Screaming When There is Sound in Space: Unrealistic Science and the Reception of Narrative Fiction

A thesis submitted for the degree of Doctor of Philosophy of The Australian National University

By

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Declaration

This thesis is my original work completed between March 2013 and December 2016. I personally completed all of the data collection, transcription, analysis, and writing described herein. To the best of my knowledge, this thesis contains no material previously published elsewhere, except where acknowledgement is made in the text. No part of this thesis has been previously submitted for an educational qualification at any university.

A preliminary version of Chapter 6 was presented as a paper titled, “Who screams when there’s sound in space? Why audiences discuss unrealistic science in fiction,” at the March 2016 Popular Culture Association/American Culture Association (PCA/ACA) National Conference, Seattle, Washington. I was the sole author and presenter.

Jarrod L. Green

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When a work is acutely consonant with the facts which it adduces, it is praised for fidelity; when it lapses from its claims, the idea of infidelity is held to be farcically solemn and inadmissible. This is not criticism but public relations.

Christopher Ricks, “Literature and the matter of fact,” 1996
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Abstract

Sound in space. Featherless dinosaurs. Physics-defying stunts. Unrealistic science in fiction is often the subject of commentary and critique. Existing audience research on science in fiction focuses on the possible effects of unrealistic science on the audience; however, there is limited research investigating how the audience evaluates and discusses unrealistic science.

This thesis reports on the outcomes of an audience research project investigating the role of unrealistic science in the reception of narrative fiction. Qualitative data drawn from focus group discussions and interviews with 55 participants were used to explore why the realism of science in fiction can be personally important to the audience, when the realism of science in fiction is most relevant to aesthetic evaluation, and what motivates audiences to discuss the realism of science in fiction.

Participants reported scientific realism to be personally important for its effects on the narrative experience, its effects on the evaluation of narrative as rhetorical communication, its effects on perceived authorial respect for science and the reader, and its perceived effects on the public’s understanding and support of science. These findings illustrate how a concern with scientific realism can be both a routine and deeply personal aspect of responding to science-themed fiction.

The aesthetic acceptability of unrealistic science depended on four key principles of aesthetic evaluation: subservience (unrealistic science is acceptable because it is subservient to the narrative's aesthetic goals), satisfaction (unrealistic science is acceptable because the narrative is aesthetically or ideologically satisfying), salience (unrealistic science is acceptable because it is unimportant to the narrative or to the audience), and severity (unrealistic science is acceptable because it is an understandable or innocuous error). The framework introduced in this study provides a catalogue of evaluative moves that audiences may deploy in response to unrealistic science and serves as a tentative guide to predicting when unrealistic science is aesthetically acceptable.

Discourse about the realism of science in fiction served nine self-reported functions, including catharsis, critique, conciliation, continued engagement, curiosity, communication, change, competence, and connection. These self-reported functions underpin three latent discourse functions identified in previous research. Discourse
about scientific realism is a form of boundary work that not only maintains the epistemic authority of scientists (credibility) but also asserts authority over public discourse about socio-scientific issues (control). Furthermore, by highlighting media effects concerns, this discourse may perpetuate and legitimise the practice of blaming fiction for public opposition to science and technology (concern). The framework introduced in this study highlights how discourse about scientific realism can serve diverse functions for diverse audiences. Any audience can participate in and benefit from discourse about scientific realism. However, the benefits and rhetorical affordances of this discourse are ultimately most accessible to audiences with self-assessed scientific competence.

This study contributes to science communication and audience reception research by introducing new frameworks for understanding how audiences evaluate and discuss unrealistic elements in fiction. These frameworks can inform science communication practice as it relates to the production and reception of narrative fiction.
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1. Introduction

1.1 The research problem

In March 2013, director Colin Trevorrow publicly announced that *Jurassic World* (2015), the fourth film in the *Jurassic Park* (1993) series, would not include feathered dinosaurs. Trevorrow made the announcement on Twitter, stating simply: “No feathers. #JP4.”¹ The decision to omit feathers meant that the visual representation of dinosaurs in *Jurassic World* would remain consistent with the original *Jurassic Park*, but it would contradict more recent scientific developments showing that many theropod dinosaurs had feathers (e.g., Norell & Xu, 2005). The response on social media was swift. Some commentators lauded Trevorrow’s commitment to the earlier films while others condemned what they perceived to be an unrealistic representation of dinosaurs. The response to Trevorrow’s tweet prefigured the response to *Jurassic World* as a whole. The release of the film in June 2015 was accompanied by prolific commentary on the realism of the film’s dinosaurs. This commentary spanned mainstream news outlets and blogs, examining virtually every aspect of the film for its consistency with current paleontological science (e.g., Long & Robinson, 2015; Phillips, 2015). As much as plot or characterisation, the realism of the scientific content in *Jurassic World* was a focal point in the film’s reception.

The response to *Jurassic World* is an illustration of a broader phenomenon in the reception of narrative fiction. The realism of science in fiction is often the subject of popular discussion. The reception of other recent fiction films, such as *The Martian* (2015), *Interstellar* (2014), and *Gravity* (2013), was also characterised by a concern with scientific realism. In the case of *The Martian*, commentators highlighted the implausibility of the sandstorm that causes the film’s protagonist to be stranded on Mars (e.g., Fecht, 2015). For *Interstellar*, commentators questioned the protagonist’s improbably safe journey to the centre of a black hole (e.g., Kluger, 2014). In *Gravity*, it was the depiction of gravity itself that attracted the ire of scientifically minded viewers (e.g., Child, 2013). Among these criticisms and others, commentators also found much to admire in these films. Discourse about the realism of science in fiction can entail praise as well as criticism.

¹ https://twitter.com/colintrevorrow/status/31438473410985217
A concern with scientific realism is not limited to science fiction or science-themed fiction, as the above examples might suggest. This concern extends to diverse forms of science and diverse forms of fiction. Writing in *The Guardian*, Hone (2016) asks whether the dragons in the television adaptation of *Game of Thrones* (2011–) could actually fly; writing in *The New York Times*, Rabin (2012) takes issue with the comedy drama *Girls* (2012–2017) for its representation of health information relating to the human papilloma virus; and also writing in *The New York Times*, Keltner and Ekman (2015) examine the psychological science of *Inside Out* (2015), an animated film depicting personified emotions for which they served as science consultants. Commentary on scientific realism follows fictional science across genres and narrative forms.

The foregoing examples are all recent fiction texts, but discourse about the realism of science in fiction is not a recent phenomenon. Perhaps the most famous example comes from the nineteenth century where George Henry Lewes criticised Charles Dickens for the implausibility of spontaneous human combustion in *Bleak House* (1852–1853). Lewes proclaimed that not one “eminent organic chemist” of the day would credit spontaneous combustion, demanding that Dickens acknowledge the scientific implausibility in a preface (cf. Haight, 1955). Dickens was not the only nineteenth century novelist to be held to account for unrealistic science. In his biography of George Eliot, Haight (1968, pp. 446–447) describes how Eliot received a letter from a surgeon who observed that Eliot’s representation of opium consumption in *Middlemarch* (1871–1872) was unrealistic. The surgeon advised Eliot that opium would cause the pupils to contract rather than dilate. As these examples illustrate, discourse about scientific realism is not a manifestation of contemporary cultural criticism. Audiences were penning their objections to unrealistic science in fiction long before the advent of Twitter or blogging.

Despite representing an enduring feature of the reception landscape, the role of unrealistic science in the reception of narrative fiction has largely escaped scholarly attention. Participant-based research on science in fiction often focuses on the possible effects of fiction on audience beliefs, attitudes, intentions, or behaviours with respect to science and scientific issues (e.g., Barnett et al., 2012; Barriga, Shapiro, & Fernandez, 2010; Dudo et al., 2010; Li & Orthia, 2015; Lowe et al., 2006; Morgan, Movius, & Cody, 2009; Shelton, Kim, & Barak, 2006; Szu, Osborne, & Patterson, 2016; Tan, Jocz, & Zhai, 2015). Some research has examined how the realism of fictional science is negotiated during the production of films and television shows (Frank, 2003; Kirby, 2003a, 2003b, 2010a, 2013), but there is little research investigating what motivates audiences to discuss unrealistic
science in fiction and how they evaluate unrealistic science aesthetically. I seek to address this gap. To adapt a phrase from Katz (1959), rather than asking what unrealistic science does to the audience, I am interested in what the audience does with unrealistic science. What are audiences doing when they are discussing, critiquing, and praising the realism of science in fiction? What functions does this discourse serve? Furthermore, rather than asking what effect unrealistic science has on the audience’s scientific knowledge, I am interested in what effect unrealistic science has on the audience’s enjoyment or appreciation of the fiction they consume. Although there are prescriptive and theoretical accounts of when realism matters in narrative fiction (Hazlett & Uidhir, 2011; Mole, 2009; Richter, 2005; Ricks, 1996; Rowe, 1997; Ryan, 2009), I am not aware of any audience research examining how audiences evaluate unrealistic science aesthetically.

Understanding how audiences evaluate and discuss unrealistic science in fiction is important for several reasons. Effects-based research on science in fiction tends to conceptualise the audience as non-scientists, but in my research, I conceptualise scientists as part of the audience. Beyond the potential effects of unrealistic science on the audience, it is important to recognise that discourse about unrealistic science also serves particular functions and interests. Previous studies have highlighted how critiques of fictional science can be used to delegitimise public concerns about science (Kitzinger, 2010; Von Burg, 2005) and maintain the credibility of the scientific community (e.g., S. A. Cole, 2015; Mellor, 2003). I build on this research by investigating audiences’ self-reported motivations for discussing unrealistic science in fiction. By understanding the communicative goals that motivate discourse about fictional science, it becomes possible to further recognise who stands to benefit and who stands to lose from a reception context that emphasises the realism of science in fiction.

Understanding the role of unrealistic science in the reception of narrative fiction also has implications for science communication practitioners. Scientists sometimes act as science consultants during the production of films and television shows (cf. Kirby, 2010). Various initiatives now exist to connect fiction creators with scientists, including the Science and Entertainment Exchange\(^2\) and the Hollywood Health and Society\(^3\) program. Indeed, scientists sometimes create fiction themselves (e.g., Jennifer Rohn, Susan Greenfield, Carl Djerassi, and Isaac Asimov). Determining how audiences evaluate

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\(^2\) [http://www.scienceandentertainmentexchange.org/](http://www.scienceandentertainmentexchange.org/)

\(^3\) [https://hollywoodhealthandsociety.org/](https://hollywoodhealthandsociety.org/)
unrealistic science aesthetically may inform creative decisions during the production of narrative fiction. Science consultants who wish to influence the representation of science in a text may be more persuasive if they can present their recommendations not just in terms of what is scientifically realistic but also in terms of what audiences are likely to deem aesthetically acceptable.

In addition to influencing the production of fiction, scientists and science communicators also use examples from narrative fiction to communicate science. Scientists and science communicators use fictional examples in public lectures, panel discussions, blog posts, magazine articles, and so forth (e.g., Wellcome Trust, 2016). Popular science books also use fictional texts as a hook, as demonstrated by titles such as *The Physics of Star Trek* (Krauss, 1995), *The Physics of Superheroes* (Kakalios, 2009), *The Scientific Secrets of Doctor Who* (Guerrier & Kukula, 2015), and *The Simpsons and Their Mathematical Secrets* (Singh, 2013). Furthermore, some teachers use fictional texts to teach science in a formal education setting (e.g., Barnett & Kafka, 2007; Liberro, 2004; Vrasidas, Avraamidou, Theodoridou, Themistokleous, & Panaou, 2015). By investigating how discussions of scientific realism are used and received in a social context, my research highlights potential risks of using fictional examples in science communication, but it also suggests strategies for minimising those risks.

Finally, my research contributes to our understanding of fundamental reception processes. As Ryan (2009) argues, fictional narratives are characterised by a tension between realism and the “tellability of extraordinary events” (p. 72). My research helps us to understand how audiences navigate this tension in their responses to narrative fiction. Although my research is concerned with the realism of science in fiction, it may also provide a framework for understanding the reception of other forms of realism, such as historical realism, or realism in general.

### 1.2 Research questions

In this thesis I explore the role of realistic and unrealistic science in the reception of narrative fiction. In particular, I aim to address the following research questions:

**RQ1:** Why is the realism of science in narrative fiction important to some audiences?

**RQ2:** When is unrealistic science most likely to affect the aesthetic evaluation of narrative fiction?
RQ3: What are the functions of discourse about the realism of science in narrative fiction?

1.3 Research design in brief

In order to investigate my research questions, I conducted an exploratory audience research project. I conducted 10 focus group discussions and 20 semi-structured interviews with a purposive sample of participants who were interested in science, fiction, or both. After transcribing the focus groups and interviews, I analysed the data thematically with respect to each research question. I describe my research methods in detail in Chapter 3.

1.4 Research scope and limitations

I will discuss the limitations of my research where relevant throughout the thesis. However, it is useful to contextualise my thesis with a few preliminary remarks on the scope and limitations of my approach.

Although my research is concerned with how audiences evaluate and discuss unrealistic science in fiction, I am not concerned with how audiences determine what is realistic or unrealistic science. My research takes as its starting point the moment when the audience notices something that they perceive as realistic or unrealistic science. For a review of the psychological processing of inaccurate information, confer Rapp and Braasch (2014).

I did not restrict the scope of my research in terms of narrative media (e.g., novels, films, games, comics, etc.). I wanted to give participants the freedom to speak about whatever examples of narrative fiction were important or familiar to them. My broad scope is also justified by theoretical considerations. In Chapter 2, I will introduce a distinction between story and narrative discourse. In brief, story refers to the events that occur in a narrative while narrative discourse refers to the way in which those events are related to the audience. Although narrative discourse is an important influence on perceived realism, my research is concerned with how readers respond to unrealistic science once it has been identified as such. This makes story—not narrative discourse—the focus of my research. In other words, my research focuses on audience responses to unrealistic story elements rather than the ways in which narrative discourse makes story elements appear more or less realistic. With story as the focus, it is justifiable to think about narrative fiction as a broad category rather than focussing on a single form of narrative.
discourse (e.g., film or novels). Narrative discourse is still relevant to my research (as my discussion of the narrative contract in Chapter 5 will illustrate), but my focus is on story elements in the first instance.

My research seeks to understand the views and experiences of people who share a concern (to some degree) with the realism of science in fiction. I recognise that not all members of the audience share this concern. My research provides qualitative insights into who cares most about unrealistic science in fiction, but a quantitative measurement of the proportion of the audience who cares about scientific realism is beyond the scope of this study.

People who have negligible or no concern with the realism of science in fiction (the “uninterested”) may provide some informative contrasts to the participants sampled in this study. Where relevant, I will discuss how recruiting such participants might be useful for my research. In the first instance, however, the uninterested were not my target population. The most productive and informative insights into my research questions are likely to come from the people who are interested in science, fiction, or both. I therefore prioritised the “interested” group.

Finally, the themes that I report in this study represent a range of qualitatively different forms of participant response. My research methodology does not allow me to make decisive conclusions about the relative prevalence of each theme. The number of participants corresponding to a theme provides a tentative indication of the theme’s prevalence. However, interviews and focus group discussions are dynamic, open-ended forms of data collection. Participants in one session may receive prompts from the interviewer or from other participants that do not occur in another session. The absence of a theme in a given focus group or interview does not necessarily mean that the relevant participants do not endorse that theme or would not articulate it in other circumstances (Braun & Clarke, n.d., "Should I use numbers?"). My sampling method was also non-representative, further limiting conclusions about the relative prevalence of each theme. Determining the prevalence of themes is better achieved using a probability sample and a closed-ended questionnaire with defined response options. My exploratory research provides a foundation for this kind of quantitative research, but such research is beyond the scope of this study.
1.5 Synopsis

My thesis is structured around my three research questions, with a chapter devoted to each. Rather than presenting an overall literature review at the beginning of the thesis, I review literature that is relevant to each research question at the beginning of the corresponding chapter. However, since the concept of perceived realism is common to all of my research questions, I begin the thesis by introducing my conceptualisation of perceived realism along with my definition of science in Chapter 2. This chapter also provides some preliminary terminological clarifications, including my decision to henceforth use the term “readers” to refer to audiences of narrative fiction. In Chapter 3, I describe my research methodology and the characteristics of my sample. This chapter includes a table describing the demographic details of each participant. Since I only describe participant demographics in the text where relevant, this table is a useful reference for readers who wish to find out more about specific participants. I also discuss how I conceptualise theoretical saturation and generalisability. Chapters 4, 5, and 6 address research questions 1, 2, and 3 respectively. Each of these chapters includes an introductory literature review, a description and discussion of my results, and a consideration of theoretical saturation and generalisability. Chapter 7 summarises the key findings of the study, its contribution to science communication and audience research, its implications for science communication practice, and directions for further research. The fictional texts that I refer to during the thesis are presented alphabetically by title in a separate list to my scholarly references.
2. An introduction to the perceived realism of science in fiction

In this chapter I introduce key concepts that I will use throughout my study. I begin the chapter by defining some key terms before providing a detailed introduction to the conceptualisation of perceived realism that informs my work. The chapter concludes with a discussion of what counts as “science” in narrative fiction.

2.1 Definitions of key terms

In this section I will provide definitions for some key terms used in my research. This section is not intended to be an exhaustive glossary. For the most part, I will introduce and define terminology when it is pertinent to the subject of discussion. Nevertheless, in an effort to attenuate the ambiguity associated with some terms, I will begin with some definitions, which are listed here in a logical progression rather than alphabetical order.

2.1.1 Fiction


2.1.2 Text

My research is not limited to a single medium of narrative fiction. I use “text” as a general term for a work of narrative fiction, including but not limited to novels, films, television shows, comics, and games. My usage of the term text is therefore consistent with “a specific work chosen as the object of analysis” rather than “the actual wording of a written work” (Baldick, 2015, “Text”).

2.1.3 Readers and reading

As noted above, my research is not limited to a particular medium of text. I use the term “reading” to refer to the comprehension of a written, visual, or audio-visual text, and I use the term reader to refer to the audience of the text; however, I do so acknowledging
the limitations of this usage. As Bordwell (1985, p. 30) argues, using the term reading to refer to the comprehension of a film overlooks any differences in the comprehension processes associated with different media. I use the term reading for convenience and I do not intend to smooth over such differences. Bordwell also notes that the term reading is ambiguous since a “reading” can refer to a critical interpretation of a text (e.g., a feminist reading). To avoid such ambiguity, I use the term interpretation to refer to a readers’ interpretation of a text.

2.1.4 Authors

In the same way as I use reader as a convenient term for the audience of a text, I use the term author to refer to the creator of a text, acknowledging that some texts, such as films, are collaborative works that may have many creators. Furthermore, I do not make a distinction between the author and what Booth (1961/1983, pp. 70–71) calls the “implied author”; that is, the image of an author that a reader perceives as they read a text. The implied author is the subject of an enduring debate (cf. Richardson, 2011), which I have no intention of resolving here. In short, I take Herman’s (2008) position that if reading involves inferring the intended meaning of a text, it ultimately makes little difference whether intentions are attributed to the actual author or the mediating construct of the implied author; in either case, the intentions of the (implied) author as perceived by the reader do not necessarily correspond with the stated intentions of the actual author.

2.1.5 Narrative: Discourse, story, and plot

I adopt a minimal definition of narrative as the “representation of an event or a series of events” (H. P. Abbott, 2008, p. 13). It is commonplace in narrative theory to distinguish between story (i.e., the events that are related by a narrative) and narrative discourse (i.e., the discourse that relates the story) (e.g., H. P. Abbott, 2008; Chatman, 1978). It is also possible to make a further distinction between story and plot where story relates to a sequence of events existing actually or imaginatively prior to discourse, and plot is the representation of the story in narrative discourse (Chatman, 1978). In general, I use narrative as an umbrella term, but where relevant, I refer more specifically to narrative discourse, story, and plot as defined here.
2.1.6 Story elements: Events and existents

Chatman (1978) argues that all stories consist of events and existents. Events are either “actions” where a character makes something happen or “happenings” where something happens to a character. Existents are either “characters” who perform plot significant actions or “settings” that do not perform plot significant actions. I use these terms in accordance with Chatman, but I also use the term “story element” as an umbrella term for events and existents.

2.1.7 Themes, theses, and ideology

I adopt Beardsley’s (1958) distinction between themes and theses. For Beardsley, a theme is an important idea or concept in a text that can be named “by an abstract noun or phrase” (p. 403). A thesis is a statement explicitly or implicitly communicated by a text that “can be called true or false” (p. 404). For example, “the risks of scientific research” is a theme, whereas “scientific research poses more risks than benefits” is a thesis. It is possible to explore a theme without endorsing a particular thesis, and a narrative may evoke multiple themes and theses. Importantly, themes and theses are products of reader interpretation.

As Chatman (1990) notes, it is also useful “to distinguish between the implication of an ideology and the urging of a thesis” (p. 11). I use the term ideology broadly to refer to “a cohesive set of beliefs, ideas, and symbols through which persons interpret the world and their place within it” (Calhoun, 2002, "Ideology"). Every narrative includes representations of people and places, and these representations may reflect an author’s ideology. The thesis of a narrative may also reflect an author’s ideology, but not every narrative will necessarily be interpreted as communicating a thesis. Representations of gender, sexuality, race, class, disability, place, and so forth can contribute to a narrative’s thesis, and any of these topics may be the subject of a narrative’s thesis. However, the concept of a thesis becomes unworkably broad if every form of representation is construed as a thesis. Having said this, the distinction between a thesis and incidental ideological content is not always clear and this distinction will ultimately be a matter of interpretation. Nevertheless, for the purposes of my research, I make a distinction between the perceived communicative intent of some narratives (i.e., the perceived thesis or theses) and the incidental ideological content that is present in every narrative.
As for themes and theses, the incidental ideological content in a narrative is subject to interpretation.

2.1.8 Discourse

My use of the term discourse is consistent with Potter and Wetherell (1987). Following Gilbert and Mulkay (1984), Potter and Wetherell define discourse broadly as “all forms of spoken interaction, formal and informal, and written texts of all kinds” (p. 7).

2.2 What is perceived realism?

In order to understand the role of realistic or unrealistic science in the reception of narrative fiction, it is first necessary to introduce the concept of perceived realism. The term “realism” has different meanings in different contexts. In this section I will describe how I conceptualise realism in my research and how this conceptualisation relates to other “realisms” described in the literature.

In the first instance, my research is concerned with perceived realism, which is commonly understood as the perceived similarity between “what is portrayed in a text [and] what the [reader] would expect to find in the real world” (Hall, 2009, p. 424). The importance of perception to perceived realism cannot be overemphasised. A given narrative may be perceived as realistic by one reader while being judged as unrealistic by another reader. In this way, perceived realism is a subjective assessment made by a reader rather than an objective quality of a text (Hall, 2009), though in a given time and place there is likely to be a degree of intersubjective agreement over what is perceived as realistic.

There are other related terms that might be used in place of perceived realism in this study, such as mimesis (e.g., Potolsky, 2006), verisimilitude (e.g., Todorov, 1977) or vraisemblance (e.g., Genette, 2001). Like perceived realism, the meanings attached to each these terms may differ. For example, Todorov (1977, pp. 80–88) identifies four different meanings of verisimilitude, one of which corresponds to the concept of perceived realism described above. Therefore, alternative terminologies do not eliminate ambiguity. I prefer the term perceived realism because it is less jargonistic than some alternatives and because it is commonly used in communication research (e.g., Cho, Shen, & Wilson, 2014). Where relevant I will draw on the work of researchers who use
different terminology, but I will use the term perceived realism (or realism for short) in relation to my own work.

With respect to the perceived realism of the scientific aspects of a narrative, the term scientific accuracy is commonly used in popular commentary about science in fiction (e.g., Arridge, 2015). However, I prefer perceived realism to perceived accuracy for two reasons, both of which are highlighted by Kirby (2015). First, the term accuracy can be associated with factual correctness. As I will describe in detail below, factuality is only one of the various dimensions of perceived realism. Second, the term scientific accuracy can imply that science is a “rigid collection of facts” rather than recognising the uncertainty and variability associated with scientific phenomena (Kirby, 2015). Using the term perceived realism avoids both unduly emphasising the factuality dimension of realism and mischaracterising the nature of scientific phenomena.

The construct of perceived realism can be distinguished from the concept of realism as it appears in the philosophy of science and the philosophy of social science. The defining feature of realism in the philosophical sense is “the belief that there is a world existing independently of our knowledge of it” (Sayer, 2000, p. 2). There are various forms of philosophical realism, including naïve realism, scientific realism, and critical realism. Each of these realisms share in the ontological belief of a mind-independent world, but they differ in their epistemological positions with respect to how directly our knowledge of the world represents the real world (cf. Willig, 2013, pp. 15–16). I outline my own ontological and epistemological assumptions in Chapter 3. I will often use the term “scientific realism” to refer to the perceived realism of the scientific content in a narrative; however, this should not be confused with scientific realism as a philosophical position, which is the view that “mature and genuinely successful scientific theories should be accepted as nearly true” (Psillos, 1999, p. xvii). When I use the term realism in this study, I am referring to perceived realism rather than a philosophical position.

Perceived realism can also be distinguished from artistic movements or styles that are associated with realism, such as Victorian realist novels (cf. Levine, 2012) or Italian neorealist films (cf. Ruberto & Wilson, 2007). Although the term “realist” can be used to describe texts belonging to a particular artistic movement or texts exhibiting a particular style (cf. Jakobson, 1987), any text can be assessed for perceived realism, and any text may display a concern with achieving perceived realism. As I will discuss in more detail in Chapter 5, even authors who reject the style of so called “realists” may display an
aspiration towards perceived realism. To be clear, texts belonging to “realist” movements are still within the scope of my research, but this study is concerned with perceived realism rather than realism as a specific artistic movement or style. I will provide a definition of a “realist” text for the purposes of my research later in this section.

