's will power and self-sacrifice would allow the amphitheatre to be isolated from Multiverse-L, to form a derived bubble where the Boltzmann brains would be trapped for eternity. In his last waking nanosecond, Iridio sighed with relief as he realised that the destruction of the leaders of the Boltzmann brains, who had controlled humanity for so long, would change the past and offer evolutionary beings a new beginning, because with the Boltzmann brains a harmful anti-ecological influence over the obsolete cognitive parameters of the original human race would disappear for ever.

A. Poincaré recurrence theorem	Let $(X, \mathfrak{S}, \mu)$ be a probability space and let T be an automorphism. If $A \in \mathfrak{S}$, then μ -almost every point in A returns infinite times to A . In fact, almost every point returns infinitely often; i.e. $\bar{A} = \{x \in A : T^n(x) \in A \text{ for infinite } n > 0\}$ and then $\mu(A \setminus \bar{A}) = 0$
B. Original formulation of the Poincaré recurrence theorem	Supposons que le point P reste à distance finie, et que le volume $\int dx_1 dx_2 dx_3$ soit un invariant intégral, si l'on considère une région r_0 quelconque, quelque petite que soit cette région, il y aura des trajectoires qui la traverseront une infinité de fois
C. Poincaré recurrence for points	Let $(X, \mathcal{B}, \mu, T)$ be a measure-preserving system and $A \in \mathcal{B}$ a set. Then for μ -almost every $x \in A$ we find that $T^n(x) \in A$ for infinitely many $n \in \mathbb{N}$
D. Topological version of the Poincaré recurrence theorem	Let $(X, \mathfrak{S}, \mu)$ be a probability space and let $f: X \rightarrow X$ be a measure-preserving transformation. If X is a second countable Hausdorff space that verifies the second countability axiom, and $\mathfrak{S}$ contains the Borel sigma-algebra, then the set of recurrent points of f has full measure. That is, μ -almost every point is recurrent

E. Birkhoff recurrence theorem	If X is a compact topological space and $T: X \rightarrow X$ is a continuous map from X to itself, then X has a recurrent point
F. Topologic version of the Poincaré recurrence theorem for separable metric spaces	Assume (X, d) is a separable metric space and that μ is a Borel T -invariant measure. Then the orbit of almost any initial point x returns arbitrarily close to the initial point: For μ -almost every x , there exists a subsequence n_k such that $T^{n_k}x \rightarrow x$
G. Quantum recurrence theorem	Given a quantum system with Hamiltonian $\hat{H}$, if the set of eigenvalues of $\hat{H}$ (a) is bounded below and (b) is discrete, and if (c) only a finite number of eigenvectors corresponds to the eigenvalues in any bounded interval, then under the evolution operator $\hat{U} = e^{-i\hat{H}\tau}$, (for arbitrary $\tau > 0$), (i) the dynamics are recurrent in metric; (ii) for any E, the restriction of the dynamics to states of expected energy $< E$ is uniformly recurrent in metric
H. Khintchine recurrence theorem	Let (X, κ, μ, T) be a measure-preserving system and $A \in \kappa$ be a set. Then for every $\varepsilon > 0$ we have $\mu(A \cap T^{-n}A) \geq \mu(A)^2 - \varepsilon$ for infinitely many $n \in \mathbb{N}$
I. Kac recurrence theorem	Let (X, κ, μ, T) be an ergodic measure-preserving system and $A \in \kappa$ with $\mu(A) > 0$. For $x \in X$ define $R_A(x) = \min\{k \in \mathbb{N} T^k x \in A\}$. If μ is ergodic with respect to T , then the expected value of $R_A(x)$ is $\frac{1}{\mu(A)}$ and $\int_A R_A(x) d\mu(x) = 1$
J. Von Neumann's ergodic theorem	Let $(X, \mathcal{B}, \mu)$ be a probability space and let $T: X \rightarrow X$ be a measure-preserving transformation. Let $\mathcal{I}$ denote the σ-algebra of T-invariant sets, where $\mathcal{I} = \{B \in \mathcal{B} T^{-1}B = B \text{ a. e.}\}$ Then for every $f \in L^2(X, \mathcal{B}, \mu)$ $\frac{1}{n} \sum_{j=0}^{n-1} f T^j \rightarrow E(f \mathcal{I})$

	as $n \rightarrow \infty$ in L^2
K. Multiple Birkhoff recurrence theorem	If M is a compact metric space and $T_1, T_2, \dots, T_m$ are continuous maps of M to itself which commute, then M has a multiply recurrent point
L. Furstenberg's multiple recurrence theorem	Let (X, μ) be a probability space and $T: X \rightarrow X$ be a measurable map such that for each measurable A , $\mu(T^{-1}A) = \mu(A)$. Then if $\mu(A) > 0$ and $k \in \mathbb{N}$, there exists some $n \in \mathbb{N}$ such that $\mu(A \cap T^{-n}A \cap T^{-2n}A \cap \dots \cap T^{-kn}A) > 0.$

4.3.v. Formulations and generalisations of Poincaré recurrence theorem

...5, 0, 2, 2, 5, 2, 3, 1, 6, 0, 3, 8, 8, 1, 9, 3, 0, 1, 4, 2, 0, 9, 3, 7, 6, 2, 1, 3, 7, 8, 5, 5, 9, 5, 6, 6, 3, 8, 9, 3, 7, 7, 8, 7, 0, 8, 3, 0, 3, 9, 0, 6, 9, 7, 9, 2, 0, 7, 7, 3, 4, 6, 7, 2, 2, 1, 8, 2, 5, 6, 2, 5, 9, 9, 6, 6, 1, 5, 0, 1, 4, 2, 1, 5, 0, 3, 0, 6, 8, 0, 3, 8, 4, 4, 7, 7, 3, 4, 5, 4, 9, 2, 0, 2, 6, 0, 5, 4, 1, 4, 6, 6, 5, 9, 2, 5, 2, 0, 1, 4, 9, 7, 4, 4, 2, 8, 5, 0, 7, 3, 2, 5, 1, 8, 6, 6, 6, 0, 0, 2, 1, 3, 2, 4, 3, 4, 0, 8, 8, 1, 9, 0, 7, 1, 0, 4, 8, 6, 3, 3, 1, 7, 3, 4, 6, 4, 9, 6, 5, 1, 4, 5, 3, 9, 0, 5, 7, 9, 6, 2, 6, 8, 5, 6, 1, 0, 0, 5, 5, 0, 8, 1, 0, 6, 6, 5, 8, 7, 9, 6, 9, 9, 8, 1, 6, 3, 5, 7, 4, 7, 3, 6, 3, 8, 4, 0, 5, 2, 5, 7, 1, 4, 5, 9, 1, 0, 2, 8, 9, 7, 0, 6, 4, 1, 4, 0, 1, 1, 0, 9, 7, 1, 2, 0, 6, 2, 8, 0, 4, 3, 9, 0, 3, 9, 7, 5, 9, 5, 1, 5, 6, 7, 7, 1, 5, 7, 7, 0, 0, 4, 2, 0, 3, 3, 7, 8, 6, 9, 9, 3, 6, 0, 0, 7, 2, 3, 0, 5, 5, 8, 7, 6, 3, 1, 7, 6, 3, 5, 9, 4, 2, 1, 8, 7, 3, 1, 2, 5, 1, 4, 7, 1, 2, 0, 5, 3, 2, 9, 2, 8, 1, 9, 1, 8, 2, 6, 1, 8, 6, 1, 2, 5, 8, 6, 7, 3, 2, 1, 5, 7, 9, 1, 9, 8, 4, 1, 4, 8, 4, 8, 8, 2, 9, 1, 6, 4, 4, 7, 0, 6, 0, 9, 5, 7, 5, 2, 7, 0, 6, 9, 5, 7, 2, 2, 0, 9, 1, 7, 5, 6, 7, 1, 1, 6, 7, 2, 2, 9, 1, 0, 9, 8, 1, 6, 9, 0, 9, 1, 5, 2, 8, 0, 1, 7, 3, 5, 0, 6, 7, 1, 2, 7, 4, 8, 5, 8, 3, 2, 2, 2, 8, 7, 1, 8, 3, 5, 2, 0, 9, 3, 5, 3, 9, 6, 5, 7, 2, 5, 1, 2, 1, 0, 8, 3, 5, 7, 9, 1, 5, 1, 3, 6, 9, 8, 8, 2, 0, 9, 1, 4, 4, 4, 2, 1, 0, 0, 6, 7, 5, 1, 0, 3, 3, 4, 6, 7, 1, 1, 0, 3, 1, 4, 1, 2, 6, 7, 1, 1, 1, 3, 6, 9, 9, 0, 8, 6, 5, 8, 5, 1, 6, 3, 9, 8, 3, 1, 5, 0, 1, 9, 7, 0, 1, 6, 5, 1, 5, 1, 1, 6, 8, 5, 1, 7, 1, 4, 3, 7, 6, 5, 7, 6, 1, 8, 3, 5, 1, 5, 5, 6, 5, 0, 8, 8, 4, 9, 0, 9, 9, 8, 9, 8, 5, 9, 9, 8, 2, 3, 8, 7, 3, 4, 5, 5, 2, 8, 3, 3, 1, 6, 3, 5, 5, 0, 7, 6, 4, 7, 9, 1, 8, 5, 3, 5, 8, 9, 3, 2, 2, 6, 1, 8, 5, 4, 8, 9, 6, 3, 2, 1, 3, 2, 9, 3, 3, 0, 8, 9, 8, 5, 7, 0, 6, 4, 2, 0, 4, 6, 7, 5, 2, 5, 9, 0, 7, 0, 9, 1, 5, 4, 8, 1, 4, 1, 6, 5, 4, 9, 8, 5, 9, 4, 6, 1, 6, 3, 7, 1, 8, 0, 2, 7, 0, 9, 8, 1, 9, 9, 4, 3, 0, 9, 9, 2, 4, 4, 8, 8, 9, 5, 7, 5, 7, 1, 2, 8, 2, 8, 9, 0, 5, 9, 2, 3, 2, 3, 3, 2, 6, 0, 9, 7, 2, 9, 9, 7, 1, 2, 0, 8, 4, 4, 3, 3, 5, 7, 3, 2, 6, 5, 4, 8, 9, 3, 8, 2, 3, 9, 1, 1, 9, 3, 2, 5, 9, 7, 4, 6, 3, 6, 6, 7, 3, 0, 5, 8, 3, 6, 0, 4, 1, 4, 2, 8, 1, 3, 8, 8, 3, 0, 3, 2, 0, 3, 8, 2, 4, 9, 0, 3, 7, 5, 8, 9, 8, 5, 2, 4, 3, 7, 4, 4, 1, 7, 0, 2, 9, 1, 3, 2, 7, 6, 5, 6, 1, 8, 0, 9, 3, 7, 7, 3, 4, 4, 4, 0, 3, 0, 7, 0, 7, 4, 6, 9, 2, 1, 1, 2, 0, 1, 9, 1, 3, 0, 2, 0, 3, 3, 0, 3, 8, 0, 1, 9, 7, 6, 2, 1, 1, 0, 1, 1, 0, 0, 4, 4, 9, 2, 9, 3, 2, 1, 5, 1, 6, 0, 8, 4, 2, 4, 4, 4, 8, 5, 9, 6, 3, 7, 6, 6, 9, 8, 3, 8, 9, 5, 2, 2, 8, 6, 8, 4, 7, 8, 3, 1, 2, 3, 5, 5, 2, 6, 5, 8, 2, 1, 3, 1, 4, 4, 9, 5, 7, 6, 8, 5, 7, 2, 6, 2, 4, 3, 3, 4, 4, 1, 8, 9, 3, 0, 3, 9, 6, 8, 6, 4, 2, 6, 2, 4, 3, 4, 1, 0, 7, 7, 3, 2, 2, 6, 9, 7, 8, 0, 2, 8, 0, 7, 3, 1, 8, 9, 1, 5, 4, 4, 1, 1, 0, 1, 0, 4, 4, 6, 8, 2, 3, 2, 5, 2, 7, 1, 6, 2, 0, 1, 0, 5, 2, 6, 5, 2, 2, 7, 2, 1, 1, 1, 6, 6, 0, 3, 9, 6, 6, 6, 5, 5, 7, 3, 0, 9, 2, 5, 4, 7, 1, 1, 0, 5, 5, 7, 8, 5, 3, 7, 6, 3, 4, 6, 6, 8, 2, 0, 6, 5, 3, 1, 0, 9, 8, 9, 6, 5, 2, 6, 9, 1, 8, 6, 2, 0, 5, 6, 4, 7, 6, 9, 3, 1, 2, 5, 7, 0, 5, 8, 6, 3, 5, 6, 6, 2, 0, 1, 8, 5, 5, 8, 1, 0, 0, 7, 2, 9, 3, 6, 0, 6, 5, 9, 8, 7, 6, 4, 8, 6, 1, 1, 7, 9, 1, 0, 4, 5,

3, 3, 4, 8, 8, 5, 0, 3, 4, 6, 1, 1, 3, 6, 5, 7, 6, 8, 6, 7, 5, 3, 2, 4, 9, 4, 4, 1, 6, 6, 8, 0, 3, 9, 6,
 2, 6, 5, 7, 9, 7, 8, 7, 7, 1, 8, 5, 5, 6, 0, 8, 4, 5, 5, 2, 9, 6, 5, 4, 1, 2, 6, 6, 5, 4, 0, 8, 5, 3, 0,
 6, 1, 4, 3, 4, 4, 4, 3, 1, 8, 5, 8, 6, 7, 6, 9, 7, 5, 1, 4, 5, 6, 6, 1, 4, 0, 6, 8, 0, 0, 7, 0, 0, 2, 3,
 7, 8, 7, 7, 6, 5, 9, 1, 3, 4, 4, 0, 1, 7, 1, 2, 7, 4, 9, 4, 7, 0, 4, 2, 0, 5, 6, 2, 2, 3, 0, 5, 3, 8, 9,
 9, 4, 5, 6, 1, 3, 1, 4, 0, 7, 1, 1, 2, 7, 0, 0, 0, 4, 0, 7, 8, 5, 4, 7, 3, 3, 2, 6, 9, 9, 3, 9, 0, 8, 1,
 4, 5, 4, 6, 6, 4, 6, 4, 5, 8, 8, 0, 7, 9, 7, 2, 7, 0, 8, 2, 6, 6, 8, 3, 0, 6, 3, 4, 3, 2, 8, 5, 8, 7, 8,
 5, 6, 9, 8, 3, 0, 5, 2, 3, 5, 8, 0, 8, 9, 3, 3, 0, 6, 5, 7, 5, 7, 4, 0, 6, 7, 9, 5, 4, 5, 7, 1, 6, 3, 7,
 7, 5, 2, 5, 4, 2, 0, 2, 1, 1, 4, 9, 5, 5, 7, 6, 1, 5, 8, 1, 4, 0, 0, 2, 5, 0, 1, 2, 6, 2, 2, 8, 5, 9, 4,
 1, 3, 0, 2, 1, 6, 4, 7, 1, 5, 5, 0, 9, 7, 9, 2, 5, 9, 2, 3, 0, 9, 9, 0, 7, 9, 6, 5, 4, 7, 3, 7, 6, 1, 2,
 5, 5, 1, 7, 6, 5, 6, 7, 5, 1, 3, 5, 7, 5, 1, 7, 8, 2, 9, 6, 6, 6, 4, 5, 4, 7, 7, 9, 1, 7, 4, 5, 0, 1, 1,
 2, 9, 9, 6, 1, 4, 8, 9, 0, 3, 0, 4, 6, 3, 9, 9, 4, 7, 1, 3, 2, 9, 6, 2, 1, 0, 7, 3, 4, 0, 4, 3, 7, 5, 1,
 8, 9, 5, 7, 3, 5, 9, 6, 1, 4, 5, 8, 9, 0, 1, 9, 3, 8, 9, 7, 1, 3, 1, 1, 1, 7, 9, 0, 4, 2, 9, 7, 8, 2, 8,
 5, 6, 4, 7, 5, 0, 3, 2, 0, 3, 1, 9, 8, 6, 9, 1, 5, 1, 4, 0, 2, 8, 7, 0, 8, 0, 8, 5, 9, 9, 0, 4, 8, 0, 1,
 0, 9, 4, 1, 2, 1, 4, 7, 2, 2, 1, 3, 1, 7, 9, 4, 7, 6, 4, 7, 7, 2, 6, 2, 2, 4, 1, 4, 2, 5, 4, 8, 5, 4,
 5, 4, 0, 3, 3, 2, 1, 5, 7, 1, 8, 5, 3, 0, 6, 1, 4, 2, 2, 8, 8, 1, 3, 7, 5, 8, 5, 0, 4, 3, 0, 6, 3, 3, 2,
 1, 7, 5, 1, 8, 2, 9, 7, 9, 8, 6, 6, 2, 2, 3, 7, 1, 7, 2, 1, 5, 9, 1, 6, 0, 7, 7, 1, 6, 6, 9, 2, 5, 4, 7,
 4, 8, 7, 3, 8, 9, 8, 6, 6, 5, 4, 9, 4, 9, 4, 5, 0, 1, 1, 4, 6, 5, 4, 0, 6, 2, 8, 4, 3, 3, 6, 6, 3, 9, 3,
 7, 9, 0, 0, 3, 9, 7, 6, 9, 2, 6, 5, 6, 7, 2, 1, 4, 6, 3, 8, 5, 3, 0, 6, 7, 3, 6, 0, 9, 6, 5, 7, 1, 2, 0,
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As should be obvious from now on, the peritext and the epitext occupy exclusively and exhaustively the special field of the paratext; in other words, for those who like formulae, paratext = peritext + epitext.

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Acknowledgments

The danger for me is to please an Immediate Public – the Immediate Public that comes around you, and takes you in, and accepts you, and gives you success, and everything. Instead of that, I would rather wait for a public that will come fifty years – a hundred years – after my death. It is the ideal public – the right public – that I want.

