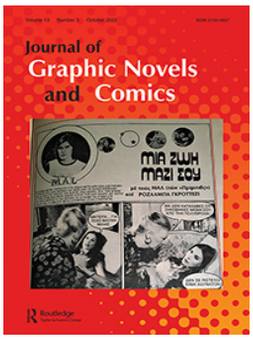

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FROM CALIGARI TO JOKER: the clown prince of crime's psychopathic science

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ABSTRACT

From the very beginning of his adventures in the DC universe, the Joker has been associated with science, particularly (bio)chemistry and microbiology. Exploring some recently published narrative examples of Joker science together with the insight provided by virology and chemistry, this paper examines the *scientific and cultural ideas of science* conveyed by the violent clown and his scientific extravaganzas. Psychopathic, mannerist Joker science, this paper shows, is intrinsically linked to the realms of hypnotism, hysteria, ecstasy and the 'hysterical realities' of different historical, physical, medial and cultural settings. Joker science is not only about how chemistry and virology *might* affect the human body but it also explores notions of possession and control – contemporary notions of what was once investigated as 'criminal suggestion' or 'hypnotic crimes' on science stages and in early film. Joker science 'jokerises': it leads to loss of motor control, muscular contortions, cramps, fatal convulsions and frenetic, deadly laughter, reminiscent of the 'strange spectacle' of hysterics and the 'science performances' and 'hysteri-culture' developed by the showman and researcher Charcot and his many fictional revenants, all characterised by a peculiar position between science, entertainment and the occult.

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Joker; science; chemistry; virology; clown; early film

Ha. Ha is the symbol of the element with which we are left at the end of *Batman Volume 3: Death of the Family*. After the (presumed?) death of the Joker in this 2014 comic book story, Batman identifies the previously unknown 'isotope in Joker toxin' as 'Element 105: Dubnium', fomerly known as 'Hahnium', or, Ha (Snyder et al.). The Joker – DC's infamous supervillain and toxin maker – 'emerged from' a chemical broth himself after an accident: 'Eleven percent sodium hydroxide. Thirty-four per cent sulphuric acid. Five per cent chromium solution. Zinc sulphide, doped with copper' plus 'some **secret ingredient**, the thing that made him' (ibid.).[1] A fall into this chemical slop is not to be

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survived – even though the high concentration of sulphuric acid was tempered by the presence of sodium hydroxide (caustic soda), which would partially neutralise the acid. Nonetheless, the Joker is a creature born of chemical waste – at least according to what is probably the best known and most frequently reiterated and interpreted origin story. In 'The Man behind the Red Hood!' (The Man behind the Red Hood!" (from Detective Comics #168, February 1951) et al., 2020), for example, the man who becomes the Joker dives 'into the catch basin for all the waste chemicals from [a] plant!' – a '**deadly chemical mixture**' (39) – that does not, surprisingly, kill him.

An array of Batman stories suggests that before becoming the infamous clown (Jürgens 2014, 2020a/b), the Joker character was a chemist or lab worker. No wonder he is sometimes being asked about his death mask-like white face, grotesque hyperbolic grin and green hair: 'You **must** have some kind of background in chemistry, right? Is that what happened to your face? A lab accident?' ("This one'll kill you, Batman!" (from Batman #260, January-February 1975) 2019). In whatever miraculous way he was brought into fictional being, from the very beginning of his adventures in the DC universe, the Joker has been associated with science, particularly (bio)chemistry and microbiology. How can his relationship to science – or even 'Joker science' – be defined? And to what extent does he use science to poison or manipulate others, and thus 'jokerise' them?

Dissecting some recently published narrative examples of Joker science together with the insight provided by virology and chemistry, in this paper we examine the *scientific and cultural ideas of science* conveyed by the violent clown and his scientific extravaganzas (without focusing on analysing 'right' and 'wrong' science). Cutting across sciences, the history of science, the fields of media studies, cultural history and comparative literature – thus interpolating visual and literary fiction and popular entertainment with other representational practices such as medicine – we intend to illuminate the ways Joker science draws on and adds to a rich cultural and scientific background revolving around notions of possession and control, hysteria and hypnosis and pathological ecstasy. In fact, we argue that Joker science leads to and manifests in contemporary versions of 'criminal suggestion' or 'hypnotic crimes' – that Joker masterly exerts indirect agency on 'possessed' (thus 'jokerised') minions *by means of science*.