So far I have characterised perceived realism as the degree of perceived similarity between the world portrayed in a narrative (i.e., the storyworld) and the real world. However, perceived realism is best understood as multidimensional. Numerous dimensions of perceived realism have been proposed in the literature (cf. Busselle & Greenberg, 2000). For the purposes of my research, I will be adapting the dimensions of realism identified by Hall (2003) in her focus group study of adult television and film audiences. I will begin by introducing Hall’s work before justifying why I regard Hall’s conceptualisation of perceived realism as the most appropriate for my research.

Hall (2003) identifies six different dimensions of perceived realism. The first is plausibility, which relates to whether events or behaviours “have the potential to occur in the real world” (p. 629). The second dimension, typicality, relates to whether events or behaviours are “common among a particular population” (p. 632). If plausibility relates to whether something can happen, typicality relates to its representativeness. For example, it is possible to receive cardiopulmonary resuscitation (CPR) and survive without incident; however, CPR is unsuccessful in most cases (G. K. Jones, Brewer, & Garrison, 2000). The depiction of someone being successfully resuscitated by CPR in a medical drama is plausible but it is not typical. The degree of typicality that is required for an event to be perceived as realistic or unrealistic may vary for different story elements and readers.

It is important to note that typicality exists on a continuum, whereas plausibility is a binary category; that is, an event is either plausible or implausible. In common usage, plausibility may be understood as “seeming reasonable, probable, or truthful” (OED Online, 2017). However, if plausible is understood as probable, the concept of plausibility overlaps with typicality since probable events are typical and improbable events are atypical. As a result, I use the term plausible to mean possible or impossible, whereas I use the term typicality to mean probable or improbable. Indeed, as Hall (2003) herself notes, the dimensions of plausibility and typicality correspond with what Dorr (1983) calls possibility and probability respectively. I will use Hall’s terminology in my research,
but I wish to make it clear that I conceptualise plausibility as a binary variable, whereas I conceptualise typicality as a continuous variable.

Plausibility and typicality are not mutually exclusive dimensions of perceived realism. As such, there is a tension between plausibility and typicality in perceived realism judgements. If an event is plausible but atypical, it is realistic according to the plausibility criterion but unrealistic according to the typicality criterion. One way of resolving this tension is to recognise that perceived realism is a continuous variable overall. In this respect, plausible but atypical events may be relatively less realistic than plausible events that are also typical. Nevertheless, the perceived realism of a plausible but atypical event may depend on the relative importance that a reader assigns to plausibility versus typicality. If plausibility is assigned a greater weighting in perceived realism judgements, then an event needs only to be plausible in order to be deemed realistic. Developmental studies of children and young adults have found that typicality is a more developmentally advanced conceptualisation of realism than plausibility, with typicality entering into realism judgements around the time of adolescence (Dorr, 1983; Morison, Kelly, & Gardner, 1981). However, Dorr (1983, p. 204) found that although adolescents and adults were more likely to use typicality than plausibility when explicitly asked to define what is “real,” they were just as likely as children to use plausibility in their realism judgements during an interview. Typicality may be a more developmentally advanced conceptualisation of perceived realism than plausibility, but adults do not abandon the concept of plausibility altogether. The relative importance of plausibility versus typicality may depend on context.

The third dimension of perceived realism identified by Hall (2003) is factuality, which relates to how well a fictional representation accords with a “specific real-world event or person” (p. 633). For example, one of the participants in Hall’s study regarded the film Schindler’s List (1993) to be realistic because it is based on historical events that occurred during the Holocaust. In this sense, Hall’s conceptualisation of factuality focuses on historical fact. For the purposes of my research, I prefer to define a fact simply as “something that has really occurred or is actually the case” (OED Online, 2017). This broader definition means that the factuality dimension of perceived realism encompasses both historical and scientific fact.

Since my research is concerned with the realism of science in fiction, it is useful to provide a more detailed definition of a scientific fact. I define a scientific fact as a
scientific statement that is provisionally accepted by the scientific community to be true. This definition echoes Latour (1987) for whom facts are statements that have built a network of allies or supporters. When defined in this way, there is some overlap between the plausibility, typicality, and factuality dimensions of perceived realism, since assessing whether something is scientifically plausible or typical will inevitably draw on scientific facts. However, the factuality dimension of perceived realism can capture instances of unrealistic science that might be missed by the plausibility or typicality dimensions. For example, in Lucy (2014), the eponymous protagonist experiences dramatic increases in her intelligence and other abilities after she is exposed to an experimental drug. During the film, a supposedly reputable scientist states, “It is estimated most human beings only use 10 per cent of their brain’s capacity.” In reality, however, humans use their entire brain (cf. Jarrett, 2015). In the film, the “10 per cent” myth is intended to help explain how Lucy experiences such dramatic cognitive improvements; nevertheless, the factuality of the scientist’s statement can be assessed separately to the plausibility of the events in the film. Errors of scientific fact in dialogue and narration can be distinct from the scientific plausibility or typicality of events occurring in the narrative. Although there is some overlap between the plausibility, typicality, and factuality dimensions of perceived realism, factuality remains a useful and distinctive dimension of perceived realism.

The fourth dimension of perceived realism identified by Hall (2003) is perceptual persuasiveness, which is “the degree to which a text creates a compelling visual illusion, independent of the degree to which the content of the text may relate to real-world experience” (p. 637). For example, one of the participants in Hall’s study described how something can look real (e.g., the dinosaurs in the 1993 film, Jurassic Park) even while knowing it isn’t real. Other participants commented on “production” and “production value,” indicating that perceptual persuasiveness is related to the perceived production quality of audio-visual texts. It is important to clarify, however, that perceptual persuasiveness is distinct from the plausibility, typicality, or factuality of a visual representation. In some cases, a visual element in a narrative might not even have a real referent but it may still look real. For example, an alien in a science fiction film may look perceptually persuasive even though there is no real alien (i.e., no real referent) to compare it to. Hall’s participants only discussed perceptual persuasiveness in terms of visuals, but it is conceivable that perpetual persuasiveness might also extend to sounds. Given that Hall’s study was limited to film and television, it is unclear whether perceptual persuasiveness can be extended to the mental imagery or sounds evoked by
written narratives. In any case, the dimension of perceptual persuasiveness usefully highlights how a text might feel experientially “real” even while knowing that what it depicts is implausible.

A similar sense of the distinction between plausibility and experiential “realness” is reflected in involvement, the fifth dimension of perceived realism identified by Hall (2003). Involvement relates to whether a reader can “feel the characters’ emotions or have an affective response to the characters as they would to a real person” (p. 635). For example, one of Hall’s participants described how they regarded the events in Forrest Gump (1994) to be unrealistic but they nevertheless identified with the emotions experienced by the film’s eponymous protagonist. In this sense, a text is realistic if it can evoke a “real” emotional response. For some of Hall’s participants, a narrative could still elicit emotional involvement despite being unrealistic with respect to other dimensions of realism, whereas for other participants, a degree of perceived realism was a precondition of emotional involvement. In this way, other dimensions of realism might contribute to involvement, but they may not be sufficient or necessary for involvement to occur. Since the dimension of involvement is about the subjective experience of a narrative rather than what is represented in the narrative, I do not regard involvement as a dimension of scientific realism. Having said this, scientific realism may still represent an influence on involvement. I will discuss the relationship between perceived realism and involvement in more detail in Chapter 4, including how Hall’s concept of involvement relates to other conceptualisations of involvement in the literature.

The final dimension of perceived realism identified by Hall (2003) is narrative consistency, which is achieved when a narrative is “internally coherent, […] doesn’t contradict itself, and leaves nothing jarringly unexplained” (p. 636). Some narratives, such as works of science fiction, fantasy, and horror, may evoke storyworlds that function differently to the real world. These narratives invite the reader to reconfigure their expectations of what is plausible, typical, or factual in accordance with the storyworld evoked by the narrative, and as long as a narrative remains consistent with the expectations and rules that it has established, it can be regarded as realistic. For example, in The Matrix (1999), people may enter into a simulated reality known as “the matrix” where real world rules of physics do not apply, enabling characters to perform otherwise implausible feats, such as dodging bullets at close range. One of Hall’s participants described how The Matrix was “a consistent story” even though she couldn’t see herself “dodging speeding bullets or anything like that” (p. 636). Dodging bullets is
plausible in the storyworld of The Matrix even if it is implausible in the real world. In this way, it is possible to distinguish between external realism—what is perceived as realistic in the real world—and narrative consistency—what is perceived as realistic in the storyworld.

Before expanding on the notion of narrative consistency, it is useful to clarify how I conceptualise storyworlds. Consistent with Herman (2009), I use the term storyworld to refer to “the world evoked explicitly as well as implicitly by a narrative” (p. 106). There are two main possibilities with respect to the ontology of a storyworld: either the narrative is constitutive of the storyworld, or the storyworld is independent of the narrative despite being evoked by the narrative. I adopt the latter position, though I permit that some readers might adopt the former position.

To elaborate on this point it is necessary to briefly introduce possible worlds theory as it relates to fictional narratives. Put simply, a possible world is a possible state of affairs (Fort, 2016, p. 13). For example, in the real world (i.e., the world in which I currently exist), I completed a university degree. However, I am able to imagine other possible worlds in which I did not complete a university degree but instead decided to open a bookstore. In this way, the real world serves as a reference world from which I can imagine other possible worlds. Fictional narratives also evoke possible worlds, though they are “possible” only in the sense that they can be imagined, not in the sense that they are necessarily consistent, complete, or non-contradictory (Fort, 2016, pp. 49–52). The real world also serves as a reference world for imagining fictional possible worlds, and I can assess the perceived realism of fictional possible worlds using the real world as a reference world (this is what I have called external realism above). However, I can also use a fictional world as a reference world. Indeed, narratives can be interpreted as simultaneously evoking both a fictional reference world and a fictional possible world. Ryan (1991) calls these worlds the textual reference world and the textual actual world respectively. The basic assumptions of Ryan’s approach, which I share, are as follows:

1. There is only one [real world].
2. The sender (author) of a text is always located in [the real world].
3. Every text projects a universe. At the center of the universe is [the] textual actual world.
4. [The] textual actual world is offered as the accurate image of [a] textual reference world, which is assumed (really or in make-believe) to exist independently of [the] textual actual world.
5. Every text has a [narrator] [...]. The [narrator] of the text is always located in the textual reference world. (pp. 24–25).

Given these assumptions, I conceptualise narrative consistency as the perceived realism of the textual actual world evoked by a narrative from the standpoint of the textual reference world that is also evoked by the same narrative (henceforth what I will call the storyworld). This is in contrast to a position where a narrative is seen to constitute the storyworld. If the narrative is taken to constitute the storyworld, then provided it is not contradictory in its evocation of the storyworld, every narrative achieves narrative consistency at least with respect to plausibility and factuality, if not typicality. On the other hand, if the storyworld is taken to exist independently of the narrative from which it is evoked, it becomes possible to assess the plausibility, typicality, and factuality (i.e., the narrative consistency) of a narrative (i.e., the textual actual world) with reference to the storyworld (i.e., the textual reference world) in the same way that it is possible to assess the external realism of a narrative (i.e., the textual actual world) with respect to the real world. Again, I prefer to conceptualise the storyworld as existing independently of the narrative (at least imaginatively if not actually), but some readers may not share this view. I will return to the implications of differing ontological assumptions about storyworlds in Chapter 5.

It is also important to clarify that storyworlds may share many features with the real world, though the degree of overlap will vary from one narrative to another. Ryan (1980, 1991) argues that readers interpret narratives by assuming that the storyworld is similar to the real world except where the narrative implicitly or explicitly indicates otherwise. This is what she calls the “principle of minimal departure.” The principle of minimal departure accounts for how readers can make sense of storyworlds that are created through discourse even though the discursive representations of these worlds are inevitably incomplete (Ryan, 1991, p. 52). Most narratives exhibit a degree of overlap between the storyworld and the real world, giving rise to a set of propositions that are unique to the storyworld (what I will call storyworld-specific propositions), a set of propositions that are unique to the real world, and a set of propositions that are shared by both the storyworld and the real world (Ryan, 1980, pp. 414–419, 1991, pp. 31–47). Hazlett and Uidhir (2011) refer to the region of propositional overlap between the storyworld and the real world as the “similarity class.” To adapt an example from Hazlett and Uidhir, consider Middle-earth, the storyworld of Tolkien’s 1954 novel The Lord of The Rings: The Fellowship of The Ring. Middle-earth has its own unique geography,
inhabitants, and phenomena, such as elves, orcs, and magic. Accordingly, there are aspects of the real world that do not appear in the storyworld, such as modern technologies and specific real world people (e.g., the current US President). Furthermore, there are also propositions that are shared by both worlds. Invoking the principle of minimal departure, the reader assumes that human characters and most other species in the storyworld require air, food, and water to survive, just as they do in the real world. Thus, even when the storyworld differs from the real world in non-trivial ways, the storyworld will usually share some features with the real world.

Figure 2.1 illustrates the typical propositional structure of a storyworld, adapted from Ryan (1980). For convenience, the Venn diagram in Figure 2.1 is symmetrical. However, the relative proportions of proposition types varies from one storyworld to the next. For illustrations of other propositional structures, confer Ryan (1980).

![Figure 2.1](image)

*Figure 2.1. Typical propositional structure of a storyworld evoked by a fictional narrative.*

Having set-out some basic assumptions about storyworlds, I will now return to Hall’s (2003) account of narrative consistency. Hall notes that a consistent narrative “leaves nothing jarringly unexplained” (p. 636). Hall does not elaborate on this point, but she seems to be alluding to events that without further explanation appear to be implausible, atypical, or nonfactual in the storyworld. This circumstance can be illustrated with an example that D. C. Bell (2011) highlights in *The Matrix*. In order to enter or leave the matrix, characters require assistance from another crewmember who remains outside of the matrix. Furthermore, the crewmember who remains outside of the matrix is able to observe what happens in the matrix by reading code from a computer screen. However, one of the characters (Cypher) is shown inside the matrix where he makes a secret deal
with the narrative’s antagonists that will ultimately betray his entire crew. The narrative provides no explanation for how Cypher enters the matrix seemingly without being assisted or observed by any of his crewmates. Although a reader might be able to invent plausible explanations for how Cypher actually entered the matrix (e.g., one of the crew was privy to the deal but was ultimately doublecrossed), the event may still be perceived as a narrative inconsistency because of its seeming implausibility.

However, as an Urban Dictionary definition of “plot hole” makes clear, a narrative consistency does not arise simply from the “omission of information or [an] unanswered question” (sensfan19_15, 2013). There are many reasons why an element in a narrative may be unexplained. For example, narratives do not systematically show or explain how characters commute from one location to another. However, travelling between locations is typical behaviour and there are various plausible explanations for how a commute might be achieved. By contrast, a perceived narrative inconsistency may arise when a reader desires an explanation for an atypical, ostensibly implausible, or ostensibly non-factual element but the narrative provides no such explanation. As Ryan (2009, p. 66) argues, narrative inconsistencies (what she calls plot holes) are associated with suspicion: the reader suspects that the author has made an error. By referring to events that are “jarringly unexplained,” Hall’s (2003) concept of narrative inconsistency seems to include both actual and suspected violations of plausibility, typicality, and factuality in the storyworld. Even though a reader might ultimately resolve a suspected violation by devising a satisfactory explanation of their own (cf. Chapter 6), the need for such non-trivial inferences may nevertheless be perceived as a narrative inconsistency.

Although I define narrative inconsistencies as real or apparent implausibilities, atypicalities, or non-factualities in the storyworld, it is important to acknowledge that narrative inconsistencies can be qualitatively different to externally unrealistic events because for some narrative inconsistencies there is no authoritative source inside or outside of the text to assess what is plausible, typical, or factual in the storyworld. To illustrate this point I will borrow an example from Ryan (2009). In Citizen Kane (1941), a reporter attempts to discover the meaning of Kane’s last word, “rosebud.” However, the film also suggests that Kane died alone, meaning that nobody was present to hear his dying words. If it is true that the reporter knows Kane’s final word then it is implausible that Kane died alone (assuming for a moment that there were no audio recorders or people in adjacent rooms to overhear). On the other hand, if Kane did in fact die alone, it is implausible that the reporter knows Kane’s final word. When two events in a narrative
are contradictory, one must be deemed factual or plausible in order to classify the other as non-factual or implausible, but without any reliable guide to the plausibility or factuality of those events, the reader is left only with a contradiction, unable to determine which of the two events is plausible or factual while knowing that both events cannot be plausible or factual at the same time. It is in this sense that narrative inconsistencies are not always storyworld analogues of externally implausible, atypical, or non-factual story elements.

As a point of terminological clarification, the term plot hole is commonly used in popular commentary on fictional narratives (e.g., Abramson, 2015). Despite the popularity of the term, plot holes have received limited attention in the scholarly literature, perhaps because, as Ryan (2009, p. 56) observes, narratological research is usually descriptive rather than prescriptive. In any case, the term plot hole commonly “designates an inadvertent inconsistency in the logical and motivational texture of a story” (Ryan, 2009, p. 66). The term “inconsistency” in Ryan’s definition signals the conceptual overlap between plot holes and narrative inconsistencies. Indeed, I regard the two terms as interchangeable.

On first inspection, however, the concept of a plot hole appears to exceed the concept of a narrative inconsistency that I have outlined previously. Under Ryan’s definition, plot holes include circumstances where characters behave in ways that “blatantly violate common sense” (p. 67). Ryan provides the example of “Little Red Riding Hood,” a fairy tale in which a girl meets a wolf on the path and tells the wolf about her intention to visit her grandmother. After parting ways, the wolf races ahead, eats the girl’s grandmother, and takes the grandmother’s place in bed. Once the girl arrives at her grandmother’s house, the wolf then proceeds to eat the girl. Ryan lists this example as a plot hole because of the wolf’s ostensibly illogical behaviour: why not eat the girl straight away rather than risk losing her in the intervening time? However, behavioural or motivational plot holes of this type can be readily accommodated within my definition of narrative consistency. In this case, the wolf’s illogical behaviour may be regarded as a narrative inconsistency because it is a behaviour that is perceived as atypical in the storyworld—in “Little Red Riding Hood” the wolf is excluded from the similarity class such that the wolf can be interpreted as having wolf-like motivations but human-like reasoning. In the first instance, illogical behaviour will usually be plausible since, as Ryan observes, “characters may not always act in the same way we would if we were placed in the same situations” (p. 67). However, behaviour that a reader perceives to be strikingly
illogical will likely be perceived as atypical, especially if the character in question usually behaves logically. As Ryan notes, unless the reader is given reason to believe otherwise, characters can reasonably be expected to have “a minimum of rationality” (p. 67). The behaviour of a character is therefore like any other aspect of a narrative and can be assessed in terms of plausibility, typicality, and, where appropriate, factuality. In this way, plot holes arising from illogical behaviour can be understood as behaviour that is atypical for a given character in a given storyworld. Thus, the notion of a behavioural or motivational plot hole is accommodated by my conceptualisation of narrative consistency. As I will explain in Section 2.3 below, character actions are largely outside of the scope of my research; nevertheless, I regard this as a useful point of clarification.

In a synthesis of the literature on the perceived realism of television content, Busselle and Greenberg (2000) identify several realism dimensions that were not articulated by Hall’s (2003) participants. However, I do not regard these additional dimensions, which they term magic window, social realism, and utility, to be appropriate for my research. Magic window is the “extent to which television allows one to observe ongoing life in another place or inside the set itself” (p. 257). Although magic window is a distinct dimension, its applicability is limited to studies of children who have not yet developed more sophisticated conceptualisations of perceived realism. Social realism is the “extent to which television content, whether real or fictional, is similar to life in the real world” (p. 257). This notion of social realism is similar to the definition of perceived realism that I introduced above except it is focussed on social reality rather than reality in general. As Busselle and Greenberg acknowledge, the perceived realism of people and social behaviours can be assessed in terms of plausibility, typicality, factuality, and so forth. I do not regard social realism as a dimension of realism, but rather as one of the many possible facets of a fictional text that might be assessed for perceived realism, including the text’s scientific content. Finally, utility refers to “how much information or events observed on television are useful to the viewer in real life” (p. 257). I see utility as a product of perceived realism or a process of assessing perceived realism rather than a dimension of perceived realism. If information is perceived to be realistic (e.g., factual), then it may be useful in real life, and if information derived from fiction proves to be useful in real life, then it may be retrospectively assessed as realistic. Given these considerations, I regard Hall’s typology of realism dimensions as more appropriate to my research than Busselle and Greenberg’s.
Some final terminological clarifications are necessary at this point. In the context of my research, I will use (un)realistic science and scientific realism as general terms to refer collectively to the five dimensions of perceived realism that I have adapted from Hall’s (2003) work (i.e., plausibility, typicality, factuality, narrative consistency, and perceptual persuasiveness). When I refer to the real world plausibility, typicality, or factuality of science in a narrative I will use the term externally (un)realistic science. When I refer to the plausibility, typicality or factuality of the science in a storyworld, I will use the term (in)consistent science.

Furthermore, it is convenient to have a term to refer to narratives where a reader perceives the storyworld to be analogous to the historical, contemporary, or near-contemporary real world in all (or almost all) respects other than the presence of individual existents (i.e., specific people existing in the real world, such as the current US president, may not exist in the storyworld, and specific characters in the storyworld may not exist in the real world). I term these narratives “realist” narratives. For a “realist” narrative, all instances of inconsistent science are also examples of externally unrealistic science. Examples of narratives that I would consider as “realist” narratives include Gravity (2013), The China Syndrome (1979), and Contagion (2011). This category would also include historical fictions, such as The Imitation Game (2015) and Apollo 13 (1995).

Since I define “realist” narratives in terms of reader perception, other readers may disagree with these categorisations. Furthermore, a “realist” narrative is a narrative where the storyworld is taken to be analogous to the real world, but this does not necessarily mean that “realist” narratives (as defined here) are realistic. Finally, even for “non-realist” narratives, there may be substantial overlap between real world science and storyworld science, meaning that the term “inconsistent science” encompasses storyworld science that is unique to the storyworld (i.e., storyworld-specific propositions) and storyworld science that is shared by the storyworld and the real world (i.e., similarity class propositions).

In this section I have introduced the conceptualisation of perceived realism that informs my research. For my specific focus on scientific realism, I have adapted five of the six dimensions of perceived realism identified by Hall (2003). The five dimensions of scientific realism include plausibility, typicality, factuality, narrative consistency, and perceptual persuasiveness. I do not regard involvement as a dimension of scientific realism, though scientific realism may represent an influence on involvement. Table 2.1 summarises the perceived realism-related definitions that I will use in this study. The
definitions outlined in this section are intended to provide a clearly defined conceptual framework for my study. I acknowledge that actual readers (and indeed, other researchers) may conceptualise realism and its dimensions differently.

Table 2.1
Definitions of terms related to perceived realism

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plausibility</td>
<td>Possibility in the real world. Plausibility is a binary variable.</td>
</tr>
<tr>
<td>Typicality</td>
<td>Probability or representativeness in the real world. Typicality is a continuous variable.</td>
</tr>
<tr>
<td>Factuality</td>
<td>“Something that has actually occurred or is really the case” (<em>OED Online, 2017</em>). A scientific fact is a scientific statement that is provisionally accepted by the scientific community as true.</td>
</tr>
<tr>
<td>Narrative consistency</td>
<td>Plausibility, typicality, or factuality in the storyworld.</td>
</tr>
<tr>
<td>Perceptual persuasiveness</td>
<td>Looking or sounding convincingly real, irrespective of the existence of a real world referent.</td>
</tr>
<tr>
<td>Involvement</td>
<td>A sense of cognitive or affective engagement with a narrative (for further discussion, cf. Chapter 4).</td>
</tr>
<tr>
<td>(Un)realistic science</td>
<td>An umbrella term for science that is realistic or unrealistic in terms of one or more of the five dimensions of scientific realism: plausibility, typicality, factuality, narrative consistency, and perceptual persuasiveness. The term (un)realistic science includes externally (un)realistic science and (in)consistent science.</td>
</tr>
<tr>
<td>Externally (un)realistic science</td>
<td>Science that is realistic or unrealistic in the real world.</td>
</tr>
<tr>
<td>(In)consistent science</td>
<td>Science that is realistic or unrealistic in the storyworld evoked by a narrative.</td>
</tr>
<tr>
<td>Realist narrative</td>
<td>A narrative that evokes a storyworld that is perceived to be analogous (or trivially different) to the historical, contemporary, or near-contemporary real world.</td>
</tr>
<tr>
<td>Real world specific propositions</td>
<td>Propositions that are unique to the real world with respect to the storyworld evoked by a given narrative.</td>
</tr>
<tr>
<td>Similarity class propositions</td>
<td>Propositions that are shared by the real world and the storyworld evoked by a given narrative (<em>Hazlett &amp; Uidhir, 2011</em>).</td>
</tr>
<tr>
<td>Storyworld specific propositions</td>
<td>Propositions that are unique to the storyworld evoked by a given narrative.</td>
</tr>
</tbody>
</table>
2.3 What is unrealistic science in fiction?