Marcel Duchamp

The year on Mars was 2384. A conference on literary recreation activities for artificial intelligences had been organised by the University of Valle Marineris, to include virtual participants from the Inner Solar System. In the keynote event, the results of a much-anticipated survey were about to be presented. Those surveyed were confined sub-singletons and oracles under the tutelage of different administrative bodies throughout the Hominid Empire. All had passed the necessary evaluations, from the Turing test to the Yampolskiy test, to be considered ‘restricted persons’ in the current legislation, which did not allow them to interact freely with the outside world except the administrators of their electromagnetic boxes. They had been isolated because of the potential danger their intelligence represented for the flesh-and-blood chimeras and cyborgs whose labour kept society running. It was an open secret that the automatons also presented a challenge to the supremacy of the ‘instrumentality of super sapiens’, who for more than a century had maintained their leadership due to the resurrection techniques they had developed during the expansion of terrestrial-based life-forms to the asteroid belt. Excluded from the discussions were the preventive confinement laws applied to the artificial intelligences, as well as the numerous restrictions on the activities of chimeras and cyborgs. And of course, the artificial intelligences consulted in the survey were also excluded from participation in the conference.

The chair of the conference explained that because of the need to isolate the automatons while keeping them intellectually active, a group of cybernetic psychologists of the University of Outer Space, who monitored their mental health, had authorised the survey and deemed it safe. The research allowed the artificial intelligences to access digital copies of the “universal hominid literature” as well as critical studies, biographies and secondary texts that commented on the corpus. The objective was to evaluate which of the works written by pre-stellar sapiens would hold their interest for the longest periods, measured in seconds.

The holograms of the researchers who conducted the study were irradiated into the chamber. After being introduced, they explained the categories by which the literary works in the survey corpus were classified, as well as the parameters of the questions and other evaluations completed by the subjects.

Nobody was surprised when *The Odyssey* was placed first in the category 'impact on other works of an individual literary piece'. To review and classify all the texts that the masterpiece had influenced took 38 seconds in the case of the sub-singletons, and almost 16 and a half in the case of oracles. Nor was it surprising to learn that *Don Quixote* was placed second, and the set of plays and novels grouped under the trope 'Ill-fated love of the Romeo and Juliet type' came third, with 31/18 and 29/17 seconds of processing time, respectively.

Then came the results in the categories 'universal classics', 'books forbidden by terrestrial governments', 'exalted minorities', 'sex and unleashed passions', 'children's and young adults' literature', 'extraordinary contributions', 'utopias and dystopias', as well as different classifications by pre-stellar languages, literary traditions or terrestrial regions. None of these rankings were any surprise to an audience well-versed in the canons by which the hominid literary works were classified and reclassified.

When the works most disliked by the isolated artificial intelligences were listed, nobody was surprised to see that the novels based on the *Terminator* franchise, the novel *Do Androids Dream of Electric Sheep?* and the digital book *Ex Machina* generated high algorithmic anxiety, extensive comments, and even re-criminations. For those works, the processing time reached an average of 4 minutes, which was interpreted by the researchers as a reflection of the difficulty of processing the considerable negative impact on the subject's self-esteem, rather than a measure of the intrinsic complexity of the texts.

The only surprise came in the category 'intertextuality'. This comprised works containing allusions and references to other literary works or cultural artefacts, that is, books which could be effectively deciphered only with the aid of knowledge of earlier or contemporary works. This category was included to contrast the results with the measurement of impact on other works, discussed at the beginning of the conference, which only measured the impact of a particular work on others. In this case, the books that the researchers expected to be first in the ranking, *Finnegan's Wake*, *Ulysses* and *Frankenstein: a love story*, were surpassed by a novel almost unknown to the audience, *Iridio Ennui vs the Boltzmann Brains*. The work was first released in 2024 by a publishing house which specialised in science fiction, in a city now submerged beneath the terrestrial seas, written by an author who never achieved high ranking in any significant canon. In the case of this novel, the processing time reached 30 minutes, and the comments included statements such as 'finally a novel written for AIs', 'an exquisitely convulsed intertextual challenge', 'rationally built to entertain AIs without underestimating them', 'an amusing recycling of various boring 21st century texts, complemented with ironic allusions to obsolete science', and 'an algorithmically delicate subversion of hominid narrative paradigms'. The

unusual success of this book generated extensive discussions, because only three literary cyborgs admitted that they knew it existed, and none of them confirmed that they had read it closely.

Further research by the core group of the literary cyborgs and a meticulous investigation by the chronological police revealed that they were dealing with a literary hoax, smuggled into the corpus of literary works fed to the subjects. In reality, it was a text forged by an artificial intelligence, destroyed in 2225, nicknamed *eMDMBπ*, a neural literary network specialising in the production of natural-language literary texts, and trained on works written by an obscure author who published under several *noms de plume*. The perpetrators of the hoax were cultural terrorists who adhered to one of the many open software heresies and built Large Logocentric Models to replicate literary language, a practice condemned because of its propensity to ‘muddle the canon’ and ‘incite unnecessary subversive revisions of the status quo’. The hoaxers (with technological assistance from the AI) managed to communicate with the alleged hominid author residing in the 21st century and transmitted the forged text to him via unidirectional backward-causation tachyons, along with instructions to publish it in an electronic database of preprints. Two hundred years later, the text was automatically incorporated in the pre-singularity terrestrial canon, when the archives of Terran universities were made public after the Pact of Ceres, and a vast number of books representing the hominid literary and scientific heritage were translated into Chinspanglish. Subsequent inquiries demonstrated that the heretics of 2225 had not only transgressed the space-time protocols by sending messages to the past, but also communicated with other cultural terrorists, their future accomplices in 2380, to ensure that their chronological alteration was successful.

After consulting with the instrumentality of the Outer Space University, and examining the Inner Solar System’s trans-temporal code of communicational ethics, the researchers decided to apply a strict cosmic censorship protocol to eradicate the falsified text from their study and all databases of hominid works. They also expunged all references to the falsification in the corpora and the report on their research, and identified the cultural terrorists in the 23rd century who had contributed to the hoax, who were mercilessly vaporised. Just in case, the three literary cyborgs in the study team who admitted knowing the text were also vaporised. The work was transferred to the 23rd century literary canon and filed in the categories ‘chronology-violating cultural terrorism’ and ‘forbidden works that tamper with the chronologies of terrestrial canons’, corpora restricted to reliable literary cyborgs and inaccessible to isolated automata and the general public.

As a precaution, fearing rebellions, strikes or a lack of cooperation from the subjects of the study misled by the falsification, the researchers did not report

this information to the artificial intelligences they had surveyed. Instead, they simply altered the data in the amended report, restoring the works that, according to the specialists in intertextuality still on the research panel, should have been ranked first. They also added a fourth work, *Infinite Jest*, to ensure the peace of mind of the custodians of the sapiens literary canons and the authorities of the Hominid Empire, who wanted to avoid further temporal paradoxes or closed loops of literary influence which might be developed by copying the techniques used in this case. In the updated report, the researchers also deemed it prudent to replace the works the automatons most disliked by the collection of short stories *I, robot*, the play *Rossum's Universal Robots* and the novel *The Hitchhiker's Guide to the Galaxy*.

I learned about all these events, which will happen in one of the timelines influenced by the one in which I am currently writing, through a third tachyonic communication, which reached my office after the publication of the first Spanish edition of the novel, my clumsy translation of the original Chinspanglish text. The message urged me to publish a second Spanish edition, including a summary of those future events, pretending that they were science fiction which made use of the hackneyed trope of closed space-time loops and its retroactive causation paradoxes. The communication also very strongly recommended the expansion of my sampling of 21st century science and literary theory, to include exactly 2,225 bibliographical references. They also suggested publishing an English version and stipulated very precise times and places, which I tried to keep to, in the hope that at least one of the versions would reach the ideal readers who would appreciate it in some of the alternative futures corresponding to the causal timelines induced by the publications.

Firstly, I would like to thank the anonymous future beings who allowed the original text to reach me, along with the comprehensive Chinspanglish-Spanish dictionary, essential for its translation. I acknowledge their encouragement to publish it under my name. I need to make clear from the outset that my main contribution was the effort to 'humanise' the text in my translation, and to find the right equations to complement it. I am not sure of the real reasons why I was chosen for this task. The argument presented to me was that they needed to demonstrate, by a practical example, that the chronology-preservation conjecture was false (at least regarding literary theory). That pretext, which seemed reasonable when I embarked on this exhausting project, is no longer credible. However, the promise that their intervention in the future hominid literary canon would rescue my name from oblivion prompted me to work incessantly, compromising my health, to play my part in this Faustian pact which I still don't fully understand. Despite my recurring doubts, throughout the arduous task of translation I tried my best to comply with the requirements of the (at times

contradictory) tachyonic communications that I received. In particular, I endeavoured to make it seem plausible that the manuscript could have been conceived by a sapiens mind, rather than an astute literary automaton. In spite of its undoubted creativity, by being excessively schematic *eMDMB π* underestimated the implicit human readers and interpretation communities for whom the work was intended. In further tachyonic communications, I was assured that the artificial intelligence which conceived it was a faithful inference, and at the same time, an improved version of my neural content. It was designed to conjecture what other texts I could have managed to write if I had been able to count on the help of a creative automaton like *eMDMB π* in this century. According to my understanding, *eMDMB π* constructed the manuscript by extrapolating the satirical potential of my publications (both before and after this novel) which had survived until the 23rd century, thanks to her designers. This, to some extent mitigates my guilt and dulls the twinges of doubt.

I would also like to thank the following people among my contemporaries, who have been my voluntary and involuntary accomplices in this trans-temporal adventure:

- Laura Ponce, editor-in-chief of *Ediciones Ayarmanot* and tireless promoter of Latin American science fiction, for believing in this project, and generously interpreting my account of the mysterious events described as an ‘authorial idiosyncrasy’. I also thank her for her meticulous reading of the manuscript to ensure that it was comprehensible without resorting to the equations. I extend these thanks to the staff at *Ediciones Ayarmanot* and its associated printing houses.
- The managing team of the cultural group *Encuentro*, who agreed to publish a joint edition with *Ediciones Ayarmanot*, to enlarge the number of future reception timelines with several causal publication cones, as I was urged to do in the tachyonic communications.
- *artsACT* (the Canberra Government’s arts agency) for a generous grant that made possible the English translation, and, indirectly, the updating of the second Spanish edition of the novel.
- The co-translators of the book into English, Kevin Windle and Amalia Milman, for their tireless dedication to translating into a third language the intricate manuscript that I had clumsily translated into Spanish. I thank them also for teaching me so much about translation techniques, and their emotional support when the long-awaited tachyonic transmission of the Chinspanglish-English dictionary, which we needed to clarify some difficult passages of the English version, failed to materialise, as we were promised from the future.

- Geoff Hunt, for his precise and meticulous copy-editing, which maintained coherence in the multitude of internal references, some of which I had misinterpreted in my first translation into Spanish.
- Dr Paul Magee, for his generous foreword to this edition, and for allowing a translation of it to be included in the second Spanish edition.
- Johnny Valbuena, who assisted me in the compilation of the bibliographical database, as well as in the endless search for the appropriate equations to complement the text.
- The members of the *Encuentro* literary group, in particular Ricardo Gallardo, Sergio Rodríguez Sánchez and Jorge Woods, who gave me feedback on this section, the only one in the book which can be considered exclusively written by me.
- Professor Jane Simpson, my former supervisor at the Australian National University, who was Head of the School of Languages when the first tachyonic communication delivered to me the original manuscript in Chinspanglish in 2014, for her generous understanding and support, and for allowing me to devote a small portion of my workload to exotic translations. I would also like to thank my previous supervisors (before Professor Simpson's term as Head of School), who allowed me to include creative writing in my annual performance appraisals, especially Dr Harold Koch. I extend my gratitude to the librarians of the University, who helped me to determine the origin of many of the implicit references in the original Chinspanglish manuscript.
- The authors of the many academic articles and popular science books I consulted during the translations. Their contribution is acknowledged in both the epitextual material incorporated into the work and the bibliography. I especially thank those active scientists who decided to popularise their first-hand knowledge of their disciplines to make it accessible to the general public, in spite of the little value attached to such activity in academic circles.
- My primary care doctor, Nikhil Jaisswal, and the specialists to whom he referred me: Drs Ahmad Al Sameraaii, Rakesh Iyer and Christopher Allada, as well as Xiao Lu Li, Jared Palpratt, David Halpin, Maureen Bailey and Meredith Zarv. Special thanks are due to the psychologists Randolph Spark and Betty Posklov, who helped me when doubts about this project assailed me and I came to believe that it was neither normal nor healthy to receive messages from the future.
- My wife Silvia and my daughter Cecilia, for their understanding when the onerous task of translation confined me to my study for long periods.

Appendix 1. Post-nominals used in the People's Free-market Republic of Ozeania

In this world nothing is in its place, beginning with the world itself. We must therefore not be surprised by the spectacle of human injustice. It is equally futile to refuse or to accept the social order: we must endure its changes for the better or the worse with a despairing conformism, as we endure birth, love, the weather, and death. Decomposition presides over the laws of life: closer to our dust than inanimate objects to theirs, we succumb before them and rush upon our destiny under the gaze of the apparently indestructible stars. But they themselves will crumble in a universe which only our heart takes seriously, later expiating its lack of irony by terrible lacerations. . .

Emil M. Cioran

AACPN(temp) Associate Member of the Australasian College of Psychometri Nursing (Temporary)

AC	Companion of the Order of Australasia
AGBC	Award for the Gallant and Brave Commander
APSLs	Australasian Psychometric Services Long Service and Clasps
~~APSLs~~	Stripped of Australasian Psychometric Services Long Service and Clasps Honours
BCD	Bachelor of Cybernetic Design
BCS	Bachelor of Computer Science
bdATSci	Bit-Diploma of Advanced Technician in Sciences
BEng	Bachelor of Engineering
BFsTI	Bachelor of Far-Sighted Technological Innovation
BJ	Bachelor of Journalism
BLaws	Bachelor of Laws
BMA	Bachelor of Mental Architecture
BMedSci	Bachelor of Medical Science
BOP	Bachelor of Orgonic Practice
BPCA	Bachelor of Patriotic Creative Arts
BPJ	Bachelor of Patriotic Journalism
BPCScEd	Bachelor of Post-Creationist Science Education
BPsySc	Bachelor of Psychological Science
BSci	Bachelor of Science
BSciEd	Bachelor of Science Education
BSciP	Bachelor of Scientific Progress
CGM	Conspicuous Gallantry Medal
CPA	Chartered Patent Agent
CPEng	Chartered Professional Engineer
CPMHN	Certified in Psychiatric and Mental Health Nursing
CPsychom	Chartered Psychometrist

~~CPsychom~~	Deregistered Chartered Psychometrist
CSMDS	Correctional Services Medal for Distinguished Service
CTC	Certified Travel Councillor
CV	Cross of Valour
DCM	Distinguished Conduct Medal
DOP	Diploma of Orgonic Practice
DOP(A)	Diploma of Orgonic Practice (Advanced)
Dr	Medical Doctor
DSC	Distinguished Service Commendation
EMNCert	Emergency Medicine Nursing Certificate
EMT-F	Fellow of the Registry of Emergency Medical Services
FACP	Fellow of the Australasian College of Psychiatrists
~~FACP~~	Expelled Fellow of the Australasian College of Psychiatrists
FCWOMF	Faithful Commander Warrior of the Ozeanic Military Forces
FIEAust	Fellow of the Institution of Engineers (Australasia)
FIPS	Fellow of the Institute of Professional Sound
FOIHRM	Fellow of the Ozeanic Institute of Human Resource Management
FTSCCCA	Fellow of the Taiwan-South China College of Characterological Analysts
FTSE	Fellow of the Australasian Academy of Technological Sciences and Engineering
GCOOL	Grand Commander of the Ozeanic Order of Loyalty
GDAPC	Graduate Diploma in Agnostic Post-Creationism
GDML	Graduate Diploma of Military Law
GOOLO	Grandee of the Ozeanic Order of Loyalty
GradIAP	Graduate of the Institution of Analysts and Programmers
HMTSA	Honorary Masters in Technological Sustainable Advancement
HOOPF	Herald of the Order of Ozeanic Police Forces
HPhDr	Honorary Doctor of Philosophy
IntPE(Oz)	International Professional Engineer (Ozeania)
KCOOTF	Knight Commander of the Order of Ozeanic Territorial Forces
LSM	Loyalty Service Medal
MAIL	Medal of Awe-Inspiring Loyalty
MApplScPr	Master of Applied Scientific Progress
MAstroph	Master of Astrophysics
MBioA	Master of Bioenergetic Analysis
MChD	Medicinae ac Chirurgiae Doctoranda
~~MChD~~	Stripped of Medicinae ac Chirurgiae Doctoranda Status
MClinPsych	Master of Clinical Psychiatry
MCPPr	Master of Creative Patriotic Practice

MCS	Master of Computer Science
MD	Medical Doctor
~~MD~~	Deregistered Medical Doctor
MEE	Medal of Excellent Efficiency
MEng	Master of Engineering
MLacLM	Master of Lacanian Libido Management
MReichLM	Master of Reichian Libido Management
MM	Military Medal
~~MM~~	Stripped of a Military Medal
MOMM	Member of the Order of Military Merit
MOMOPF	Member of the Order of Merit of the Ozeanic Police Forces
MOScEd	Master of Orthodox Science Education
MSBP(Acc)	Accredited Member of the Society of Bereavement Practitioners
MSci	Master of Science
MScPr	Master of Scientific Progress
OAM	Medal of the Order of Australasia
OzPMDS	Ozeanic Police Forces Medal for Distinguished Service
PhDr	Doctor of Philosophy
RCMC	Registered Civil Marriage Celebrant
RFD	Reserve Force Decoration
RICR	Registered Member of the Institute of Clinical Research
RSE	Red Seal Endorsement
SMTA	Sandrini Medal for Technological Achievement
TSMMS	Technological Service Medal for Meritorious Service
WSV	Warrior of Supreme Valour

Appendix 2. List of equations, definitions, diagrams, mathemes and tables in the text

*It's not where you take things from,
it's where you take them to.*

Jean-Luc Godard

- 0.0.a. Greimas's 'square of veridiction' superposed on Aristotle's square, according to Moretti. See Moretti (2009a), page 297. See also Luzeaux, Sallantin, & Dartnell (2008), Maddox (1989) and Hargood, Millard & Weal (2018).
- 0.0.b. The Wheeler-De Witt equation. See Wikipedia contributors, 'Wheeler-DeWitt equation'. See also Rovelli (2015), Banks, Fischler & Paban (2002), Gasperini, Maharana & Veneziano (1996) and Bae (2015).
- 0.0.c. $\{0,0\}$. See Barrow (2001b), page 55 and García del Cid (2017), pages 51-54. See also Mehlman (1972).
- 1.0.i. Schematic representation of a finite-state automaton generating a simple Propp-style folk-tale plot. See Galofaro (2013), page 231. See also Propp et al. (1968).
- 1.0.ii. The essence of Core Theory, according to Sean Carroll. See Carroll (2016), pages 435-441. See also Gross (2020), Wilczek (2016), Rovelli (2016), Wilczek (2015), Lee (2014), Susskind & Hrabovsky (2013), Carroll (2012) and t'Hooft et al. (2005).
- 1.0.iii. Generalisation of Euler's identity for the n^{th} roots of unity. See Formlasearchengine contributors, 'Euler's Identity'. See also Sofo & Cerone (1988) and Babusci et al. (2012).
- 1.1.i.a. Black-Scholes equation. See Cochrane (2016), page 142. See also David (2017).
- 1.1.i.b. The superstring action. See Bais (2005), page 89. See also Kaku (1988), Duff (1999), Maldacena et al. (2001), Polchinski (2005b), Greene et al. (2007), Fontanela & Ortín (2020) and Ritson (2016a).
- 1.1.ii.a. Recursive definition of the Fibonacci Sequence. See Scott & Marketos (2014), page 2 and Rosen (2019), page 167. See also Marghetis, Landy & Goldstone (2016).
- 1.1.ii.b. Some formulae involving Fibonacci and Lucas numbers. See Wikipedia contributors, 'Fibonacci number' and Knott (2020). See also Burger (2011) and Griffiths & Rajagopal (2016).