Intellectually, this paper builds and expands on two companion pieces: the book chapter 'The Cheshire Clown: Joker's Infectious Laughter',[2] exploring the ability of the supervillain's monstrous laughter to *detach itself* from the violent clown and to spread *like* and *as* a wicked facial disease through society; and 'The Pathology of Joker's Dance: On the Origins of Arthur Fleck's Body Aesthetics in Todd Phillips's 2019 *Joker* Film' (Jürgens 2020), focusing on how a recent filmic Joker incarnation echoes and updates the cultural links between performance traditions from the popular stage – featuring bizarre contortions, dislocations, jerking and gesticulating – and the medical discourses about the nervous system. This paper contributes to clarifying the role and facets of science in comic book narratives, and in particular the Joker's (mis)use of science and its cultural and scientific context, thus adding some new perspectives on why the figure of the violent clown – hyperbolically speaking – seems to be everyone's favourite nightmare in pop culture.[3]

Intoxicating and pathological: Joker's science machinations

Many Batman narratives – recent stories in particular – point to the chemical composition of Joker's biochemical weapons and offer (some) scientific explanations for their devastating effects. In a 1993 story from *Batman: Legends of the Dark Knight* (#50, 'Images'), a 'walking hunk of idiot-savant genius' in a caravan – a muscleman in a singlet who happens to be Joker's cousin – produces DIY poisons for the Clown Prince of Crime by means of absurd equipment: gigantic glass flasks with bubbling pink liquid, test tubes, red cables and a huge retort (O'Neil et al. 2020b, 196–7). Studying their result under a scientific optical microscope (and later through a magnifying glass [sic!]), Batman calls it 'nothing [he has] ever seen … – … some strange compound of chlorides and hydrocolloids with a protein catalyst', a poison 'apparently activated through body heat and introduced into the blood through the skin.' (204) The poison causes a laughing fit, leading to suffocation and immediate death, after which the faces of humans and animals remain distorted by the laughter.

Other Joker poisons consist of substances, or 'variants', with specific (paradoxical) qualities and properties, representing chimeras that combine aspects of chemistry and biology that would not be expected to exist together. In the 2008 story *Batman: The Man who Laughs*, for instance, these variants are both 'fast-acting and slow-acting' (35). 'The Clown at Midnight' (Batman #663), a 2007 comic in prose, provides another example: '*a new airborne strain of the Joker poison*' (also called '*a death pollen*' as it is first discovered in flowers genetically engineered to release '*a short-acting toxic venom aerosol form*').'*The aerosol nerve agent activates when the red and the black flowers are brought together and remains effective for ten minutes*' (Morrison, Van Fleet, and Kubert et al. 2014). In *Batman Volume 3: Death of the Family*, this is taken to another level when Joker creates a toxin as 'a binary compound': half of it is in an 'epidermal solution' dabbed on by cloths, the other half ('the **activating** half') is mixed into a floor cleaner. '[I]t's a variation of toxin thirty-four, but the troponin levels have been adjusted to produce a different muscular contraction in the facial muscles' resulting in a 'frown'. In addition, Batman's crew discovers 'three non-essential components to the compound': 'Three substances that seem to simply be additives, nothing functional. Chlorine. Ethane and common aspirin' (Snyder, Capullo, and Clapion et al. 2014). In non-fictional science nomenclature, this 'binary compound' does not make sense, as a binary compound is one with only two types of atoms (water is an example, consisting of just hydrogen and oxygen), not a combination of two entirely different substances or mixtures. The proteins of the troponin complex are probably not particular useful as a toxin, but they are indeed involved in muscle contraction, giving the monstrous mixture a hint of plausibility. And the Joker added the non-functional components presumably for fun and good measure. What Joker creates is a mashup of ideas about science that mirrors the hybrid nature of the toxins themselves.

Nightwing Volume 3: Death of the Family offers another example of convulsion-inducing chemistry results, when Joker poisons the air with a gas whose formula he (is said to have) developed himself. Here, blood from a poisoned person contains what are called 'chemical anomalies': 'Composite jet fuel – Kerosene. A0-30. Dinnsa. DCI-4A' (Higgins et al. 2013). The picture accompanying this analysis in the graphic narrative contains the chemical structure of naphthalene, the main ingredient of mothballs.

Although this is certainly not something that one wants to inhale or have in the blood, this mixture of chemicals would be more dangerous as a highly flammable substance than a poison. Even more interesting, however, is that jet fuel poisoning does indeed cause convulsions (see National Research Council (US) Subcommittee on Jet-Propulsion Fuel 8, 2003). However, creative the chemical mixture and wild the science, 'jokerisation' thus seems to result and manifest in loss of motor control, muscular contortions, cramps and deadly convulsions. The physiological manifestation of Joker science shows itself especially and most shockingly in the face.

Effects of Joker science: Laughter going berserk

Across his different iterations since the 1940s, Joker confronts his opponents with chemical and biochemical weapons, including venom guns ('The Joker returns' [Batman #1], 25), 'harmless but paralyzing gas(es)' ('Batman vs. the Joker' [Batman #1], 18) and poisonous cigars containing 'ammonium nitrate. Heated, it forms laughing gas!' – which causes frenetic laughter and horrible facial convulsions ('The Cross Country Crimes!' [Batman #8], 11). Joker also poisons food with a 'laughing drug' which induces laughing spasms: 'Limbs trembling … ribs aching … with this brutal, uncontrollable laughter!' ('This one'll kill you, Batman!' [Batman #260], 72, cf. 61) If they do not cause cramps, paralyse or kill straight away, Joker chemicals increase the propensity to violence and the desire to destroy or otherwise lose control over oneself – but not without first turning Joker victims into *Joker copies*. The countless 'joker gases', 'joker toxins' and 'joker poisons' have indeed similar physiognomic effects: 'skin is bleached, nerves of facial muscles are damaged, jaws are broken' (Johns, Fabok, and Anderson 2020). Those poisoned and corrupted by Joker science have the evil clown's look and can be read as projections of their and the Joker's inner emptiness: once infected by the societal pollutant, they show a grotesque, 'empty' smile on their distorted white faces, the '"gaping grimace". The everlasting smile courtesy of **the Joker**' (Hine et al. 2011).