It is possible to assess the perceived realism of various aspects of a narrative. My research focuses on the realism of a narrative’s scientific content. As I will describe in Chapter 3, I did not define “science” during the focus groups and interviews that I conducted for my research. I made this decision because I did not want to constrain the scope of the discussion and I was interested in what participants would identify as “science” in fiction. Nevertheless, it is useful to comment on how I personally use the term science, especially for contextualising the theoretical aspects of my work.

Defining science is difficult, and any definition of science is likely to be contested. It is possible to define science in various ways, including from philosophical (e.g., Popper, 1934/1972), sociological (e.g., Merton, 1973), rhetorical (e.g., Gieryn, 1999), and historical standpoints (e.g., Cunningham & Williams, 1993). I use the term science in the quotidian sense that it is used in Australia’s national strategy for engagement with the sciences, Inspiring Australia (Department of Innovation, Industry, Science and Research, 2010, p. ix). In this sense, “science” refers to the natural and physical sciences (e.g., physics and chemistry), the applied sciences (e.g., engineering, medicine, and technology), the social sciences (e.g., psychology), mathematics, and interdisciplinary fields related to any of the above (e.g., environmental science and nanotechnology). Unlike the Inspiring Australia strategy, however, I do not include the humanities in my definition of science.

There are at least two broad meanings that I associate with science as defined above. First, “science” can refer to scientific practices or what Kirby (2014) calls the social, cultural, and political “systems of science” (pp. 97–98). Scientific practices include things like wearing personal protective equipment, collaborating within and between research groups, gaining ethical clearance for research, or writing peer reviewed papers. Second, “science” can refer to a body of knowledge produced by (or associated with) scientific practices, things like Newton’s laws of motion, the standard model of particle physics, or the germ theory of disease. For the first meaning of science, what counts as scientific realism depends on our perception of what is depicted in the narrative—is there a depiction of a scientific practice or not? For the second meaning of science, what counts as scientific realism depends on our perception of how perceived realism is being assessed—is the assessment informed by scientific knowledge or not? Characterising scientific realism in this way means it is difficult or impossible to demarcate a clear boundary between scientific realism and what might be called general realism. Science
is, among other things, a (provisional) body of knowledge about reality, and as such, it may inform assessments of perceived realism even when narrative elements are not widely considered as “science.”

Consider the common example of sound in space. Sound waves involve vibrations of molecules in air and other media, meaning that sound waves cannot travel through the relative emptiness of space—at least not soundwaves that are audible to the human ear (cf. Fabian et al., 2006). Space and space exploration may be associated with various fields of science, both pure and applied. The connection between space and the genre of science fiction may also strengthen associations between sound in space and “science.” However, in other respects, sound is not explicitly a case of “science” in fiction. When we hear sound in space there are very often no scientists or scientific practices in the frame. When we hear sound in space we are simply encountering the phenomenon of sound, a phenomenon that in other contexts may have stronger connections with music or speech than with science. If we are to call sound in space an example of unrealistic science in fiction, what seems to define it as such is the mobilisation of scientific knowledge about sound waves rather than a claim that sound is “science.”

Some further examples may help clarify my perspective. Scientific realism, as I conceptualise it, relates not only to representations of stereotypically “scientific” phenomena, such as forensic tests (as in CSI, 2000–2015), nuclear power stations (as in The China Syndrome, 1979), or viral pandemics (as in Outbreak, 1995), but to situations where scientific knowledge is used to assess the perceived realism of phenomena that may not be typically associated with science, such as a bus jumping over a missing section of a highway (as in Speed, 1994) or a shark repeatedly pursuing a stranded surfer (as in The Shallows, 2016). In the bus example, physics knowledge may inform an assessment of perceived realism; in the shark example, zoological knowledge may inform an assessment of perceived realism. In Section 1.1, I mentioned an article in The Guardian where Hone (2016) analyses whether the dragons in Game of Thrones (2011–) would be able to fly in the real world. Although dragons are not typically associated with “science,” Hone’s analysis draws on scientific knowledge from the field of biophysics, and as a result, I regard his analysis as an assessment of scientific realism. Therefore, I use scientific realism to refer not only to the perceived realism of scientific practices and stereotypically science-related topics, but also to science-informed assessments of perceived realism.
My conceptualisation of scientific realism is broad but it is not all-encompassing. There are at least three aspects of a narrative that I regard as beyond the scope of science or scientific realism. The first of these is historical realism. In Apollo 13, Ron Howard’s 1995 fiction film about the Apollo 13 space accident, astronaut Jim Lovell reports an incident to mission control by stating, “Houston, we have a problem.” However, according to NASA’s transcript, Lovell actually stated, “Houston, we’ve had a problem” (NASA, 1970, p. 160). I do not regard this point of difference as unrealistic science. Historical realism is distinct from scientific realism, though it is possible that a narrative element might be both historically unrealistic and scientifically unrealistic.

Coincidences are also distinct from unrealistic science. A coincidence is “a notable concurrence of events or circumstances having no apparent causal connection” (OED Online, 2017). Since coincidences are atypical events (Ryan, 2009), they may be regarded as unrealistic. For example, in Star Wars: The Force Awakens (2015) several characters infiltrate an enormous enemy base, in part with the intention of rescuing one of their companions. While they are discussing a plan to search for their companion, she happens to be sighted climbing a wall directly opposite where they are standing, thereby precluding what might have been an arduous search. In my view, assessing the perceived realism of such a coincidence is unrelated to scientific knowledge. For further discussion of coincidences, confer Ryan (2009).

The final aspect of realism that I regard as distinct from scientific realism relates to character actions. Although I include psychology and other social sciences in my definition of science, I do not (in general) regard character behaviour and motivations as science or amenable to a science-informed analysis. For example, in Ishiguro’s Never Let Me Go (2005), human clones are raised as organ donors. Once the clones reach maturity, they undergo several consecutive organ donations before they finally “complete” (i.e., die). Despite never being overtly detained or supervised in their adult life, the clones never attempt to escape or rebel. Although it is possible to rationalise this behaviour (e.g., perhaps the characters are resigned to their fate), the apparent lack of resistance exhibited by the clones may be perceived as unrealistic. However, if the clones’ behaviour is perceived as unrealistic, I do not regard it as a case of unrealistic science. Character actions in this sense are outside of the scope of what I regard as science and scientific realism.
In conclusion, I define science as the practices and knowledge associated with pure and applied scientific disciplines. For me, scientific realism refers not only to the perceived realism of scientific practices but to a science-informed assessment of perceived realism. This definition is intended to clarify how I conceptualise scientific realism; it is not an attempt to solve the problem of demarcating science from non-science. Ultimately, attempting to define scientific realism is less important than recognising the difficulties of defining scientific realism and the myriad notions of "science" that readers are likely to bring to their encounters with narrative texts.
3. Methodology

In this chapter I describe my research methodology. I begin by providing an overview of the study and a description of my sample. I then describe how I conducted focus groups and interviews before detailing the transcription and analysis of participant responses. I conclude the chapter with a discussion of how I conceptualise theoretical saturation and generalisability.

3.1 Overview

I investigated my research questions (cf. Chapter 1) by conducting interviews and focus group discussions with readers of narrative fiction. My goal was to understand the views and experiences of readers who care (to some degree) about the realism of science in fiction. I sampled purposively for participants who were interested in discussing this issue, recruiting primarily from the community of students and staff at the Australian National University, a public university located in Canberra, Australia.

The first phase of my project involved focus group discussions. I used focus groups for initial data collection for two main reasons. First, focus groups allow participants to interact with and respond to other people, which can be attractive for participants who might feel that they have little to contribute on their own (Barbour, 2007; Kitzinger, 1995). I did not wish to constrain the exploratory nature of the research by providing specific fictional texts as stimuli. A group discussion setting would therefore help participants identify and respond to various examples of science in fiction, something that may be difficult for some participants to do individually. Second, a focus group more closely resembles the ways in which people construct meaning through social interaction in everyday life (Barbour, 2007; Bryman, 2012). This is of particular relevance given that the reception of popular fiction is often social in nature (e.g., Gauntlett & Hill, 1999). I describe how I conducted my focus groups in Section 3.4 below.

After completing the focus groups and conducting a preliminary analysis of my data, I identified concepts and questions that warranted further exploration (cf Section 3.7). Rather than conducting additional focus groups, I collected more data by conducting semi-structured interviews. Interviews are a useful complement to focus groups because participants may share views or experiences in an individual setting that they might feel uncomfortable sharing in a group setting (Barbour, 2007; Michell, 1999). This feature of
interviews is particularly useful given my interest in the social aspects of discussing scientific realism in fiction. Focus groups may be a more naturalistic setting for discussing scientific realism, but interviews may provide unique insights into how these discussions are perceived. Interviews are also a useful complement to focus groups in terms of recruitment and sampling, as focus groups may exclude people who find group discussions unappealing. The ability to explore individual views and experiences in greater depth is a further advantage of interviews. I describe how I conducted my interviews in Section 3.5 below.

Although I collected more data after a preliminary analysis of my focus group data, I do not regard my sampling method as theoretical sampling. Theoretical sampling involves simultaneous data collection and data analysis with the goal of theory generation, making decisions throughout data collection not only about what to ask next but also who to ask next (Glaser & Strauss, 1967). Although I did adapt my interview questions and methods after pausing to transcribe and analyse my focus group data, overall I did not analyse and collect my data simultaneously. Furthermore, I sampled from the same community for my interviews and focus groups. My sampling method is therefore best characterised as what Bryman (2012, p. 422) calls generic purposive sampling. This approach involves identifying participants who are relevant to the research questions and sampling from those participants, but unlike theoretical sampling, it does not involve collecting and analysing data simultaneously. In my case, I aimed to sample people who cared (to some degree) about the realism of science in fiction, either because they were interested in science, interested in fiction, or both. Given that a university community includes people who are interested in science (e.g., science students) and people who are interested in fiction (e.g., literature and film students), the community of students and staff at the Australian National University was both convenient and appropriate to my needs. I describe my recruitment strategies and the characteristics of sample in Section 3.3 below.

Towards the end of my interviews, participant responses to my questions started to feel familiar to me, which was a tentative indication of data saturation. I use the term data saturation to refer to a point where there are few or no “surprises” in participant responses, which is distinct from the concept of theoretical saturation as it is used in grounded theory (cf. O’Reilly & Parker, 2012). Theoretical saturation refers to “a conceptually dense theoretical account of the field of interest in which all categories are fully accounted for, the variations within them explained, and all relationships between
the categories established, tested and validated for a range of settings” (J. Green & Thorogood, 2004, p. 103). My data collection phase ended both because I had an impression of data saturation and because new participants were no longer forthcoming with my existing recruitment strategies.

### 3.2 Ethical approval

I obtained approval for the ethical aspects of this research from the Australian National University’s Human Research Ethics Committee (HREC Approval No. 2015/069).

### 3.3 Recruitment and participants

I recruited a total of 55 participants from the community of staff and students at the Australian National University (ANU) and from the wider Canberra community. I conducted 10 focus groups and 20 semi-structured interviews, seven of which were follow-up interviews with focus-group participants. Participants were invited to participate in a follow-up interview in cases where focus group discussions had run short on time.

Participants were required to be 18 years of age or older but there were no other exclusion criteria. I promoted the study through announcements in undergraduate and postgraduate courses at the university, including courses in science communication, physics, biology, computer programming, film studies, and English. In addition, I placed posters near major teaching venues and posted information in the Facebook groups of relevant student societies, including the ANU Science Communication Society, the ANU Chemistry Society, the ANU Fiction Society, and the ANU Anime and Gaming Society. I also distributed flyers at a “Nerd Trivia” night at a local bar.

Recruitment materials included the question: “Does the realism of fictional science matter?” Participants were invited to share their views on (un)realistic science in fiction. A movie voucher for a cinema located near the university campus was provided as an incentive. Focus group participants were also provided with refreshments during the session.

Participants were asked to complete a demographic information form prior to each focus group and interview (cf. Appendix A). Of the 55 participants, 54% identified as female and 46% identified as male. The median age was 22 years (range: 18–50 years). Most participants were current undergraduate students (65%) or current postgraduate...
students (22%). The remaining participants were non-students who self-identified as being employed in a Science, Technology, Engineering, or Mathematics (STEM) related job (9%) or a non-STEM related job (4%). Most participants had a science background (85%), defined as having completed or currently studying towards a STEM related degree, diploma, or certificate or being currently employed in a STEM related job. Around half of the participants (47%) had studied or were currently studying a science communication course at university. Finally, a small proportion of participants (13%) had a fiction background, defined as nominating a discipline related to the theory or practice of narrative fiction as a major area of study, including but not limited to literature, film, cultural studies, media studies, creative writing, and acting.

Table 3.1 provides the demographic details of each participant in the study. In subsequent chapters I will only describe participant demographic details where relevant to the analysis. My operationalisation of science background is adapted from previous research (Li & Orthia, 2015), and it is intended only as a crude measure of a participants’ scientific knowledge and interests. I acknowledge that participants without formal science qualifications may also be knowledgeable and interested in science. Furthermore, the demographic question about previous or current studies in science communication is primarily intended as an indicator of the proportion of participants who were recruited from the science communication courses taught by my department, the Australian National Centre for the Public Awareness of Science. I acknowledge that participants may have experience with science communication theory and practice in other contexts, including employment in a science communication-related job. Similarly, my operationalisation of fiction background only captures formal study in a fiction-related discipline but does not capture participants’ informal engagements with fiction or any pre-tertiary studies in a fiction-related discipline.
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Note.

a F = Female; M = Male; X = Other.

b US = Current undergraduate student; PS = Current postgraduate student; E = Employed in a science technology, engineering, or mathematics (STEM) related job, including volunteer and intern positions; O = Other: not employed in a STEM related job and not currently studying.

c Highest completed level of post-secondary education: Certificate, Bachelor’s degree, Master’s degree, Doctor of Philosophy (PhD).

d S = Science background, defined as having completed or currently studying towards a STEM related university qualification or currently employed in a STEM related job; SC = Science communication background, defined as having completed or currently studying towards a science communication course at university; F = fiction background, defined as nominating a narrative fiction-related discipline as a major area of study at university, including but not limited to film, literature, poetry, cultural studies, media studies, creative writing, and acting; O = Other, defined as not fitting any of the other background definitions.

FG(no.) = Focus group participant (focus group number); I = Interview participant.

3.4 Focus groups

Prior to recruiting research participants, I conducted a pilot focus group session with other postgraduate research students in my department. The pilot was intended to test the clarity of the questions and provide an indication of the running time of the focus group discussion. Feedback from pilot participants indicated that the questions were understandable and the number of questions was appropriate.

I conducted focus group discussions in a meeting room at the Australian National Centre for the Public Awareness of Science. There was an average of four participants in each session (range: 2–6). I did not manipulate the composition of the groups because I intended to focus on an individual-level analysis rather than a group-level analysis (Ritchie, Spencer, & O’Connor, 2003, p. 258). Participants were permitted to participate with friends and most sessions included at least two participants with some form of apparent affiliation. Excluding the introduction and conclusion, the average duration of each discussion was 39 minutes (range: 25–47 minutes). In order to appeal to students, the total length of each focus group was limited to 50 minutes and was therefore accommodated in one block of the daily university timetable.

At the beginning of each session I explained the purpose of the study and the implications of participation, including how data would be used and how confidentiality
would be managed. I also explained the “ground rules” for the discussion, which I adapted from Krueger and Casey (2000). I did not define “science” or “realism” because I was interested in how participants understood and used these terms. However, given that the word fiction is commonly associated with prose texts (Cuddon & Preston, 1999, p. 320), I provided the following definition of fiction to emphasise the broad scope of the discussion:

In my questions today, I will often use the word “fiction.” When I use the word fiction I am referring to any kind of imaginative story, including films, TV shows, novels, comics, plays, and games—really any kind of fiction at all. This can also include any genre of story, not just science fiction but any time science is depicted in fiction. So feel free to draw on any form of fiction that is familiar or important to you.

Each discussion commenced with participants introducing themselves and sharing examples of fiction that they had been enjoying recently. The discussion was semi-structured and based on a discussion guide I developed in advance (cf. Appendix A). Early questions invited participants to think of examples of unrealistic science in fiction and describe how they responded to it. Subsequent questions explored when and why the realism of science in fiction was important or unimportant to participants. The last set of questions explored participants’ experiences with talking to other people about the realism of science in fiction.

My moderation style entailed minimal intervention in the discussion. The same core questions were asked in most focus groups, though occasionally questions were omitted if they had already been addressed in the discussion or if time was limited. Where appropriate, I asked personally directed questions to ensure everyone had an opportunity to participate. Sometimes I also included spontaneous follow-up questions to further explore ideas raised in the discussion. Where relevant, I recorded brief field notes about group dynamics and any other notable features of the discussion that might not be captured in the audio recording.

3.5 Semi-structured interviews

Prior to recruiting participants for my interviews, I conducted an informal pilot interview with a postgraduate research student in my department (who had not previously participated in the focus group pilot) to test the clarity of my questions. The pilot participant confirmed that the wording was appropriate.
I conducted most interviews in a meeting room or office at the Australian National Centre for the Public Awareness of Science, though two interviews were conducted at participant workplaces. The average duration of each interview was 26 minutes (range: 18–44 minutes).

As for the focus groups, participants were welcomed, briefed on the implications of participation, and provided with relevant definitions. As I describe in Section 3.7 below, I conducted the interviews to learn more about what made a narrative “serious” about realistic science and why participants discussed unrealistic science with other people. The interview guide therefore included some new questions that were not asked in the focus group discussions (cf. Appendix A). In particular, I included more detailed questions about who participants talked to about scientific realism and why. The interview guide also included new questions that asked participants how they determine whether a story is serious about scientific realism and why they think fictional stories sometimes depict unrealistic science. Where appropriate, I asked follow-up questions to further explore participant responses. In addition to the interviews, I also conducted one opportunistic focus group incorporating these updated questions.

3.6 Transcription

I transcribed the audio recordings of focus group discussions and interviews using conventions adapted from McLellan, MacQueen, and Neidig (2003). I used a denaturalised approach to transcription because I was primarily interested in analysing the meanings articulated by participants rather than conducting a detailed conversation analysis (D. G. Oliver, Serovich, & Mason, 2005). As a result, I did not transcribe pauses, non-verbal language, accents, or mispronunciations. I did not transcribe filler sounds (e.g., um, er, uh) but I did transcribe filler words and discourse markers (e.g., you know, like). I made the same distinction between words and sounds when transcribing what Gardner (2001) calls response tokens (i.e., the vocalisations made by someone who is listening). Laughter was transcribed but other involuntary vocalisations and non-verbal sounds were not. In all other respects the audio recordings were transcribed verbatim and I did not correct grammar, slang, or misused words or concepts. I checked each transcript for accuracy by re-listening to the audio-recording. Transcripts were also de-identified and participants were anonymised using pseudonyms.
3.7 Analysis

I analysed my data by adapting Braun and Clarke’s (2006) approach to thematic analysis. In summary, this approach involves familiarisation with data, coding of data, identification of themes, reviewing themes, defining and naming themes, and producing a report. This process does not proceed linearly but is recursive, moving “back and forth as needed, throughout the phases” (Braun & Clarke, 2006, p. 86). There is some debate over whether thematic analysis should be regarded as an analytic method in its own right or whether it is merely a process common to a range of analytic methods, such as grounded theory (cf. Willig, 2013). Following Braun and Clarke (2006), I regard thematic analysis as method in its own right as long as the worldview informing the analysis is made explicit. Indeed, flexibility is one of the advantages of thematic analysis since it is not wedded to any particular worldview (Braun & Clarke, 2006). In this section I describe the worldview underpinning my research before providing a more detailed account of how I analysed my focus group and interview data.

My research is informed by a critical realist worldview. Critical realism has its roots in Roy Bhaskar’s philosophy of science and social science (e.g., Bhaskar, 1989). A critical realist perspective asserts that unlike the natural world, the social world is “not independent of human minds,” but it is nevertheless “independent of any particular human mind” (Gorski, 2013, p. 666). In other words, critical realism maintains that social reality exists independently of what a particular individual thinks about it while recognising that all “description[s] of that reality [are] mediated through the filters of language, meaning-making and social context” (C. Oliver, 2012, p. 374). Furthermore, critical realism proposes that social reality has both discursive and extra-discursive dimensions. Sims-Schouten, Riley, and Willig (2007) characterise the extra-discursive dimensions of social reality as embodied (e.g., physical health), material (e.g., availability of resources), and institutional (e.g., government policies), each of which can influence and constrain an individual's discursive constructions. Critical realism is my preferred stance because, as Sims-Schouten et al. (2007) argue, it provides “an alternative both to naïve versions of realism and to totalizing versions of relativism” (p. 103). A critical realist stance acknowledges that accounts of reality are provisional, fallible, and contextually situated, but it does not accept the relativist assertion that all accounts of reality are equally valid (C. Oliver, 2012). Critical realism is also appropriate for my research because it is compatible with mixed methods research (Sayer, 2000) and with the application of validation techniques, such as triangulation (cf. Mays & Pope, 2000; Miles, Huberman, &
Saldana, 2014). Although I do not use mixed methods in this study, I outline directions for further research on the assumption that my results may be validated through additional research, including quantitative research.

The concept of a theme is crucial to thematic analysis. Adapting Braun and Clarke's (2006, pp. 82–83) definition, I define a theme as a conceptually distinct form of response with respect to a research question. A theme may be represented by one or more participants. In relation to my research questions, a theme is therefore (1) a distinctive reason for assigning importance to scientific realism in fiction, (2) a distinctive way of evaluating unrealistic science in fiction aesthetically, and (3) a distinctive function of discourse about scientific realism in fiction.

I was primarily interested in participants’ self-reported responses in relation to each of my research questions. I share a basic assumption with the uses and gratifications approach to audience research, which is to say that audiences “are sufficiently self-aware to able to report their interests and motives in particular cases” (Katz, Blumler, & Gurevitch, 1973–1974, p. 511). This assumption is reflected in my focus group and interview guides (Appendix A) where my questions were often direct and transparent in purpose (e.g., explicitly asking why realism is personally important or unimportant). Having said this, I recognise that there is more to participant responses than what is explicitly self-reported, and where appropriate, I comment on the implicit meanings and strategies that I see at work in the focus groups and interviews.

Given that my third research question relates to the functions of discourse about scientific realism, it is worth clarifying that I performed a thematic analysis of self-reported functions of discourse about scientific realism rather than a discourse analysis of discourse about scientific realism. In other words, my thematic analysis should not be confused with discursive analysis as introduced by Potter and Wetherell (1987), Foucauldian discourse analysis (e.g., Parker, 1992), or other forms of discourse analysis. My approach resembles Potter and Wetherell’s approach to the extent I am interested in how “talk fulfils many functions and has varying effects” (p. 168). However, rather than analysing language use in participants’ discourse about scientific realism, I asked participants to self-report why they participated in discourse about scientific realism. I then organised their discursive motivations and purposes into distinctive themes.

My data analysis started during the transcription of my data. I used transcription as an opportunity to familiarise myself with the data. I also wrote analytic memos during
transcription, making a note of potential codes and themes and identifying questions that warranted further analysis. After transcription of my focus group discussions, I identified two main areas where I wanted to collect more data. First, I recognised that for many participants, unrealistic science was more problematic when it occurred in a narrative that was “serious” about realism. I wanted to find out more about what makes a narrative “serious” about realism. Second, I recognised that I needed more data about participant motivations for discussing scientific realism in a social context. As a result, I conducted interviews to further investigate these areas. After the interviews were complete, I familiarised myself with the data through transcription and recorded my early thoughts in memos in the same way as I had for the focus groups.

In the next stage of my analysis, I coded my data with the support of NVivo for Mac (Version 10.2.2). For me, Nvivo is a convenient way to code and re-code data. It is also a convenient way to organise and review coded data. However, beyond these conveniences, Nvivo was incidental to my analysis, and I do not expect my final analysis would differ if conducted with pencil and paper. I make a note of Nvivo here only in the interest of transparency.

As a point of terminological clarification, I use the word “code” to mean “a word or short phrase that symbolically assigns a summative, salient, or essence-capturing, and/or evocative attribute for a portion of language-based or visual-data” (Saldana, 2013, p. 3). In my thematic analysis, a theme is usually a category or synthesis of multiple codes, though as I noted above, a theme can also be represented by a single example. The word “code” is also a verb. Portions of text can be assigned to (coded at) a higher-level theme or a lower-level code.

I commenced the coding process with an initial cycle of eclectic coding (Saldana, 2013, pp. 188–193). I read the transcripts line-by-line, coding words, sentences, or paragraphs that were relevant to my research questions. Some of my initial codes were informed by my reading of the literature; other codes were identified in vivo. I also used structural coding (Saldana, 2013, pp. 84–87) to collect passages of text that related to a particular question before coding the passages more closely. After the initial cycle of coding, I organised codes together into preliminary themes and subthemes for each of my research questions. I then assessed the themes for conceptual distinctiveness and reviewed the data collected under each theme for consistency with the theme, revising the themes where necessary. With preliminary definitions of my themes in mind, I re-
read each transcript to identify additional examples of each theme and, where necessary, re-coded existing examples in accordance with my current thematic scheme. In the final stage of my analysis, I refined the definitions of my themes and started producing a report of my results. Like Braun and Clarke (2006), I regard report writing as part of the analytic process. Indeed, during the process of writing up my results and relating my findings to the literature, I further refined my definitions of themes, sometimes introducing a new theme or consolidating existing themes at this stage. In cases where themes were significantly modified during the writing process, I re-read the transcripts again to check the adequacy of my thematic scheme and re-coded text as needed.