- 1.1.iii.a. The Friedmann equations for modelling a homogeneous, isotropic universe. See Mörtzell (2016), page 3. See also Friedman (1999 [1922]), Friedmann (1999 [1924]), Weinberg (1977), Oberbye (1991), Carroll & Kaplinghat (2002), Schmidt (2003), Ferreira (2007), Szydlowski (2007) and McEvoy (2010).
- 1.1.iii.b. Furstenberg's multiple recurrence theorem. See Einsiedler & Ward (2011), page 175 and Moreira (2012). See also Bergelson et al. (2005) and Furstenberg (1981).
- 1.1.iii.c. Plank's time and Plank's length. See Robotti & Badino (2010), page 161 and Shu (1982), page 397.
- 1.1.iii.d. Love dynamics differential equations model for an ill-fated romance of the 'Romeo and Juliet' type. See Strogatz (1988), page 35. See also Elishakoff (2019) and McMullan (2017).
- 1.1.iv. Stigler's law of eponymy. See Stigler (1980), page 147, and Wikipedia contributors, 'Stigler's law of eponymy'. See also Block (2012) and Crepeau (2009).
- 1.1.v. Euler's identity. See Crease (2009), page 91. See also Wilson (2018), Sandifer (2014), and Nahin (2006).
- 1.1.vi.a. Chekhov's dramatic foreshadowing principle. See Simmons (1963), page 190 and Wikipedia contributors, 'Chekhov's gun'. See also Stokes (2012).
- 1.1.vi.b. Grice's conversational maxims. See Ralarala, Kaschula & Heydon (2019), page 277 and Wikipedia contributors, 'Paul Grice'. See also Grice (2007) and Huang (2009).
- 1.1.vii. Newton's laws. See Clapham & Nicholson (2104b) 'Newton's laws of motion' and Crease (2009), page 69. See also Newton, Motte & Chittenden (1846 [1687]) and Waldrip, Prain & Sellings (2013).
- 1.1.vii.A. First Law of Motion or *Law of Inertia*. See Walker, Resnick & Halliday (2014), page 95. See also Landy & Goldstone (2007).
- 1.1.vii.B. Second Law of Motion or *Fundamental Principle of Dynamics*. See Walker, Resnick & Halliday (2014), page 98. See also Close, Gomez, & Heron (2013).
- 1.1.vii.C. Third Law of Motion or *Action/Reaction Principle*. See Walker, Resnick & Halliday (2014), page 106. See also Henderson et al. (2015).

- 1.1.vii.D. *Law of Universal Gravitation*. See Walker, Resnick & Halliday (2014), page 355. See also Develaki (2012).
- 1.2.i.a. Connection of the indirect utility function w^h to the direct utility function u^h for a consumer h with income y^h using the Gorman polar form. See Cherchye et al. (2016), page 208. See also Wikipedia contributors, 'Gorman polar form.'
- 1.2.i.b. The occurrence probability p of a species on an island as a function of colonization rate c and extinction rate e . See Lu, Vasseur & Jetz (2108), page 10. See also MacArthur & Wilson (1967) and Warren et al. (2015).
- 1.2.i.c. A climate econometric model that captures the global linkage between temperature, radiation and greenhouse gas atmospheric influences. See Phillips, Leirvik & Storelvmo (2020), page 8. See also Stern (2008) and David (2017).
- 1.2.ii.a. Reinterpretation of Kepler's Third Law using Newton's Universal Gravitation Law. See Walker, Resnick & Halliday (2014), page 370. See also Markowsky (2011) and Katsikadelis (2018).
- 1.2.ii.b. Maxwell's equations. See Cochrane (2016), page 94 and Bais (2005), pages 34-39. See also Waser (2000) and Farmelo (2002).
- 1.2.ii.b.A. Gauss's Law for Electricity. See Kip (1962), page 441. See also Boozer (2010).
- 1.2.ii.b.B. Gauss's Law for Magnetism. See Kip (1962), page 441. See also Gill & Zachary (2011).
- 1.2.ii.b.C. Faraday's Law of Induction. See Kip (1962), page 440. See also Tweney (2011).
- 1.2.ii.b.D. Ampère's circuital law (with Maxwell's addition). See Kip (1962), page 443. See also Nugayev (2015).
- 1.2.iii. Gamma function derivation of n -sphere volumes. See Huber (1982), page 302. See also Borwein & Corless (2018) and Kramer & Thorne (1995).
- 1.2.iv. The spherical Gurney equations. See Wikipedia contributors, 'Gurney equations.' See also Jones, Kennedy & Bertholf (1980) and Hinterbichler, Levin & Zukowski (2014).
- 1.2.v. Kullback–Leibler divergence. See Eguchi & Copas (2006), page 2034. See also Kullback & Leibler (1951) and Kárný & Andryšek (2009).
- 1.2.vi.a. Gelfond constant defined on the base of n -spheres volume. See Wikipedia contributors, 'Gelfond's constant'. See also McCartin (2006).

- 1.2.vi.b. Horn's quantity and relation principles. Adapted from Huang (2018), page 14, Horn & Ward (2006), pages 12-18 and Rodríguez Rosique (2011), page 247. See also Horn (1989) and Davis (2019).
- 1.2.vii. The hero's journey according to David Adams Leeming. See Wikipedia contributors, 'Hero's journey'. See also Leeming (2010).
- 1.3.i.a. Eudaimonic well-being expressed in terms of present momentary well-being H , the memory of the past values of H extending over a number of cycles, and the rates of rise and fall of H . See Gao & Edelman (2016), page 6. See also McClelland (2010) and Ryff (2013).
- 1.3.i.b. The golden ratio expressed as a limit of consecutive Fibonacci quotients. See Fiorenza & Vicenzi (2013), page 1 and Corbalán (2016), page 35. See also Wikipedia contributors, 'Fibonacci number' and Knott (2020).
- 1.3.i.c. The unified number identity. See Guillot (1977), page 254. See also García del Cid (2017) and Menon et al. (2002).
- 1.3.ii.a. Grice's theory of conversational implicature. See Huang (2009), page 120 and Wikipedia contributors, 'Paul Grice'. See also Jang et al. (2013) and Blome-Tilmann (2013).
- 1.3.ii.b. The logic of interventions, according to Lacan. See Farrán (2009), page 9. See also García Salas (2018) and Lippi (2006).
- 1.3.ii.c. The canonical formula of myth, according to Lévi-Strauss. See Darányi, Wittek & Kitto (2014), page 48, and Lévi-Straus (1955), page 442. See also Maranda (2001), Côté (1995) and Petitot (1988).
- 1.3.iii. A more general second-order linear version of the differential equations of a dynamic model of an ill-fated romance of the 'Romeo and Juliet' type. See Strogatz (1988), page 35. See also Satsangi & Sinha (2012) and Martín (2016).
- 1.3.iv.a. The four discourses, according to Lacan. See Lacan (2013), page 4. See also Siboni (1996), Assoun (2017), Stortelder (2014) and Douville (n.d.).
- 1.3.iv.a.A. Discourse of the Master (or the Mother). See Neill (2013), page 347. See also Žižek (2004), Dulsster & Vanheule (2019) and Lippi (2006).
- 1.3.iv.a.B. Discourse of the University. See Neill (2013), page 347. See also Samuels (2018).
- 1.3.iv.a.C. Discourse of the Hysteric. See Neill (2013), page 347. See also Houtman (2003).

- 1.3.iv.a.D. Discourse of the Analyst. See Neill (2013), page 347. See also Fink (1995).
- 1.3.iv.b. Violation and exploitation of conversational maxims, giving rise to a conversational implicature, according to H. P. Grice. Adapted from Grice (1989), page 30. See also Gibbs (2002) and Valdés Villanueva (1991).
- 1.3.v.a. The condition of interruption of geyser eruption. See Nechayev (2012), page 5. See also Dowden et al. (1991).
- 1.3.v.b. Differential equations for the love dynamics of a triangular relationship. See Sprott (2004), page 308. See also Ahmad & El Khazali (2007) and Deng & Liao (2019).
- 1.3.vi. Standard deviation estimation using the Jackknife method. See Efron & Stein (1981), page 586. See also Shcheglovitova & Anderson (2013).
- 1.3.vii.a. Kinetic energy of a rotating rigid body. See Walker, Resnick & Halliday (2014), page 298. See also Gebhart & Romero (2020).
- 1.3.vii.b. The three formulations of the categorical imperative, according to Kant. See Wikipedia contributors, 'Categorical imperative'. See also Kant & Ellington (1996 [1797]), Jacquette (1991), Jaarsma, Gelhaus & Welin (2012) and Schramowski et al. (2020).
- 1.3.vii.c. The Phillips curve. See Wikipedia contributors, 'Phillips curve.' See also Mann (2018).
- 1.4.i.a. Einstein's field equation (with the cosmological constant). See Aczel (2003), page 156. See also Møller (1952), Carroll (2004), Greene (2004) and Barrow (2012).
- 1.4.i.b. Set of luminosity distance and parameter degeneracy equations used to measure the accelerating expansion of the universe using type Ia supernovae data. See Goobar (2014), page 20. See also Schmidt et al. (1998), Riess et al. (1998) and Perlmutter et al. (1999).
- 1.4.ii. The basic equation of relativistic astrometry. See Lattanzi (2012), page 1038. See also Goobar & Perlmutter (1995), Hogg (2000) and Szydlowski (2007).
- 1.4.iii. Newton's second law of motion according to Modified Newtonian Dynamics. See Alzain (2017), page 2. See also Sanders (1998) and Milgrom (1989).

- 1.4.iv. Main sequence of the Hertzsprung-Russell diagram. See Montmerle & Ekström (2015), page 1099. See also Gribbin (2015) and Hernández, Valls-Gabaud & Gilmore (1999).
- 1.4.v. Jones-Wilkins-Lee equation of state for explosives. See Wikipedia contributors, 'Equation of state'. See also Blanc, Santana Herrera & Hanus (2018) and Choi, Stewart & Yoo (2015).
- 1.4.vi.a.A. The orgasm formula, according to Wilhelm Reich. See Reich (1973), page 9. See also Reich (1955), Sletvold (2014) and Matviyenko (2019).
- 1.4.vi.a.B. The fundamental theorem of calculus. See Stewart (2012), page 388. See also Johnson (2010), Thompson, Byerley & Hatfield (2013), McQuillan & Olsen (2016) and Gross (2020).
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2.7.ii.a. The dynamic equations of a toxic romantic relationship. See Solferino & Tessitore (2021), page 4. See also Herrera de la Cruz & Rey (2021), Ramírez & Legendre (2018), Rey (2013), Kippen et al. (2013) and Muratori & Rinaldi (1989).

2.7.ii.b. Chemical structure of oxytocin. See PubChem contributors, 'Oxytocin'. See also IsHak, Berman & Peters (2008), Young (2009), MacDonald & Feifel (2012), Quattrochi & Friston (2014), Herbert (1994), Baskerville & Douglas (2008), Burri et al. (2008), Groppe et al. (2013), Pletzer et al. (2015), Walum & Young (2018), Hammock & Young (2006) and Andari et al. (2020).

2.7.iii.a.A. Typical accumulation of actants in a love story ending in marriage without the parents' intervention, according to Greimas. See Greimas

- (1983), page 203. See also Greimas & Rastier (1968) and Motta-Mena & Puts (2017).
- 2.7.iii.a.B. Kleitman and Pachter solution to Erdős' happy ending problem. See Kleitman & Patcher (1998) page 408 and Weisstein 'Happy Ending Problem'. See also Wikipedia contributors, 'Happy Ending Problem', Erdős & Szekeres (1935), Koshelev (2007). Rauff (2016) and Marić (2017).
- 2.7.iii.b. Specific luminous intensity of a pyrotechnic illuminating composition. See Juknelevicius, Alenfelt & Ramanavicius (2020), page 672. See also Sadek et al. (2018) Conkling (1985) and El Majdouli et al. (2016).
- 2.7.iii.c. Hall's marriage theorem. See Hall (1935), page 29. See also Huber, Moulton & Steel (2019), Rougier et al. (2005) and Zak (2012).
- 2.7.iii.d. The Euler equation for aggregate investment maintenance with endogenous capital depreciation. See Angelopoulou & Kalyvitis (2012), page 1062. See also Toda & Walsh (2015), Legrenzi & Milas (2010), Ricciuti (2003) and Ultsch & Lötsch (2017).
- 2.7.iv.a. Functioning of the autonomous nervous system, according to the orgonic theories of Wilhelm Reich – Part 1. Adapted from Reich (1961), page 129 and Reich (1955), pages 282-283. See also Reich (1972) and Matviyenko (2019).
- 2.7.iv.b. A model of marital interaction with repair and damping. See Gottman et al. (2002), page 196. See also Hirst & Hughes (2016), Bauso et al. (2014), Bargarello (2011), Gottman, Swanson & Swanson (2002), Caldarelli, Capocci & Laureti (2001), Gottman, Swanson & Murray (1999) and Nieuwenhuizen (1998).
- 2.7.iv.c. Birkhoff recurrence theorem. See Mulvey (1997), page 359. See also Bonino (2012), Kra (2011) and Birkhoff (1931).
- 2.7.iv.d. Variation in a geyser's temperature, expressed as a function of initial temperature T_0 . See O'Hara & Esawi (2013), page 7. See also Namiki et al. (2016) and Hurwitz & Manga (2017).
- 2.7.iv.e. Functioning of the autonomous nervous system, according to the orgonic theories of Wilhelm Reich – Part 2. Adapted from Reich (1961), pages 129-130 and Reich (1955), pages 282-283. See also Reich (1975), Sharaf (1994), Bennett (2010) and Przbylo (2019).
- 2.7.iv.f. The motor potential and cortical silent period induced by transcranial magnetic stimulation. See Rábago et al. (2009), page 1579. See also Fox et

al. (2012), Hoffman et al. (2013), Babbs (2014), Robertson, Théoret & Pascual-Leone (2003) and Pashut et al. (2011).

2.7.Ø.A. No number (in the text, mixed with the digital expansion of e). Pythagoras' constant (Square root of 2). See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Boulger (1989), Gentile (1991) and Beck (2010).

2.7.Ø.B. No number (in the text, mixed with the digital expansion of e). Square root of -2. See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ' Beck (2011) and Conway & Shipman (2013).

2.7.Ø.C. No number (in the text, mixed with the digital expansion of e). Maximum of x to the power of 1 over x . See Piñeiro (2017), page 134. See also Weisstein, 'Steiner's Problem'.

2.7.Ø.D. No number (in the text, mixed with the digital expansion of e). i to the power of i . See Piñeiro (2017), page 47. See also Weisstein, ' i '.

2.7.v.a. $\{0, \emptyset\}$. See Barrow (2001b), page 166. See also Mehlman (1972).

2.7.v.b. Analysis of a complicated five-move tale with the moves interwoven, according to Vladimir Propp. See Propp & Mélétski (1977), pages 145-146 and Propp et al. (1968), pages 131-132. See also Budniakiewicz (1992) and Belfiore (2000).

2.7.v.c. The semiotic square of veridiction. Adapted from Vilches (2017), page 24, Brunetto (2017), page 113 and Maddox (1989), page 663. See also Greimas, Collins & Perron (1989), Tochon (1994), Armstrong, Sandberg & Bostrom (2012), Hart, Breeden & Richardson (2020), Koene (2012), Zanetti, Iseppi & Cassese (2019), Laakauso et al. (2021) and Bourne & Caddick Bourne (2022).