A particularly interesting version of Joker convulsant can be found in the 2011 story *Batman Imposters*, which offers a more detailed '[c]hemical breakdown of Joker juice' produced by an imposter Joker – not the 'real' Joker. This is why '[t]he most lethal element of [the] authentic Joker venom, hydrogen cyanide, is absent.' But the mixture does include 'methamphetamine, MDMA and nitrous oxide', and causes 'euphoria, mild hallucinations, increased energy levels, uncontrolled hilarity, and muscular spasms. – It is likely to be psychologically addictive after a **single** dose.' While neither laughing gas (nitrous oxide) nor ecstasy (MDMA) is particularly addictive, methamphetamine certainly is, especially in its pure form crystal meth or ice, and the described physiological effects sound plausible. Modified within the course of the story – by adding 'several steroids in a combination that seems to be calculated to increase aggression, along with a powerful pain suppressant' – this mixture causes 'pure '**roid rage**' as described in the narrative. And one of the additional chemical ingredients of this 'Joker juice' is particularly interesting: 'Strychnodide', which 'causes the muscle convulsions that produce the hallmark grin. The **rictus sardonicus**' (Hine et al. 2011) in the comic book. While there is no such chemical as strychno*dide*, strychnine is the highly poisonous, bitter-tasting alkaloid of Agatha Christie fame that rapidly causes muscular spasms, and 'risus sardonicus' or 'rictus grin' – terms that are blended in the comic book story and that are indeed

used in science lingo within this context (see Appendino et al. 2009; Kobayashi and Iwasaki 2017). By (con)fusing science and science vocabulary with fantasy, Joker chemistry explores fictional ideas about how chemicals (especially in the guise of chemical weapons) *might* affect the human body. If it does not kill instantly, Joker science leads to various forms of loss of motor control, most notably facial distortions and neurological alterations including behavioural changes. And these disorders have a long prehistory in cultural contexts. In the figure of the Joker, different cultural discourses and fantasies around science collide in a very productive, and even ingenious, way.

'You must become the Joker!'[4] – Dr Caligari, Rotwang, Joker — Beyond Mad

Joker science does not merely result in muscular contractions – painful muscle spasms of the facial muscles resembling a Joker smile, thus exerting formlessness upon others by annihilating the individual bodies of the poisoned, Joker science also recreates the Joker's *state of mind* in his victims; a sense of absurdity and an urge to destroy (see e.g. Hine et al. 2011). By using science to make others behave the way *he wants* them to – for example by changing his victims neurology and psychology and thus '[m]aking them go after anything they have **affection** for' (Snyder and Capullo et al. 2015) – Joker exerts a deranged authority over bodies *and* minds, or, in other words, a sort of hypnotism (defined by Merriam Wester as a trancelike state induced by 'a person whose suggestions are readily accepted by the subject', Hypnosis, 2021). So it is more than fitting that in *Batman Imposters* the imposter-Joker's science-collaborator in laughter-making is called Dr Caligari. This is a reference to the infamous horror film protagonist of the same name who uses a manipulated minion to commit murders in a quintessential Expressionist film from 1920.

As is well known, the iconography of the Joker itself – i.e. his whitened, skull-like face with its exorbitantly overemphasised (painted or flesh-cut) mouth – is based on a film from the 1920s: Paul Leni's *The Man who Laughs* from 1928, featuring Conrad Veidt as a travelling comic performer who bears a hyperbolic, permanent grin (Spear 1999, 40; cf. Andrae 2011, 70). The Joker character thus shares the visual style – 'if not a cultural background' (Brooker 2000, 49) – of Hollywood films from the late 1920s and 1930s; it has also been associated with German Expressionist cinema. Jerry Robinson, one of the Joker's creators, was inspired by Robert Wiene's *The Cabinet of Dr Caligari* (Prawer 1980), F.W. Murnau's *Nosferatu* (1922) and Fritz Lang's *Metropolis* (1926), and went to see such Expressionist films together with his colleague, Bill Finger (Couch 2010, 8, 9, 36, 47). Robinson remembered: 'Bill loved German Expressionist movies, and I fell for them, too.' (36) Many of these internationally highly influential films, whose aesthetics drew heavily on visual arts, featured artificial painted sets, extreme, wry angels and reversed perspectives, as well as an array of equally extreme and visually stunning characters. According to Christopher Couch, 'the exaggerated nature of the characters in these films' inspired the young creators of comic book stories to bring to life 'distorted, carnivalesque villain[s]' such as the Penguin or Scarecrow, characters 'who would not have been out of place in the classic Tod Browning film *Freaks* (1932)' (50).[5] And, we can add, the science worlds of the Joker also show traces of these carnivalesque villains.