When presenting my results in this thesis, I provide an indication of the number of participants corresponding to a theme by using pronouns, such as several, various, and many. Since pronouns on their own can be ambiguous (Sandelowski, 2001), I provide operational definitions for these pronouns in Table 3.2. As I noted above, I regard a single conceptually distinct response as sufficient to constitute a theme. Furthermore, as I noted in Chapter 1, the open-ended nature of interviews and focus groups means that the absence of a response supporting a theme does not necessarily mean the theme is unsupported (Braun & Clarke, n.d., "Should I use numbers?"). The aim of my analysis is to understand the conceptually distinct themes relevant to my research questions rather than attempting to rigorously quantify the relative prevalence of each theme. Furthermore, the responses associated with a theme may range from a detailed example to a passing allusion. For these reasons, I do not regard precise counts of responses to be meaningful when reporting my results. Nevertheless, the number of participants associated with each theme does provide a tentative measure of each theme’s prevalence in my sample. Providing an indication of the number of participants corresponding to each theme also contributes to the transparency of my analysis, and transparency is a feature of good qualitative research (Tracy, 2010).

Table 3.2

*Definitions of pronouns for describing participant numbers*

<table>
<thead>
<tr>
<th>Pronoun</th>
<th>No. of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Several</td>
<td>3–5</td>
</tr>
<tr>
<td>Various</td>
<td>6–10</td>
</tr>
<tr>
<td>Many</td>
<td>11–27</td>
</tr>
<tr>
<td>Most/majority</td>
<td>&gt; 27</td>
</tr>
</tbody>
</table>

41
Finally, it is worth noting that I did not verify the accuracy of the scientific claims made by the participants in this study. In some cases, participants discussed complex scenarios where it is difficult to make a definitive assessment of what is and what is not realistic. Furthermore, digressing into detailed explanations of scientific plausibility would distract from the focus of my thesis. I report on what participants perceive to be realistic or unrealistic and the justifications that they provide for their perceptions, but I do not attempt to establish what is actually realistic or unrealistic. Participant quotations should not be taken as a reliable source of scientific information.

3.8 A note on theoretical saturation and generalisability

As I described above, I did not use theoretical sampling in my study (cf. Section 3.1); nevertheless, it is possible to examine the extent to which I reached theoretical saturation. Since my research does not aim to generate theory as such, I use the term theoretical saturation to describe a point at which I have adequately accounted for the major themes relevant to my research question and described each theme satisfactorily. I refer to “major themes” in my definition of theoretical saturation because in some contexts, the number of themes is potentially endless and an exhaustive account of the research question may be impossible (O’Reilly & Parker, 2012).

Unfortunately there are limited practical guidelines for how to determine if theoretical saturation has been reached (O’Reilly & Parker, 2012). The concept of theoretical saturation presupposes data saturation, which Guest, Bunce, and Johnson (2006) define “as the point in data collection and analysis when new information produces little or no change to the codebook” (p. 65). However, data saturation does not necessarily equate to theoretical saturation if the researcher is sampling the same kinds of participants with the same kinds of experiences.

In a study of antipoverty projects in Jamaica, Bowen (2008) claimed to reach theoretical saturation when “additional data and further analysis failed to uncover any new thematic idea in relation to the emerging theory” (p. 145). Bowen considered a category as saturated “if it was reflected in more than 70 percent of the interviews, confirmed by member checks (interviewee feedback on the analyzed data), resonated with key informants, and made sense given prior research” (p. 148). Unlike Bowen, I did not place a quantitative threshold on the number of participants required for a theme, I did not conduct member checks, and there are no “key informants” in my research context.
However, the notion of reflecting on theoretical saturation in relation to the literature is prudent.

In my view, theoretical saturation is ultimately a matter of researcher judgement. Although we can confidently identify when theoretical saturation has not been achieved, we can only ever make a provisional claim that it has been achieved. In this study, I operationalise theoretical saturation in terms of the following questions:

- Is the researcher aware of significant gaps in their understanding of existing themes?
- Is there reason to believe that sampling new or different participants within the target population will give rise to significant new themes?
- Based on relevant research literature, is there reason to believe that the current study has not accounted for significant themes?

With this operationalisation in mind, I address the issue of theoretical saturation in relation to each of my research questions in Chapters 4, 5, and 6.

In addition to commenting on theoretical saturation, I also comment on the generalisability of my findings in each chapter. Generalisability “refers to the extent to which findings from a study apply to a wider population or to different contexts” (J. Green & Thorogood, 2004, p. 197). There are different ways of assessing generalisability (cf. Polit & Beck, 2010). Statistical generalisability relates to sample size and sampling methodology. Large probability samples are more generalisable than small non-probability samples. When assessed purely on a statistical metric, most qualitative studies, including this study, have limited generalisability. However, generalisability can also be assessed in terms of transferability, which involves a reasoned judgement about the extent to which results obtained in one context might be transferred (generalised) to another context. Transferability is often characterised as an assessment made by the reader based on a “thick description” of a study’s research context (Polit & Beck, 2010); however, as Kvale (2007, p. 127) notes, it is also possible for the researcher to comment on the potential transferability of their findings beyond just providing a description of how the study was conducted. When I discuss generalisability in this thesis, my comments should be understood as reflections on the transferability of my findings rather than a claim to statistical generalisability.
4. The personal importance of scientific realism in fiction

My aim in this chapter is to answer my first research question: Why is the realism of science in narrative fiction important to some readers? I begin by reviewing relevant literature before describing the results of my participant research. I conclude the chapter with a discussion of my results, including questions of theoretical saturation and generalisability. This chapter provides context for the more substantive findings of my research that I report in Chapters 5 and 6.

Furthermore, my focus in this chapter is on the personal aspects of reception rather than the social aspects of reception. As I will describe in Chapter 6, there are social motivations for discussing and critiquing the realism of science in fiction, and these social motivations might also be conceptualised as reasons why scientific realism is important to a given reader. However, my focus in this chapter is on why readers perceive scientific realism to be inherently important rather than why discourse about scientific realism might be useful or important in a social context.

4.1 Literature review

Responses to perceived realism are widely recognised as a fundamental form of response to narrative fiction (cf. Michelle, 2007), but I am not aware of any research directly examining why perceived realism is personally important to readers. However, there is a large body of research that examines the effects of perceived realism on various outcomes. From this literature it is possible to infer three overarching reasons why the realism of science in fiction may be important to readers: (1) realism can affect a reader’s enjoyment or appreciation of narrative fiction; (2) realism is relevant to assessing narrative fiction as a form of rhetorical communication; and (3) science in fiction may affect (positively or negatively) the public’s science-related knowledge, attitudes, or behaviours.

4.1.1 Perceived realism, enjoyment, and appreciation

To understand why realism in narrative fiction might be important to readers it is important to recognise what motivates readers to consume narrative fiction. Current
research in this area focuses on two major motivations for consuming entertainment media: enjoyment and appreciation (e.g., M. B. Oliver & Bartsch, 2010; Vorderer, 2011). The realism of science in fiction may be important to the extent that it affects a reader’s enjoyment or appreciation of the fiction that they consume.

Broadly defined, enjoyment can be understood as a “pleasant experiential state” (Vorderer, Klimmt, & Ritterfeld, 2004, p. 393). Enjoyment can also be understood as a positive attitude toward a media text (Nabi & Krcmar, 2004). M. B. Oliver and Bartsch (2010) conceptualise enjoyment more narrowly in terms of two dimensions: fun and suspense. They operationally define fun in the context of film reception with a three-item scale: “It was fun for me to watch the movie; I had a good time watching this movie; and the movie was entertaining.” They also operationalise suspense with a three-item scale: “I was at the edge of my seat while watching this movie; this was a heart-pounding kind of movie; and the movie was suspenseful.” As Oliver and Bartsch observe, both fun and suspense have been theorised as entertainment motivations. Zilman’s (1988/2015) mood management theory posits that readers select media to manage their affective state. Fun texts (e.g., comedies and action narratives) are selected on this basis because they are conducive to a positive mood. Zuckerman (1996/2013) proposes that media choices are influenced by a sensation-seeking trait, defined as the seeking of “varied, novel, complex, and intense sensations and experiences” (p. 148). Suspenseful texts (e.g., horror and thriller narratives) are selected on this basis because they are conducive to sensation-seeking.

When defined as the experience of fun or suspense, enjoyment does not seem to satisfactorily account for the appeal of dramatic texts that invite thoughtful reflection and evoke a pensive mood. Oliver and Bartsch (2010) posit that appreciation better accounts for the appeal of these texts than enjoyment. They define appreciation as an “experiential state that is characterized by the perception of deeper meaning, the feeling of being moved, and the motivation to elaborate on thoughts and feelings inspired by the experience” (p. 76). Note that this definition of appreciation is distinct from a sense of appreciation as a detached evaluation of the formal composition of a text (e.g., Nabi & Krcmar, 2004, p. 290). In any case, it is possible to distinguish between hedonic (pleasure-seeking) and eudaimonic (meaning-seeking) motivations for consuming narrative fiction (M. B. Oliver & Raney, 2011).
Previous research suggests that perceived realism contributes to both enjoyment and appreciation. Bilandzic and Busselle (2011) asked 162 participants to watch the science fiction film *Gattaca* (1997), the crime thriller *A Murder of Crows* (1999), and the romantic comedy *The Very Thought of You* (1998) on consecutive nights. Participants completed a self-report questionnaire after each film, which included measures of external realism, narrative realism (i.e., narrative consistency), enjoyment, and other variables. Bilandzic and Busselle conducted a path analysis for each film and found that narrative realism made a direct contribution to enjoyment in *Gattaca* and *A Murder of Crows*. Similarly, van Leeuwen, Renes, and Leeuwis (2013) found perceived realism to be associated with enjoyment in their study of an alcohol-themed entertainment education series, *Roes* (2008). In a focus group reception study of *The Big Bang Theory* (2007–), Li (2016) also found that the perceived scientific realism of the series contributed to enjoyment but primarily for participants with a science background.

Previous research has also linked perceived realism to appreciation. In a qualitative study of reader responses to violent media (including narrative fiction), Bartsch et al. (2016) found that thoughtful reflection on media violence was more likely when participants perceived a text’s representation of violence to be realistic. Bartsch et al. observed that a perception of unrealism “resulted in emotional and cognitive disengagement, such that interviewees could not take the violent content seriously, and felt unmotivated to waste their thoughts on it” (pp. 759–760). Similarly, in a focus group reception study of a production of Caryl Churchill’s 2002 play *A Number*, Donkers and Orthia (2014) found that some participants were more amenable to thoughtful discussion and reflection when narratives entailed some degree of seriousness and external realism (what Donkers and Orthia call “non-speculative, non-satirical” texts), such as *A Number, Never Let Me Go* (2005, 2010), and *My Sister’s Keeper* (2004, 2009).

Perceived realism can affect enjoyment and appreciation directly but it can also affect enjoyment and appreciation indirectly through other variables, such as transportation. M. C. Green and Brock (2000) define transportation as “a convergent process, where all mental systems and capacities become focused on events occurring in the narrative” (p. 701). Transportation relates to the experience of being “lost in a book” (Nell, 1988) or immersed in a storyworld. It is associated with an emotional response to the narrative, a loss of awareness of the reader’s physical surroundings, and in the case of written or oral narratives, vivid mental imagery (M. C. Green & Brock, 2000, 2002). Transportation is an inherently pleasurable experience but it may also contribute to narrative enjoyment.
because it co-varies with or gives rise to other enjoyable outcomes (M. C. Green, Brock, & Kaufman, 2004). Previous studies have reported correlations between transportation and perceived realism (Bilandzic & Busselle, 2011; M. C. Green, 2004; Hall & Bracken, 2011; Krakowiak & Oliver, 2012), enjoyment (Bilandzic & Busselle, 2011; Hall & Bracken, 2011; Johnson & Rosenbaum, 2015; Krakowiak & Oliver, 2012), and appreciation (Johnson & Rosenbaum, 2015; Krakowiak & Oliver, 2012).

Perceived realism may also influence enjoyment and appreciation by affecting a reader’s relationship with one or more of the characters in a narrative. A number of variables describe the relationship between a reader and a character, including identification, wishful identification, similarity, liking, and parasocial interaction (cf. Moyer-Gusé, 2008). Of these constructs, identification and parasocial interaction may be of particular relevance. For J. Cohen (2001), identification occurs when the reader imagines “being that character and replaces [their] personal identity and role as audience member with the identity and role of the character within the text” (pp. 250–251). Transportation and identification are often correlated, and identification shares an absorption dimension with transportation; however, transportation and identification can be manipulated independently, suggesting that they are distinct constructs (Tal-Or & Cohen, 2010). Cho, Shen, and Wilson (2014) found that the perceived typicality of events in a public service announcement predicted identification with the protagonist. Identification might in turn predict enjoyment or appreciation, though as Tal-Or and Cohen (2010) observe, the relationship between identification and enjoyment may depend on the specific experiences and outcomes experienced by the character with which the reader has identified.

First introduced by Horton and Wohl (1956), the concept of parasocial interaction can be understood as “a one-sided interpersonal relationship that [readers] establish with media characters” (R. B. Rubin & McHugh, 1987, p. 280). A. M. Rubin and Perse (1987) found perceived realism to be associated with parasocial interaction with soap opera characters, and Hartmann and Goldhoorn (2011) found parasocial interaction to be associated with the enjoyment of a short TV clip. When taken together, these studies suggest that the relationship between perceived realism and enjoyment might be mediated by parasocial interaction in some circumstances.

Transportation, identification, and parasocial interaction can all be conceptualised as forms of “involvement” in narrative fiction (W. J. Brown, 2015). Indeed, each of these
variables may be related to the dimension of perceived realism that Hall (2003) calls “involvement.” As I noted in Chapter 2, Hall’s concept of involvement may be better conceptualised as a covariate of scientific realism rather than a dimension of scientific realism. Also as I noted in Chapter 2, some of Hall’s participants regarded perceived realism as a precondition of involvement, whereas others felt involvement could compensate for a lack of perceived realism. In this way, Hall’s study seems to corroborate the relationship between perceived realism and the involvement variables described above, but it also suggests that perceived realism may not be necessary or sufficient for involvement to occur.

The effect of perceived realism (especially narrative consistency) on enjoyment, appreciation, and “involvement” can be understood in relation to the concept of coherence. For W. R. Fisher (1987), coherence is the degree to which a narrative “hangs together” and is an innate criterion by which readers evaluate all narratives (I will discuss Fisher’s notion of coherence in more detail in Section 4.1.2 below). As McAdams (2006) observes, the coherence of a narrative broadly relates to whether it is comprehensible in terms of the reader’s understanding of how stories are told and how the world works. In this way, coherence can be defined in terms of narrative discourse (form) and story. Narrative discourse may be incoherent if it is perceived as insufficient (under-explaining), overabundant (over-explaining), or fragmentary (i.e., consisting of disparate elements that do not form a coherent whole) (Rabinowitz, 1987). Story may be incoherent if there are narrative inconsistencies (i.e., events or existents that are implausible, atypical, or non-factual in the storyworld). However, narratives can include ostensibly incoherent elements and still be coherent as long as those elements can be interpreted as serving some form of aesthetic or communicative function (Rabinowitz, 1987; Stroud, 2002). Narrative coherence therefore rests not so much on the ostensible coherence of the narrative but on the ability of the reader to construct a coherent meaning (Stroud, 2002). If a threshold level of coherence is necessary for enjoyment or appreciation, it is understandable why narrative inconsistencies might detract from enjoyment or appreciation.

Narrative comprehension models provide further insight into how narrative inconsistencies might detract from enjoyment or appreciation. During narrative comprehension, readers construct a mental model (situation model) of the events and existents in a story (Zwaan & Radvansky, 1998). The event-indexing model (Zwaan, Langston, & Graesser, 1995) proposes that readers update situation models along five
dimensions as they read. These dimensions include time, space, protagonist, causality, and intentionality. Similarly, the constructionist theory of narrative comprehension (Graesser, Olde, & Klettke, 2002) assumes that readers seek to establish and maintain a coherent situation model at the local level (i.e., the sentence level) and the global level (i.e., the paragraph level and greater). Experimental research has found that participants take longer to read a sentence if it is discontinuous with the previous sentence in terms of one or more of the dimensions of the situation model (e.g., Curiel & Radvansky, 2014; Radvansky & Copeland, 2010; Rinck & Weber, 2003; Zwaan, Langston, et al., 1995; Zwaan, Magliano, & Graesser, 1995). For example, if the setting changes from one sentence to the next, the two sentences can be considered spatially discontinuous. The increased reading time in response to a discontinuity reflects increased cognitive processing that is presumably directed towards updating the situation model and establishing coherence (Graesser et al., 2002; Zwaan & Radvansky, 1998). Much of the experimental support for the event-indexing model is in the context of written narratives, but there is also support for the model in the context of film narratives (Magliano, Miller, & Zwaan, 2001).

The relationship between narrative comprehension processes and enjoyment or appreciation is made explicit in Busselle and Bilandzic’s (2008) model of narrative comprehension and engagement. Busselle and Bilandzic conceptualise transportation as “a flow experience in constructing the mental models of a story that is accompanied by the positioning of oneself in the story world” (p. 263). The term “flow” refers to a state of pleasurable absorption in a task when the task is neither too easy nor too difficult (Csikszentmihalyi, 1991). In Busselle and Bilandzic’s (2008) model, narrative inconsistencies (what they call violations of narrative realism) can disrupt mental model construction and in turn, disrupt a reader’s transportation into a narrative. In the absence of narrative inconsistencies, situation model construction can proceed smoothly and transportation can be maintained. Since readers also construct mental models of characters, narrative inconsistencies relating to character might also be expected to disrupt identification. In this way, narrative inconsistencies might affect enjoyment or appreciation through their effect on transportation or identification. Put most simply, narrative inconsistencies might detract from enjoyment and appreciation because they make it difficult or impossible for a reader to construct a coherent situation model of the story.

As a result, scientific realism may be important to readers because it has the potential to directly or indirectly affect their enjoyment or appreciation of the narrative fiction that
they consume. To the extent that transportation, identification, enjoyment, and appreciation depend on narrative coherence, unrealistic science may detract from transportation, identification, enjoyment, and appreciation by detracting from narrative coherence.

4.1.2 Perceived realism and rhetoric

Beyond its effects on the enjoyment or appreciation of narrative fiction, the perceived realism of science in fiction may also be important to readers because it informs their evaluation of narratives as a form of rhetorical communication. First championed by Booth (1961/1983), a rhetorical approach to fiction conceptualises narrative as a "multidimensional purposive communication from a teller to an audience" (Phelan & Rabinowitz, 2012, p. 3). In this approach, narrative is defined as "somebody telling somebody else, on some occasion, and for some purpose, that something happened to someone or something" (Phelan & Rabinowitz, 2012, p. 3). The communicative purposes to which narratives can be directed are diverse, and a rhetorical approach to narrative is not limited to narratives with persuasive intent. Nevertheless, my focus in this section is on how perceived realism might contribute to or detract from an author's capacity to communicate a persuasive thesis to a reader.

W. R. Fisher's (1987) narrative communication paradigm provides a useful framework for examining how the scientific realism of a narrative relates to the validity of its thesis. In this paradigm, Fisher proposes that an innate narrative rationality precedes but may be supplemented by traditional forms of rationality (e.g., formal and informal logic). As I will elaborate in detail below, narrative rationality consists of the tests of coherence (which Fisher sometimes refers to as probability) and fidelity. Fisher argues that narrative rationality may be used to evaluate all forms of communication (not just narratives), which is a claim that some scholars contest (e.g., Rowland, 1989). Since the scope of my research is limited to narrative fiction, I seek only to apply Fisher's work to narrative forms of communication.

In the narrative communication paradigm (Fisher, 1987), coherence and fidelity are the criteria by which narratives are assessed as rhetorical communication. Fisher's concept of coherence differs somewhat from the conceptualisation of coherence I introduced in Section 4.1.1 above. For Fisher, coherence relates to "whether a story hangs together" and has three dimensions: argumentative or structural coherence, material coherence, and characterological coherence (p. 47). Fisher does not define argumentative or structural
coherence, but based on his discussion of coherence in relation to *Death of a Salesman* (1949) and *The Great Gatsby* (1929), this dimension seems to refer to how the various incidents in a narrative work coherently to present the same thesis. For Fisher, a narrative would be incoherent if the narrative contained “irrelevant and digressive incidents and discourse” or if the narrative seemed to “support conflicting themes” (p. 177). Assessing material coherence involves comparing a narrative to other related narratives to identify what it is omitted or how it has distorted the issue at hand. As Fisher writes, “a story may be internally consistent, but important facts may be omitted, counterarguments ignored, and relevant issues overlooked” (p. 47). Finally, characterological coherence “requires that characters behave characteristically” (p. 47). This form of coherence requires that the “actional tendencies” of characters should not “contradict one another, change significantly, or alter in ‘strange’ ways” (p. 47). Thus, for Fisher, narratives that achieve argumentative, material, and characterological coherence will be superior examples of rhetoric.

Fidelity is the second criterion by which narratives are assessed in Fisher’s (1987) narrative communication paradigm. For Fisher, narrative fidelity “concerns the ‘truth qualities’ of a story, the degree to which it accords with the logic of good reasons: the soundness of its reasoning and the value of its values” (p. 88). In other words, fidelity concerns the validity of a narrative’s thesis. Fisher explains that the validity of a thesis can be tested through traditional forms of rationality where relevant, but the more fundamental test pertains to the values embedded in the thesis (pp. 88–89). Indeed, for Fisher, “all serious discourse expresses values” (p. 109). Furthermore, values have currency in the logic of good reasons, which Fisher defines as “elements that provide warrants for accepting or adhering to the advice fostered by any form of communication that can be considered rhetorical” (p. 107). In this way, Fisher characterises narrative fidelity as a values-based assessment of a narrative’s thesis.

Fisher’s (1987) conceptualisations of coherence and fidelity are a useful starting point for thinking about realism and rhetoric. However, modifying these concepts enhances the utility of the narrative communication paradigm for my purposes. As Stroud (2002) has observed, Fisher’s notion of coherence has difficulty accounting for narratives that communicate a coherent meaning despite including incoherent elements. Stroud argues that coherence is better conceptualised as the ability to discern a coherent meaning. As I described above in Section 4.1.1, I draw on McAdams (2006) to conceptualise coherence in terms of two dimensions (as opposed to the three dimensions of Fisher’s scheme). My
first dimension, formal coherence (i.e., the coherence of narrative discourse) maps onto Fisher’s notion of structural coherence. My second dimension, narrative consistency (i.e., plausibility, typicality, and factuality in the storyworld) is compatible with Fisher’s notion of characterological coherence but it is broader because narrative consistency includes all events and existents in the story, not just character actions. As I will describe below, Fisher’s third dimension of coherence, material coherence, is better conceptualised as an aspect of fidelity.

As for his conceptualisation of coherence, Fisher’s (1987) conceptualisation of fidelity also benefits from some modifications. Fisher characterises fidelity in terms of consistency between the values of the reader and the values advanced by the narrative’s thesis. Some critics regard Fisher’s notion of fidelity as too conservative because it seems to preclude, or least underemphasise, the possibility of a reader changing their values through reading a narrative (Kirkwood, 1992; Stroud, 2002). As a result, Stroud (2002) redefines fidelity as “whether or not a story ‘rings true’ with the values that [a reader] holds or potentially could hold, given a coherent reconstruction of the narrative in question” (p. 389, emphasis added).

My objection to Fisher’s (1987) characterisation of fidelity is somewhat different to Stroud’s (2002). I find an overarching emphasis on values to be limiting. Fisher’s emphasis on values can be understood by recalling the broader context of his work. Fisher is not merely describing criteria for evaluating narratives, but he is attempting to establish a new paradigm that precedes and subsumes traditional rationality. Values are important to Fisher’s project because values need not be the product of formal education and therefore can be the basis of an innate narrative rationality that can be used to evaluate all rhetorical messages. I agree with Fisher that values are important, and perhaps it is true that all theses and all evaluations of theses can ultimately be traced to values, but I prefer to adopt a broader and more flexible conceptualisation of fidelity that includes but is not limited to values-based assessments. Put simply, I prefer to conceptualise fidelity as the validity of a narrative’s thesis, the determination of which may draw upon a reader’s prior knowledge, beliefs, values, and so forth. My approach is consistent with Rowland’s (1989) characterisation of fidelity as the determination of “whether the ideas or arguments in a story hold up when they are pulled out of the story and tested against the real world, using the standards of informal logic” (p. 51). This approach is not inconsistent with Fisher, but it is a broader framing of the fidelity concept that doesn’t afford values the same emphasis.
Having introduced and redefined Fisher’s (1987) concepts of coherence and fidelity, I now turn to the relationship between them. Since a thesis is inferred from a narrative’s representation of events and existents, the coherence of a narrative is linked to the fidelity of its thesis. As Farner (2014, pp. 304–310) observes, the evaluation of a narrative’s thesis is inextricably tied to an evaluation of the narrative consistency of the events from which the thesis is derived. However, fidelity and coherence are not identical constructs. A coherent narrative that has no major inconsistencies may still lack fidelity if the reader regards the narrative’s thesis as invalid. Every narrative, however coherent, is a construct that shapes, omits, and distorts aspects of an issue through, for instance, choosing to tell a story from one perspective but not another or choosing to emphasise some details but not others (Booth, 1961/1983). This point accords with Fisher’s (1987) description of material coherence when he states that “a story may be internally consistent, but important facts may be omitted, counterarguments ignored, and relevant issues overlooked” (p. 47). As a result, what Fisher calls material coherence is better understood as an aspect of fidelity rather than coherence. For example, a narrative where a child experiences a severe allergic reaction after being vaccinated might be used to present an anti-vaccination thesis. However, even if this narrative had formal coherence and narrative consistency, the fidelity of the thesis could still be interrogated. For many readers, the fidelity of such a narrative would be reduced if the narrative overlooked the benefits of vaccination and focussed only on the risks. Coherence and fidelity can be linked but they are not interchangeable. Narratives with major forms of incoherence (including narrative inconsistencies) are likely to lack fidelity, but not all narratives lacking fidelity are incoherent.