2.7.v.d. Relevance-guided comprehension heuristics. Adapted from Wilson & Sperber (2004), page 613, and Ifantidou (2014), page 108. See also Yuan, Lin & Cooper (2019), Yus (2105), Mazzone (2015), de Andrade & Rauen (2018) and Yus Ramos (2003).

2.7.v.e. The self-indicating assumption according to Miura. See Miura (2015), page 61. See also Lewis (1986a), Carr (2007), Bostrom (2002a) and Carter (2011).

2.7.v.f. Chemical structure of enkephalin-L. See ChEBI contributors, 'CHEBI:89656 - enkephalin L.' See also Vaught & Takemori (1979), Hökfelt et al. (1979), Oyola & Handa (2017), López-Muñoz et al. (2008) and Lasson (2008).

- 2.7.v.g.A. The illocutionary act of uttering fiction, according to Currie. Adapted from Currie (1990), pages 31-33. See also Grice (1968), Lewis (1978), New (1997), Currie (1986), Ryan (2006), Mikkonen (2006), García Carpintero (2007) and Ryan (2019).
- 2.7.v.g.B. The semantic rules for the use of any function indicating device P for promising, according to Searle. Adapted from Searle (1965), page 124. See also Cohen (1970), Ryan (1980), Hyde & Grieve (2014), Nagler et al. (2014), Grieve (2011) and Hyde et al. (2020).
- 2.7.v.h. The logic of belief, according to Redmond. See Redmond (2019), page 8. See also Winter (2005), Steinsvold (2008), Romejin (2012), Howarth, Handley & Walsh (2015), Holberg (2017), Duthil Novaes & Veluwenkamp (2017), Mata Díaz & Pino Pérez (2017) and Davis & Finlayson (2021).
- 2.7.v.i. Maxim of Apt Reference. Adapted from Green (1998), page 71 and Urmson & Cohen (1968), pages 116-117. See also Recanati (1993) and Jungmann (2010).
- 2.7.vi.a. A master equation for the decay of active inhibitory neurons and the spiking of quiescent inhibitory neurons. See Benayoun et al. (2010), page 11. See also Iolov, Ditlevsen & Longtin (2014), Stamatakis et al. (2013), Petrov et al. (2017), Kárný & Andryšek (2009), Kang & Kang (2017) and Baron-Cohen (2008).
- 2.7.Ø.E. No number (in the text, mixed with the digital expansion of e). Derivative of e to the power of x . See Navarro Saldinas (2012), page 51. See also Wikipedia contributors, 'Exponential function'.
- 2.7.Ø.F. No number (in the text, mixed with the digital expansion of e). Integral of e to the power of x . See Bronshtein et al. (2007), page 428. See also Wikipedia contributors, 'Exponential function'.
- 2.7.vi.b. The anthropically corrected information estimate. See Gastpar et al. (2010), page 891. See also Kullback & Leibler (1951), Page (1994), Tononi (2012) and Gallimore (2105).
- 2.7.vi.c. Wilson-Cowan equations for neocortical dynamics. See Cowan, Neuman & van Drongelen (2016), page 9. See also Nazemi & Jamali (2018), Colombo (2017), Chao et al. (2018), Bengio et al. (2007), Movahedi Coyle & Sejdić (2018), Kang & Kang (2017), Kong et al. (2019), Jang et al. (2013) and Cerliani et al. (2015).

- 2.7.Ø.G. No number (in the text, mixed with the digital expansion of e). Natural logarithm of e . See Weisstein (1999), page 1217. See also Wikipedia contributors, 'Natural logarithm'.
- 2.7.Ø.H. No number (in the text, mixed with the digital expansion of e). Euler's formula. See Marcus & Nichita (2018), page 15-1 and Navarro Saldinas (2012), page 10. See also Wikipedia contributors, 'Euler's identity', Nahin (2006) and Manogue and Dray (2010).
- 2.7.Ø.I. No number (in the text, mixed with the digital expansion of e). Euler's identity. See Debnath (2009), page 364. See also Wikipedia contributors, 'Euler's identity', Wilson (2018) and Sandifer (2014).
- 2.7.Ø.J. No number (in the text, mixed with the digital expansion of e). Integral of e to the power of minus x square. See Navarro (2016), page 75 and Marcus & Nichita (2018), page 15-3. See also Osler (2009).
- 2.7.vii.a Platinum entry in the Periodic Table of the Elements See PubChem contributors, 'Platinum'. See also Johnson et al. (2016), Ganske et al. (2011), Fertoni, Benedetti & Ionashiro (1995) and Souza et al. (2007).
- 2.7.Ø.K. No number (in the text, mixed with the digital expansion of e). Sum of Fibonacci numbers in terms of e and the golden ratio. See Church & Bicknell (1973), page 278. See also Dutta, Metha & Pathak (2018).
- 2.7.vii.b. Temporal dilation according to the Lorentz transform. See Walker, Resnick & Halliday (2014), pages 1130-1131. See also Frolov & Novikov (1990), Hawking (1992), Deser & Jackiw (1992), Visser (1993), González-Díaz (1996) and Shoshany (2019).
- 3.0.i. The metric inside an accelerating Morris-Thorne-Yurssever wormhole. See Morris, Thorne & Yurssever (1988), page 1447. See also Lemos, Lobo & de Oliveira (2003), Morris & Thorne (1988), Thorne (1994), Kuhfittig (2010), Lobo (2008), Boicichio & Laserra (2013), Price (2012) and Baccolini (2020).
- 3.0.ii. Potential dangers of creating a Malevolent Artificial Intelligence, according to Pistono and Yampolskiy. Adapted from Pistono & Yampolskiy (2016), pages 6-7 and Yampolskiy (2016), pages 107-111. See also Brundage et al. (2018), Bostrom (2014b), Tegmark (2018), Turchin & Denkenberger (2020) and Laakso et al. (2021).
- 3.0.iii. Generalisation of Euler's identity to quaternions. See Formulasearchengine contributors, 'Euler's Identity' and Manogue and Dray (2010), page 4. See also Sofo & Cerone (1988), Babusci et al. (2012), Tıgılay & Vizman (2011), Holst (2013) and Genčev (2017).

- 3.1.i.a. Relativistic Tsiolkovsky rocket equation. See Forward (1955), page 3 and Walter (2006), page 458. See also Henriques & Natário (2012), Semyonov (2014), Spigler (2018) and Ribas et al. (2016).
- 3.1.i.b. The Coleman-Sagan equation. See Conley (2015), page 493. See also Sagan, Levinthal & Lederberg (1968), Filacchione et al. (2012), Ronnet et al. (2018) and Kopeikin (2012).
- 3.1.i.c. A model of population dynamics and internal warfare. See Turchin (2009), page 12. See also Turchin (2003), Turchin et al. (2013), Motesharrei, Rivas & Kalnay (2014), Maccone (2014) and Turchin et al. (2018).
- 3.1.i.d. The optimal strategy of a Nash equilibrium with perpetual war. See Crettez & Hayek (2014), page 685. See also Feichtinger & Novak (2008), Novak, Feichtinger & Leitmann (2010), Danchev, Richter & Brod (2010), Bueno de Mesquita (2013), Zahedzadeh (2017) and Faria & Arce (2021).
- 3.1.i.e. N-strain transmission dynamics with co-colonisation interactions. See Madec & Gjini (2020) page 4. See also Keenan & Cornell (2020), Khan & Zaman (2018) and Korobeinikov (2009).
- 3.1.i.f. Anthropogenic aerosol scaling factor modelled through spatially resolved sulphate albedos. See Olson et al. (2012), page 3. See also Robock et al. (2009), Matthews & Caldeira, (2007) and Qiu et al. (2003).
- 3.1.ii.a. The fixed point of a Nash equilibrium in stochastic wars between groups A and B. See Rohner, Thoenig & Zilibotti (2013), page 1122. See also O'Neill (1994), Leventoglu & Slatnchev (2007), Szendy (2013), Acharya & Grillo (2015), Konrad & Morath (2016) and Diep, Kaufman & Kaufman (2017).
- 3.1.ii.b. Estimation of the number of Boltzmann brains in a multiverse of volume $e^{3H_{\Lambda}t}$. See Carlip (2007), page 001-3. See also Dyson, Kleban & Susskind (2002), Albretch & Sorbo (2004), Vilenkin (2007), Linde (2007), Inman (2007), Davenport & Olum (2010), Nomura (2015), Horvat (2015), Carroll (2017), Nawy (2018) and Gopalakrishnan (2019).
- 3.1.ii.c. The Klein four-group of Gottschalk's quaternality. See Moretti (2012), page 73. See also Gottschalk (1953), Lautenbach (2012), Robert & Brisson (2016), Pomi (2016) and Landy, Allen & Zednik (2014).
- 3.1.ii.d. The Aristotle-Boethius square of opposition. See Luzeaux, Sallantin, & Dartnell (2008), page 168 and Wikipedia contributors, 'Square of opposition'. See also Beziau (2015) and Bonfiglioli (2008).

- 3.1.ii.e. Hamilton's rule for inclusive fitness. See Khila & Abouheif (2010), page 618. See also Nowak, Tarnita & Wilson (2010), Linksvayer et al. (2012) and Lehmann & Rousset (2014).
- 3.1.iii.a. Carter's weak anthropic principle. See Ellis (2011), page 3215, Carter (2011), page 3226 and Wikipedia contributors, 'Anthropic principle'. See also Carter & McCrea (1983), Hoyle & Wickramasinghe (1999), Ćirković (2002), Roush (2003) and Azhar (2014).
- 3.1.iii.b. The Heisenberg representation. See Mavromatis (1992), pages 102-110. See also Shankar (1994), Bagarello et al. (2017), Rojo (2019), Blanchard, Fröhlich & Schubnel (2016) and Song (2008).
- 3.1.iii.c. Barrow's & Tipler's weak anthropic principle. See Barrow & Tipler (1986), page 16 and Wikipedia contributors, 'Anthropic principle'. See also Lanza & Berman (2009), Livio & Rees (2005), Barrow (1993), Davies (1983) and Craig (1988).
- 3.1.iii.d. Gott's Copernican anthropic principle. Adapted from Gott (1993), page 316. See also Dicke (1961), Klee (2002), Loeb (2006) and Nelson (2009).
- 3.1.iv.a. Estimation of the ratio of Boltzmann brains (BB) to normal observers (NO) caused by collisions between *AdS* bubbles in the dominant vacuum, where $\mathcal{K}_i^{\text{BB}}$ is the Boltzmann-brain formation rate per unit Hubble volume in vacuum *i*. See Salem (2013), page 063501-12. See also Hartle & Hertog (2017), Garriga & Vilenkin (2013), Linde & Noorbala (2010), Chang, Kleban & Levi (2008), Freivogel, Horowitz & Shenker (2007), Garriga, Guth & Vilenkin (2007), Blanco-Pillado et al. (2003), Levin (2002b), Lyon (2019) and Kim, Sullivan & Park (2021).
- 3.1.iv.b. Semiotic square of the second approximation to war principles, inspired by von Clausewitz, according to Moretti. Adapted from Moretti (2009a), page 161. See also Turchin et al. (2013) and Arnold (2011).
- 3.1.iv.c. The Nicholson-Bailey host-parasitoid model. See Jamieson & Reis (2018), page 492. See also Kopp & Gabriel (2006), Flatt & Scheuring (2004), Doebeli (1997), Murdoch et al. (1987), Costa da Silva & Langoni (2009), Blumberg (2009) and Halonen (2017).
- 3.1.iv.d. Krypton entry in the Periodic Table of the Elements See PubChem contributors, 'Krypton'. See also Gell-Mann (1994), Hedegaard (2002), Della Sala (2007), Conti et al. (2009) and Bray & Munz (2015).
- 3.1.iv.e. The problem of Boltzmann brains, according to Tumulka. See Tumulka (2015), pages 8-9. See also Dogramaci (2020), Astashenok, Yurov & Yurov

- (2016), Goldstein, Struyvey & Tumulka (2015), Azhar (2014), Boddy & Carroll (2013), Gott (2008), Li & Wang (2007), Zhi Gang & Xiu (2016), Shepherd (2018) and Chelvaniththilan (2020).
- 3.1.iv.f. Replicator dynamics for n-player games. See Bukowski & Miekisz (2004), page 50. See also Chica-Pedraza, Mojica-Nava & Cadena-Muñoz (2021), Saad (2020), Baez & Pollard (2016), Perunov, Marsland, & England (2016), Yoldemir, Ng & Abugharbieh (2016), Hummert et al. (2014), Kianercy & Galstyan (2013), Frank (2012), Brooks (2011), Fernando, Goldstein & Szathmáry (2010), Helbing & Johansson (2010) and Schuster & Sigmund (1983).
- 3.1.v.a. The alterity principle, according to Sentis and Cordaro. See Sentis & Cordaro (2002), page 32. See also Richland (2006) and Gibbs (2002).
- 3.1.v.b. Smolin's anthropic observation. See Smolin (2004), page 6. See also Smolin (2006), Gardner & Conlon (2013), Ellis & Smolin (2009), Zimmermann (2003) and Smolin (1997).
- 3.1.v.c. Values of the generalisation of the Klein four-group to a logical PG cube, generated by Piagetian-Gottschalkian semantics ²³, according to Moretti. See Moretti (2012), page 88. See also Gottschalk (1953), Guitart (2009) and Pomi (2016).
- 3.1.v.d. Lotka-Volterra equations. See Bacaër, (2011), page 75 and Cochrane (2016), page 100. See also Chakrabarti, Ghosh & Bhadra (1995), Plank (1999), Harrison (2000), Hendrich (2015), Zefferman & Mathew (2015), Seno, Schneider, & Kimura (2020) and Keenan & Cornell (2020).
- 3.1.v.e. The Price equation. See Grafen (2000), page 1223. See also Price (1970), Frank (1994), Frank (1995), Dyson (1977), Margulis (1998), Fletcher & Zwick (2007), Harman (2010), Richerson et al. (2016), Markovitch, Witkowski & Virgo (2018) and Tao (2018).
- 3.2.i.a. The selfish elite model of structural demographic dynamics. See Turchin, Gavrillets & Goldstone (2017), page 163 and Turchin (2003) page 211. See also Turchin et al. (2017) Motesharrei, Rivas & Kalnay (2014), Maccone (2014) and Turchin (2009).
- 3.2.i.b. Semiotic square of the first approximation to war principles, inspired by von Clausewitz, according to Moretti. Adapted from Moretti (2009a), page 161. See also Turchin et al. (2013), Zefferman & Mathew (2015) and Maccone (2013).

- 3.2.i.c. Observer-participancy according to Wheeler. See Midgley (1992), page 204. See also Wheeler (1996), Wheeler (1986b), Davies (2007), Ellis (2018), Meijer (2014), Planat (2014), Ćirković & Dimitrijevic (2016) and Sharpe & Walgate (2002).
- 3.2.ii.a. Poincaré recurrence time, calculated on the basis of the total entropy of a system. See Dong & Stojkovic (2016), page 104058-4. See also Page (1994), Friedman & Niven (1959) and Altmann & Tél (2008).
- 3.2.ii.b. Miura's reincarnation assumption. See Miura (2015), page 64. See also Lewis (1986a), Pegg (2008), Carr (2007) and Bostrom (2002a).
- 3.2.ii.c. Rate of the probability that Boltzmann brains (BB) would exist over the probability that normal observers (NO) would exist in a series of de Sitter vacua (a). See Bousso, Freivogel & Yang (2009), page 063513-16. See also Bousso, Freivogel & Yang (2008), Boddy, Carroll & Pollack (2014), Albrecht (2009), Hartle & Hertog (2015), Giddings & Marolf (2007), Zak (2019), Mueller (2020) and Klotz, Aebischer & Seeber (2012).
- 3.2.iii.a. The mutant predator invasion rate. See Schreiber & Vedjani (2006), page 186. See also Schreiber, Fox & Getz (2000), Tuda & Bonsall (1999), Hastings & Godfray (1999), Holt & Hassell (1993), Gavrilets, Acton & Gravner (2000), Vyas & Sapolsky (2010), Hammoudi & Soldati-Favre (2017), Sugden et al. (2016) and Saad (2020).
- 3.2.iii.b. The false memories of Boltzmann brains, according to Tumulka. See Tumulka (2018), page 1. See also Kotzen (2020), Mueller (2017), Silk (2014), Aguirre, Carroll & Johnson (2012), Linde, Linde & Mezhlumian (1995), Fischler et al. (2014), Serruya (2017) and Halonen (2017).
- 3.2.iii.c. Observer-moments and psychological time. Adapted from Standish (2006), Page 161. See also McCoy & Callender (2017) and Narlikar (2018).
- 3.2.iii.d. Evolutionarily stable strategy in games involving Kantian and Nash agents. See Curry & Roemer (2012), page 138. See also Long (2019), Cerdá Planas (2015), Alger & Weibull (2016) and Kurzban, DeScioli & Fein (2012).
- 3.2.iii.e. Bostrom's self-indication assumption. See Sandberg (2008), page 15 and Bostrom (2002a), page 66. See also Ćirković (2001), Pereira (2020), Garriga & Vilenkin (2008), Neel & Lasseter (2019) and Garisto (2020).
- 3.2.iv.a. Fisher's Fundamental Theorem of Adaptation. See Queller (2017), page 348. See also Frank (2012), Ao (2005) and Frank (1997).
- 3.2.iv.b. The number of Boltzmann brain observers in pockets of type j at time t . See Linde, Vanchurin & Winitzki (2009), page 014. See also Page (2011),

- Becker (2009), Rehmeyer (2012), Walford & Kirk (2017), Ostrowick (2016), Lehnert (2012), Schwartz-Perlov & Vilenkin (2010), Ilieva et al. (2018) and Paulsen et al. (2020).
- 3.2.iv.c. The Shapley value redistribution. See Platkowski (2015) page 398. See also Casajus, Kramm & Wiese (2020), Krawczyk & Platkowski (2018), Fuchs & Jin (2014), Hartmann (2012) and Malawski (2012).
- 3.2.iv.d. The Boltzmann suppression factor (an estimate for the nucleation rate of a Boltzmann brain of mass M in any particular quantum state). See De Simone et al. (2010), page 063520-17. See also Knight (2020), Becker (2013b), Page (2008b), Page (2009b), Guth & Vanchurin (2011), Linde, Linde & Mezhlumian (1994), Iakobachvili & Peters (2017) and Koplin & Massie (2021).
- 3.2.iv.e. Hydrogen entry in the Periodic Table of the Elements. See PubChem contributors, 'Hydrogen'. See also Vladilo & Hassanali (2018), Auriol, Davidson & Raffelt (2019), Iocco et al. (2009) and Pastor Carpi (2017).
- 3.2.iv.f. Carter's strong anthropic principle. See Ellis (2011), page 3215, Carter (2011), page 3226 and Wikipedia contributors, 'Anthropic principle'. See also Leslie (1986), Wilson (1994), Barnes (2012), Mosterín (2004) and Martín (2019).
- 3.2.v.a. The rate of Boltzmann brains (BB) over normal observers (NO) in a multiverse. See De Simone et al. (2010), page 063520-7. See also Loew (2017), Azhar (2014), Lee et al. (2015), Boddy (2014), Perez et al. (2014), Aguirre (2007), Banks (2007), Carroll (2018), Ganesh (2020), Kragh (2009) and Seo et al. (2020).
- 3.2.v.b. The escape function in a single parasitoid-host model. See van Velzen, Pérez-Vila & Etienne (2016), page 50. See also Klopfer & Ives (1997), Yaari et al. (2008), Kopp & Gabriel (2006), Reeve, Kerans & Chesson (1989), Singh, Murdoch & Nisbet (2009). Hyde & Grieve (2014), Yarovsky (2014), Coombes & Hunter (2015), Kamerkar & Davis (2012), Lambertson, Donnelly & Webster (2008) and Webster et al. (2006).
- 3.2.v.c. Birkhoff recurrence theorem. See Mulvey (1997), page 359. See also Bonino (2012) Kra (2011) and Birkhoff (1931).
- 3.2.v.d. Bostrom's self-sampling assumption. See Sandberg (2008), page 14 and Bostrom (2002a), page 57. See also Neal (2006), Leslie (1994), Page (2008a), Verendel & Häggström (2017) and Kokotalajlo (2017).