What the abovementioned films from the 1920s have in common is, firstly, the thematic concern with the anxiety over being governed by an outside force – the loss of agency and autonomy of the self, body and mind (e.g. through hypnosis-like modes of control). Secondly, they all revolve around prominent medical references to conditions and disorders such as somnambulism and hysteria. Thirdly (and most notably for *Caligari* and *Nosferatu*), they share 'a highly stylized performance style, reminiscent of cabaret and music hall performances' (Maude 2014, 46). The first two aspects resurface in the science practices of the Joker – himself a descendant of a specifically violent circus tradition (on his relation to popular entertainment, see Jürgens 2014, 2020a/b) – as a closer look at the *Caligari*-Joker and *Metropolis*-Joker connections can illuminate.

The Joker's scientific ventures are reminiscent of the manipulative machinations of the fairground showman, imposter, charlatan, psychiatrist and (mad)[6] scientist, Dr Caligari, who does not only explore the effects of hypnosis but uses his mental, hypnotic powers and malevolent authority to turn others into murderous instruments of his will. Revolving around the possibility of implanting the idea to perform a criminal action in a hypnotised person, the *Caligari* film appropriated a lively scientific and cultural discussion about the unlimited power of suggestion, or 'mental contagion' (Andriopoulos 2008, 53), which was a fiercely debated and enormously popular topic in turn-of-the-twentieth-century medicine, law, literature and, a bit later, film. As shown in detail by Anton Kaes, Caligari was modelled on Jean-Martin Charcot (1835–1893) – foremost psychiatrist of the time and director of the Salpêtrière hospital, the premier insane asylum of Paris – who was interested in finding scientific explanations for the phenomenon of 'possession', and experimented with somnambulism and hypnotism. Charcot (and others) studied hypnosis as both a cure for nervous illness and hysteria, and as its cause (see Smoodin 2015, 62). And, hysteria was in vogue.

Hysteria was perceived as a behaviour exhibiting bodily expression of intense emotion, ecstasies and hallucinations with dramatic gestures and excessive muscular movement – including jerky motions and acrobatic convulsions (see Cole 2016, 6). The 'strange spectacle' of hysterics, as it was called by contemporaries (Andriopoulos 2008, 13), was presented by Charcot as a sort of scientific entertainment; Charcot displayed his patients – hysterics in particular – to audiences as part of his infamous, theatrical public lectures in a five-hundred-seat amphitheatre, 'a circus-like setting' (Kaes 2009, 63; see also Andriopoulos 2008; Cole 2016). While attracting 'the entire Paris intelligentsia, including Henri Bergson, Sarah Bernhardt, Émile Durkheim, Guy de Maupassant, and in the winter of 1885–86, Freud' (Kaes 2009, 63), some critics took issue with the theatrical exhibition of (performing or staged?) mentally ill patients, denigrated Charcot as a showman and quack, and called his work 'hystericulture' (63 [quoting Bernheim]). It is not only this ambivalence of the psychiatrist as both scientist and showman that finds its echo in the eponymous hero of *Caligari* but also the attributes of hysteria: 'extreme agitation and exaggerated gesticulation, contortions, convulsions, languor, delirium, and stupor – the full range of symptoms recorded in Charcot's iconography of hysteria and madness' (64). 'Hystericulture' also finds its echo in Joker science.

Joker blends key characteristics of Caligari – his ambivalent role as master manipulator, scientist and entertainer – and takes them to new extremes; he exerts his indirect agency on the 'possessed' bodies of his instruments of mayhem, predatory *doppelgangers* of the violent clown, not by means of hypnosis but by means of chemical and biological

science. Like Caligari's machinations, Joker's science-induced dominating influence – his science-based 'hypnotic suggestion' – manifests in his minions in contortions, laughing spasm and other hysteria-like physical reactions. Those affected by Joker science thus bear an uncanny resemblance to Cesare, Caligari's hypnotised, strangely moving instrument of murder; they are likewise as much horrific murderers as innocent victims. And maybe that is why the Joker is such a favourite pop cultural nightmare: because, like Caligari, he exerts a hypnotic influence over his spellbound audiences – including us?

But Joker's scientific undertakings (and nefarious jokerised replicas) are also reminiscent of those of outright megalomaniac, obsessed scientists who followed in Caligari's steps on the silver screen, where they build and control dangerous hench(wo)men for destructive purposes – such as Rotwang from *Metropolis*.[7] Rotwang, 'the most influential scientist in the history of the cinema' (Frayling 2006, 60), builds a wicked human machine to get revenge against a rival in love matters, and then embarks on an all-encompassing destruction spree which springs, it seems, from a perverse zest for 'cataclysmic and joyful apocalypse' (66). And it is fascinating that 'the great inventor' in Thea von Harbou's novel *Metropolis* (Von Harbou 2002, 54), on which Lang's film is based, is constantly laughing in his madness. One might be tempted to read the way this mad scientist laughs – 'The noiseless laughter drew back his mouth to his ears.' (54, cf. 59, 60, 211) – and his 'strong white teeth and [his] jaws of the beast of prey' (57) as blueprints for the iconography of Joker's bestial, cannibalesque, ear-to-ear smile (see Jürgens 2014, 2018).