The relationship between fidelity and the narrative consistency dimension of coherence is particularly complex with respect to the concept of typicality. As I noted in Chapter 2, there is an inherent tension between plausibility and typicality in assessments of perceived realism. A plausible but atypical event can be regarded as realistic or unrealistic depending on whether the reader prioritises plausibility or typicality respectively. In this way, an atypical event does not necessarily mean that a narrative will be perceived as inconsistent. However, even if typicality does not enter into a reader’s judgement with respect to narrative consistency, it may still be mobilised in an assessment of fidelity. An atypical event might not be striking enough to be perceived as a narrative inconsistency, but a reader may still regard the narrative as lacking fidelity because the thesis is derived from an event that is unrepresentative of how things
typically are or how things typically should be. To return to the example above, a narrative about a child’s severe allergic reaction to vaccination might be used to present an anti-vaccination thesis. However, the validity of the thesis would be undermined for many readers because it focuses on an atypical case: severe allergic reactions are an atypical outcome of vaccination (cf. Bohlke et al., 2003). In this way, atypical events may undermine the perceived fidelity of a narrative even if they do not undermine its perceived narrative consistency.

However, just because typicality can be a consideration for assessing fidelity doesn’t mean that it always will be or that is always should be. The relative importance of typicality versus plausibility for achieving narrative fidelity may vary from issue to issue and from reader to reader. Although typicality is likely to enhance fidelity, typicality is not necessary or sufficient to achieve fidelity.

Narratives about risk events provide a useful illustration of the complex relationship between typicality and perceived fidelity. Risk is commonly understood in terms of a technical or quantitative definition where the probability (typicality) of a risk event is multiplied by the expected consequences of that event, such as injury or death (e.g., Crouch & Wilson, 1982). However, technical definitions of risk alone fail to adequately account for how publics perceive and assess risk. In practice, risk perception and risk acceptability are determined by a host of psychological, social, and cultural influences (Kasperson et al., 1988). Although heuristics and cognitive biases can lead to overestimates or underestimates of risk event frequency (e.g., Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978), public perceptions of risk should not be viewed simply as flawed deviations from the “correct” technical calculations conducted by scientific experts. Otway and von Winterfeldt (1982) reject the notion that public assessments of risk are simply “irrational” and should ideally be brought into alignment with the “rational” technical assessments made by scientists. Different views of risk acceptability, they argue, cannot be reduced to “numerical disagreements about risk magnitude” (p. 252). Even if there is agreement over the probability and consequences of a given outcome, there is not necessarily agreement over the meaning attached to that outcome or the acceptability of that outcome (Kasperson & Kasperson, 1991). Risk acceptability is inextricably caught up in value judgements (Fischhoff, Lichtenstein, Slovic, Derby, & Keeney, 1981). As a result, the acceptability of a risk is not reducible to the likelihood or typicality of a risk event as estimated by scientific experts. A narrative that
portrays an atypical risk event can still achieve perceived fidelity as long as the risk event is perceived as both plausible and unacceptable.

The conflict between typicality and plausibility in establishing narrative fidelity is illustrated by the reception of *The China Syndrome* (1979), a film about safety concerns at a nuclear energy plant. *The China Syndrome* was a common reference point in public discourse about nuclear energy, both before and after the 1979 Three Mile Island nuclear accident in Pennsylvania, which occurred just 12 days after the film’s cinematic release (cf. Von Burg, 2005). Through its dramatisation of safety incidents at a fictional power plant, *The China Syndrome* can be interpreted as communicating an anti-nuclear thesis. As Von Burg (2005) describes, proponents of nuclear energy sought to discredit the film by emphasising the atypical nature of a nuclear meltdown, whereas opponents of nuclear energy defended the film by emphasising the plausibility of a nuclear meltdown. For proponents of nuclear energy, the narrative lacked fidelity because it dramatised concern over an atypical event (i.e., a nuclear meltdown). For opponents of nuclear energy, the narrative achieved fidelity irrespective of the historical frequency (typicality) of nuclear meltdowns. In other words, proponents of nuclear energy emphasised a technical definition of risk whereas opponents of nuclear energy adopted a broader conceptualisation of risk acceptability. In this way, the reception of *The China Syndrome* illustrates how the perceived fidelity of a narrative’s thesis cannot be reduced to the typicality of the events or risks that it portrays. Typicality is not synonymous with fidelity, just as acceptable risk is not synonymous with technical definitions of risk.

So far I have been discussing the relationship between narrative consistency and fidelity. For a realist narrative, narrative consistency is synonymous with external realism (cf. Chapter 2). However, for a non-realist narrative, there is a distinction between external realism and narrative consistency. As a result, the fidelity of a non-realist narrative may involve assessments of external realism as well as narrative consistency. After all, narrative fidelity is concerned with the validity of a narrative’s thesis in the real world. For example, Guyer and Moreno (2004) argue that science fiction narratives are typically not a useful platform for thematic explorations of bioethical issues, such as gene technology. For Guyer and Moreno, it is only possible to assert valid theses about current bioethical issues if a narrative is grounded in what it is actually possible to achieve with science and technology:

A common and disturbing feature of the ubiquitous bioethical commentaries is the short shrift—often, complete inattention—given to the feasibility of the
technologies under discussion. So many of the commentaries include the caveat “when the technology is good enough” and then carry on with the ethical analyses and risk-benefit assessments. Yet, many of the futurist therapies and fixes are never going to become standard or useful, because the technologies are not now and never will be precise, predictable, and reliably controllable. (p. W14)

Non-realist narratives about futuristic science and technology may entail storyworlds where, unlike the real world, the technology at issue is indeed “good enough.” However, as Guyer and Moreno’s position illustrates, readers will not necessarily accept theses about the real world as valid if those theses are derived from a non-realist narrative. In this way, external realism, not just narrative consistency, may affect the fidelity of a non-realist narrative.

The relationship between external realism and fidelity is particularly nuanced in narratives dealing in symbol, conceptual metaphor, and allegory. As Farner (2014) notes, an allegorical narrative consists of both a surface story and an underlying story, and it is the underlying story that is “the real vehicle for the [thesis]” (p. 305). For example, Godzilla (1954) can be interpreted in terms of an anti-nuclear thesis. There is little external realism to be found in the Godzilla concept—the emergence of a giant monster as a result of nuclear weapons testing seems to be implausible. However, Godzilla still functions as a metaphor for the monstrous consequences of nuclear fallout in the real world (Brothers, 2011). As a result, the fidelity of the narrative’s thesis does not necessarily depend on the narrative’s external scientific realism. As long as there are undesirable consequences from nuclear weapons in the real world, Godzilla (the monster) functions as a metaphor for those consequences and Godzilla (the film) functions as a vehicle for an anti-nuclear thesis. To some extent, the fidelity of even a non-allegorical narrative’s thesis can be separated from its scientific realism, since by virtue of being a form of generalisation, a narrative’s thesis can be valid even if the specific story used to evoke the thesis contains unrealistic elements. As Farner (2014, p. 305) notes, the degree of abstraction involved in inferring a thesis may vary from one reader to the next. Nevertheless, for a non-allegorical narrative, the surface story remains the vehicle for the thesis and the scientific realism of the surface story is directly relevant to the fidelity of the thesis, whereas for allegorical narratives, the scientific realism of the surface story may be less important because the underlying story is the intended vehicle for the narrative’s thesis.

Fisher’s (1987) narrative communication paradigm is not the only framework for thinking about how readers might assess the thesis of a narrative. In C. R. Berger, Ha,
and Chen’s (2016) story appraisal theory, readers evaluate narratives in terms of their pointedness, plausibility, and probative value. Pointedness refers to the ability to discern a thesis; plausibility refers to “believability and whether story events could actually happen to people” in the real world (p. 5); and probative value relates to “whether it is reasonable to use [a] story as a basis for generalizing to conditions in the physical or social world in terms of their prevalence” (p. 5). In other words, probative value is essentially synonymous with typicality as defined by Hall (2003).

Story appraisal theory resembles the modified narrative communication paradigm described above, but I prefer the modified narrative communication paradigm because it allows for a more sophisticated understanding of what represents a valid narrative thesis. In the modified narrative paradigm, I draw on McAdams (2006) and define coherence as consisting of formal coherence and narrative consistency. Following Rowland (1989), I define fidelity as the validity of a narrative’s thesis when assessed in terms of a reader’s informal logic. The notion of formal coherence maps onto Berger et al.’s concept of pointedness (i.e., assessing whether the narrative communicates a coherent thesis). The main difference between the two approaches is that story appraisal theory seems to reduce narrative consistency to plausibility and reduces narrative fidelity to typicality. As I argued above, typicality is neither necessary nor sufficient for a narrative thesis to be deemed valid. To the extent that the thesis of a narrative is more valid when the story is perceived as typical, story appraisal theory may be a serviceable approach to understanding the evaluation of narrative theses; however, story appraisal theory may be inadequate in circumstances where typicality is not a necessary determinant of thesis validity (e.g., in the reception of The China Syndrome).

In any case, both Berger et al.’s (2016) story appraisal theory and Fisher’s (1987) narrative communication paradigm afford a role to perceived realism in reader evaluations of narrative theses. As such, both theories predict a relationship between perceived realism and message evaluation, a relationship that has also been postulated by Cho, Shen, and

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4 Berger et al.’s (2016) conceptualisation of plausibility is somewhat unclear. Berger et al. cite Hall (2003) when introducing the concept of plausibility, suggesting that like Hall, they conceptualise plausibility as binary (i.e., possible/impossible). However, Berger et al. operationalise plausibility by asking participants to rate the degree to which a story about crime on a university campus was “believable, plausible, true to life, and reflective of events that could happen to students on campus” (p. 9, emphasis in original). Depending on how these items are interpreted, they do not necessarily measure plausibility as a binary construct. Although there is some evidence of discriminant validity for Berger et al.’s measures of plausibility and probative value (r = 0.4), story appraisal theory would benefit from a clearer definition of plausibility, thereby clarifying the extent to which plausibility overlaps with or is distinct from probative value (typicality).
Wilson (2014). Message evaluation refers to the perceived effectiveness or persuasiveness of a message (Dillard, Weber, & Vail, 2007), which in this case is the perceived effectiveness of a narrative’s thesis. I am not aware of any research that directly examines the relationship between perceived realism and message evaluation in the context of narrative fiction. However, several studies of narrative-based public service announcements have reported a correlation between one or more dimensions of perceived realism and message evaluation (e.g., Cho & Choi, 2010; Cho, Shen, & Wilson, 2014; Fishbein, Hall-Jamieson, Zimmer, Von Haeften, & Nabi, 2002). Furthermore, Berger et al. (2016) found a composite measure of pointedness, plausibility, and probative value to be associated with estimated behaviour change for news stories on various topics.

To assert that scientific realism can influence the perceived validity of a narrative’s thesis does not mean that all unrealistic elements are equally important in this respect. As I will describe in Chapter 5, the relevance of an unrealistic element to the narrative’s thesis may moderate its impact on the validity of the thesis. Moreover, as I will describe in Chapter 6, the relationship between scientific realism and narrative fidelity can be emphasised or downplayed depending on whether the thesis of a narrative is congruent or incongruent with a reader’s existing beliefs and values. It is not my intention in this section to describe when realism matters most rhetorically. My intention in this section is to highlight that, at least on the basis of Berger et al.’s (2016) story appraisal theory and Fisher’s (1987) narrative communication paradigm, perceived realism is relevant to the evaluation of narrative as rhetorical communication. The perceived realism of science in fiction may be important to readers for this reason.

4.1.3 Perceived realism and media effects

The realism of science in fiction may also be important to some readers because of the perceived effects of realistic or unrealistic science on other readers. In general, realistic science is lauded for its perceived positive effects while unrealistic science is critiqued for its perceived negative effects.

Writing in Science, Greenbaum’s (2014) review of The Perfect 46 (2014), a fiction film about human genome sequencing, is representative of the media effects concerns that are sometimes espoused by the scientific community:

Concerns with accurate representation go way beyond simply mangling scientific theories at the water cooler. Good science in film can inspire innovation and promote participation in scientific endeavors. Controversial or bad science can,
intentionally or otherwise, excessively influence conventional wisdom, public policy, legal outcomes, and even the direction and funding of research. (p. 980)

Greenbaum (2009) proposes various strategies for reducing the perceived negative influence of unrealistic science in fiction. Greenbaum suggests that scientists should act as consultants during the production of fiction and review fiction for its realism during its reception. However, he worries that such initiatives may not be enough to achieve change if readers and authors don’t ultimately care about scientific realism. He therefore proposes government intervention. Fictional texts could be labelled with warnings about unrealistic science, Greenbaum says. These warnings would be “akin to disclaimers and warnings found on our pharmaceuticals, cigarette packages and food products” (p. 317). Governments could offer tax breaks for films with realistic science and tax penalties for films with unrealistic science. “The most extreme solution,” Greenbaum writes, “would be to prevent, or at least severely limit, the showing of misrepresented science in film in a manner similar to the methods now used to control certain forms of pornography in film” (p. 318). Greenbaum then goes on to provide a serious discussion of the constitutionality of censoring films with unrealistic science in the US, concluding that censorship “may not always run afoul of constitutional free speech rights” (p. 250).

Although it is unlikely that many scientists would endorse Greenbaum’s more extreme strategies, many scientists do share a concern with the effects of unrealistic science on the public. As Kirby (2010a) has observed, science in fiction is “something of a cultural ‘bogeyman’” for the scientific community (p. 23). Rogers (2007) characterises unrealistic science in films as a “danger to clear thinking” (p. 8). Guyer and Moreno (2004) argue that “science fiction should not be allowed to drive and shape science policy” (p. W17).

Concern about the influence of unrealistic science in forensic dramas, namely Crime Scene Investigation (CSI, 2000–2015), is so widespread that it has been popularly termed the “CSI effect” (cf. S. A. Cole, 2015). The “CSI effect” is actually an umbrella term for a range of different effects attributed to CSI, though the most prominent is the suggestion that CSI causes juries to acquit due to a lack of forensic evidence when they otherwise might have convicted (S. A. Cole & Dioso-Villa, 2011). Various other examples of concern about unrealistic science in fiction are described by Kirby (2003, p. 262) and Orthia et al. (2012, pp. 150–151).

The effects of science in fiction are not always conceptualised as negative. Unrealistic or “speculative” science can also be valued for its potential to inspire scientific innovation. In a foreword to The Physics of Star Trek (Krauss, 1995), physicist Stephen Hawking
states, “Science fiction like *Star Trek* is not only good fun but it also serves a serious purpose, that of expanding the human imagination” (xi). As Milburn (2010) notes, “the idea that science fiction influences science as much as science influences science fiction is now something of a cliché” (p. 561). There are various anecdotal cases of real science being inspired by fictional narratives, including the influence of the comic book series *Dick Tracy* (1938–) on Martin Cooper’s invention of the mobile phone (M. Fisher, 2015). Indeed, Kirby (2010b) has documented how scientists sometimes use fiction to “prototype” prospective technologies and attract public support and funding.

Beyond inspiring innovation, positive and exciting (if not realistic) portrayals of science and scientists are valued for their potential to inspire interest in science and even inspire scientific careers. Indeed, the “CSI effect” can also refer to the perceived positive effect of forensic dramas on the desirability of a career in forensic science (S. A. Cole & Dioso-Villa, 2011). Anecdotally, various scientists have traced their careers in science to inspiration from works of fiction. As physicist Sidney Perkowitz writes in the introduction to his book, *Hollywood Science* (2010):

> So when I write about science in the movies, I’m paying homage to how science fiction, at its best, can bring us back to that sense of marvels yet to be found and how it can inspire those among us, myself included, who dream about becoming scientists. (p. x)

For astronomer and astrophysicist Bryan Gaensler, Heinlein’s 1956 novel *Time for the Stars* was a seminal influence:

> [It] is ultimately a breezy kids’ adventure novel, but it had a massive influence on me. Modern physics wasn’t abstruse. It was measurable, and it had consequences. I was hooked. And I’ve never let go. (M. J. I. Brown et al., 2015)

Palaeontologist Stephen Brusatte (2015) offers a similar account of *Jurassic Park* (1993) and its influence on his career choice. For Brusatte, the perceived ability of the *Jurassic Park* films to spark interest in science outweighs the possibility of readers learning inaccurate scientific information about dinosaurs.

Survey research also highlights how scientists perceive fiction as an important influence on the public. Caulfield and Zarzeczny (2010) surveyed 56 attendees of the 2009 annual general meeting of the Canadian Stem Cell Network about science and popular culture. They found that the majority of respondents believed that popular culture has an effect (86%) or sometimes has an effect (12.5%) on public perceptions of science. Similarly, most respondents agreed that popular culture affects (48%) or sometimes affects (32%)
Respondents were divided over the nature of the effects, with 47% agreeing that popular culture makes people “more suspicious” of technology and 42% agreeing that popular cultures make people “more accepting” of technology. Respondents were similarly divided over the appropriateness of popular culture as “a mechanism for critiquing the benefits and risks of science,” with 41% deeming it appropriate and 45% deeming it inappropriate. However, perceptions of media effects were not limited to the public. Although 39% of respondents reported that popular culture representations of science had “nothing to do with their work,” 45% reported that it had made them “think about their work in a different way,” and 20% agreed that they had “thought about popular culture representations of science when making decisions about what project(s) to pursue.” The results of this study should be interpreted with caution given that the study did not use representative sampling. It would also be interesting to investigate how responses might change if the survey questions specified realistic or unrealistic representations of science rather than just asking about representations of science in general. Nevertheless, Caulfield and Zarzeczny’s work suggests that many scientists believe fictional science has an effect (positive or negative) on public perceptions of science, science funding, and science policy.

Although it is beyond the scope of this study to provide a detailed review of effects research, it is useful to contextualise the media effects perceptions above by highlighting some of the key findings from effects research on narrative fiction. A recent meta-analysis of 74 experimental and quasi-experimental studies suggests that fictional narratives exert a modest influence on readers’ attitudes, intentions, and behaviours (Braddock & Dillard, 2016). As the authors note, the effect sizes for narrative messages were comparable to other forms of persuasive messages. Furthermore, various studies suggest that readers can learn inaccurate information from fiction (cf. Marsh, Butler, & Umanath, 2012). In the specific context of the “CSI effect,” however, there is limited evidence to suggest that forensic dramas ultimately affect juridical decision-making (S. A. Cole & Dioso-Villa, 2011; Shelton, Barak, & Kim, 2011). It is also important to recognise that the persuasive effects of fictional narratives may be mediated and moderated by a range of variables (cf. Moyer-Gusé, 2008). In short, existing research suggests that narrative fiction is neither impotent nor omnipotent as a source of influence.

To acknowledge that narrative fiction can influence readers does not mean that narrative fiction is the only influence or the most important influence on readers’ understanding...
of science or attitude towards science. As Turney (1998) notes, fiction reflects as well as influences public concerns about science. Indeed, Shelton et al. (2006) suggest that the CSI effect, in so far as it exists in the form of increased demand for scientific evidence, is a reflection of broad social and cultural changes related to the advancement of technology rather than the influence of a particular television series. Indeed, CSI might be seen as a product of those changes rather than their cause.

Moreover, concern about the effects of unrealistic science on the scientific knowledge of readers may be misplaced if scientific knowledge is seen as the primary determinant of public attitudes toward science. Numerous researchers have critiqued the view that a deficit of scientific knowledge is the root cause of public opposition to science (cf. Cortassa, 2016). This assumed relationship between scientific knowledge and support for science is often referred to as the cognitive deficit model. Although there is meta-analytic evidence for a small correlation between general science knowledge and general support for science, this relationship is moderated by the specific scientific issue in question (Allum, Sturgis, Tabourazi, & Brunton-Smith, 2008). For example, in the case of genetically modified (GM) food, Allum et al. (2008) found no relationship between general science knowledge and attitudes towards GM food. Rather than a deficit of scientific information, socio-scientific disputes are often underpinned by values-based conflicts (Nisbet & Scheufele, 2009). In an illustrative study, Kahan et al. (2012) found that survey respondents with the highest scores on a general science and numeracy test were also the most polarised with respect to concern about climate change. Cultural worldview, not scientific knowledge, was the primary driver of climate change concern. Studies such as this suggest that the provision of scientific information alone is an inadequate response to disputes over value-relevant socio-scientific issues. In this way, concerns about the effects of unrealistic science in fiction on public attitudes towards science may be misguided if they assume that public attitudes towards science are solely determined by scientific knowledge.

Scientists’ concerns about the influence of narrative fiction are not unfounded, though they may sometimes be exaggerated. Discourse about powerful media effects has its own functions, which is an issue that I will discuss in detail in Chapter 6. For now it is

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5 The term “deficit model” has a range of uses and meanings. Sometimes it is used more or less interchangeably with one-way communication (Trench, 2008), and sometimes it is used to refer to the assumption that non-scientists have limited or no issue-relevant knowledge (Wynne, 1991). I use the term deficit model to refer to the assumption of a linear relationship between scientific knowledge and support for science (Cortassa, 2016).
sufficient to observe that, irrespective of the actual effects of science in fiction, perceptions of effects (positive or negative) appear to be an important reason why readers regard the realism of science in fiction as important.

4.2 Results

Participants in this study reported four interrelated reasons why the realism of science in fiction was personally important to them. Consistent with the literature reviewed in Section 4.1 above, scientific realism was important for its effects on the narrative experience, its perceived effects on other readers, and its effects on rhetorical evaluation. The fourth theme, effects on authorial respect for science and the reader, was not explicitly emphasised in the literature that I reviewed and is a novel finding for this study. This theme highlights how scientific realism can be intrinsically important because it signifies the way in which the author thinks about science and their readership.

4.2.1 Effects on the narrative experience

In the first instance, scientific realism was important to participants because it could affect their experience of a narrative. In particular, participants described how scientific realism could impact on enjoyment and transportation.

For the majority of participants in the study, scientific realism appeared to have some bearing on their enjoyment of a fictional narrative. In most interviews I explicitly asked participants about the contribution of scientific realism to their overall enjoyment of a narrative. All of the participants who were asked this question indicated that scientific realism had some influence on their enjoyment, but most replied by observing that the contribution of scientific realism to their enjoyment of a narrative depended on context. I will explore these contexts in detail in Chapter 5. In general, participants described how unrealistic science detracted from their enjoyment, whereas realistic science enhanced their enjoyment:

I think [scientific realism is] extremely important [to my enjoyment]. I recently read *Jurassic Park* and I’m a big fan of *Jurassic Park* in the general sense, but just reading the book and realising just how much of the stuff now has either been disproven or was really made-up, it has completely ruined my enjoyment of the book entirely. I think it’s extremely important and it has very much distracted from my ability to continue to read the book. (Laura)
For some reason medical dramas seem to annoy me the most and that, which is why I don’t watch them all that often. I made the exception for House and that’s purely because of Hugh Laurie, and not the hospital, and it, it’s just how often they sort of like, “Oh no! This patient’s dying. Quick, we’ve got to electrocute them.” And then they’re all fine again and then also the, also the cases they have, the patient’s sort of, you know, always nearly, nearly dying and then miraculously get saved. And then patients sort of always sort of young people, whilst my dad’s a doctor, and I know for a fact that most of the people he treats are actually fairly old people, so it, all of that, plus little things like the nurses not having their hair tied back- [....] The doctors wearing heels. Who would wear heels in hospital? And [it] sort of just makes it so I really don’t enjoy watching medical dramas at all, and it yeah it actively gets in the way of me enjoying those things. (Aubrey)

I really enjoy it when they get it right. That does give me a quiet thrill because it happens so rarely but yeah when they do actually use science in a clever way and get it right that really does give me a buzz. MacGyver used to do that a lot because while a lot of the time they would exaggerate the effect, it was a real effect, and I’ll accept exaggeration over outright fabrication. (Leo)

In other cases, unrealistic science was seen to enhance enjoyment while realistic science was seen as a threat to enjoyment. As Dakota stated:

I guess in movies I haven’t really seen any, like, I probably haven’t seen a whole movie that’s been accurate from head to toe, like a science fiction movie, because I feel like that would be a bit bland, because the movie is trying to attract everyone, not just like the scientists out there. So I think it would be really bland if it was all realistic science just because there’s no kind of like [?smashing?] barriers or something like, particularly for people who are more into like the big kind of out-there movies but like there are scientific shows, like kind of sci-fi, but also more scientific shows, I still haven’t really seen anything—I guess I don’t watch that much—I haven’t really seen anything that has been that accurate so yeah I don’t know if I would be happy, because I might be bored with the actual movie itself. If I really want to learn science I would go to a lecture or like read a textbook or do my course, but when I’m watching a movie I do want to enjoy like the plot, like that’s like ideal, I don’t go into a science fiction movie with a pen and paper analysing the science.

Again, the ultimate contribution of realistic or unrealistic science to the enjoyment of a narrative depends on context, and I will describe these contexts in detail in Chapter 5. For now what I wish to highlight is that one of the reasons why scientific realism was important to participants was for its potential impact on their enjoyment of a narrative.