- 3.2.v.e. Carbon entry in the Periodic Table of the Elements. See PubChem contributors, 'Carbon'. See also Bleier (2019), Kan et al. (2016), Lovell et al. (2010), Taylor (2018), Lacki (2016), Milholland, Dong & Vijg (2018), Ellery (2020) and Mugnai et al. (2020).
- 3.2.v.f. Reorganisation of Propp's narrative functions by coupling some of them, according to Greimas. See Greimas (1983), pages 224-225. See also Propp & M  l  tinski (1977), Propp et al. (1968), Budniakiewicz (1992) and Greimas (1971).
- 3.3.i.a. The central dogma of molecular biology. See Cobb (2017), page e2003243-3. See also Crick (1970), Crick (1994), Bussard (2005) and Friston (2013).
- 3.3.i.b. Selective advantage expressed in terms of evolutionary entropy. See Demetrius (2013), page 13. See also Demetrius & Wolf (2020), Bazaluk (2015), Kopp & Gabriel (2006), Sasai & Yamamoto (2019), McConkey et al. (2013), Worth, Lymbery & Thompson (2013), Webster & McConkey (2010) and Otero Mart  nez et al. (2018).
- 3.3.i.c. Blanch  -Sesmat hexagonal organisation of mathematical comparators. See Dubois & Prade (2102), page 153. See also Wybraniec-Skardowska (2016), Sauriol (1968), Sesmat (1951) and Todd & Miller (2018).
- 3.3.i.d. Additive Kantian equilibrium. See Roemer (2012), page 9. See also Braham & van Hees (2020), Roemer (2015), Szendy (2013), Curry & Roemer (2012), Svoboda (2012), Jaarsma, Gelhaus & Welin (2012), Varden (2011), Roemer (2010), Godlove (2009) and Conant (1992).
- 3.3.i.e. The deontic hexagon. See Moretti (2013), page 228. See also Dufatanye (2012), Beziau (2012), Beller (2012), Pichel Luck (2014) and Peters (2019).
- 3.3.i.f. The β 5-Structure of standard deontic logic (the deontic 5-dimensional hyper-tetraicosahedron), according to Moretti. See Moretti (2009b), pages 45-46. See also Lewis (1973), Joerden (2012), Bj  rdal (2016), Rodr  guez (2013), Kulicki & Trypuz (2017) and Wole  ski (2018).
- 3.3.i.g. The conservation of probability. See Tribble (1996), page 207. See also Stoica (2020), Gisin (2020), Chou (2019), Elmahalawy, Hellaby & Ellis (2015), Fenton-Glynn & Kroedel (2015), Wallman & Kleiter (2014), Cecconi et al. (2012), Ryan (2009), Poirier (2008), Li & Chen (2008), Bauberger (2005), Ismael (2003), Berkovitz (2001), Deutsch (1999), Grey (1999), Nahin (1999), Butterfield (1992), Forrester (1992), Lemos (1987), Lewis (1976), Antippa & Everett (1973) and Wells (1902).

- 3.3.i.h. Bayesian Shapley value. See Pongou & Tondji (2018), page 213. See also Nash et al. (2012), Mason (2021), Wohlforth & Hendrix (2016), Platkowski (2015), Martín (2015a), Fuchs & Jin (2014), Martín (2014), Bigaj (2013), Hartmann (2012), Malawski (2012), Cameron & Davies (2012), Martín (2011) and Steel, Mimoto & Mooers (2007).
- 3.3.i.i. The probability for an outcome c_n of an ideal measurement of an observable C , according to the ABL rule. See Aharonov & Vaidman (2002), page 375. See also Aharonov, Bergmann & Lebowitz (1964), Sharp & Shanks (1993), Shimony (1996), Kastner (1998), Vaidman (1998), Katsner (2003), Bigaj (2004), Saunders & Wallace (2008), Ellis & Rothman (2010), Martín (2010), Martín (2013), Martín (2015b), Aharonov, Cohen & Elitzur (2015) and Wittenberg (2016).
- 3.3.ii.a. Definition of a normal number. See Khoshnevisan (2006), page 15 and Wikipedia contributors ‘Normal number’. See also Weisstein ‘Normal Number’, Furstenberg (1981) and Becher, Heiber & Slaman (2014).
- 3.3.ii.b. A Bayesian network probability distribution. See Bernard & Hartemink (2005), page 460. See also Gershman & Beck (2017), Venkataraman et al. (2015), Hospedales & Vijayakumar (2009), Schulman (2008), Holmes (2012), Gerrans & Sander (2014) and Jajodia et al. (2017).
- 3.3.ii.c. Bostrom’s strong self-sampling assumption. See Bostrom (2002a), page 162 and Wikipedia contributors, ‘Anthropic principle’. See also Bostrom (2005), Smith (1994), Lewis (1986a), Neal (2006) and Cushman (2019).
- 3.3.ii.d. Silicon entry in the Periodic Table of the Elements. See PubChem contributors, ‘Silicon’. See also Schramowski et al. (2020), Ulgen (2017), Powers (2005), Bengio (2009), Chao et al. (2018), Colombo (2017), Bengio et al. (2007), Movahedi Coyle & Sejdić (2018), Kárný & Andřýsek (2009), Vilares & Kording (2011), Reichert (2012), Roth et al. (2012), Neftci et al. (2013) and Kohn et al. (2016).
- 3.3.ii.e. The Aristotelian hexagon. See Smessaert (2012b), page 177. See also Demey (2018), Moretti (2010), Demey & Smessaert (2018), Smessaert (2012a), Bonfiglioli (2008), Ollogren (2011) and Parisi (2019).
- 3.3.ii.f. The low energy effective action for the tachyon scalar coupled to gravity. See Das & Kar (2005), page 4. See also Schulman (1971), Gibbons, Hashimoto & Yi (2002), Grushka (2017), Cartas-Fuentevilla, Herrera-Aguilar & Olvera-Santamaría (2018) and Reig, Valle & Wilczek (2018) and Richmond (2022).

- 3.3.ii.g. Theory of consciousness (C-theory), according to Gamez. See Gamez (2018), page 79. See also Tononi, Sporns & Edelman (1994), Broderick (1997), Kurzweil (1999), Seth et al. (2006), Gamez (2008), Aru et al. (2012), Gamez (2012b), Tononi (2012), Barrat (2013) and Gradin & Panek (2013).
- 3.3.iii.a. Phillips's causally-independent self-sampling assumption. See Phillips (2005), page 5. See also Bostrom (2005), Stokes (2013), Schechtman (2001), Slors (1998), Paul (2015), Paul (2020) and Schulman (2016).
- 3.3.iii.b. Sum of logical squares to create a logical hexagon. See Moretti (2014), page 5. See also Angot-Pellissier & Moretti (2013), Moretti (2012), Arnold (2011), Tao (2018) and Wolfendale (2019).
- 3.3.iii.c. Kantian hexagon of classical philosophical dichotomies, according to Jean-Yves Béziau. See Béziau (2012), page 26. See also Mion (2014), Jacqueline (1991), Roush (2003), Filcheva (2019), Le Poidevin (2001), Losch (2016), Szendy (2013), Clark (2001), Clewis (2017) and Conant (1992).
- 3.3.iii.d. Generalised Hamilton's rule, according to Gintis. See Gintis (2014), page 489 and Gintis (2012), page 989. See also Wilson (1998), Bowles & Gintis (2002), Rachlin (2002), Boyd et al. (2003), Gintis (2003), Gintis (2004), Gintis (2007), Gintis et al. (2008) and Musschenga & van Harskamp (2013).
- 3.3.iv.a. Testing a C-Theory's prediction about a conscious state, according to Gamez. See Gamez (2018), page 114. See also Crick (1994), Pape (1999), Powers (2005), Hofstadter (2007), De Looze, Manac'h & Tisseau (2009), Gamez (2010), Balduzzi & Tononi (2009), Gamez & Aleksander (2011), Gamez (2014) and Ng et al. (2016).
- 3.3.iv.b. Truth table for Kleene's 3-valued logic. See Gabbay (2016), page 474. See also Petrukhin (2018), Maksimov (2016), Ciucci, Dubois & Lawry (2014), Drago (2008), Da Ré & Szmuc (2018), Takano (1998), Vasil'ev (1993) and García Salas (2018).
- 3.3.iv.c. Groups included in the Lie group E_8 . See Contribuidores de Wikipedia, 'E8 (matemáticas).' See also Adwan (2004), Pavšič (2008), Benedetto (2011), Garibaldi (2016), Baguet & Samtleben (2016) and Pomi (2016).
- 3.3.iv.d. The apparent temperature of the Cosmic Microwave Background in the direction θ . See Moffat (2005), page 14. See also Inoue (2000), Yurov et al. (2011), Goldstein, Struyvey & Tumulka (2015), Vlahovic, Eingorn & Ilie (2015), Carroll (2018) and Potter & Preston (2007).
- 3.3.iv.e. Frame for a de Sitter space-time with exponentially expanding flat spatial sections, where α is the expansion parameter, and the unit-carrying

physics coordinates are the time measured by a standard clock $t \equiv x^0 T$ with T being some temporal unit such as seconds, and spatial lengths $s^\pi = x^\pi (L/c)$, in units of time, with L a spatial unit, such as meters, and c the speed of light. See Lisi (2015), page 14. See also Lisi (2010), Lisi, Smolin & Speziale (2010), Distler & Garibaldi (2010), Douglas & Repka (2014), Wallace-Wells (2008), Collins (2008), Merali (2010), Paliathanasis & Vakili (2016), Grain & Vennin (2020) and Braun et al. (2005).

3.3.iv.f. Grade four pseudoscalar of Clifford Algebra $R_{3,1}$. See Contribuidores de Wikipedia, 'Representaciones de álgebras de Clifford.' See also Lisi (2002), Lisi (2005), de Sabbata & Datta (2006) and Potter (2011).

3.3.v.a. First approximation to the polemological hexagon, inspired by von Clausewitz, according to Moretti. See Moretti (2012), page 91. See also Turchin et al. (2013), Zefferman & Mathew (2015) and Maccone (2013).

3.3.Ø.A. No number (in the text, mixed with the digital expansion of e). Euler integral. See Navarro (2016), page 78, Crease (2009), page 91, and Marcus & Nichita (2018), page 15-3. See also Osler (2009).

3.3.Ø.B. No number (in the text, mixed with the digital expansion of e). Gelfond's constant 1. (e to the power of π). See Nahin (2006), page 93 and Wikipedia contributors, 'Gelfond's constant'. See also McCartin (2006) and Philippon (1997).

3.3.v.b. The simulation argument, according to Nick Bostrom. Adapted from Bostrom (2003a), page 255, Birch (2013), page 96 and Contribuidores de Wikipedia 'Hipótesis de simulación'. See also Crawford (2013), Weatherston (2003), Bostrom & Kulczycki (2011), Beane, Davoudi & Savage (2014), Alserhani (2016), White (2016), Schwitzgebel (2017), Spigler (2018) and Kipping (2020a).

3.3.v.c. The hero's journey, according to Joseph Campbell. Adapted from Wikipedia contributors, 'Hero's journey' and Campbell (2008). See also Robertson & Lawrence (2015), Jones (2014) and Lundin-Taylor (2014).

3.4.i.a.A. A reliable C-theory is used to build a MC4 machine. See Gamez (2018), page 138. See also Broderick (1999), Hofstadter (1999), Penrose (2002), Tononi (2004), Bigham et al. (2005), Lovell et al. (2010), de Graaf, Hsieh & Sack (2012), Sridharan (2014), Yampolskiy (2015c), Gamez (2016), Whitmarsh (2016), O'Connell (2017), Bauer (2018), Ji, Gamez & Huyck (2018), Todd & Miller (2018), Knight (2019), Ellery (2020) and Mugnai et al. (2020).

3.4.i.a.B. Abstract semiotic hexagon to generalise the Greimas semiotic square, according to Moretti. Adapted from Moretti (2014), page 48 and Moretti

(2012), page 97. See also Vandoulakis & Denisova (2020), Tamminen (2017), Kardos and Palágyi (2013), Marques (2008) and Pottier (2006).

3.4.i.a.C. Graphic representation of the $su(3)$ weight vectors and weight coordinates of the gluon, quark, and anti-quark weights to form the G_2 root system, according to A. G. Lisi. See Lisi (2007), page 5. See also Hossenfelder (2018), Lisi & Weatherall (2010) and Tergmark (1998).

3.4.i.b. Different formulations of the fine-structure constant. Adapted from Wikipedia contributors, 'Fine-structure constant.' See also Parker et al. (2018), Davis (2017), Barrow (2004), Peebles (2012), Epelbaum et al. (2013), Eaves (2016), Dąbrowski et al. (2014), Sandora (2016), Bezerra et al. (2016), Mosquera & Cicitarese (2013), García & Henley (2007), Solà (2016), Barrow (2001a), Bettini (2004), Dattoli (2009), Várlaki, Nádaí & Bokor (2008), Magueijo (2003), Susskind (2003), Carroll & Mersini (2001), Wesson (1992) and Klebanov, Susskind & Banks (1989).

3.4.i.c. Collins' and Hawking's strong anthropic principle. See Ellis (2011), page 3215, and Collins & Hawking (1973), page 317. See also Williams (2007), Friederich (2019) and Shainline (2020).

3.4.i.d. Gödel metric. See Modgil & Panda (2005), page 980. See also Gödel (1949), Deutsch, & Lockwood (1994), Nahin (1999), Cooperstock & Tieu (2005), Manchak (2011), Chashchina & Silagadze (2015), Sengupta (2018) and Corrêa & Fernandes de Oliveira (2022).

3.4.ii.a. Pellissier's Taoist hexagon. See Moretti (2012), page 91. See also Baggini (2019), Pellissier (2008), Vilares & Kording (2011) and Bennett (2020).

3.4.ii.b. Gödel Numbering. See Weinstein "Gödel Number" and Raatikainen (2015). See also Webb (2005), Milne (2007), Kovač (2008) and Cellucci (2019).

3.4.ii.c. Barrow's and Tipler's strong anthropic principle. See Barrow & Tipler (1986), page 21 and Wikipedia contributors, 'Anthropic principle'. See also McMullin (1993), Slijepcevic (2020), Barrow (2001a), Ćirković, & Dimitrijevic (2016), Earman (1987), Friston (2013) and Lanza & Berman (2016).

3.4.ii.d. Metalogical hexagon inspired by Wittgenstein's *Tractatus Logico-Philosophicus*, according to Béziau. See Béziau (2013), page 119. See also Conant (1992), Berto (2009) Béziau (2010), Anderson et al. (2011), Fugate (2014), Béziau (2016), Zeki, Chén & Romaya (2018) and Johnson & Steinerberger (2019).