However, it is not just the mad scientist's look and 'sheer devilment' (Frayling 2006, 66) that re-emerge in Joker stories such as *Batman Volume 7*: *Endgame* (Part 2), in which Joker initiates the outbreak of an airborne virus in Gotham City – a virus that spreads *like* and *through* laughter[8] – but also his peculiar position between science and occultism. Both Rotwang and the *Endgame* Joker characters embody a kind of gothic grain that has grown with the modern age. In von Harbou's novel *Metropolis*, Rotwang lives in a house 'stronger than the centuries' (Von Harbou 2002, 48), older than the town, and '[m]any said that it was older, even, than the cathedral' (47).

> Set into the black wood of the door stood, copper-red, mysterious, the seal of Solomon, the pentagram. It was said that a magician who came from the East (and in whose track of the plague soon followed) had built the house in seven nights. (47)

> It was as though the plague that had followed the path of the red shoes of the magician still crouched in the corners of the narrow house, springing out at men from behind to seize them by the neck. They died, and no doctor knew the illness. [...] It was a place so forbidding that even though it was in Metropolis – for the most part a city of reasoned, methodical hurry – there were many who would rather go far out of their way than pass Rotwang's house. (48)

In other words, in *Metropolis*, modernity is unable to 'repress' the subliminally magical and pathogenic house – and underbelly – of the mad scientist (see Frayling 2006, 60). Quite similar, the Joker in *Endgame* is embodying unprecedented science and 'mysticism'; he is the most recent incarnation of an antediluvian supernatural creature with 'the biology of an undead' and the creator and source of a never-seen biochemical substance. Joker carries the essence of a supernatural virus in his more-than-biological body – a so-called 'chemical compound' that, as his scientist-ally explains, has 'existed in

nature long ago' and that can activate 'just the right genes': ' . . . the same ones we tinker with endlessly. Lin28. AMPK . . . The matrix that controls how our bodies repair themselves' (Snyder and Capullo et al. 2015).

Here, plausible-sounding but impossible or even absurd representations of cell biology and virology are amalgamated with mythopoetic fantasy. The names of real genes are used and their known functions are not incompatible with the their fictional use: Lin28 is one of a handful of factors that together de-programme cells back to an embryonic-like state with the potential to self-renew and be pushed to produce almost any other type of cell. AMPK is linked to long life due to increasing the capacity of cells to cope with adverse conditions. In experimental molecular biology and increasingly in medicine genes can be used to make changes to cell behaviour or to treat disease. However, these are not used as chemicals, rather their code is delivered such that the final biologically active molecule is made by the cells themselves. At present, the use of such methods in medicine remains limited to replacing faulty or missing genes to correct inherited diseases. The Joker virus in *Endgame* thus seems to be inspired by the use of viruses as vectors (a Trojan-horse-like use) to deliver genes as in these real-world applications of gene therapy. However, the payload is not designed to heal, but to harm and viruses are used to deliver genes and not chemical compounds.

In the comic book story, the mysterious chemical compound that is extracted from the Joker and forms the core of the virus is dubbed 'Dionesium' after the Greek god Dionysus. This is an ingenious choice of name, because the cultural, 'classical predecessors' of the clown include not only 'the satanic clown Mephisto' but also, indeed, Dionysus (Riggan 1981, 98). While there is a connection between *Metropolis*'s Rotwang and medieval and Renaissance-era magic, occultism and alchemy, Joker is linked to a Greek god who, in ancient times, was the source of both ecstasy and terror – a god for whom ecstatic worship was a requirement: 'those who resisted him would be driven mad and forced to destroy their own children' (Ehrenreich 2007, 33). Itinerant charismatics, serving as healers, seers and wandering magician-priests, capable of inspiring 'hysteria' in their devotees and curing the sick by drawing them into ecstatic dances – 'which may well have been effective in the case of psychosomatic and mental illnesses' (40) – have been pointed to as a possible historical basis for the Dionysian rite and the god himself (40). Thus, in *Endgame*, by means of science Joker not only 'plays' god like Rotwang and mad scientists of his ilk (Frayling 2006, 107) but is perceived as a kind of god himself.[9]