In addition to the concept of enjoyment, many participants used language that was reminiscent of transportation when describing their response to unrealistic science. In this respect, unrealistic science was a distraction that disrupted a sense of flow or engagement with the narrative (added emphasis in the quotations that follow):
It basically *makes me switch out of the emotion* because I’m like, “No, that’s just too ridiculous.” And then instead of watching it and sort of *being immersed in the story*, I sort of watch it from the outside sort of perspective and be like, “This is silly.” You become, I become more critical of it if I’m then *disconnected out of the emotion*. (Marcus)

Like there was one episode [in *Breaking Bad*] where I remember they had to, I don’t know, poison somebody with a chemical and it felt a little too unrealistic and when it does get unrealistic it *does take me out of the plot for a moment, so I disengage*. (Philip)

Sometimes when I’m watching a film and then they get something completely wrong, it does tend to *distract me from the moment a little bit*. Like not so much to my enjoyment of the film, but *it does just kind of niggle at the back of my brain*. Like *Jurassic World*, like, they tried, some of the biology stuff was a bit off, but they tried so that was a little bit distracting. (Riley)

These comments are consistent with Busselle and Bilandzic’s (2008) model of narrative comprehension and engagement where unrealistic elements can disrupt the construction of a coherent mental model of the story and thereby disrupt transportation. Given the relationship between transportation and enjoyment, it is possible that the effects of scientific realism on enjoyment described above are partially mediated by transportation.

### 4.2.2 Effects on other readers

Scientific realism was also important to many participants for its perceived effects on other readers. Concerns about media effects represented a further reason why scientific realism could impact on the narrative experience; however, these concerns were also important in their own right.

Many participants expressed concern that unrealistic science in fiction would cause other readers to acquire misconceptions about science in the real world. This effect was particularly concerning for participants when it related to areas of science that were perceived as relevant to people’s everyday lives, such as medicine, public health, and climate change. Abigail’s response is representative:

As I was mentioning before, kind of like psychology, especially if it’s, psychology and medicine, like biology, if it, especially if it’s labelling an illness or a disorder wrong, like if somebody is called psycho or schizophrenic or they’re depressed or something in a film, or they say, you know, “oh they have the flu,” or something, which I know they don’t have, or they, either that or they’re representing it completely wrong. That gets me really frustrated, because I think there’s, not just because it’s like, “oh I know that,” cos it’s not really about that for me; it’s about that if it’s labelled wrong, I think the public can learn about illnesses and disorders and stuff completely wrong and it just increases the stigma that goes
on. So I think it’s frustrating to me because of how it might influence people to stigmatise illnesses and stuff.

For Charlie, a research scientist and lecturer in computer science, the perceived effects of unrealistic science in fiction had the potential to directly affect his work and livelihood in the area of artificial intelligence (AI):

A special side effect in my personal research background for that one, where I react to specific movies in a way which, well, I’m unhappy because I know this reflects my funding. This reflects my income. This reflects my audience. If I see movies with robots depicted, say, a movie, I-Robot, you have probably seen that movie, this is so terribly ludicrous and so painful to watch that. And then I have so many people coming at me: “Have you seen that movie? It’s so great. We will do this in ten years. It will be fantastic.” Guys this is just utter rubbish and it’s just there’s no foundation to it whatsoever. And this is for me then also affecting actually my daily life because I have to fight for funding with people who claim that they have already done that or this is a research project worth funding, so a politician gives us money for doing that. Can we do something slightly more working with a chance of having some success? So that’s a funny side effect with my work when I see AI and robot[s] depicted and this has actually a strong public effect. I see this in [the class I teach] with over 300 students. I would say a good 200 of them have strong AI affiliation by now, coming here and telling us, “I want to actually study that to make some progress in AI.” And almost all of their notions of AI are coming from that kind of background, meaning in other words it’s completely misinformed. This leads to frustration, not only for me but also for the students, that they think they can actually put up the next new intelligent system in the next five years, and then they realise that it’s just a bunch of statistics which is actually happening in real life. It’s much more boring than they thought it is. So that kind of effect is interesting from my experience.

Leo, a high school science teacher, described a related experience:

There’s occasionally, in my day job, when I get to go, I’m a teacher, and it’s actually known among teachers now the CSI effect, where students go, “But I saw them do this on CSI.” And you have to sit down and go, “No, that’s a television show and the science behind it is wrong. This is what should have happened. That’s not how you do it.” But because they saw it on something and they believe it’s just and it’s got enough misconceptions accurately presented that teachers are now actively fighting what they call the CSI effect because it was such a popular show.

In this way, unrealistic science was perceived to be problematic for both formal and informal learning about science.

When participants discussed the perceived effects of unrealistic science in fiction, these effects were usually characterised as negative. However, several participants described how some unrealistic science might also have positive effects by inspiring scientific innovation. Gavin argued that unrealistic science forms part of a valuable innovation...
process, citing a crowd funding campaign to develop a hover board, a speculative technology that was popularised by *Back to the Future Part II* (1989):

I think that science being unrealistic shouldn’t, we shouldn’t actually like stop this process. We shouldn’t deny people being unrealistic because like the hover board, the Kickstarter hover board, it pushes people in new ideas: “Ok let’s work really hard. Maybe one day when the levels of science are adequate enough we can actually build this.” It encourages creativity and critical thinking. How can we do this? What process can we get from A to B? How are we going to do that? So I say that, let it be, but not too much of an extreme.

Liam, Abigail, and Dominic discussed the supposed influence of *Star Trek* on Martin Cooper’s invention of the mobile phone in a similar way. However, it is important to note that the idea of unrealistic science inspiring innovation seems to be tied to a particular conceptualisation of “unrealistic science”; that is, unrealistic science conceptualised as futuristic technology that is ostensibly implausible with contemporary scientific and technological capabilities. Fiction that contravenes well-established contemporary science (e.g., a straightforward factual error) did not seem to be valued for its potential effects on innovation in the same way. As I will describe in Chapter 5, ostensibly unrealistic science that relates to areas of scientific uncertainty was also seen to be more aesthetically acceptable.

Beyond inspiring innovative thinking, several participants described how narrative fiction might inspire students to study science. This inspiration was perceived to occur in spite of (or perhaps because of) unrealistic representations of science. As Damien stated:

I was thinking about stuff before I came in here and one thing I was thinking about is whether or not I kind of resent the movies that I watched as a kid which represented science badly, and I came to the conclusion that, cos obviously these movies gave me false impressions of science, like, you know, but at the same time, because they were so entertaining and fun and because the science portrayed in it was inaccurate but still cool, it kind of shaped me back then to who I am now. So I might not be doing science if I hadn’t of watched some of that terrible sci-fi that I watched as a kid. So in a way I’m like, well that’s good, and it doesn’t really matter about the science inaccuracies.

Damien’s response offers a counterpoint to Charlie’s position quoted above. Whereas Charlie lamented the apparent misconceptions of artificial intelligence research held by

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6 http://hendohover.com/

7 The idea that *Star Trek* inspired Martin Cooper to invent the mobile phone was popularised by the documentary *How William Shatner Changed the World* (J. Jones, 2007), though as Cooper clarifies in a recent interview (M. Fisher, 2015), the comic book series *Dick Tracy* (1938--) was a more important influence on his work.
his students, Damien seemed to value how fictional science might stimulate interest in the sciences even if it means fostering some scientific misconceptions.

For most of the participants who discussed negative media effects, these effects were conceptualised as something that happens to other people (e.g., the “public” or non-scientists). For example, Harriet explicitly contrasted her critical viewing practices with non-scientists:

Like I feel like a lot of people think that what’s in the movies or TV shows actually is right. So when you talk to people who don’t do science they think well that’s actually what happens and that’s, cos I talk to some of my friends about TV shows and they think, “Oh yeah, that’s actually what happens in real life.” Like the DNA sequencing, “yeah that exists,” like no question about it. Whereas like for me, if I see something and I’m like, “mmm I don’t think that’s right,” like what I have learnt, I usually google it, cos it like frustrates me if I don’t know, like, if that’s right or if I’m right. So I usually just like try and find out myself. I definitely agree that people do think what they see is right cos since it’s on TV like yeah it must have some truth to it.

This finding is consistent with the third person effect, a tendency to perceive that the media influences other people more than it influences the self (Davison, 1983). The third person effect is particularly strong when the effects of the media are perceived to be undesirable (cf. Perloff, 2002). The third person effect has been reported in various contexts, including in relation to violent television content (Hoffner et al., 2001), pornography (Gunther, 1995), and health-related news (Wei, Ven-Hwei, & Hung-Yi, 2008). As Perloff (2002) observes, the third person effect may be attributed in part to social desirability bias, and such bias may be particularly salient in the context of focus group research where participants may be unwilling to acknowledge negative influences in the presence of other participants. Furthermore, I did not explicitly ask participants to compare the effect of unrealistic science on other people versus its effect on themselves. Nevertheless, my study provides a tentative indication that the third person effect extends to the perceived influence of unrealistic science in narrative fiction.

Most participants who talked about negative media effects seemed to conceptualise non-scientists (the public) as vulnerable to the influence of unrealistic science. However, Zach, a non-scientist, explicitly contested this conceptualisation of the public:

To me, so yeah, I’m not a big science buff. I just take things, I don’t accept things as they appear. I just don’t get angry when science is wrong and I don’t get thrilled when science is right. I’m a complacent member of society. I see things as a form of entertainment. I never take things at face value. Whether or not the realism is important, yes it’s important because it adds to the entertainment
value, and the extent to which people can actually believe in it. But do people actually believe in it? I don’t think so. It’s just all entertainment to me.

Zach was participating in a focus group discussion as the only participant with a non-science background. In the same discussion, Leo, a scientist, had already articulated his concerns about media effects. As a result, Zach’s defence of the public seems to be a defence of his own status as a critical reader. Elsewhere Zach acknowledged that “if you can’t tell that something’s wrong, yes you are likely to accept it as long as it looks realistic enough,” but he ultimately maintained that “for the most part people can, you know, tell truth from false, and real from unreal.” As a member of the general public—a “complacent member of society”—Zach does not conceptualise the public as susceptible to the negative effects of unrealistic science. Consistent with the observation that media effects concerns depend on the identification of a more vulnerable “other” (Gauntlett, 2001), Zach’s response suggests that concerns about unrealistic science may be diminished or contested when a reader belongs to a group that is supposedly at risk of negative effects.

In this way, participant responses largely echoed the literature reviewed in Section 4.1.3. Scientific realism was important to many participants for its perceived effects on other readers. These effects primarily related to the perceived negative effects of unrealistic science on the public’s understanding of science or support for science, though some participants also highlighted positive effects associated with fiction’s perceived capacity to inspire innovation and future scientists.

### 4.2.3 Effects on authorial respect for science and the reader

Various participants described how the scientific realism of a narrative can communicate a sense of respect or disrespect. Two interrelated forms of disrespect were apparent in participant responses: disrespect for the reader and disrespect for science. Disrespect for the reader arises when an author appears to assume that the reader has limited scientific competence. Disrespect for science arises when an author appears to undervalue science and scientists. For readers who are scientists, unrealistic science can evoke both of these types of disrespect simultaneously.

In the first instance, disrespect for the reader stems from the perceived authorial assumption that unrealistic science will escape the reader’s attention. The implication is that readers are not perceptive or knowledgeable enough to identify unrealistic science. As Charlie stated:
I would sometimes use the term disrespectful because the moviemakers obviously assume that you don’t see [the unrealistic science] and that’s a disrespectful way of telling a story, just try to bluff your way through and you hope that your audience doesn’t point at it.

A sense of disrespect can also stem from the perceived authorial assumption that the reader is not interested or competent enough to understand anything more than rudimentary science:

Lucas: In the show *The Flash* there’s a scene, the first episode of it involves a particle accelerator, and the main character, the Flash guy, is supposed to be pretty intelligent, not like ridiculously intelligent, but pretty intelligent, and he’s got a friend who he’s going to the opening of the, well, the gig with. He just basically explains the general premise of what the thing is, he doesn’t go into any detail, he basically says, “It’s a particle accelerator; it accelerates particles.” And her reaction to that is, “Whoa, whoa, slow down I don’t care.” That enrages me because it is basically treating your audience like drooling infants who can’t understand the most basic [aspects] of what a device does.

Henry: But at the same time I’d say that was, that character, you know, “slow down, egghead,” or whatever, she was more of a portrayal of someone who didn’t give a crap about science, period.

Lucas: Yeah, I’d say that’s a problem in media. [Cross talk]. Nobody cares about science in the media.

Henry: Well that’s just a problem with people.

Lucas: Maybe. Maybe. You could be right. You could be right.

Although a simplistic account of a particle accelerator is not an example of unrealistic science per se, Lucas perceives that the author has disrespectfully assumed that “real” science would exceed readers’ interests or abilities. Henry’s position is somewhat different; he argues that the author is catering for a mass readership that has limited interest in science. For Henry, the author’s approach is not so much disrespectful as it is symptomatic of a society that undervalues science. The sense of marginalisation that Henry seems to feel as a scientist points towards the other type of disrespect that can be evoked by unrealistic science in fiction: disrespect for science itself.

A sense of disrespect for science stems from a perception that the author undervalues scientists and scientific knowledge:

[Unrealistic science] does seem disrespectful to the science and the, it’s like the, you know, you’re not respecting the knowledge that has been discovered or built up. You’re respecting the wonderful visual effects and the power of storytelling but you’re not respecting one of the key devices of your story and yeah, that’s a bit disappointing. (Danielle)
If someone was to portray some sort of religious concept inaccurately or in a bad light in movies, people get really up in arms about that, you know. It’s the same if you are from a scientific background I think, like, and yet people don’t get up in arms about that; they don’t understand that the feelings towards it can be similar. If you truly believe in science and science is, you know, what you stake your life in, then when someone comes along and misportrays it, that’s almost insulting I think in a similar parallel. (Logan)

But I find when I’m—going back to the whole portrayal of scientists thing, how they’re usually fairly negative—it’s almost offensive, in a way, because it’s sort of like, “Oh, that’s how you view people like me; that’s nice, thank you” [tone is ironic]. (Aubrey)

The comments above reflect more than just a concern with the coherence of a narrative. These comments reflect a feeling of being insulted, offended, or disappointed by an author’s perceived orientation towards science and scientists. This sense of disrespect arises not necessarily because the narrative is advancing an anti-science thesis, but because the narrative is implicitly informed by a perceived disregard or disrespect for science (i.e., an ideology that is indifferent or opposed to science). For participants who are scientists or who strongly identify with a science identity, unrealistic science in fiction can contribute to a feeling of being undervalued by the author or by the readership for which the author is writing.

If unrealistic science in fiction can represent a form of disrespect towards science in the real world, it follows that realistic science in fiction can represent a form of respect towards science in the real world. Various participants described how realistic science in fiction was accompanied by a sense of acknowledgement or recognition:

I guess when you make your life around science, when someone does a good job putting it into an exciting movie, that’s exciting because well, that’s your life, that’s your career, that’s seeing it appreciated in the way that it should be appreciated, correctly, is really good. (Logan)

I do have like a sense of respect or possibly pride in the movie when it is correct, when it could otherwise not be, like the movie Contagion, which was maybe not 100% perfect, but it was pretty damn good. (Lucas)

Yeah you get excited and it kind of gives you the opportunity for people who aren’t into science to show them what you do, like if you are studying it, astrophysics or something. “This is totally what I’m studying right now; it’s exactly what I’m doing.” And you just get really excited and happy, like, “Yes, they got it right.” It’s a pretty good feeling. (Dominic)

In this way, the realism of science in fiction can be personally important for the sense of personal and collective value that it brings to readers who are scientists or who identify with a science identity.
Feelings of respect and disrespect are connected to other reasons for caring about the realism of science in fiction. Feeling disrespected by the author may detract from the narrative experience, and feeling that a narrative disrespects science may be associated with a concern that the narrative will cause other readers to undervalue science or scientists. However, feelings of respect are also important in their own right and are not reducible to narrative engagement or media effects concerns.

4.2.4 Effects on rhetorical evaluation

The importance of scientific realism for the rhetorical evaluation of narrative was not a major theme in my study. Valerie was the only participant to self-report that scientific realism was important for this reason. As I will describe in Chapter 5, participants certainly recognised when unrealistic science was in the service of a narrative’s thesis, suggesting that participants do take scientific realism into account when evaluating the thesis of a narrative. However, most participants did not self-report scientific realism to be personally important for this reason, possibly because in the first instance they viewed narrative fiction as a source of entertainment rather than as a source of rhetorical communication.

Valerie described how the realism of science in fiction affected the credibility of a text as a form of rhetoric about the future:

Yeah so I think it’s important because it helps you to think about what the possibilities might be in terms of, so when something is realistic, it makes me think, it makes me more likely to think about whether something that’s happening currently will have an effect in the future or whether the inventions that are around now are changing the way that we live or changing the way that we react to certain situations or changing the way that we, that I guess, politicians and so on are dealing with crises like population and things like that. So that’s why the science and the realism of it is important for me because it helps me to connect the dots between, ok, well, that type of gadget is being, you know, developed now, so it might be developed in the future, what does that mean for the social conditions in the future? So it helps me to make that link between thinking about the outcomes [that] the film is showing as a conceivable future or a conceivable problem.

Valerie’s response might be interpreted in terms of the effect of scientific realism on appreciation (i.e., a more realistic text is more likely to invite thoughtful reflection). However, Valerie also seems to be suggesting that she is more likely to take a text’s thesis about the future seriously if the science in the narrative is also perceived to be realistic.
4.3 Discussion

4.3.1 Theoretical saturation

In this section I will examine the extent to which I have reached theoretical saturation with respect to this chapter’s research question. As I described in Chapter 3, I define theoretical saturation as the point at which I have accounted for the major themes relevant to my research question and described those themes in suitable detail.

In addition to identifying a theme that has not been emphasised previously (i.e., effects on authorial respect for science and the reader), the themes I identified in participant responses account for each of the themes that I identified in relevant literature and commentary. This may be a tentative indication of saturation with respect to the total number of themes identified, but there remains scope to learn more about individual themes. In particular, there is scope to understand more about how unrealistic science affects the narrative experience and how unrealistic science affects the evaluation of narrative as rhetorical communication.

The importance of scientific realism for rhetorical evaluation was only glimpsed in the context of this study. As I suggested above, this might owe to participants largely conceptualising narrative fiction in terms of entertainment rather than rhetorical communication. The role of realism in rhetorical evaluation might be better explored by a study where participants are asked explicitly about how they evaluate narrative theses. Moreover, as I will describe in Chapter 5 and especially in Chapter 6, the relationship between scientific realism and the validity of a narrative’s thesis can be emphasised or downplayed depending on whether the reader agrees or disagrees with the thesis.

There is also scope to further explore the relationship between scientific realism and the narrative experience. Participant responses in this study primarily seemed to relate to enjoyment and the associated sense of transportation. Participants did not explicitly describe identification or parasocial interaction, though negative appraisals of unrealistic scientists may imply that it is more difficult to form a mediated relationship with unrealistic characters. It is perhaps not surprising that identification and parasocial interaction were not major themes in the discussion since most participants seemed to conceptualise unrealistic science in terms of scientific knowledge and scientific phenomena rather than representations of scientists as people. Identification and parasocial interaction may be more closely related to the realism of characters and
character actions, which may not have been clearly within the scope of the discussion for many participants. The concept of appreciation was also largely absent from participant responses; however, it is possible that some participants may conceptualise enjoyment in such a way that it encompasses appreciation. In future studies it would be advantageous to ask participants specifically about the relationship between scientific realism and aspects of the narrative experience that were not explicitly highlighted by participants in this study, including appreciation, identification, and parasocial interaction.

4.3.2 Generalisability

There are two questions to ask with respect to the generalisability of my results. First, are the themes identified in my sample likely to generalise to other readers who care about the realism of science in fiction? A concern with the effect of unrealistic science on the narrative experience seems to be a fundamental concern and is likely to be shared by other readers. This is because unrealistic elements can detract from the coherence of a narrative, and as I reviewed above in Section 4.1.2, seeking coherence is a fundamental feature of narrative comprehension. Similarly, the role of scientific realism in rhetorical evaluation is likely to generalise to any context where scientific realism is relevant to a narrative’s thesis. Effects on authorial respect for science and the reader are also likely to generalise to any readers for whom science is personally important.

The generalisability of media effects concerns is less clear. Most of the participants in my study had a science background and around half of the participants in my study had studied a science communication course at university. Students who study science communication courses at my department, the Australian National Centre for the Public Awareness of Science, are encouraged to think about science and its role in society. Courses such as “Science and the Media” and “Science in Popular Fiction” deal with the possible effects of science in news and entertainment media respectively. Although these courses do explore media effects, they also encourage students to go beyond deficit model conceptualisations of the public. Participants who studied these courses are not necessarily more likely to espouse media effects concerns. Indeed, they may be more likely to challenge such concerns. Moreover, participants without a science communication background also articulated media effects concerns, suggesting that these concerns are not simply a product of communication training.

When participants with a science or science communication background talked about media effects, they seemed to be speaking from a position of scientific expertise. It is
unclear to what extent concerns about media effects are also shared by participants without self-assessed expertise in science. Of the seven participants in my study without a science background, Leah and Hannah were the only participants to express media effects concerns, and Zach actively resisted the notion that non-scientist readers are seriously affected by representations of science in fiction. Given the robustness of the third person effect (cf. Perloff, 2002), it would not be surprising to find that non-scientist readers also perceive unrealistic science to have a greater influence on other people than themselves. However, it is unclear whether the perceived effects of unrealistic science are important to non-scientist readers in the same way as they appear to be important to scientist readers. The relative importance of media effects concerns might be explored further by asking survey respondents to indicate the importance of media effects concerns on a rating scale. It would then be possible to investigate whether a science background (or self-assessed expertise in science) predicts the importance of perceived media effects.

It is also possible to ask whether the themes identified in this chapter can be generalised to other forms of realism or realism in general. Again, the effect of unrealistic elements on the narrative experience is likely to represent a widespread concern because it is fundamental to narrative comprehension. Furthermore, as I reviewed in Section 4.1.2, questions of perceived realism are fundamentally linked to rhetorical evaluation. In the case of authorial respect for the reader, unrealistic science may be just one of various ways in which a reader may perceive that the author is underestimating the intelligence of the reader. For example, dialogue or narration that is seen to over-explain narrative events might also signal disrespect. In the case of authorial respect for science, science is not the only discipline or profession that might be disrespected through unrealistic representations, though the extent to which other professions perceive or care about such disrespect is unclear.

In relation to media effects concerns, there are good reasons to suspect that media effects concerns may generalise at least to the context of historical realism. Historians such as Inga Clendinnen (2006) have criticised authors of narrative fiction who claim to truthfully represent the past. In the context of formal education, using historical fiction to teach history is sometimes regarded as a "double-edged sword" for its engaging but potentially misleading nature (cf. Marsh, Butler, & Umanath, 2012). The relationship between history and fiction is complex (cf. Curthoys & Docker, 2010), and a detailed review is beyond the scope of this study. Nonetheless, it is plausible that some readers
may be concerned about the effects of unrealistic history in the same way as participants in this study were concerned about the effects of unrealistic science.

4.3.3 Understanding why scientific realism is personally important

A concern with perceived realism is sometimes characterised as misguided; that is, as a deficient way of engaging with imaginative works. In a review of *Genius* (2016) for *The New Yorker*, Brody (2016) prefaces his concerns with historical accuracy in the film by stating that “fact-checking a movie that’s based on a true story is a facile way to review it” (para. 1). Brody is quick to distance his approach from what he typically sees as an unsophisticated and unfruitful approach to criticism. To be sure, realism may be more relevant to aesthetic evaluation in some contexts than others—I explore these contexts in detail in Chapter 5. However, my purpose in this chapter has been to look past outright dismissals of realism-based concerns and ask readers why scientific realism is important to them. Participant responses reveal both the ordinariness of a concern with scientific realism and its underlying connections to real world issues and identities.

In the first instance, a concern with scientific realism in fiction can be a routine part of engagement with narrative fiction even if a reader has no special relationship with science. Participants highlighted how scientific realism can affect the narrative experience and inform the evaluation of narrative as rhetorical communication. Although it may be true that readers with a science background are more likely to notice unrealistic science (especially in its more esoteric forms), a concern with narrative coherence or narrative fidelity is not limited to readers with a science background. Readers care about scientific realism in part because it is inextricably connected to the enjoyment, appreciation, or rhetorical evaluation of a narrative, especially a science-themed narrative. Reasons for caring about scientific realism are mirrored in reasons for caring about fiction itself.

Scientific realism may be an almost routine concern when any reader encounters a science-themed narrative; however, it can also be a deeply personal concern for readers who value science. The scientific realism of a narrative provides a perceived insight into how an author views science and their readers. For readers who are scientists or who identify with a science identity, unrealistic science can leave them with a sense of being undervalued. To dismiss a concern with scientific realism outright is to overlook the ways in which the scientific realism of a narrative helps shape the perceived relationship between the author and the reader. Far from incidental minutiae, elements of realistic or
unrealistic science can function as important signifiers of an author’s values and intended audience.

Readers also approach narrative fiction with an awareness of its potential effects on others. For these readers, the realism of science in the storyworld matters for its perceived influence (positive or negative) on science in the real world. I will explore the implications of discourse about perceived media effects in Chapter 6. For now, it is sufficient to observe that caring about scientific realism is not simply or even necessarily an aesthetic concern. Even when readers care very little for a narrative aesthetically they may still care very much about its scientific realism and how realistic or unrealistic science may influence other readers’ perceptions and understandings of science.