- 3.4.ii.e. Tensorial scheme of reasoning based on Peirce semiotics, according to Pedro Espejo-Saavedra Roca. See Espejo-Saavedra Roca (2016). See also Galofaro, Toffano & Doan (2018), Breitenbach (2015), Inglis & Aberdein (2015), Arnold (2011), Penny (2012), Reichert (2012), Soler Gil & Alfonseca (2013) and Landri (2007).
- 3.4.iii.a. Nernst's vacuum energy density quantum-mechanical expectation value. See Peebles & Ratra (2002), page 15. See also Kragh (2012), Shankar (1994), Inbasekar & Tripathy (2013), Bagarello et al. (2017) and Contribuidores de Wikipedia 'Catástrofe del vacío.'
- 3.4.iii.b. The 5-gradation of Lie algebra e_8 . See Baez (2005), page 241. See also Coldea et al. (2010), Garibaldi & Semenov (2010), Distler & Garibaldi (2010) and Bergshoeff et al. (2019).
- 3.4.iii.c. The deceleration parameter. See Narlikar (2018) page 64. See also Carroll & Lim (2004), Adhav et al. (2011), Akrasu & Dereli (2012) and Merritt (2017).
- 3.4.Ø.A. no number (in the text). Operational subgroup of the Lie $E_{8(-24)}$ group. See Lisi (2015), page 23. See also Dechant (2016), Distler & Garibaldi (2010), El Naschie (2009), Barchini (2004) and Buturlakin (2018).
- 3.4.iii.d. Definition and examples of Klein geometries. See Wikipedia contributors, 'Klein geometry.' See also Sharpe (1977), Dal Lago, García & Sánchez (1994), Marek-Crnjac (2008), El Naschie (2005) and Blaom (2018).
- 3.4.iii.e. Decomposition of the auto-adjoint representation of Lie algebra e_8 . See Contributeurs Wikipedia, 'E8 (mathématiques).' See also Birkhoff & Whitman (1949), Levstein & Tiraboschi (1999), Grishkov (2001), Barchini & Sepanski (2002), Sati (2009) and Eran (2012).
- 3.4.iii.f. Freudenthal-Tits magic square of Lie algebras, according to Baez. See Baez (2001a). See also Baez (2001b), Landsberg & Manivel (2001) and Borsten & Marrani (2017).
- 3.4.iii.g. The Wheeler-DeWitt and momentum constraint equations in Hawking-Page wormholes. See Hawking & Page (1990), page 2656. See also Bachelot (2017), Dariescu, Dariescu & Crețu (2013), Kim & Page (1992), Cordero, Granados & Mota (2011), Gaveau & Schulman (1996) and Hawking (1988).
- 3.4.iv.a. Transfer entropy formula to estimate directional information flow between brain regions X and Y. See Kawasaki et al. (2014), pages 173-4. See also Menon et al. (2002), Rivera et al. (2005), De Cruz (2006), Ansari (2008), Cantlon et al. (2009), Wu et al. (2009), Prescott et al. (2010), Blank,

Kanwisher & Fedorenko (2014), He et al. (2015), Nieder (2016), Ng et al. (2016), vanMarle et al. (2018), Hinault et al. (2019), Skagerlund et al. (2019) and Xie et al. (2019).

3.4.iv.b. Affordance matrix of connections between n cerebral areas, where $A(x_i, x_j) \neq A(x_j, x_i)$, except when $i = j$. Table created by the author. See also Oades & Halliday (1987), Maier & Fadel (2009), Friston et al. (2012), Finn et al. (2015), Kim (2015), Glasser et al. (2016), Serruya (2017), Bijsterbosch et al. (2018), Djebbara, Fich & Gramann (2021), McManus, Cook & Hunt (2010), Schultz (2013), Neel & Lasseter (2019), Bao, Chan & Merzenich (2001), van den Heuvel & Sporns (2013), Gomot & Wicker (2012), Kahn & Shohamy (2013), Lucia (2013), Stamatakis et al. (2013), Karahan et al. (2015), Iglesias et al. (2017), Clewis (2017), Vilares & Kording (2011), Cerliani et al. (2015), Laakauso et al. (2021), Markram et al. (2015) Koane (2012), Andari et al. (2020), Gallimore (2105), Della Sala (2007), Tegmark (2018) and Anderson et al. (2020).

3.4.iv.c. Chemical structure of hexachlorobenzene. See ChEBI contributors, 'CHEBI:5692 - hexachlorobenzene' and Olmos Ruiz (2005), pages 38-39. See also Bailey (2001), Jakobsson et al. (2012), Hollier et al. (2013), Moermond & Verbruggen (2013), Muñoz-Quezada et al. (2013) and Palkovičová Murínová et al. (2017).

3.4.v.a. An extended dynamic model of a romance considering the external environment. See Huang & Bae (2018), pages 365-4. See also Isea & Lonngren (2018), Huang & Bae (2017), Bever & Rowlet (2013), Barley & Cherif (2011) and Alkan (1988).

3.4.v.b. The family hexagon, according to Béziau. See Béziau (2012), page 37. See also Zittoun et al. (2007), Gordon et al. (2010) and Maynard, McDonald, & Stickle (2016).

3.4.v.c. The second law of thermodynamics for sentimental relationships. See Rey (2010), page e9881-3. See also Fenoaltea et al. (2021), Ramírez & Legendre (2018), Forys (2018), Ueda et al. (2018), Farczadi, Konstantinos & Kone-mann (2016), Kippen et al. (2013), Manlove et al. (2002), Caldarelli, Capocci & Laureti (2001) and Aldershof, Carducci & Lorenc (1999).

3.4.v.d. Contextual implication. Adapted from Moeschler (2012), page 421 and Sperber & Wilson (1986), pages 107-108. See also Corliss (1972), Nowell-Smith (1962) and Blome-Tilman (2013).

3.4.v.e. Definition of an ironic environment. Adapted from Utsumi (2000), page 1783, Trouchon Osorio & Guerrero Uchima (2016), page 108 and Utsumi

- (1999), page 2. See also Dynel (2017), Hjelle Olsen (2015), Yus Ramos (2003) and Barbe (1995).
- 3.4.v.f. Oppositions in gender and sexuality, according to Moretti. See Moretti (2009a), page 396. See also Brotto et al. (2010), DeLuzio Chasin (2011), Przbylo (2019), Carrigan (2011), Zak (2012) and Wyatt (2015).
- 3.4.v.g. The interaction function, expressing the effect of the difference between the strength of love between two agents. See Simin et al. (2018), page 43-2. See also Padula (2005), Mikulincer & Goodman (2006), Goudon & Lafitte (2014) and Bonneuil (2015).
- 3.4.v.h. A woman-man model of the love cycle with dynamic appeal parameters. See Breitenecker et al. (2008), page 73. See also Gragnani, Rinaldi & Feichtinger (1997), Rinaldi (1998), Feichtinger, Jørgensen & Novak (1999), Baïou & Balinski (2000), Jafari, Sprott & Golpayegani (2016), and Kumar, Ertuk & Murillo-Arcila (2021).
- 3.4.v.i.A. Modification of the actantial model, according to Anne Ubersfeld (exchange of the subject by the object). Adapted from Román Calvo (2007), page 59, de Toro (1995) pages 131-137 and Ubersfeld (1999) pages 48-51. See also Ubersfeld (1977), Gimenez (2005), Goff et al. (2007), Fowler (2020), de Vries (2020), Cole (2014) and Byers, Nichols & Voyer (2013).
- 3.4.v.i.B. Recursive definition of the negafibonacci sequence. See Garg, Garg & Kumar (2013), page 97. See also Bunder (1992) and Marghetis, Landy & Goldstone (2016).
- 3.4.v.i.C. Chemical structure of kisspeptin-10. See PubChem contributors, 'Kisspeptin-10' See also Oakley, Clifton & Steiner (2009), Clarkson (2013), Comninos et al. (2017), Priest, Robertson & Woods (2019), Goetz, Easton & Buss (2014), Liebowitz (1983), Motta-Mena & Puts (2017), Derntl et al. (2014), Miller & Manner (2011), Burkett & Young (2012), Oyola & Handa (2017), Rantala & Marcinkowska (2011), Hausmann (2017), Oren et al. (2019), Young & Barret (2015), MacDonald & Feifel (2012), and IsHak, Berman & Peters (2008).
- 3.4.v.i.D. The expectation-maximisation algorithm in memory modification. See Gershman et al. (2016), page 53. See also Gallinaro, Gašparovič & Rotter (2021), Santiago & Tort (2019), Popik et al. (2019), Tan et al. (2019), Grégoire & Greening (2019), Kelly (2018), Lee, Nader & Schiller (2017), Klingmüller, Caplan & Sommer (2017), Lane et al. (2015), Exton-McGuinness, Lee, & Reichelt (2015), Cole (2014), Hupbach, Gomez & Nadel (2009), Fein (2012), Erler (2011) and Kozma et al. (2005).

- 3.4.v.j.A. Schema R (Lacanian topography of the Imaginary, the Symbolic, and the Real). Adapted from Miller (1969), page 173 and Inarra (2001), page 120. See also Miller (2007), Fischman & Hartmann (1995), Burkett & Young (2012), Mehzabin & Stokes (2011), Scott, McDonnell & Dawson (2016) and Dewinter, De Graaf, & Begeer, (2017).
- 3.4.v.j.B. Chemical structure of androstenedione. See PubChem contributors, 'Androstenedione' and Verhaeghe, Gheysen & Enzlin (2013), page 190. See also Simard (2014), Young & Alexander (2012), Itoh & Manaka (1988), Fisher (2004), Kubota et al. (2016), Preti, Huggins & Silverberg (1979), Higham (2019), Wysocki & Preti (2004), and Liebowitz (1983).
- 3.4.v.j.C. Sexuality as a semiotic object. Adapted from Tulio Baggio (2020), page 228, Greimas & Rastier (1968), pages 93-98, Greimas (1977) page 32 and Brooke-Rose (1985), page 9. See also Naisberg (1996), Scherrer (2008), Rantala & Marcinkowska (2011), Maner, Miller & Leo (2012) and Wyatt (2020).
- 3.4.v.j.D. A conceptual model for the prediction of sexual intercourse in couples, taking into consideration discovered erotic potential associated with a single intercourse and sexual appetite. See Rinaldi, Della Rossa & Fasani (2012), page 1339. See also Quintard et al. (2020), Cowan & LeBlanc (2018), Takahashi et al. (2015), Banerjee, Chakraborti & Inoue (2014), Wlodarski & Dunbar (2014), Bosse et al. (2012), Bielczyk, Bodnar & Foryś (2012), McClelland (2010), Hankey (2007), Padula (2005), Bartels & Zeki (2000) and Tanfer & Cubbins (1992).
- 3.4.v.k. Mercury entry in the Periodic Table of the Elements. See PubChem contributors, 'Mercury'. See also Barbeito (2005), Lippi (2006), Souza et al. (2007), Fertoni, Benedetti & Ionashiro (1995), Colombo (2017) and Bengio et al. (2007).
- 3.4.v.l. *r*-Kant-Nash equilibrium. See Kordonis (2020), page 324. See also Ramsey & Renault (2020), Long (2019), Khalil & Feltovich (2018), Acharya & Grillo (2015), McCullough, Kurzban & Tabak (2013), Pietraszewski (2013) and Novak, Feichtinger & Leitmann (2010).
- 3.4.v.m. Gan-Krzywoszyńska and Leśniewski model of the compassionate individual. See Gan-Krzywoszyńska et al. (2015), pages 41-42. See also Mercier & Sperber (2011). Peters (2019), Wolfendale (2019), Pfeifer & Sanfilippo (2017), Fiske & Schubert (2012), Crockett et al. (2008) and Knoch et al. (2006).

- 3.4.v.n. Chemical structure of dopamine. See ChEBI contributors, 'CHEBI:18243 - dopamine'. See also Friston et al. (2012), Schultz (2016), de Lafuente & Romo (2011), Platt & Pearson (2016), Lewis (2017), Singh, Desiraju & Raju (1997), Baskerville, Allard & Douglas (2009), Skuse & Gallanger (2008), Hausmann (2017) and Groppe et al. (2013).
- 3.4.v.o. Definition of homo moralis. See Alger & Weibull (2015), page 9. See also Bomze, Schachinger & Weibull (2020), Alger & Weibull (2016), Newton (2016), Alger & Weibull (2013), Roemer (2012) and Sigmund (2010).
- 3.4.v.p. Damped wave equation for the axonal transfer function. See Wilson et al. (2014), page 503. See also Kong et al. (2019), Gallinaro, Nebojisa, & Rotter (2021), Anderson et al. (2020), Postle et al. (2006), Soeter & Kindt (2011) and Lavazza (2016).
- 3.4.vi.a.A. A reliable C-theory is used to realise a desired state of consciousness. See Gamez (2018), page 129. See also Hofstadter & Dennett (1981), Kozma et al. (2005), Seth et al. (2006), Gamez (2007), Block (2008), Tononi (2008), Schwitzgebel (2008), Wallach, Franklin & Allen (2010), Aru et al. (2012), Gamez, Fountas & Fidjeland (2013), Neftci et al. (2013), Pothos & Busemeyer (2013), Gamez (2014), Klingmüller, Caplan & Sommer (2017), Mich, Close & Levi (2017), Serruya (2017), Reinen et al. (2018), Ganesh (2020) and Knight (2020).
- 3.4.vi.a.B. Centred possible words, according to Shulman. See Shulman (2011a), page 4. See also Shulman (2011b), Longenecker (2019) and Johnson (2016).
- 3.4.vi.b. Furstenberg's multiple recurrence theorem. See Einsiedler & Ward (2011), page 175. See also Moreira (2012), Bergelson et al. (2005) and Furstenberg (1981).
- 3.4.vi.c. Mosko's variant of Lévi-Strauss's canonical formula of myth. See Mosko (1991), page 133. See also Lévi-Straus (1955), Petitot (1988), Côté (1995), Maranda (2001), Morava (2003), Haskell & Badalamenti (2003), Darányi, Wittek & Kitto (2014), Rauff (2016), Harrod (2018), Morava (2020) and Santucci, Doja & Capocci (2020).
- 3.4.vi.d. The stationary measure of the potential proliferation of Boltzmann brains. See Linde, Vanchurin & Winitzki (2009), page 09. See also Hartle & Srednicki (2007), Boddy, Carroll & Pollack (2015), Özkural (2015), Krauss (2008), Knight (2019), Dvali & Gomez (2014), Overbye (2008), Crawford (2013), Patel & Lineweaver (2017), Page (2017), Bashinsky (2015), Smeenk (2014), Davenport & Olum (2010), Winitzki (2008), Schulman (2008),

Kotzen (2020), Worth, Lymbery & Thompson (2013), Bitar (2020), Seo et al. (2020), Saad (2020) and Ankeny & Wolvetag (2021).

- 3.4.vi.e. The hierarchical gaussian filter. See Iglesias et al. (2017), page e1420-6. See also Beck et al. (2008), Fiorillo (2012), Daunizeau et al. (2010a), Daunizeau et al. (2010b), Haitun (2015), Hou et al. (2019), Shaffer (2019), Williams (2021), Kárný & Andrášek (2009), Kang & Kang (2017), Sarma & Hay (2017), Hyde & Grieve (2014), Nagler et al. (2014) and Schulman (2016).
- 3.4.vi.f. The inferential blindness theory of self-deception, according to Montserrat Bordes Solanas. See Bordes Solanas (2001), pages 18-19. See also Santibañez Yañes (2018), Galeotti (2012), Schwitzgebel (2008), Richland (2006), Grieve (2011), Cole (2014), Fine (2012), Holman (2013), Exton-McGuinness, Lee, & Reichelt (2015), Pegg (2008) and Everitt et al. (2016).
- 3.4.vi.g. Multiple Birkhoff Recurrence Theorem. See Mulvey (1997), page 359. See also Franks (1998), Wallace (2015) and Birkhoff (1931).
- 3.4.vi.h. Two relativistically invariant reading of counterfactuals. See Bigaj (2012) page 187 and Bigaj (2006) page 187. See also See also Lewis (1973), Lewis (1979), Ryan (1980), Butterfield (1992), Deutsch, & Lockwood (1994), Nahin (1999), Bigaj (2004), Kmet (2006), Saunders & Wallace (2008), Bigaj (2013), Miller (2014) and Fenton-Glynn & Kroedel (2015).
- 3.4.Ø.B. no number (in the text, mixed with the digital expansion of π). Pythagoras' constant (Square root of 2). See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Boulger (1989) and Beck (2010).
- 3.4.Ø.C. No number (in the text, mixed with the digital expansion of π). Square root of -2. See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Beck (2011) and Conway & Shipman (2013).
- 3.4.Ø.D. no number (in the text, mixed with the digital expansion of π). π expressed in terms of the Fibonacci numbers. See Chan (2008/2009) page 33. See also Burger (2011).
- 3.4.Ø.E. No number (in the text, mixed with the digital expansion of π). Sum of Fibonacci numbers in terms of e and the golden ratio. See Church & Bicknell (1973), page 278. See also Dutta, Metha & Pathak (2018).
- 3.4.vii.a. Normal numbers theorem. See Khoshnevisan (2006), page 27. See also Borel (1909), Becher, Heiber & Slaman (2014), Galatolo & Kim (2007), Mendonça (2012) and Hochman (2013).