Using science to manipulate others into crimes, exploring the corruptible condition of subjective identity, inspiring ecstatic out-of-control mental states, forged on the loss of (bodily) control or controlling others from afar, Joker's science realm encompasses many characteristics of stereotypical 'mad science' (see Haynes 2017) – as 'a mad scientist typically turns the body into a piece of artifice, making of it not something to be desired but something from which we almost instinctively recoil' (Telotte 1995, 73). Although Christopher Flayling's provocative statement that '[w]itches had pointy hats and broomsticks: scientists have physical disabilities instead' (26) can hardly be directly related to the Joker, within the cultural representation of 'mad science', Joker's outward, visible signs of difference – his ultra white skin, too large or too many teeth, and grotesque facial expression (potentially caused by a chemical accident) – signal separateness from other human beings. This also suggests a further reading – one of symbols of warped mental powers and loss of touch with humanity. In the tradition of Rotwang's metal hand (a

result of a science accident), Dr Strangelove's gloved hand and later Dr No's black prosthetic hands (the list of prosthetic mad scientists is long, see Frayling 2006), Joker's extravagant physiognomy indicates a morally twisted character.

In accordance with its Expressionist pedigree and cinematic tradition, Joker science can be read as a parody of a type of science (or imagined process in the scientific endeavour) that we fear – a 'mad science' that explores our ambivalence about power over the body and is not constrained by ethics, morals or societal norms. But Joker's association with science also goes beyond the stereotypical cultural trope of the mad scientist, as described by Haynes (2017) and others. Joker can not only 'reprogramme' physiological expression into hysterical states by means of cleverly mixed chemical substances, as shown above, but he also 'goes deeper' and can do some reprogramming on the molecular level by mixing ([poisonous] stuff from) *himself* into the plot. In the story 'The Clown at Midnight', for instance, Joker's blood turns out to be toxic for blood-sucking insects: 'The mosquito, meanwhile, gets the message, shudders and falls from the Joker's hand. Blind and crippled, it spins in circles on the radiant floor, choking on tainted blood' (Morrison, Van Fleet, and Kubert et al. 2014). Joker is even the enemy of our usual biological enemies – his toxin perverts or destroys not only people but their entire ecosystem. Not surprisingly, the Joker is frequently compared to infectious diseases.

The Making of Joker Science: Being the Pathogen

Staff of the psychiatric hospital-prison Arkham Asylum slam 'the door behind [the Joker], as quickly as they can, the way you would if you thought something might escape in the form of a cloud of evil gas if you didn't act fast to trap it.' (Morrison, Van Fleet, and Kubert et al. 2014) Joker here, it seems, is linked to the 'miasma' theory of disease that predated modern ideas of germs. In other stories, Joker is 'a **disease**', 'like a one-man **plague**!' (O'Neil et al. 2020b, 79) – which reminds us of the abovementioned dark underbelly of Rotwang's science and its association with plagues. 'Everything he touches is corrupted' (Lemire, Sorrentino, and Bellaire 2020). But the Joker is not only a malady and carrier of viruses, a sort of insecticide, inverted vampire or parasite (see Englehart et al. 2020, 114). As discussed earlier, in *Endgame* Joker *is* the virus. The chemical compound at the core of the virus that Joker creates in this story 'isn't anything [a scientist] could make in a lab' (Snyder and Capullo et al. 2015). The special 'substance in the virus, it's from **him**' – the Joker – 'from his spine' (ibid.). By providing, and being, the essence of a science, this Joker version represents both the potentialities of science (developing a new, yet-to-be-created 'regenerative science'), and a counterpoint to the endeavour of science to fathom the unknown: this Joker is the obscure, primordial unknown (or occult), a part of the natural world that seems inaccessible to purely rational minds and that is associated with a (futuristic) idea of science as a return to the repressed and forbidden energies of the past. Caligari, Rotwang and their many progenitors – which include the alchemist Coppelius from E.T.A. Hoffmann's short story *The Sandman* (1817) and Shelley's *Frankenstein* (1818) – are the Joker's distant relatives. Like them, he is a 'primitive bogeyman and pioneering man of science' (which is what Webber called Coppelius; Webber 1996, 148).

But even beyond the *Endgame* story, bodily fluid (mostly a component of blood) from the violent clown – more than once called 'Joker serum' (see e.g. 'The Cross Country Crimes!' [Batman #8], 11) – is an essential component of Joker science; it is the basis of various chemicals, pathogens and the ingredient of biochemical weapons. And yet again things get scientifically messy and turn into congeries of pseudo-scientific medical fantasies when victims of Joker venom – in the form of a 'laughing drug' (causing laughter when confronted with horror, violence and death) – are injected 'with the **antidote** to the **Joker's** serum' ('This one'll kill you, Batman!' [Batman #260], 75). This antidote, created by a scientist and Batman-ally, is supposed to be a mystery, but we can surmise that it must be something like liquefied jokes or a concentrate of the truly funny in drug form, because it can be tested on bad jokes; if the poisoned person does not laugh, the cure is a success. In the 2016 story *Superman: Emperor Joker*, such absurd science – or science-sounding nonsense – is even taken a step further when Joker gains most of the powers of the fifth-dimensional imp, Mr Mxyzptlk. Joker thus becomes the Emperor of a topsy-turvy universe, in which Superman (commonly known as a superhero) is a hunted villain, and a science spaceship and '**science miscreants reconstruction center**' (the S.S. Arkham) is called 'The U.F.O of irrationality!' Interestingly, Superman is diagnosed with rationality and logic by Joker's scientific staff 'and – >Gasp!< – **scientific reasoning**!' – and thus dubbed a pervert (Loeb et al. 2016).