Reasons for caring about scientific realism provide some insights into who cares most about scientific realism. As I noted above, scientific realism is potentially a concern (to some degree) for any reader who encounters a science-themed narrative. However, caring about scientific realism for its perceived effects on others and for its perceived relationship to authorial respect for science depends on a degree of self-assessed scientific knowledge, a sense of a science identity, and a stake in how science is perceived by the public. For this reason, concerns about scientific realism are most likely among scientists and science-valuing readers, perhaps especially when a narrative is not overtly science-themed.

The findings of this chapter illustrate the benefits of understanding a concern with scientific realism as something other than mere pedantry. By exploring readers’ reasons for caring about scientific realism, it becomes possible to appreciate both how ordinary and how personal a concern with scientific realism can be.

4.4 Summary

In this chapter I answered my first research question: Why is the realism of science in fiction important to some readers? For the participants in this study, scientific realism was important for its effects on the narrative experience, its effects on authorial respect for science and the reader, its effects on the evaluation of narrative as rhetorical communication, and its perceived effects on the public’s understanding and support of science. These findings highlight how a concern with scientific realism can be an ordinary aspect of reading narrative fiction, especially science-themed fiction, but for some readers who value science, this concern can be deeply personal because of
scientific realism’s perceived connection to what other readers learn about science and the extent to which science is valued by the author.

This chapter highlights how scientific realism is important for participants because of its potential effect on the narrative experience. However, the ultimate contribution of realistic or unrealistic science to a narrative usually depended on context. In the next chapter, I discuss these contexts in detail by exploring when unrealistic science matters to aesthetic evaluation.
5. Scientific realism and the aesthetic evaluation of narrative fiction

In this chapter I will address my second research question: When is unrealistic science most likely to affect the aesthetic evaluation of narrative fiction? In particular, I seek to understand when readers characterise unrealistic science as aesthetically acceptable. I begin the chapter with definitions of aesthetics and acceptability. I then review relevant literature on realism and aesthetic evaluation before introducing my definition of the narrative contract, a concept that both synthesises related positions in the literature and informs my analysis of participant responses. I then turn to describing the results of my participant research. I conclude the chapter with a discussion of my results, including questions of theoretical saturation and generalisability.

5.1 Defining aesthetics

In order to investigate when scientific realism matters to aesthetic evaluation, it is first necessary to define what I mean by aesthetic. Levinson (2005) distinguishes between three different but interrelated meanings of the term aesthetic: as relating to art, as relating to particular aesthetic properties, such as beauty, or as relating to an aesthetic experience or state of mind, such as disinterestedness. I use the term aesthetic in the first sense; that is, as relating to art. Of course, defining aesthetics in this way begs for a definition of art, a term that also resists definition (Stecker, 2005). I use the term art simply to refer to a creative work. All forms of narrative fiction are art in this sense—both the “popular” and the “literary.” It is not my intention to advance a rigorous definition of art, and for my purposes, there is no benefit in doing so. I use the language of aesthetics in this chapter as a convenient way to signal my attention to the reception of narrative fiction as a creative work, which is distinct from thinking about narrative fiction in terms of its potential persuasive effects on the reader. I do not assume that my participants share my definition of art or my characterisation of narrative fiction as a form of art, but their responses can nevertheless be understood from what I have defined here as an aesthetic perspective; that is, they can be understood as relating to the experience and evaluation of narrative fiction as a creative work.
5.2 Defining aesthetic acceptability

The aim of this chapter is to determine when readers regard unrealistic science as acceptable in a work of fiction when viewed from an aesthetic perspective. I use the word acceptability in this context to refer to that which is “tolerable or allowable” or “not a cause for concern” (OED Online, 2017, "acceptable"). Again, my analysis does not aim to determine when participants are more or less likely to regard fictional science as unrealistic. Instead, my analysis aims to identify when fictional science that is perceived as unrealistic is regarded as aesthetically acceptable.

In theory, there are two circumstances in which unrealistic science can be deemed acceptable. In the first, an instance of unrealistic science is perceived as an aesthetic flaw but it is tolerated as such. In the second, an instance of unrealistic science is not perceived as an aesthetic flaw and is therefore deemed acceptable. In this way, I use “acceptable” as an umbrella term for both tolerable flaws and non-flaws. Although in many cases the extent to which unrealistic science is deemed acceptable may correlate with the extent to which it is deemed aesthetically flawed, it is not always straightforward to distinguish between unrealistic science that is deemed “flawed but acceptable” and unrealistic science that is deemed “unflawed and therefore acceptable.” As a result, my analysis focuses on determining when unrealistic science is perceived as acceptable rather than when unrealistic science is perceived as an aesthetic flaw.

Furthermore, there are two different ways of framing my research question. The first approach is to ask when unrealistic science is perceived as acceptable. The second approach is to ask when unrealistic science is perceived as unacceptable. These questions have the same answer since to describe when something is unacceptable is also to describe by implication when it is acceptable and vice versa. However, the framing of these questions implies a different value judgement. The former frame values the realistic over the unrealistic, which for Potolsky (2006, p. 93) is characteristic of the prevailing Western orientation towards art, whereas the latter frame values the unrealistic over the realistic. In other words, to ask when unrealistic science is acceptable implies that unrealistic science is unacceptable until shown to be otherwise, whereas to ask when unrealistic science is unacceptable implies that unrealistic science is acceptable until shown to be otherwise. I adopt the former frame because I am sympathetic to Hazlett and Uidhir’s (2011) position that narrative inconsistencies are prima facie aesthetic flaws (cf. Section 5.3.1 below); however, I do so recognising the limitations of
this perspective and acknowledging that unrealistic elements in a narrative may be desirable and even inevitable.

It is worth clarifying that my inquiry into the acceptability of unrealistic science cannot be equated with an inquiry into the “suspension of disbelief.” Coleridge (1817/1971) coined this phrase in *Biographia Literaria* as part of his reflections on the *Lyrical Ballads* (1798/1971), a collaboration with Wordsworth where Wordsworth’s poetry would attend to the everyday while Coleridge’s poetry would attend to the supernatural. As Coleridge (1817/1971) describes:

> [In the *Lyrical Ballads*] my endeavours should be directed to persons and characters supernatural, or at least romantic; yet so as to transfer from our inward nature a human interest and a semblance of truth sufficient to procure for these shadows of imagination that willing suspension of disbelief for the moment, which constitutes poetic faith. (Chapter XIV)

Since Coleridge coined the phrase, the “willing suspension of disbelief” has been widely adopted as a way of describing the experience of narratives, but it lacks a clear definition (cf. Ferri, 2007). Used colloquially, the phrase might be invoked when unrealistic elements in a text are deemed aesthetically acceptable, which is the focus of my research, but “the suspension of disbelief” is also used to describe a way of engaging with a fictional text where a reader suspends critical judgement, perhaps even to the point of literally believing what is happening in the narrative. Given the ambiguities of the phrase, I avoid using it to describe the subject of my research.

### 5.3 Literature review

#### 5.3.1 Realism and aesthetic evaluation

In this section I will review literature that is concerned with realism and its role in the aesthetic evaluation of narrative fiction. I am not aware of any audience research that is directly concerned with this topic, hence the motivation for my study. Some audience research has documented readers’ critiques of unrealistic science (e.g., Amesley, 1989; Harrington & Bielby, 1995, pp. 91–93), but this research does not investigate how readers determine the acceptability of unrealistic science. Given the paucity of audience research in this context, I will focus on theoretical and prescriptive literature—mostly from literary theory and philosophy. Although much of this literature is concerned with realism in general rather than scientific realism, it can nevertheless suggest principles that may be transferred to the present context. I use this body of literature as a starting
point for exploring the extent to which participant perspectives converge with or diverge from theoretical and perspective accounts.

It is important to note that there is also a growing body of scholarship that seeks to understand unnatural narratives; that is, narratives that involve some form of break with the expectations or conventions of “realistic” narratives (cf. Alber, Iversen, Nielsen, & Richardson, 2010). However, the field of unnatural narratology is outside of the scope of this review, in large part because the field is primarily concerned with how unnatural narratives function rather than when unnatural elements are aesthetically acceptable.

Perceived realism is often identified as an aesthetic goal of narrative fiction. Although authors may disagree about what represents a realistic work of fiction, they frequently share the aspiration to create one. The “realist” label has become associated with some artistic movements, such as the realist novel of the nineteenth century. However, a concern with perceived realism can be discerned even among writers who reject “realist” fiction. Woolf’s (1921/1984) position in “Modern Fiction” is commonly highlighted as an example of this. For Woolf, a modernist author, “life escapes” from “materialist” authors like Arnold Bennett (p. 159). Although such authors provide “an air of probability” and detailed descriptions of characters “dressed down to the last button of their coats in the fashion of the hour” (p. 160), the materialists fail to evoke the subjective experience of reality that is important to Woolf. Yet, as Bowlby (2007) notes, “the right representation of reality, or ‘life,’ is the aim [for Woolf], just as it would be for an avowedly realist writer” (p. xvi). Robbe-Grillet (1965) goes so far as to argue that “[a]ll writers believe they are realists” (p. 157). It is out of a concern for realism, Robbe-Grillet argues, that “each literary school has sought to destroy the one which preceded it” (p. 157). At least for some authors, perceived realism is the proper goal of narrative fiction, and it is perceived realism that distinguishes aesthetically meritorious fiction from aesthetically flawed fiction.

Some authors may indeed aspire towards perceived realism as an aesthetic ideal; however, perceived realism is not the only aesthetic goal of narrative fiction and it need not be the most important. A narrative might seek to excite, entertain, persuade, speculate, amuse, arouse, horrify, and so forth. A commitment to perceived realism might accord with some of these goals but it can conflict with others. A narrative consisting of entirely typical people experiencing entirely typical events might be realistic but it may fail on other metrics, such as entertainment. As Ryan (2009) notes,
narrative fiction is subject to paradoxical expectations: “on one hand we want some
degree of realism, otherwise we could never relate emotionally to the characters nor
follow their reasoning; on the other we demand the tellability of extraordinary events”
(p. 72). As a result, it would be overly simplistic to characterise narrative fiction as an
artform where perceived realism is an uncontested ideal. Instead, as Ryan observes,
narrative fiction is an artform characterised by a tension between realism and tellability.

Aristotle’s account of Greek tragedy in Poetics (trans. by M. Heath, 1996) is a logical
starting point for examining the tension between realism and tellability. Aristotle
emphasises that a tragic plot should develop according to “probability or necessity”
(Chapter 9). Probability can be understood as “likelihood” (Halliwell, 1987, p. 99), and in
this sense, Aristotle’s concept of probability is analogous to Hall’s (2003) concept of
typicality. The meaning of necessity is less clear. Necessity might refer, as Halliwell
(1987) suggests, to “complete certainty or inevitability” (p. 99). By contrast, Belfiore
(1992, pp. 114–119) argues that Aristotle uses necessity to mean actions that are compelled
by circumstances or that arise from human nature. In any case, it is clear that Aristotle
prefers events to be connected with a strong sense of probability. The “worst” plots,
Aristotle argues, are those “in which the sequence of episodes is neither necessary nor
probable” (Chapter 9). Aristotle is not mandating that tragedies should deal with typical
people and events, but rather prescribing that there should be a strong sense of
causation linking the events in the plot: one event should be a highly probable
consequence of another (Heath, 1996, p. xxvii). However, this emphasis on probability
and necessity does not mean that the tragic plot should exclude surprising or
“astonishing” events. Indeed, for Aristotle, the evocation of fear and pity, which is the
function of tragedy, occurs “above all when things come about contrary to expectation
but because of one another” (Chapter 9). Astonishment “is an effect which should be
sought in tragedy” (Chapter 24), but even astonishing events should ideally arise from
probability or necessity.

Despite Aristotle’s emphasis on necessity and probability, he later observes that the
“irrational” is “the most important source of astonishment” (Chapter 24). As Halliwell
(1987) explains, the “irrational” can be understood as “the realm of events that are not
intelligible by normal causal explanation” (p. 175). Elsewhere Aristotle speaks of
“impossibilities,” which appear to be more or less synonymous with irrationalities
(Margon, 1976, p. 239). As a result, there is a tension between Aristotle’s claim that good
tragic plots conform to probability and necessity and his claim that astonishment is both
a desirable effect in tragedy and an effect that often arises from the irrational (i.e., something that is not probable or necessary). In other words, there is a tension between realism and tellability. There are two different ways of approaching this tension. The first is to argue that, for Aristotle, probability and necessity are not essential to a good plot, but the impression of probability and necessity is. The second is to argue that, for Aristotle, probability and necessity are often advantageous but their importance depends on the goals of the author. In neither case does Aristotle totally exclude irrationality from poetry.

I will begin by considering the second approach. Aristotle notes that the inclusion of impossibilities in a poem is "correct if it attains the end of the art itself [...] i.e. if it makes either this or some other part have greater impact" (Chapter 25). One of the implications of this statement is that the end justifies the means. Heath (1996) suggests that Aristotle values probability and necessity not for "any abstract a priori reason" but because probability and necessity generally enhance the impact of events (p. lviii, emphasis in original). So if the evocation of pity and fear is the single most important aesthetic goal of tragedy, and if probability and necessity are valued by Aristotle only because they are usually but not inevitably the most effective way to evoke pity and fear, then the irrational is acceptable when it allows for a greater evocation of pity and fear than could be achieved by adhering to probability or necessity.

There is also a broader implication in Aristotle's attention to "the end of the art itself." As Halliwell (1987) notes, Aristotle goes against Plato and other contemporaries by arguing for "a style of criticism which works with, rather than from outside, the intrinsic aims and techniques of the individual art or genre" (p. 179, emphasis in original). In other words, the judgement of a text should not be based entirely on prescriptive criteria but should consider the aesthetic goals of the text. This tendency is illustrated by Aristotle's distinction between intentional errors and mistakes:

If someone has chosen to imitate accurately but failed to so because of incompetence, the fault is intrinsic; but if [they have] chosen not to do so correctly (e.g., to show a horse with both right legs thrown forward) the error is in respect to the particular art (e.g., in respect to medicine or some other art), not in respect to the art of poetry itself. (Chapter 25)

This paragraph should be interpreted with caution since, as Heath notes, the original text is damaged at this point. Nevertheless, this paragraph seems to suggest that deliberately unrealistic elements are more acceptable than mistakes. If a text never takes
realism as an “end” or goal, then unrealistic elements are more likely to be acceptable. If, on the other hand, a text does take realism as a goal and fails to be realistic, the unrealistic elements are less likely to be acceptable.

The extract above might imply that realism is meritorious for Aristotle only if realism is “an end of the art itself.” However, as Halliwell (1987, p. 180) notes, Aristotle’s accommodating attitude toward the irrational in Chapter 25 seems to be at odds with his otherwise prescriptive insistence on probability and necessity elsewhere in Poetics. Indeed, after arguing that impossibilities are correct if they “attain the end of the art itself,” Aristotle hastens to add that if “it is possible for the end to be achieved as well or better without contravening the art concerned with those matters, then the error is not correct; there should if possible be no error at all” (Chapter 25). In other words, the inclusion of the irrational is only warranted if it achieves an effect that otherwise could not be achieved through adherence to probability and necessity.

Furthermore, just because Aristotle permits the irrational when it can achieve an otherwise unobtainable effect does not mean that he would be in favour of a text that appears irrational. In Chapter 24, Aristotle describes various strategies for concealing irrationalities in a narrative. The reader can be misled by false inferences or distracted by “other good qualities” in the play. The irrational can be also be concealed if it is narrated or implied rather than directly shown on stage. Aristotle goes so far as to argue that “[p]robable implausibilities are preferable to implausible possibilities” (Chapter 24). In other words, events that are not probable or necessary but appear to be so are preferable to events that are probable and necessary but do not appear to be so (Heath, 1996, p. lvii). In this way, Aristotle does indeed seem to adopt a prescriptive position where a lack of apparent probability and necessity is inherently damaging to any narrative, not just a narrative that takes realism as an aesthetic goal. The irrational is still allowable if it is the only way to achieve an effect, but it should be suitably concealed to maintain the impression of probability and necessity.

To fully appreciate the contribution of Poetics, it is also important to consider Aristotle’s conceptualisation of mimesis, which Heath translates as imitation. Aristotle regards poetry as mimetic (Chapter 1). For Aristotle, poetry may imitate “one of three things: either the kind of thing that was or is the case; or the kind of thing that is said or thought to be the case; or the kind of thing that ought to be the case” (Chapter 25). As Heath (1996, p. xiv) notes, Aristotle does not require poetry to imitate something that actually
exists. For Aristotle, a narrative does not need to imitate events that actually did or actually could happen in the real world, but the events should still be connected with a sense of probability and necessity. As Potolsky (2006, pp. 97–98) observes, Aristotle anticipates the notion of what some scholars call verisimilitude, or following Hall (2003), what I call narrative consistency. A narrative may evoke a storyworld that differs from the real world, but as long as the narrative is realistic within the evoked storyworld, it may be aesthetically acceptable.

In summary then, Aristotle seems to allow for externally unrealistic events provided that they are probable and necessary within the storyworld. Aristotle also allows for violations of probability and necessity, though the extent of his leniency in this regard is subject to interpretation. Two principles seem to guide Aristotle’s evaluation of unrealistic events. The first, which appears to be the closest to Aristotle’s final position, is that unrealistic events are acceptable if they allow for effects that cannot be achieved through realism alone, provided that the unrealistic events appear to be realistic. The second, which may be somewhat more flexible than Aristotle ultimately allows, is that the acceptability of unrealistic events relates to the extent to which a text takes realism as an aesthetic goal. As the forthcoming discussion will attest, the principles that Aristotle outlines in *Poetics* can also be seen at work in more recent commentary on realism and aesthetic evaluation.

Like Aristotle, Ryan (2009) is also concerned with the acceptability of unrealistic events or what she calls “cheap plot tricks.” Echoing Aristotle, Ryan argues that the aesthetic evaluation of unrealistic events is governed by an “economic principle” where the “reward” should justify the “cost” (p. 68). The cost incurred from an unrealistic event should be minimised or eliminated, but it can be justified if it provides a reward that could not otherwise be provided through an adherence to realism. Nevertheless, story events should ideally maintain “an impression of growing from within the narrative situation, rather than depending on the intervention of too freely created external events” (p. 68). As for Aristotle, the goal seems to be an “impression” of realistic plot development, rather than realistic plot development per se.

If the acceptability of unrealistic events depends on minimising their costs and maximising their rewards, the placement of unrealistic events within a narrative may be important. As Ryan (2009) notes, a “story-ending [cheap plot trick] represents a failure to find a satisfactory resolution to the narrative conflict, while a preparatory [cheap plot
trick] at least holds the promise of future satisfaction” (p. 72). Preparatory plot tricks may be acceptable if they give rise to a rewarding or potentially rewarding narrative situation; however, once the narrative situation is established, readers may nevertheless expect the plot to progress and conclude realistically. As Ryan notes, story-ending plot tricks might also be less acceptable because they are more recent and therefore more memorable.

In addition to the “economic principle” of maximising rewards, Ryan suggests several other influences on the acceptability of unrealistic events. First, she notes that taste can change over time. What might be acceptable for one generation of readers might not be acceptable for the next. Second, she argues that unrealistic events will be more acceptable in genres where realistic plot development is not conventionally expected, such as horror or fantasy. Third, she argues that unrealistic events are more likely to be acceptable if they serve a thematic or symbolic function. Ryan regards Sophocles’ *Oedipus the King* as exemplary in this respect:

> [In *Oedipus the King*] the plotting of the author stands in for the will of the gods who hold the strings of human lives, and his heavy hand in arranging the circumstances that make Oedipus guilty of parricide and incest can be interpreted as an allegory of the inescapability of fate. (p. 73)

Finally, Ryan also notes how self-reflexivity might confer acceptability to unrealistic events. In Byatt’s *Possession* (1990), two academics team up to research a previously unknown love affair between two Victorian poets, and in the process they begin to fall in love themselves. Furthermore, one of the academics discovers that she is related to one of the poets that they are researching, an event that Ryan regards as not only unrealistic but also “an obvious parody of romantic plots” (p. 70). In other words, unrealistic events may be more acceptable if a text appears to be knowingly unrealistic.

As for Aristotle in *Poetics*, Ryan (2009) focuses on unrealistic events. However, other scholars have focussed on the role of factuality in fiction. For example, Ricks (1996, pp. 280–310) argues that the accuracy of facts presented in fiction is always relevant to aesthetic evaluation. Although neither necessary nor sufficient for “literary worth,” Ricks argues that factual accuracy is “always a virtue” (p. 283). By contrast, factual errors vary in their importance. In particular, the importance of a factual error depends on “the terms on which a work of literature offers itself” (p. 286). If a fictional text lays claim to factuality it should be held to account. For example, in Pushkin’s *Eugene Onegin* (1833), a cavalier guard wears spurs on his boots while participating in a ballroom dance.
According to Ricks, this representation is historically inaccurate; the spurs would likely cause injury or tear the dresses of other dancers. Ricks cannot brush this representation aside as “mere social detail” because the “traditional grounds for valuing Pushkin’s art give salience to his mastery of circumstantial social detail” (p. 303). For Ricks, realistic social detail is one of Pushkin’s aesthetic goals. Therefore, unrealistic social detail counts as an aesthetic flaw in Eugene Onegin. When it comes to matters of fact in fiction, Ricks argues, “we should prefer [authors] to be right, and we should particularly do so when their own standards would have been stringent” (p. 282).

Rowe (1997) also takes up the question of factual accuracy in fiction. Consistent with Ricks (1996), Rowe argues that factual errors will be more damaging for genres of fiction where the reader expects a high standard of factual accuracy. Rowe highlights historical fiction as a genre that might be read for the purpose of finding out “what living in a certain era was like” (p. 340). However, even in historical fiction Rowe permits a degree of factual distortion for the sake of storytelling, but only when “it has no serious moral implications” (p. 340). For example, Rowe highlights how the biopic Michael Collins (1996), which is set in the Irish Civil War, was criticised for altering the historical record in order to present its eponymous protagonist and the Irish Republican Army in a more favourable light. In this way, factual errors may be less acceptable if they are perceived as ideologically motivated distortions.

The period in which a text was created may be a further influence on the acceptability of factual errors in fiction. As Rowe (1997) notes, what was factual for an ancient author is not necessarily factual for a modern author. Rowe argues that we should be sympathetic to narratives that were factually accurate at the time of their publication but have since become inaccurate as a result of developments in human knowledge. Rabinowitz (1987, pp. 99–100) shares a similar view and even suggests that perceived realism should be defined in terms of the contemporaneous audience for which the text was intended (what he calls the authorial audience) rather than in terms of the present-day audience. Even if readers do not define realism in the same way as Rabinowitz, they may still take the author’s milieu into account when assessing the aesthetic significance of a factual inaccuracy in a text.

Rowe’s (1997) final observation is that the perceived intentionality of a factual error may influence its acceptability, a point that we have already encountered in Poetics. Adopting an example from Ricks (1996), Rowe refers to a line in Bishop’s poem “Faustina, or Rock
Roses” where Bishop writes that “the eighty-watt bulb betrays us all, / discovering the concern / within our stupefaction” (as cited in Ricks p. 285). As far as Rowe and Ricks are concerned, there is no such thing as an eighty-watt light bulb. Following Ricks, Rowe ponders whether Bishop has made an error or whether she is intentionally aiming for some other effect, such as evoking a dreamlike state or implying that “we are never likely to be betrayed” (p. 339). Whereas Ricks uses this example to make a general point about the relevance of facts to aesthetic evaluation and interpretation, Rowe uses the example to explicitly highlight how the acceptability of factual inaccuracies may hinge on questions of intentionality. In this way, factual inaccuracies that are perceived to be made for a reason might be more acceptable than those perceived as mistakes, though the presence of ambiguity with regard to the author’s intention may be damaging in itself.

Mole (2009) provides an additional perspective on factual accuracy in fiction. Mole’s position corresponds with Ricks (1996) in some respects but departs from him in others. Unlike Ricks, Mole does not regard factual accuracy as inherently virtuous. For Mole, factual accuracy does not inevitably improve a text and might even be detrimental to it. For example, Mole argues that setting a story in a real location rather than a fictional location might be detrimental to the extent that it robs the story of its universality. Mole also proposes a different account of when factual errors count as aesthetic flaws. For Mole, an error of fact in fiction is an aesthetic flaw whenever it is distracting or disruptive to the reader’s imaginative realisation of a scene, and this can occur irrespective of the text’s genre or the author’s apparent commitment to factual accuracy. From Mole’s perspective, the spurs on the cavalier guard’s shoes in Eugene Onegin are an aesthetic flaw because Pushkin seemingly intends to portray a glamorous scene and yet the imaginative realisation of that scene is rendered difficult by the precariousness of the guard’s spurs. Mole agrees that a text’s perceived commitment to factual accuracy may influence the perceived severity of a factual inaccuracy as an aesthetic flaw, but in the first instance, the acceptability of a factual error is determined by its effect on the imaginative realisation of a scene.

Mole (2009) also argues that factual errors can undermine the authority or credibility of the author. For Mole, a factual error is particularly damaging if an “author fails to accurately depict facts awareness of which [they] are trying to urge upon us” (p. 503). For example, in the poem “On First Looking into Chapman’s Homer,” Keats appears to mistake Cortez for the first European to reach the Pacific Ocean by crossing Panama (it
was actually Balboa). For Mole, Keats’ poem is about “the fervour and reward of intellectual and imaginative exploration, [but] in making this error he shows himself to have fallen short in respect of the very pursuits that he is offering his own example as advertising” (p. 503). In this way, factual errors may be more damaging to the credibility of the author if the errors relate to the subject of a narrative’s thesis. However, errors that are relevant to the narrative’s thesis may also detract from the cogency of the thesis itself, not just the author’s credibility. The more general implication of Mole’s observation is that unrealistic elements may matter more when they are relevant to a narrative’s thesis.