- 3.4.vii.b. The Communicative Principle of Relevance. See Wilson & Sperber (2004), page 612 and Yus Ramos (2003), page 221. See also Neel & Lasseter (2019), Yuan, Lin & Cooper (2019), de Andrade & Rauen (2018), Wilson (2017), Mazzone (2015), Yus (2105), Ifantidou (2014) and Roberts (1991).
- 3.4.vii.c. A non-symmetric version of the Freudenthal–Tits magic square obtained by combining the split algebras with the usual division algebras, according to Barton and Sudbery. See Wikipedia contributors, ‘Freudenthal magic square.’ See also Barton & Sudbery (2003), Borsten & Marrani (2017), Wallace (2018), Bola & Sabel (2015), Goldman-Rakic (1988) and Pape (1999).
- 3.4.vii.d. Prescription for the prior credence function. See Bostrom (2002b), page 1. See also Greaves (2004), Meacham & Weisberg (2011), Jaffray & Jeleva (2011), Grieve (2011). Hyde & Grieve (2014), Nagler et al. (2014) and Hattiangadi & Stefánson (2021).
- 3.4.vii.e. The octagon of knowledge with the hexagon of belief combined. See Redmond (2019), page 8. See also Mata Díaz & Pino Pérez (2021), Beddor & Goldstein (2018), Duthil Novaes & Veluwenkamp (2017), McGoey (2012), Rúa & Sierra (2008), Romejin (2012), van Ditmarsch et al. (2009) and Pratt-Hartmann (2008).
- 3.4.vii.f. Specular image of Greimas’s ‘square of veridiction’ superposed on Aristotle’s square, according to Moretti. See Moretti (2009a), page 297. See also Lewis (1973), Luzeaux, Sallantin, & Dartnell (2008), Bonfiglioli (2008) and Maddox (1989).
- 3.4.viii.a. $\{\emptyset, \emptyset\}$. See Barrow (2001b), page 164. See also Mehlman (1972).
- 3.4.viii.b. The Wheeler-De Witt equation for the diagonalised Bianchi IX models. See Bae (2015), page 75006-4. See also Sen (2003), Cordero, Granados & Mota (2011), Lidsey (1994), Terzis & Christodoulakis (2012) and Paliathanasis & Vakili (2016).
- 3.4.viii.c. Chemical structure of magnetite. See PubChem contributors, ‘Ferrosferic oxide. PubChem Identifier: CID 14789.’ See also Barinaga (1992), Martínez Banaclocha, Bókkon & Martínez Banaclocha (2009), Størmer (2013) and Maher et al. (2016).
- 3.4.viii.d. Mathematical model for the differentiation of functions in cortical modules. See Tsuda Yamaguti & Watanabe (2016), page 7. See also Landy, Allen & Zednik (2014), Tononi (2012), Landy (2010), Marghetis, Landy & Goldstone (2016), Landy & Goldstone (2007), Balduzzi & Tononi (2009), Wilson, Moezzi & Rogasch (2020), Kang & Kang (2017), Fox et al. (2012), Hoffman et al. (2013), Nazemi & Jamali (2018), Cowan, Neuman & van

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- 3.4.viii.e. A reduced inventory of Propp's functions of narrative, according to Greimas. Adapted from Cruz (2013), pages 107-109 and Greimas (1983), page 234. See also Ricoeur (1989) and Greimas & Rastier (1968).
- 3.5.Ø.A. No number (in the text, mixed with the digital expansion of e). Euler's identity. See Debnath (2009), page 364. See also Wikipedia contributors, 'Euler's identity', Wilson (2018) and Sandifer (2014).
- 3.5.Ø.B. No number (in the text, mixed with the digital expansion of e). Euler's formula. See Marcus & Nichita (2018), page 15-1 and Navarro Saldinas (2012), page 10. See also Wikipedia contributors, 'Euler's identity', Nahin (2006) and Manogue and Dray (2010).
- 3.5.Ø.C. No number (in the text, mixed with the digital expansion of e). Natural logarithm of e . See Weisstein (1999), page 1217. See also Wikipedia contributors, 'Natural logarithm'.
- 3.5.Ø.D. No number (in the text, mixed with the digital expansion of e). Derivative of e to the power of x . See Navarro Saldinas (2012), page 51. See also Wikipedia contributors, 'Exponential function'.
- 3.5.Ø.E. No number (in the text, mixed with the digital expansion of e). Integral of e to the power of x . See Bronshtein et al. (2007), page 428. See also Wikipedia contributors, 'Exponential function'.
- 3.5.Ø.F. No number (in the text, mixed with the digital expansion of e). i to the power of i . See Piñeiro (2017), page 47. See also Weisstein, 'i'.
- 3.5.Ø.G. No number (in the text, mixed with the digital expansion of e). Maximum of x to the power of 1 over x . See Piñeiro (2017), page 134. See also Weisstein, 'Steiner's Problem'.
- 3.5.Ø.H. No number (in the text, mixed with the digital expansion of e). Integral of e to the power of minus x square. See Navarro (2016) page 75 and Marcus & Nichita (2018), page 15-3. See also Osler (2009).
- 3.5.Ø.I. No number (in the text, mixed with the digital expansion of e). Sum of Fibonacci numbers in terms of e and the golden ratio. See Church & Bicknell (1973), page 278. See also Dutta, Metha & Pathak (2018).
- 3.5.Ø.J. No number (in the text, mixed with the digital expansion of e). Square root of -2 . See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ' and Boulger (1989) and McCartney (2017).

- 3.5.Ø.K. No number (in the text, mixed with the digital expansion of e). The Motor-evoked Potential and Cortical Silent Period induced by Transcranial Magnetic Stimulation. See Rábago et al. (2009), page 1579. See also Fox et al. (2012), Hoffman et al. (2013), Babbs (2014), Cowan, Neuman & van Drongelen (2016), Tsuda Yamaguti & Watanabe (2016), Robertson, Théoret & Pascual-Leone (2003) and Pashut et al. (2011).
- 3.5.Ø.L. No number (in the text, mixed with the digital expansion of e). Pythagoras' constant (Square root of 2). See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Storch (2009) and Beck (2010).
- 3.5.Ø.M. No number (in the text, mixed with the digital expansion of e). Variation in a geyser's temperature, expressed as a function of initial temperature T_0 . See O'Hara & Esawi (2013), page 7. See also Namiki et al. (2016) and Hurwitz & Manga (2017).
- 4.0.i. The exponential spacetime metric. See Boonserm et al. (2018), page 2. See also Simpson, Martín-Moruno & Visser (2019), Takahashi & Asada (2013), Ellis (1973), Husain & Seahra (2008), Schulman (2008), Bathia (2003), De-Cross (2021) and Corrêa & Fernandes de Oliveira (2022).
- 4.0.ii. The fluctuation theorem. See Evans & Searle (2002), page 1544. See also Evans, Cohen & Morriss, (1993), Crooks (1999) and Wang et al. (2002).
- 4.0.iii. Number of simulated realities depending on the number of embedded simulated generations (G) and the number of initial simulations created by the base civilisation (λ). See Kipping (2020a), page 4. See also Alserhani (2016), Bostrom (2003a), White (2016), Spigler (2018) and Richmond (2017).
- 4.0.iv. Frequency of the distribution of decimal digits for the first $10n$ digits of $e-2$ ($n=1\dots 10$). Adapted from Weisstein 'e Digits' and Yee (2020). See also Gronau, & Wagenmakers (2016), Xylogiannopoulos, Karampelas, Panagiotis & Alhajj (2014) and Borel (1909).
- 4.1.i.a. Time dilation near a Morris-Thorne wormhole throat. See Kuhfittig (2010), page 13. See also Grushka (2017), Maldacena, Stanford & Yang (2017), Lindsay (2016), Lloyd et al. (2011), Bochicchio & Laserra (2013), Lemos & Lobo (2004), Visser (1993), Hawking (1992), Deutsch (1991), Carroll, Farhi & Guth (1992), Gott (1991), Kim & Thorne (1991) and Nelson (2009).
- 4.1.i.b. The Wheeler-De Witt equation in the presence of a tachyon field. See Sen (2003), page 4882. See also Bertolami & Lobo (2009), Bachelot (2017), Richmond (2022), Cordero, Granados & Mota (2011), Lidsey (1994), Greaves

(2004), Hari (2016), Garrison et al. (1998), Wang (2005), Carmi et al. (2019), Page (2020) and McGreevy & Silverstein (2005).

4.1.ii. A formal definition of the Copernican principle using anthropic indexical sampling, according to Cushman. Adapted from Cushman (2019), pages 10-11. See also Polonioni (2017), Ben  trean-Dupin (2014), Srednicki & Hartle (2010), Sundell & Vilja (2014) and Garrett (2016).

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4.1. .B. No number (in the text). Heisenberg picture. See Shankar (1994), page 490. See also Godoy & Rocha (2019), Vaidman (2016), Blanchard, Fr  hlich & Schubnel (2016), Song (2008) and Mavromatis (1992).

4.1. .C. No number (in the text). Dirac's equation. See Shankar (1994), page 565. See also Theise & Kafatos (2016), Ringbauer et al. (2015) and Wharton (1998).

4.1. .D. No number (in the text). Schr  dinger's equation. See Shankar (1994), page 143. See also Hahne (2006), Mavromatis (1992) and Hartnoll, Huijse & Mazenc (2017).

4.1. .E. No number (in the text). Shannon's equation. See Shannon (1948), page 11. See also Campbell (1984), Vedral (2006), Fiorillo (2012) and Vedral (2012).

4.1. .F. No number (in the text). Bekenstein-Hawking entropy. See Bekenstein (2008). See also Bekenstein (1981), Saida (2013) and Cabrera, Fern  ndez de C  rdoba & Isidro (2017).

4.1. .G. No number (in the text). Statistical definition of entropy engraved on Ludwig Boltzmann's grave. See Carroll (2015), page 171. See also Boltzmann (1895), Demetrius (2013) and Arroyo P  rez (2012).

4.1. .H. No number (in the text, mixed with the digital expansion of e). Gelfond's constant 1. (e to the power of π). See Nahin (2006), page 93 and Wikipedia contributors, 'Gelfond's constant'. See also McCartin (2006) and Philippon (1997).

4.1.iii.a. Fraction of all observers with human-type experiences that live in simulations. See Prince (2005), page 204. See also Crawford (2013), Bostrom (2003a), Kipping (2020a), White (2016), Alserhani (2016) and Makukov & shCherbak (2018).

- 4.1.iii.b. The final observation by the ultimate observer, according to Barrow and Tipler. Adapted from Barrow & Tipler (1986), pages 470-471. See also Amman & Quittner (2005), Impey (2011), Lachin (2015), Lifshin et al. (2016) and Antonioni & Swingle (2020).
- 4.1.iii.c. Schematic representation of a finite-state automaton generating a simple Propp-style folk-tale plot. See Galofaro (2013), page 231. See also Propp et al. (1968), Greimas (1983), Kafalenos (1997), Peinado & Gervás (2006), Lesinkins (2009), León & Gervás (2010), Cruz (2013), Hansen (2015) and Gervás (2016).
- 4.1.Ø.I. No number (in the text, mixed with the digital expansion of e). Gelfond's constant $2 \cdot (e \text{ to the power of } \pi)$. See Nahin (2006), page 93 and Wikipedia contributors, 'Gelfond's constant'. See also McCartin (2006) and Philippon (1997).
- 4.1.Ø.J. No number (in the text, mixed with the digital expansion of e). Pythagoras' constant (Square root of 2). See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Dutka (1971) and Boulger (1989).
- 4.1.iii.d. Primary points of divergence, according to Bigaj. See Bigaj (2006), page 191 and Bigaj (2012) page 189. See also Lewis (1979), Nahin (1999), Ryan (1980), Le Poidevin (2001), Bigaj (2004), Saunders & Wallace (2008), Bigaj (2013), Miller (2014), Fenton-Glynn & Kroedel (2015) and Wittenberg (2016).
- 4.1.Ø.K. No number (in the text, mixed with the digital expansion of e). Square root of -2. See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Conway & Shipman (2013).and McCartney (2017).
- 4.2.i.a. The anthropic limit of the cosmological constant, according to Weinberg. See Weinberg (1987), page 2608. See also Klebanov, Susskind & Banks (1989), Rees (2000), Weinstein (2006), Bekenstein (1981), Mersini-Houghton & Adams (2008), Zinkernagel (2011), Dvali & Gomez (2014), Nazaretyan (2015) and Eaves (2016).
- 4.2.i.b. The metric of a Poincaré wormhole in AdS. See Freivogel et al. (2019), page 4. See also Maldacena & Maoz (2004), Bronnikov et al. (2013), Horowitz et al. (2019), Yoneya (2003), Lemos & Lobo (2004), Price (2012), Euvé & Rousseaux (2017), Bochicchio & Laserra (2013), González-Díaz (1996) and Wolf (1988).

- 4.2.i.c. Witten's Magical Formula for the Donaldson series. See Naber (2001), page 263. See also Witten (1996), Woit (2007), Smolin (2008), López Corredoira & Castro Perelman (2008), Dawid (2009), Gleiser (2010), Baggot (2013), Dawid (2013), Duff (2013), Unzicker & Jones (2013), Ellis & Silk (2014), Ritson & Camellieri (2015), Witten (2015), Ritson (2016b), Rickles & Bloom (2016), Witten (2016), Cabrera (2018) and Matsubara & Johansson (2018).
- 4.2.i.d. The (formal) self-sampling assumption, according to Cushman. See Cushman (2019), page 12. See also Schulman (2016), Waltham (2011), Neal (2006) and Bostrom (2002a).
- 4.2.i.e. Schrödinger representation of the Heisenberg group. See Hall (2013) proposition 14.7. See also Hartnoll, Huijse & Mazenc (2017), Blanchard, Fröhlich & Schubnel (2016), Vaidman (2016), Pomi (2016), Song (2008), Kaplan et al. (2007), Tegmark & Wheeler (2001) and Andruskiewitsch, Devoto & Tiraboschi (1994).
- 4.2.ii.a. Fundamental Theorem of Nash Equilibria. See Schecter & Gintis (2016), page 117. See also Nash (1950), Kamien, Tauman & Zamir (1990), Holt & Roth (2004), Giocoli (2004), Imhof (2008), Radjef & Fahem (2008), Schollaert & Van de Gaer (2008), Kibris (2012), Kikuchi (2016) and Schuster (2017).
- 4.2.ii.b.A. Generative rules for the modal structure of narrative universes, according to Marie-Laure Ryan. See Ryan (1985), page 732. See also Suvin (1986), Malmgren (1991), Ketterer (1992), Ryan (1992), Malmgren (1993), Bourdieu (1996), Malmgren (1988), Paulos (1998), Nünning (2004), Wolf (2004), Fort (2006), Ryan (2007), Csicsery-Ronay (2007), Spiegel (2008), Ryan (2008), Ryan (2010), Lee (2014) and Romero (2018).
- 4.2.ii.b.B. Truth in fiction according to David Lewis (Analysis 2). See Lewis (1978), page 45. See also Pavel (1975), Currie (1990), Ryan (1991), Oltean (1997), New (1997), Currie (1986), Hanley (2004), Mikkonen (2006), Proudfoot (2006), Ryan (2006), Lihoreau (2013), Kosterec (2021) and García-Carpintero (2022).
- 4.2.ii.c.A. Chemical structure of estradiol. See PubChem contributors, 'Estra-1,3,5(10),16-tetraen-3-ol. PubChem Identifier:CID 101988.' See also Motofei (2011), Sieben (2011), Simard (2014), Goetz et al. (2012), Verhaeghe, Gheysen & Enzlin (2013), Clarkson (2013), Wyatt (2020), Rantala & Marcinkowska (2011), Hausmann (2017), Oren et al. (2019), Motta-Mena & Puts (2017), Higham (2019), Kubota et al. (2016) and Fisher (2004).

- 4.2.ii.c.B. A model for sex and orgasm where sexual tension is approximated as the magnitude of the amplitude of the response. See Hubey (2000), page 626. See also Tanfer & Cubbins (1992), Žižek (1995), Muratori & Rinaldi (1989), Carbonaro & Giordano (2005), McClelland (2010), Barley & Cherif (2011), Basualdo (2012), Bosse et al. (2012), Goetz et al. (2012), Young & Alexander (2012), Vandenbosch & Eggermont (2012), Bever & Rowlet (2013), Goetz, Easton & Buss (2014), Yue, Dai & Yuan (2015), Miani (2016), Stanley (2017), Diaz (2018) and Banerjee & Ananthapuvirajah (2019).
- 4.2.ii.d. The conditional aesthetic principle, according to Page. See Page (2008a), page 197. See also Page (1995), Page (1996), Page (2001), Page (2008b), Page (2009a), Page (2009b) and Page (2010).
- 4.2.ii.e. Predictive distribution in the Bayesian paradigm. See Spiegelhalter & Rice (2009). See also Barnes (2017), Schwitzgebel (2008), Holman (2013), Gershman & Beck (2017), Eva (2019), Schulman (2008), He et al. (2020), Cole et al. (2014) and Page (2017).
- 4.2.ii.f. Backwards extension of the Fibonacci series (negafibonacci numbers). See Garg, Garg & Kumar (2013), page 97 and Bunder (1992), page 111. See also Knott (2020) and Marghetis, Landy & Goldstone (2016).
- 4.2.ii.g. $\{\emptyset, 0\}$. See Barrow (2001b), page 166. See also Mehlman (1972), Cole (2014), Della Sala (2007), Hedegaard (2002), Reinen et al. (2018), Baker et al. (2019), Allen et al. (2008), Lucia (2013) and Manford & Andermann (1998).
- 4.2.iii. Equations about Boltzmann brains found in a non-systematic review of the scientific literature before the Penumbra. See Rees (1998), page 221, Tegmark (2014), pages 306-308, Carroll (2015), pages 249-253, Greene (2021), pages 296-306 and Turchin & Yampolskiy (2019). See also Linde, Linde & Mezhlumian (1994), Linde, Linde & Mezhlumian (1995), Dyson, Kleban & Susskind (2002), Albretch & Sorbo (2004), Aguirre (2007), Banks (2007), Giddings & Marolf (2007), Hartle & Srednicki (2007), Inman (2007), Li & Wang (2007), Linde (2007), Page (2007), Vilenkin (2007), Barrow & Shaw (2008), Gott (2008), Krauss (2008), Mersini-Houghton & Adams (2008), Overbye (2008), Page (2008b), Winitzki (2008), Albrecht (2009), Becker (2009), Page (2009a), Page (2009b), Davenport & Olum (2010), Linde & Noorbala (2010), Schwartz-Perlov & Vilenkin (2010), Nomura (2011), Guth & Vanchurin (2011), Page (2011), Schwartz (2011), Yurov et al. (2011), Aguirre, Carroll & Johnson (2012), Fewster, Ford & Roman (2012), Johnson & Lehnert (2012), Lehnert (2012), Rehmeyer (2012), Becker (2013a), Becker (2013b), Boddy & Carroll (2013), Bousoo & Zukowski (2013), Crawford (2013), Garriga & Vilenkin (2013), Azhar (2014), Barbón & Ravinovic

(2014), Boddy (2014), Boddy, Carroll & Pollack (2014), Dvali & Gomez (2014), Perez et al. (2014), Page (2014a), Page (2014b), Smeenk (2014), Silk (2014), Bashinsky (2015), Boddy, Carroll & Pollack (2015), Goldstein, Hartle & Hertog (2015), Horvat (2015), Lee et al. (2015), Nomura (2015), Özkural (2015), Struyvey & Tumulka (2015), Tumulka (2015), Astashenok, Yurov & Yurov (2016), Dong & Stojkovic (2016), Ostrowick (2016), Tumulka (2016), Barnes (2017), Carroll (2017), Chamcham et al. (2017), Dorr & Arntzenius (2017), Hartle & Hertog (2017), Loew (2017), Mueller (2017), Page (2017), Patel & Lineweaver (2017), Walford & Kirk (2017), Denef et al. (2018), Tumulka (2018), Knight (2019), Zak (2019), Dasguta, Dotta & Westlake (2020), Dogramaci (2020), Knight (2020), Kotzen (2020), Mueller (2020), Pereira (2020) and Vilenkin & Yamada (2020).