'How many times has someone been "jokerised" and driven mad?' – Conclusion

'Science and entertainment represent two of the most powerful cultural institutions that humans have developed to understand and explore their world' (Kirby 2018, 1). Popular cultural products, including fictional films and comic book stories, reflect our cultural ideas about science – but also construct perceptions for both the public and scientists in a mutual shaping of science and culture (see Kirby 2008, 44). What can we learn through Joker stories – and *Joker science* – about our cultural ideas or cultural meanings of science?

In many ways, the Joker is a creature not only of homicidal but also of gothic, occult and absurd science – whether through his biochemical make-up, his use of science for malevolent purposes, by being his own chemistry kit[10] with 'whatever's in that clown's blood' (Snyder and Capullo et al. 2015) or because he is an avid consumer of his own chemical experiments; 'the Joker's immunity to poison concoctions that might kill another man in an instant has been developed over years of dedicated abuse' (Morrison, Van Fleet, and Kubert et al. 2014, 8). Joker is a twist on the mad scientist. He is not an intellectual caught up in abstractions, nor is his engagement with science for money and fame (cf. e.g. *Jurassic Park*); he is not interested in discovering the secrets of the universe, of life and death (cf. *Frankenstein*), nor is his aim to harm humanity per se (cf. *The Mask of Fu Manchu*).[11] Joker does not act in the name of national security (cf. *Dr Strangelove*) nor for the sake of pure scientific experimentation (cf. the *Re-Animator* film series). Rather, Joker science is all about Joker's egocentric sick gratification and perverse, antisocial entertainment. This is why his science can be called *psychopathic*. Moreover, Joker science topples logic and common sense, and is highly stylised; it is ostentatiously presented (as a 'show' of sorts, featuring 'props' like poisoned cigars), striving for effects

(by being 'expressed' in facial contortions) and creates an overwhelming impression in the baffled spectator (whether Batman or us), which is why – using a term from art history that perfectly sums up these qualities – it can be called *mannerist* (see Jürgens 2020c).

Psychopathic, mannerist Joker science is the science of a carnivalesque science villain: a diabolical showman and chemist, master manipulator and virologist, psychologist-tinker and charismatic occultist. Joker science is intrinsically linked to the realms of hypnotism, hysteria, ecstasy and the 'hysterical realities' (Gangnes 2017, 511) of different historical, physical, medial and cultural settings. Thus, Joker science is not only about how chemistry and virology *might* affect the human body, but it also explores notions of possession and control – contemporary notions of what was once investigated as 'criminal suggestion' or 'hypnotic crimes' on science stages and in early film. Joker science 'jokerises': it leads to loss of motor control, muscular contortions, cramps, fatal convulsions and frenetic, deadly laughter, reminiscent of the 'strange spectacle' of hysterics and the 'science performances' and 'hystericulture' developed by the showman and researcher Charcot and his many fictional revenants, all characterised by a peculiar position between science, entertainment and the occult. As a form of indirect agency, Joker science is a corrupting and desensitising means of depersonalisation that can be read as a commentary on the history of psychiatry (and its theatricality), the fear that identities can be absorbed by a foreign power and the terrifying notion of murder committed against one's will. The sheer popularity of the Joker (and its science narratives) is testament to the fact that these topics that pervade(d) the domains of science, fiction and film are anything but outdated and irrelevant today.

Finally, while the question 'How many times has someone been "jokerised" and driven mad?' (Images" (from Batman: Legends of the Dark Knight #50, September 1993) 2020) can hardly be answered, 'the scientist' is just one of many Joker iterations, as Batman aptly explains in 'The Clown at Midnight': '*He has no real personality, remember, only a series of "superpersonas"*' (Morrison, Van Fleet, and Kubert et al. 2014). The Joker's scientist-superpersona is that of a charismatic leader, who evokes (and throws into question?) the powers exerted by absolute authority (at least as long as Batman does not interfere). Ultimately, it seems there is only one way to really understand this violent clown: you must become the Joker. Ha.

Notes

1. All emphasis in this and the following quotes is taken from the original texts which often do not have page numbers. Authors are fully aware that it is insufficient to reference the authorship of comics with only one or two names as it is common in academic writing, as each comic is the result of the talent and hard work of many people. Space does not allow us to include all writers and artists – colourists, letterers, cover-artists, co-authors and many more. . Further information about the comic book artists referred to in this paper can be found at www.comics.org.
2. Co-authored between Anna-Sophie Jürgens, Anastasiya Fiadotava and David C Tscharke for a forthcoming edited collection on humour (currently under review). This paper also adds to the article 'Spreading Fun: Comic Zombies, Joker Viruses and Covid-19 Jokes' (by the same authors plus John Noel Viaña), in press with the *Journal of Science & Popular Cultures*.