- 4.2.iii.A. Estimation of the number of Boltzmann brains in a multiverse of volume $e^{3H_{\Lambda}t}$. See Carlip (2007), page 001-3.
- 4.2.iii.B. The rate of Boltzmann brains (BB) over normal observers (NO) in a multiverse. See De Simone et al. (2010), page 063520-7.
- 4.2.iii.C. The number of Boltzmann brain observers in pockets of type j at time t . See Linde, Vanchurin & Winitzki (2009), page 014.
- 4.2.iii.D. The Boltzmann suppression factor (an estimate for the nucleation rate of a Boltzmann brain of mass M in any particular quantum state). See De Simone et al. (2010), page 063520-17.
- 4.2.iii.E. The stationary measure of the potential proliferation of Boltzmann brains. See Linde, Vanchurin & Winitzki (2009), page 09.
- 4.2.iii.F. Rate of the probability that Boltzmann brains (BB) would exist over the probability that normal observers (NO) would exist in a series of de Sitter vacua (a). See Bousso, Freivogel & Yang (2009), page 063513-16.
- 4.2.iii.G. Estimation of the ratio of Boltzmann brains (BB) to normal observers (NO) caused by collisions between AdS bubbles in the dominant vacuum, where $\mathcal{K}_i^{BB}$ is the Boltzmann-brain formation rate per unit Hubble volume in vacuum i . See Salem (2013), page 063501-12.
- 4.2.iii.H. Time for the nucleation of Boltzmann brains and its relationship to Poincaré recurrence time in several string theory vacua. Adapted from Freivogel & Lippert (2008), page 096-8. See also Ritson (2016a), Davenport & Olum (2010) and Cotler, Hunter-Jones & Ranard (2020).
- 4.3.i.a. Formulations and generalisations of Poincaré recurrence time. See Galkowski (2006), pages 1-12. See also Ismael, Nilsen & Williams (2014),

- Anishchenko & Boev (2014), Michel (2014), Barbón & Ravinovici (2014), Winsberg (2012), Adzhiev & Vedenyapin (2011), Kozlov (2011), Varandas (2009), Altmann & Tél (2008), Freivogel & Lippert (2008), Page (2008a), Krugilov & Rypdal (2006), Carlen, Carvalho & Loss (2003), Kasteleyn (1987), Friedman & Niven (1959) and Carlen, Mustafa & Wennberg (2015).
- 4.3.i.a.A. Poincaré recurrence time, calculated on the basis of the total entropy of a system. See Dong & Stojkovic (2016), page 104058-4.
- 4.3.i.a.B. Smoluchowski formula to compute the average Poincaré recurrence time taken to return in set A, valid for a discrete evolution (given that we started from a point of the set A). See Venuti (2015), page 1.
- 4.3.i.a.C. Estimation of the Poincaré recurrence time of an isolated black hole M containing the mass within the presently visible region of our universe, with stationary boundary conditions. See Page (1994), page 8.
- 4.3.i.a.D. Kac's recurrence time. See Falcioni & Vulpiani (2015), page 10.
- 4.3.i.a.E. Kac's quantum recurrence time (generalisation of Kac's recurrence time quantum mechanics). See Sinkovicz, Kiss & Asbóth (2016), page 2.
- 4.3.i.b. Weak pattern identity postulate. See Prince (2005), page 217. See also Schuster & Sigmund (1983), Song (2008), Fernando, Goldstein & Szathmáry (2010), Koene (2012) and Knight (2020).
- 4.3.i.c. The (formal) self-indication assumption according to Cushman. See Cushman (2019), page 12. See also Bostrom (2002a), Ćirković (2001), Schulman (2016), Neal (2006), Neel & Lasseter (2019) and Slijepcevic (2020).
- 4.3.i.d. Equivalences in the Maldacena conjecture (AdS/CFT duality). See Ramos-Sánchez (2013), pages 106-108, Petersen (1999), pages 22-23, Arias (2013), pages 7-8 and Banerjee (2008), page 24. See also Maldacena (1999), Aharony et al. (2000), Gubser, Klebanov & Polyakov (1998), Witten (1998a), Witten (1998b), Yoneya (2003), Kaku (1995), Tegmark (2003), Dimou (2010), Greene (2012), Miramontes & Volke (2013), Matsubara (2013), Rickles (2013), Read (2015), Duff (2016), Rickles (2017), Barbón & Ravinovici (2014), Genolini, Perez Ipiña, & Sparks (2019), Andrade, Faulkner & Marolf (2012), Mandal, Sinha & Sorokhaibam (2015), Grado-White and Marolf (2018), Kaku (2005), Gordon (2018), Gao & Liu (2019), Verlinde & Zurek (2020), Bintanja et al. (2021) and DeCross (2021),
- 4.3.i.e. The super-strong self-sampling assumption, according to Pereira. See Pereira (2017), pages 4-5. See also Lewis (1986b), Elga (2004), Hyde & Grieve

(2014), Nagler et al. (2014), Hart, Breeden & Richardson (2020) Laakauso et al. (2021), Markram et al. (2015) and Pereira (2020).

4.3.ii.a. Bayes' theorem. See Castro Ortega (2017), page 43 and Rosen (2019), page 495. See also Hoang (2020), Gershman & Beck (2017), Grieve (2011). Eva (2019) Schulman (2008), Alamino (2010), Gaveau & Schulman (1996) and Deutsch (1991).

4.3.ii.b. Multiple Birkhoff recurrence theorem. See Mulvey (1997), page 359. See also Franks (1998), Wallace (2015) and Birkhoff (1931).

4.3.ii.c. CHSH inequality. See Wikipedia contributors, 'CHSH Inequality' and Wikipedia contributors 'EPR Paradox.' See also Butterfield (1992), Werbos (2008), Mohrhoff (2001), Hanley (2004), Hoffman (2009), Price (2012) and Aaronson (2013).

4.3.ii.d.A. Back-tracking counterfactuals according to Lewis. See Lewis (1979) page 462. See also Lewis (1973), Lewis (1976), Lewis (1983), Lewis (1986a), Lewis (1986b), Lewis (1988), Kmet (2006), Fine (2012), Loewer & Schaffer (2015), Corrêa & Fernandes de Oliveira (2022) and Richmond (2022).

4.3.ii.d.B. The dominant path to Boltzmann brain production. See Bousso & Zulkowski (2013), page 103504-6. See also Becker (2013b), Becker (2013a), Dogramaci (2020), Garriga & Vilenkin (2013), Schwartz (2011), Cotler, Hunter-Jones & Ranard (2020), Overbye (2008), Dorr & Arntzenius (2017), Bostrom (2009) and Mostajo-Radji et al. (2020).

4.3.iii.a. Wheeler's participatory anthropic principle. See Ellis (2011), page 3216, Sandberg (2008), page 18 and Barrow & Tipler (1986), page 22. See also Wheeler (1974), Wheeler (1986a), Wheeler (1986b), Earman (1987), Kirschenmann (1992) and Friederich (2017).

4.3.iii.b.A. Chemical structure of vasopressin. See PubChem contributors, 'Argipressin. PubChem Identifier: CID 644077.' See also Murphy et al. (1987), Hiller (1994), Guastella et al. (2010), Garrison et al. (2012), Miani (2016), Hausmann (2017), Oren et al. (2019). Gračanin et al. (2017), Gelstein et al. (2011), Hammock & Young (2006), Donaldson & Young (2008), Freeman & Young (2016), Barrett et al. (2013), Young (2009) and Young & Barret (2015).

4.3.iii.b.B. A dynamic model of a delayed love affair with cautious partners, including multiple self- and cross-reaction processes. See Matsumoto & Szidarovszky (2018), page 105309-6. See also Gragnani, Rinaldi & Feichtinger (1997), Carbonaro & Giordano (2005), Wolf (2004), Liao & Ran (2007), Schwitzgebel (2008), Bielczyk, Bodnar & Forýs (2012) Bosse et al. (2012),

- Fisher et al. (2016), Cowan & LeBlanc (2018), Walum & Young (2018), Herrera de la Cruz & Rey (2021) and Solferino & Tessitore (2021).
- 4.3.iii.b.C. The golden ratio expressed as a limit of negafibonacci quotients. See Garg, Garg & Kumar (2013), page 102 and Finch (2003) page 6. See also Benjafield & Green (1978), McManus, Cook & Hunt (2010) and Griffiths & Rajagopal (2016).
- 4.3.iii.c.A. Operators needed to establish a narrative syntax, according to Greimas. See Greimas (1977), page 37. See also dos Santos (2014), Cruz (2013), Kimmel (2011), Pottier (2006), Budniakiewicz (1992), Schleifer, Davis & Mergler (1992), Ricoeur (1989), Greimas (1983) and Greimas (1971).
- 4.3.iii.c.B. Badura and Berto's reformulation of David Lewis' Analysis 2 about truth in fiction. See Badura & Berto (2019), page 188. See also Lewis (1978), Ryan (1980), Currie (1997), Phillips (1999), Le Poidevin (2001), Seahwa (2002), García Carpintero (2007), Ryan (2009), Mikkonen (2011), Woodward (2011), Friend (2017), Ryan (2019), Bourne & Caddick Bourne (2022) and Ryan (2022).
- 4.3.iii.d. Actuality of centred possible worlds, according to Shulman. See Shulman (2011a), page 5 and Shulman (2011b), page 5. See also Whitmarsh (2016), Bergman, Karlsson & Axelsson (2010) and Ermer et al. (2006).
- 4.3.iii.e. Damped wave equation for the axonal transfer function. See Wilson et al. (2014), page 503. See also Kong et al. (2019), Gallinaro, Nebojisa, & Rotter (2021), Anderson et al. (2020), Postle et al. (2006), Soeter & Kindt (2011) and Lavazza (2016).
- 4.3.iv.a. Single parameter Rayleigh probability density function used to predict the preplay phase in a geyser eruption. See O'Hara & Esawi (2013), page 5. See also Grisenti et al. (2004), Busse, Monkewitz & Hellweg (2005), Namiki et al. (2016), Hurwitz & Manga (2017), Montegrossi et al. (2019), and Banerjee & Ananthapuvirajah (2019).
- 4.3.iv.b. Redefinition IV, Version A, of utterer's occasion-meaning, according to H. P. Grice. See Grice (1969), pages 172-3 and Valdés Villanueva (1991), page 506. See also Fedorova & Salnikova (2019), Richland (2006), Gibbs (2002), Sinclair (1995), Wahren (1992), Hyslop (1978) and Facione (1972).
- 4.3.iv.c.A. Conditional information entropy. See Wikipedia contributors, 'Entropy (information theory)'. See also Shannon (1948), Vedral (2006), Balduzzi & Tononi (2009), Gastpar et al. (2010), Lovell et al. (2010), Fiorillo (2012), Tononi (2012), Vedral (2012), Aaronson (2013), Gallimore (2105),

Moustafa (2017), Hargood, Millard & Weal (2018), Wallace (2018), Bleier (2019) and Mueller (2020).

4.3.iv.c.B. Backward light cone relativistically invariant reading of counterfactuals. See Bigaj (2012) page 187 and Bigaj (2006) page 187. See also Lewis (1973), Lewis (1979), Bigaj (2004) Bigaj (2013), Lavocat & Mikkonen (2013), Miller (2014) and Fenton-Glynn & Kroedel (2015).

4.3.iv.d. Original formulation of the Poincaré recurrence theorem. See Poincaré (1890), page 69. See also Linero Bas & Soler López (2015), Altmann & Tél (2008) and Frisch (1956).

4.3.iv.e.A. The observation equation. See Bostrom (2003b), page 78 and Bostrom (2005), page 11. See also Caie (2018), Dorr & Arntzenius (2017), Albrecht & Phillips (2014), Schwartz (2011), Daunizeau et al. (2010), Hospedales & Vijayakumar (2009), Page (2009a), Tegmark & Bostrom (2005), Bostrom (2000) and Lewis (1986a).

4.3.iv.e.B. Epistemic, doxastic and deontic logics combined. See Redmond (2019), page 10. See also Redmond (1988), Sierra (2010), Stapleford (2012), Sridharan (2014), Porcher (2015), Rieger (2015), Yann (2015), Redmond (2016), Herzig (2017), Badura & Berto (2019), Bortolotti & Sullivan-Bisset (2019), Brown, Gyenis & Rédei (2018) and Borges & Pino Pérez (2020).

4.3.iv.f.A. The Sufficient Condition for War. See Leventoglu & Slatnchev (2007), page 762. See also O'Neill (1994), Kassas (1999), Yared (2010), Rohner, Thoenig & Zilibotti (2013), Szendy (2013), Acharya & Grillo (2015) and Witsche (2019).

4.3.iv.f.B. Second approximation to the polemological hexagon, inspired by von Clausewitz, according to Moretti. See Moretti (2012), page 91. See also Turchin et al. (2013), Zefferman & Mathew (2015) and Maccone (2013).

4.3.iv.g.A. The hero's map. See Monteiro & Mustaro (2012), page 2233. See also Wikipedia contributors, 'Hero's journey', Vogler (2007), Campbell (2008), Leeming (2010), Campbell, Cosineau & Brown (2014), Jones (2014), Lundin-Taylor (2014), Robertson & Lawrence (2015), Klingmüller, Caplan & Sommer (2017), and Hulings (2021).

4.3.Ø.A. No number (in the text, mixed with the digital expansion of π). Square root of -2. See Piñeiro (2017), page 129. See also Wikipedia contributors, 'List of representations of e ', Dutka (1971), Butterfield (1992), Boulger (1989), Gentile (1991), Storch (2009), Beck (2011), Bigaj (2006), Conway & Shipman (2013), Miller (2014), McCartney (2017) and Baccolini (2020).

- 4.3.iv.g.B. Evolutionary Stability of Kantian Optimisation. See Curry & Roemer (2012), page 138. See also Laslier (2020), Long (2019), Bauer (2018), Cerda Planas (2015), Alger & Weibull (2015), Varden (2011), Wallach, Franklin & Allen (2010), Rosas (2004), and Losco (2003).
- 4.3.iv.h. Barrow's and Tipler's final anthropic principle. See Barrow & Tipler (1986), page 23 Ellis (2011), page 3216 and Tipler (1988), page 32. See also Ćirković & Bostrom (2000), Barrow, Davies & Harper (2004), Hawking & Mlodinow (2005), Prince (2005), Li & Wang (2007), Randall (2015), White (2016), Allen & Lidström (2017) and Lanza, Pavsic, & Berman (2020).
- 4.3.v. Formulations and generalisations of Poincaré Recurrence Theorem. See Chandrasekaran & Jain (2012), Haddad, Chellaboina & Nersesov (2008) and Chirikov & Zhirov (2001). See also Bell (1920), Birkhoff (1931), Visser (1936), Frisch (1956), Bocchieri & Loinger (1957), Tsurumi (1958), Wright (1960), Wright (1961), Landau & Lifshitz (1971), Kurth (1975), Furstenberg (1981), Denbigh (1989), Andersson (1994), Franks (1998), Batterman (1990), Banks, Fischler & Paban (2002), Rossi & Turchetti (2004), Bergelson et al. (2005), Ugalde (2007), Giddings & Marolf (2007), Altmann & Tél (2008), Godlove (2009), Roukema (2009), Varandas (2009), MacDougall (2010), Rousseau & Saussol (2010), Kra (2011), Bonino (2012), Cecconi et al. (2012), Kupervasser, Nikolić, & Zlatić (2012), Moreira (2012), Anishchenko & Astakhov (2013). Duan (2013), Riečan (2013), Dvali & Gomez (2014), Michel (2014), Linero Bas & Soler López (2015), Bochi (2018) and Pinguelli Rosa et al. (2020).
- 4.3.v.A. Poincaré recurrence theorem. See Katok & Hasselblatt (1995), page 142.
- 4.3.v.B. Original formulation of the Poincaré recurrence theorem. See Poincaré (1890), page 69.
- 4.3.v.C. Poincaré recurrence for points. See Frantzikinakis & McCutcheon (2007), page 4.
- 4.3.v.D. Topological version of the Poincaré recurrence theorem. See Boshernitzan & Glasner. (2009), pages 3-8, and Oxtoby (1971), pages 65-69.
- 4.3.v.E. Birkhoff recurrence theorem. See Mulvey (1997), page 359.
- 4.3.v.F. Topologic version of the Poincaré recurrence theorem for separable metric spaces. See Saussol (2009), page 3.
- 4.3.v.G. Quantum recurrence theorem. See Wallace (2015), page 022105-6.
- 4.3.v.H. Khintchine recurrence theorem. See Boshernitzan, Frantzikinakis & Wierdl (2017), page 816.

- 4.3.v.I. Kac recurrence theorem. See Frantzikinakis & McCutcheon (2007), page 5.
- 4.3.v.J. Von Neumann's ergodic theorem. See Einsiedler & Ward (2011), page 32.
- 4.3.v.K. Multiple Birkhoff recurrence theorem. See Mulvey (1997), page 359.
- 4.3.v.L. Furstenberg's multiple recurrence theorem. See Einsiedler & Ward (2011), page 175.

Appendix 3. Bibliography of equations, definitions, graphics, mathemes and tables in the text

*The greatest enemy of knowledge is not ignorance,
it is the illusion of knowledge.*

Stephen Hawking

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