3. The Joker is widely known as the most popular supervillain in the DC universe. Two major Academy Awards are associated with the Joker (for Best Actor/Best Supporting Actor – Joaquin Phoenix, Heath Ledger) and in 2019 the character became the eponymous hero of the world's highest-grossing R-rated motion picture (with eleven Oscar nominations).
4. 'You must become Caligari' was the suggestive slogan that, advertised all over Berlin, helped get curious people into the theatre to watch *The Cabinet of Dr Caligari* in 1920.
5. For another example, see e.g. the abstract urban landscape in the background of the Detective Comics #62 cover (from April 1942), which resembles a movie set from a German expressionist film (Couch 2010, 56). Cf. the more recent DC 'German cinema trilogy', including *Superman's Metropolis* (1996) and *Batman: Nosferatu* (1999), in which the universes of the historical *Metropolis, Caligari* and *Nosferatu* films are brought together in a visually impressive way.
6. On the history of the film's framing story and its impact on the scientist's in/sanity, see (Robinson 2013).
7. Rotwang is not the only mad scientist descendent from Caligari, also 'Karloff's performance was not without its precedents [. . .]. Its make-up in *Frankenstein* occasionally reminds us of Cesare's in *Caligari*' (Prawer 1980, 28).
8. For more detail see our discussion of 'Joker virology' in the abovementioned forthcoming book chapter ('The Cheshire Clown: Joker's Infectious Laughter'). For the sake of completeness, it should be noted that viruses also appear in the Batman universe *without* the Joker, see e.g. *All-Star Batman Volume 2: Ends of the Earth* (2018) or *Batman Contagion* (2016).
9. Given its propensity for violence and destruction, it seems only logical that he is placed in a row with Shiva: 'a diseased demon jester from a negative world beyond all human laws, tuned to frequencies so fast and so hot that the skin of his brain feels like it's 8:15a.m. at ground zero in Hiroshima.' (Morrison, Van Fleet, and Kubert et al. 2014)
10. Or futuristic biotech kit: In the animated film *Batman Beyond: Return of the Joker* (Curt Geda, 2000) the Joker overcomes bodily decay by mastering futuristic biotechnology and encoding his DNA and consciousness on a genetic microchip that he implants in another person, who slowly turns into a Joker replicate – yet another way of how the Joker repopulates the world in his own image.
11. However, like Joker, the infamous Dr Fu Manchu (Boris Karloff) in Charles Vidor's 1932 *The Mask of Fu Manchu*, who develops a death-ray to harm humanity, also mixes his own blood into his science through which he can control others: 'This serum distilled from dragon's blood, my own blood, the organs of different reptiles and mixed with the magic brew of the sacred seven herbs will temporarily change you into the living instrument of my will. You will do as I command!' (May 2018, 143)

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published her first paper on the Joker in 2014 (with the *Journal of Graphic Novels and Comics*) and has recently added several new publications to her 'clowniverse' (on technology in Batman stories, mannerist Joker Science in animated film, and the origins of Arthur Fleck's 'pathological dancing').

David Tscharke began his research career at the University of Adelaide and IMVS in Adelaide, studying interactions between the immune system and herpes simplex virus (HSV, the cause of cold sores). After gaining his PhD he worked in postdoctoral positions at Oxford University and then Imperial College London in the UK, working on projects related to viral pathogenesis and vaccine design. Following this, he moved to the US National Institutes of Health (Bethesda, MD) where he focused on understanding how the immune system recognises viruses and vaccines. He then returned to Australia, working first at QIMR in Brisbane, before starting his own lab and taking on undergraduate teaching in the former department of Biochemistry and Molecular Biology at the ANU in 2006. Since then he has received a Young Tall Poppy Award and has held an NHMRC Career Development Award and ARC Future Fellowship. In 2016, he moved his laboratory across campus to the John Curtin School of Medical Research (JCSMR) and took up an NHMRC Senior Research Fellowship. Since mid-2017 he has been Head of the Department of Immunology and Infectious Diseases at JCSMR. Throughout his career he has had the benefit of working with excellent mentors, generous collaborators and brilliant students. His current research combines all the themes he has developed throughout his career, from understanding the dormant phase of infection with HSV to gaining new insight into the way our immune system recognises and responds to viruses and vaccines.

Jochen Brocks, from the Research School of Earth Sciences at the Australian National University, calls his field of research 'Paleobiogeochemistry' as he is fascinated by biological processes in deep time from the origin of life to mysterious ecosystems in Earth's earliest oceans, and events that may have spawned the evolution of complex multicellular life. To find clues about ancient ecosystems, he studies molecular fossils of biological lipids (biomarkers) that can be preserved in sedimentary rocks for billions of years. Currently he and his students investigate the question why large, multicellular and active creatures appeared on Earth some 600 million years ago, and whether ancient oceans harboured a lost world of complex life that left no traces . . . . . possibly apart from a few obsolete molecules.

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