The idea that unrealistic science matters more when it underpins a narrative’s thesis may be more relevant when narrative is viewed from a rhetorical perspective (cf. Section 4.2.4) rather than an aesthetic perspective. For Lamarque and Olsen (1994), the truth-value or cogency of a narrative’s thesis should not enter into aesthetic evaluation. They argue that an appreciation of how a theme is developed is relevant to aesthetic evaluation, but the truth-value of a thesis is not (p. 338). However, as Rowe (1997) argues, even if you agree with Lamarque and Olsen’s view of what aesthetic criticism should entail, this does not change what aesthetic evaluation does entail in practice. As Rowe describes, commentary on the validity of a narrative’s thesis routinely enters into critical discussion of narrative fiction. Moreover, I take the view that communicating a thesis is a form of aesthetic goal. Both the truth-value of the thesis and the manner in which the thesis is presented may be relevant to aesthetic evaluation. It is therefore appropriate to suggest that the relevance of unrealistic science to a narrative’s thesis may influence its aesthetic acceptability.

Hazlett and Uidhir (2011) also take-up the question of when realism matters aesthetically. However, unlike the scholars discussed above, Hazlett and Uidhir are concerned with realism in general, not just factuality. For Hazlett and Uidhir, narrative inconsistencies are prima facie aesthetic flaws. They liken imagining a narrative world to following a set of instructions, and consistent instructions will always be easier to comprehend than inconsistent instructions. Thus, “a consistent (possible) world is typically, and thus prima facie, easier to imagine than an inconsistent (impossible) world” (p. 38). In this respect, Hazlett and Uidhir echo narrative comprehension theory (e.g., Busselle & Bilandzic, 2008) where narrative inconsistencies make it more difficult for the reader to construct a coherent situation model of the storyworld (cf. Section
This point is also reflected in Mole’s (2009) observation that factual errors can disrupt the “imaginative realisation” of a text.

Although Hazlett and Uidhir (2011) regard unrealistic elements as prima facie aesthetic flaws, they emphasise that being unrealistic is not always a flaw and can even be aesthetically meritorious. For Hazlett and Uidhir, the aesthetic evaluation of unrealistic elements in a text depends on the text’s genre and whether the unrealistic elements “interfere with the goals of a particular work of fiction” (p. 41). For example, Hazlett and Uidhir argue that unrealistic stunts in action films do not necessarily represent aesthetic flaws because action films, or at least some action films, “are supposed (or allowed) to be unrealistic” (p. 41, emphasis in original). In an action film like Live Free or Die Hard (2007), “dramatic, over-the-top, explosive action sequences are good-making features” (p. 41). In such a text, there is an invitation to “embrace and enjoy the spectacle” (p. 41). Hazlett and Uidhir acknowledge that offering an invitation does not guarantee its acceptance, and unrealistic elements in a text might be regarded as aesthetic flaws despite the text’s invitation to overlook or embrace them. Nevertheless, they argue that the genre and aesthetic goals of a text are an important determinant of the aesthetic acceptability of unrealistic elements.

In addition to assessing the relationship between unrealistic elements and the aesthetic goals or genre of a text, Hazlett and Uidhir (2011) argue that the “salience” of unrealistic elements should also be taken into account when assessing their aesthetic relevance. In the case of an historical drama, Hazlett and Uidhir distinguish between historical minutiae, such as the details of costuming or modes of transportation, and “salient propositions about the historical figures and events” (p. 42). For Hazlett and Uidhir, unrealistic elements would count as aesthetically flawed only if they fell into the latter category. The argument that salient historical figures or events will matter more than historical minutiae is intuitively appealing. However, Hazlett and Uidhir do not clearly define “salience.” There are various reasons why historical events might be perceived as more salient than costuming details. For instance, historical events may be more central to the plot or more likely to be noticed by the non-historian. Historical events might also be perceived as more important for understanding the significance of the historical period. The concept of salience requires more careful definition, or at least more careful distinctions between types of salience, before it can serve as a clear guide to the aesthetic relevance of unrealistic elements in a text.
Richter (2005) provides an alternative way of thinking about the salience of unrealistic elements in his discussion of “cheats” in film. The notion of a “cheat” implies “that there is a tacit narrative contract between the film and the viewer, and that the film in some way breaches that contract” (p. 11). I will return to the concept of a narrative contract in detail below (see Section 5.3.2). For now, what I wish to highlight is how Richter distinguishes between a “cheat” and a “mere goof.” A goof is an “inadvertent lapse” arising from financial constraints or continuity errors, but there is “no attempt to extract unlawful gain” (p. 12). For example, Richter suggests that, given the expense of shooting in New York City, using an establishing shot of Manhattan before cutting to the streets in Toronto is a minor matter, a “mere goof” (p. 12). The substitution of the streets of one city for another is a logistical compromise that does not attempt to manipulate the emotional response of the reader. However, “the goof rises to the level of a cheat when we are asked to respond emotionally to an episode that outrages the probability scheme of the world portrayed in the film” (p. 13). For example, the protagonist in The Sixth Sense (1999) is a ghost but the author does not reveal that the character is a ghost until the conclusion of the film. Upon re-reading it is possible to see how, with the exception of a boy who can see ghosts, none of the living characters actually interact with the ghost. For Richter, the problem is that the ghost does not realise that he is a ghost despite the fact that he is systematically ignored by the people around him. In this way, The Sixth Sense “cheats” because it asks the reader to respond emotionally to the revelation that the protagonist is a ghost despite the apparent implausibility of the ghost failing to realise this for himself.

It is important to note that Richter seems to regard a cheat as worse than a goof because of its potential to undermine a narrative’s emotional impact, not because a cheat inevitably undermines a narrative’s emotional impact. This becomes clear when Richter notes that the acceptability of a violation of external realism depends on two things: “what the [reader] knows, and what the [reader] cares about” (p. 20). “Caring” about an unrealistic element in this context seems to be related to its effect on the experience of a fictional work as a whole. For example, Richter highlights how the plot in House of Sand and Fog (2003), a film about a woman’s attempt to regain her house after she is evicted, is premised on an unrealistic portrayal of legal matters relating to tax and property ownership. Readers who are unfamiliar with such legal matters will not notice or care, but even for those readers who do notice, Richter suggests that they may not care because “the tragic momentum of the story has an emotional payoff that makes the
factual error worth bracketing” (p. 20). The unrealistic legal issues in *House of Sand and Fog* have the potential to “sabotage the [narrative’s] intended emotional effect,” especially given that the legal issues are used to advance the plot (p. 20), but, as Richter suggests, the narrative might still achieve its effect despite the reader’s awareness of the unrealistic legal issues. As long as an emotional effect is still achieved, problems associated with how the text seeks to elicit the effect might be overlooked, though in many cases, problems associated with how an effect is elicited will also prevent the effect from being achieved. In this respect, Richter’s position is similar to Mole’s (2009). For both Richter and Mole, the acceptability of unrealistic elements ultimately hinges on the extent to which they interfere with the imaginative realisation or emotional “payoff” of a narrative.

In summary, Richter distinguishes between a cheat and a goof on the basis that a cheat has the potential to undermine a narrative’s emotional impact, whereas a goof is an incidental mistake of little emotional consequence. However, both the cheat and the goof can “rise to an artistic effect” when done deliberately and self-reflexively (p. 12). Richter highlights *Adaptation* (2002) as an example of this, a film that uses unrealistic events self-reflexively as part of its concern with the art and industry of screen writing (p. 13). In this way, Richter echoes Ryan’s (2009) observation that unrealistic events can be aesthetically acceptable if a text seems to demonstrate its own awareness of them.

The literature reviewed so far provides useful general principles that can be applied to understand the aesthetic relevance of scientific realism. Literature that is directly concerned with the acceptability of unrealistic science is rare. Scientific plausibility is commonly recommended in the context of science fiction (e.g., Schmidt, 1991), especially hard science fiction, which is a subgenre of science fiction that is committed to scientific plausibility (cf. Cramer, 2003; Westfahl, 2005). Indeed, various guides have been published to assist aspiring science fiction writers with creating realistic storyworlds (e.g., Anderson, 1991). However, recommending scientific realism is not the same as describing when unrealistic science is acceptable or desirable (in science fiction or elsewhere). Benford (1994) appears to make a concession to unrealistic science when he notes that hard science fiction must adhere to scientific “facts” but “can play fast and loose with theory as it likes” (p. 16, emphasis in original). However, despite this ostensibly liberating licence to play “fast and loose” with theory, Benford does not seem to be suggesting that authors can simply disregard established scientific theories. “Any new scientific theory,” Benford hastens to add, “must explain the facts we already know”
In this way, Benford seems to be granting authors permission to propose new (but credible) scientific theories in fiction rather than making a concession to unrealistic science.

Although writing in a popular rather than a scholarly context, Rogers (2007) provides a rare discussion of science in fiction that goes beyond only recommending scientific realism to describe basic principles for assessing the aesthetic acceptability of unrealistic science. In particular, Rogers outlines two “guidelines for safe movie physics.” The first guideline states that with the exception of some genres, namely parodies, fantasies (including cartoons), and comic book adaptations, a film should “never break laws or principles taught in high school or first year college classes” (p. 5). Rogers specifies introductory physics in this guideline because introductory “physics principles have been around for decades [or] centuries” and therefore “lots of people know about them” (p. 5). Unrealistic science that is related to non-introductory topics is presumably more acceptable to Rogers, possibly because fewer people are likely to notice it or because an author might be more easily forgiven for misapplying esoteric science (the latter is more relevant to my focus). Rogers does not list action or science fiction as genres where violations of basic physics principles are acceptable, possibly because doing so would nullify the premise of his book, which primarily aims to explain why the science in action and science fiction films is unrealistic. Nevertheless, Rogers echoes Hazlett and Uidhir (2011) and other scholars who also highlight the role of genre in determining the acceptability of unrealistic science.

Despite exempting action and science fiction films from acceptable violations of basic physics, Rogers (2007) does permit some “stretches” of real world physics even in these genres. Rogers’ second guideline for “safe movie physics” states that physics knowledge can sometimes be “stretched beyond its current boundaries” but only if all of the following conditions are met:

The stretched area of physics is not fully understood and is at least remotely possible; the story cannot be done without the stretch and the stretch creates unique entertainment or artistic opportunities; the stretch is explained with a minimum of scientific mumbo jumbo; [and] the stretch does not obviously contradict the first law of thermodynamics. (p. 6)

Rogers does not elaborate on what he means by “scientific mumbo jumbo,” though he is likely referring to what is elsewhere called “technobabble,” which is “incomprehensible or pretentious technical jargon” (OED Online, 2017). There are at least two senses in
which technobabble might be incomprehensible. First, the real or fictional jargon may be unfamiliar to the reader. Second, even if the jargon is familiar to the reader, its usage may be unclear or incorrect. In either case, technobabble aims not so much to explain something but to give the appearance of explaining something; it signifies the act of explanation but actually explains little or nothing. To the extent that “stretches” of real science require some justification, a degree of technobabble may be necessary or admissible, but for Rogers, this practice should be minimised.

Beyond the minimisation of technobabble, Rogers’ (2007) second guideline for “safe movie physics” asserts that “stretches” of real physics should be both plausible and necessary for the narrative to achieve its aesthetic goals. For Rogers, the first law of thermodynamics, which states that energy is neither created nor destroyed, is “as close to absolute truth as anything known to humanity” (p. 34) and therefore can never be plausibly contravened. As opposed to well-established scientific principles, such as the first law of thermodynamics, “stretching” science is more permissible in areas of science that are not fully understood because by virtue of scientific uncertainty there is a greater range of plausible alternatives. Rogers volunteers time-travel in *The Terminator* (1984) as exemplary in this regard. In *The Terminator*, a robot is sent back in time in order to assassinate the mother of a man who will eventually lead a resistance against the robots of the future. Rogers endorses this example of “stretched” physics because not only is the plausibility of time-travel uncertain, but without it the plot of *The Terminator*—and the “great cinematic moments” it provides—would be impossible (pp. 3–4). For Rogers, acceptable deviations from contemporary science must be plausible (i.e., not totally impossible) and they must provide storytelling effects that could not otherwise be achieved.

A discussion of realism and aesthetics would not be complete without a comment on the concept of poetic licence. Poetic licence is sometimes referred to as artistic license, creative license, or dramatic license, though for some scholars, these terms should not be used interchangeably (e.g., Davis, 2005). Like the phrase “suspension of disbelief,” the phrase “poetic license” may be used colloquially whenever an unrealistic element is deemed acceptable or desirable, but using the phrase in this way says nothing about why the unrealistic element is deemed acceptable or desirable. There are, however, some more precise ways of defining poetic license. In a narrow sense, poetic license is the “imaginative and linguistic freedom granted to poets, allowing them to depart from normal prose standards of factual accuracy, syntax, grammar, or pronunciation where
this may produce a more satisfying imaginative or metrical effect” (Baldick, 2015, “poetic license”). In a broader sense, poetic license relates to any medium, not just poetry, and it may relate not just to factuality but to any dimension of perceived realism. This broader notion of poetic license seems to be what Davis (2005) is proposing when she characterises poetic license as the transgression of “rules governing the form, or grammar, or ostensible logic of a medium [...] for purposeful effect” (p. 60). It is possible to conceptualise poetic license as something that is assumed by the author during the production of a text or something that is granted by the reader during the reception of the text; I prefer the latter conceptualisation. Furthermore, definitions of poetic license differ with respect to the kind of effect they require. For Davis, license is granted for a “purposeful” effect, whereas for Baldick, license is granted for a “more satisfying” effect. If poetic license is granted for a “purposeful” effect, then license is presumably granted whenever a departure from perceived realism is perceived to be intentional rather than a mistake. If poetic license is granted for a “more satisfying” effect, then the granting of license demands that a departure from perceived realism is not only perceived as intentional but it must also allow for a more satisfying effect than could be achieved without the departure. Indeed, for Cuddon and Preston (1999), the liberty granted by poetic license “depends on the end justifying the means” (p. 681). Aristotle, Ryan (2009), and Rogers (2007) can be understood as invoking poetic license in this sense.

Before summarising this section, it is important to note that even when unrealistic science is deemed aesthetically unacceptable, it is not necessarily beyond enjoyment or appreciation. McCoy and Scarborough (2014) distinguish between three different ways in which readers account for their consumption of what they perceive to be “bad” television. First, readers may characterise their consumption of “bad” fiction as a “guilty pleasure” where they continue to consume fiction despite experiencing guilt or shame. Second, readers may consume “bad” fiction ironically, deriving enjoyment from mocking or ridiculing a text. Finally, borrowing a term from Sontag (1964/1999), McCoy and Scarborough describe how readers may adopt a “camp sensibility” where they admire the goals of a text even though the text is ultimately a failure. In each case, readers know that the text is aesthetically “bad,” but they find ways to enjoy or appreciate it despite its “badness” or because of its “badness.” The modes of response that McCoy and Scarborough describe are undoubtedly relevant to the reception of unrealistic science in fiction, but they are not the focus of my research. I am investigating how readers distinguish between aesthetically “good” and “bad” instances of unrealistic science in
fiction rather than how they might enjoy or appreciate instances of unrealistic science that they have already characterised as "bad."

In summary, the acceptability or desirability of unrealistic science in a fictional narrative might depend on a range of factors. Table 4.1 summarises the principles of aesthetic acceptability that can be derived from the theoretical and prescriptive accounts found in the literature. Although most of these accounts are not directly concerned with unrealistic science, they may nevertheless be generalised to the context of the present study. Several scholars, such as Aristotle, Mole (2009), and Richter (2005), observe that unrealistic elements that are not noticed or perceived as unrealistic will be acceptable. Although this is an important observation to make, I have not included this as a principle in Table 4.1 because I am interested in when an unrealistic element is deemed acceptable or desirable given that it has been identified as such by the reader.

The principles of aesthetic evaluation outlined in Table 4.1 are largely distinct; however, Table 4.1 is intended as a convenient summary of the literature rather than a list of conceptually distinct principles. For example, Principle 4 (i.e., unrealistic by intent) may be redundant because it underpins various other principles, including Principles 1, 2, 3, 5, 6, 7 and 8. Furthermore, the principles outlined in Table 4.1 may come into conflict, in which case one principle might be used to overrule another principle depending on which principle is most highly valued.

As Table 4.1 illustrates, many of the scholars reviewed above express some form of allegiance to Principle 2; that is, the acceptability of unrealistic elements depends on the extent to which perceived realism is important to the aesthetic goals of a text or the genre to which a text belongs. As Ricks (1996) notes, to assess the acceptability of unrealistic elements in accordance with the goals or terms offered by the narrative entails “a contractual model [of] literary understanding” (p. 286). Indeed, I argue that a contractual model of narrative provides a useful framework for thinking about the aesthetic acceptability of unrealistic science and for framing my own analysis of participant responses. As a result, I now turn to introducing and defining the concept of a narrative contract.
Table 5.1

<table>
<thead>
<tr>
<th>No.</th>
<th>Description of principle</th>
<th>Associated literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Externally unrealistic elements are (more) acceptable if they are realistic in the storyworld.</td>
<td>Aristotle; Hall (2003)</td>
</tr>
<tr>
<td>2</td>
<td>Unrealistic elements are less acceptable if realism is necessary to the aesthetic goals of a text or the genre to which the text belongs.</td>
<td>Aristotle; Hazlett &amp; Uidhir (2011); Mole (2009); Ricks (1996); Rogers (2007); Rowe (1997); Ryan (2009)</td>
</tr>
<tr>
<td>3</td>
<td>Unrealistic elements are (more) acceptable if they achieve effects that otherwise could not be achieved (or achieved to the same extent) by an adherence to realism.</td>
<td>Aristotle; Rogers (2007); Ryan (2009); see also “poetic license” as defined by Baldick (2015); Cuddon and Preston (1999)</td>
</tr>
<tr>
<td>4</td>
<td>Unrealistic elements are (more) acceptable if they are perceived as intentional rather than as a mistake.</td>
<td>Aristotle; Ricks (1996); Rowe (1997)</td>
</tr>
<tr>
<td>5</td>
<td>Unrealistic elements are (more) acceptable if they create conflict rather than resolve conflict.</td>
<td>Ryan (2009)</td>
</tr>
<tr>
<td>6</td>
<td>Unrealistic elements are (more) acceptable if they can be interpreted in terms of a thematic or symbolic function.</td>
<td>Ryan (2009)</td>
</tr>
<tr>
<td>7</td>
<td>Unrealistic elements are (more) acceptable if they are acknowledged self-reflexively by the text.</td>
<td>Richter (2005); Ryan (2009)</td>
</tr>
<tr>
<td>8</td>
<td>Unrealistic elements are (more) acceptable if they would be considered realistic at the time the text was produced.</td>
<td>Rowe (1997)</td>
</tr>
<tr>
<td>9</td>
<td>Unrealistic elements are less acceptable if they are put in service of an objectionable ideology.</td>
<td>Rowe (1997)</td>
</tr>
<tr>
<td>10</td>
<td>Unrealistic elements are less acceptable if they disrupt the imaginative or emotional realisation of a narrative.</td>
<td>Hazlett and Uidhir (2011); Mole (2009); Richter (2005)</td>
</tr>
<tr>
<td>11</td>
<td>Unrealistic elements are less acceptable if they are relevant to a narrative’s thesis.</td>
<td>Mole (2009)</td>
</tr>
<tr>
<td>12</td>
<td>Unrealistic elements are less acceptable if they are central to the plot.</td>
<td>Richter (2005)</td>
</tr>
<tr>
<td>13</td>
<td>Unrealistic elements are less acceptable if they are salient in the narrative.</td>
<td>Hazlett &amp; Uidhir (2011)</td>
</tr>
<tr>
<td>14</td>
<td>Unrealistic science is less acceptable if it is basic science that is familiar to many people.</td>
<td>Rogers (2007)</td>
</tr>
<tr>
<td>15</td>
<td>Potentially “unrealistic” science is more acceptable when it relates to areas of scientific uncertainty compared to established laws or theories</td>
<td>Rogers (2007)</td>
</tr>
<tr>
<td>16</td>
<td>Unrealistic science more acceptable if it is explained with a minimum of “technobabble.”</td>
<td>Rogers (2007)</td>
</tr>
</tbody>
</table>
5.3.2 Conceptualising the narrative contract

In this section I introduce the concept of a narrative contract, both as a way of synthesising an important strand in the literature reviewed in Section 5.3.1 above and as a way of introducing a theoretical construct that informs my analysis of participant responses in Section 5.4 below. The narrative contract can be understood as an implied contract between the reader and the author concerning what can be expected from a narrative in terms of perceived realism. As I will describe below, the narrative contract establishes the basic terms of acceptability for unrealistic science in fiction by specifying the kind of narrative a reader can expect from an author, and in particular, whether the narrative is committed to realism.

The narrative contract can be conceptualised in various ways. For example, Barthes (1975, pp. 88–90) argues that narration involves exchange. For Barthes, the narrative contract specifies what a narrative is worth and what it can be exchanged for (p. 89). At the very least, narration always involves an exchange of narrative for a reader’s attention, and quite often narratives are exchanged for much more (e.g., people routinely exchange money for movie tickets, novels, and so forth). However, a purely transactional view of narrative is limited since narrative is also freely offered in the course of everyday sociability (Prendergast, 1986, pp. 84–85). Rather than conceptualising the narrative contract as an agreement to exchange narrative for goods or services, I conceptualise the narrative contract as a perceived agreement between an author and a reader about the kind of narrative that an author is telling. Even narratives that are offered freely without any expectation of something in return are subject to a “contract” in this sense.

The concept of a narrative contract as a set of implicit expectations about a narrative has been articulated by various scholars (e.g., Gabriel, 2004a, 2004b; Price, 1983, pp. 1–23; Richter, 2005; Ricks, 1996, p. 286; Searle, 1979, p. 73). My focus is on how the narrative contract negotiates expectations about perceived realism. As Searle (1979) argues, there is an implicit “set of understandings” between the author and the reader that determine “the extent of the author’s commitment to represent actual facts [...] or general facts about what it is possible for people to do and what the world is like” (p. 73). For Gabriel (2004b), the narrative contract “regulates the terms of a narrative or a story, the acceptable deviations from documentable reality, the drawing of inferences and making of connections, the legitimate exaggerations and omissions” (p. 172). In the same spirit as Searle and Gabriel, I define a narrative contract as an implicit agreement between a
reader and an author about the extent of a narrative’s commitment to narrative consistency, remembering that for what I call a realist narrative, narrative consistency and external realism are essentially interchangeable (cf. Chapter 2). Of course, expectations about perceived realism are not the only expectations that might be negotiated between authors and readers. A broader definition of the narrative contract might be extended to include expectations of subject matter, endings, or conventions of narrative discourse (cf. Richter, 2005). For the purposes of my research, I focus on the narrative contract as it relates to perceived realism.

My definition of the narrative contract as a commitment to narrative consistency rather than a commitment to external realism requires some explanation. Defining the narrative contract as the degree of commitment to external realism conflates every narrative that has a non-realist storyworld and fails to recognise that despite evoking a non-realist storyworld, a narrative may nevertheless remain committed to narrative consistency. In short, a text’s commitment to narrative consistency (i.e., realism within the storyworld) is in principle independent of the type of storyworld evoked by the narrative (realist or non-realist), remembering that even non-realist storyworlds contain both similarity class propositions and storyworld specific propositions, and a violation of either of these proposition types is a narrative inconsistency (cf. Chapter 2).

The advantage of defining the narrative contract as the degree of commitment to narrative consistency can be illustrated by comparing two films about advanced forms of artificial intelligence, *I, Robot* (2004) and *Ex Machina* (2015). At least with respect to today’s technology, both films evoke storyworlds that include externally unrealistic existents (e.g., human-like robots). However, these films have different commitments to realistic events within their storyworlds (i.e., different commitments to narrative consistency). In *Ex-Machina*, a programmer is transported to a remote scientific facility where he is tasked with assessing the artificial intelligence of a newly created robot. Much of the film deals with philosophical discussions between the programmer, the robot, and the robot’s creator. Once we accept the existence of the robot, the events in the narrative proceed plausibly for the most part. By contrast, *I, Robot* deals with an action-filled investigation where a police detective pursues a robot, initially because he suspects the robot of murder. In one scene, the detective finds himself inside a house scheduled for demolition. The detective runs through the house as a demolition robot tears the house down, improbably evading falling debris all around him. He also manages to improbably shoot the hinges and locks from the front door while holding his
gun in one hand and sprinting at full speed. Assuming guns in the storyworld behave similarly to real world guns, such accuracy under these conditions is improbable (cf. Rogers, 2007, pp. 15–31). However, *I, Robot* is relatively uncommitted to narrative consistency in this sense because its aesthetic goals lie elsewhere—the film joins *Live Free or Die Hard* (2007) in the tradition of action films aiming (at least in part) for spectacle. *Ex Machina* and *I, Robot* are both films with externally unrealistic existents, but their commitment to realistic events within the storyworld is very different. What this means is that a narrative inconsistency is more likely to be perceived as a breach of the narrative contract in *Ex Machina* (which I characterise as committed to narrative consistency) than in *I, Robot* (which I characterise as relatively uncommitted to narrative consistency). Defining the narrative contract as a commitment to narrative consistency makes it possible to distinguish between texts that evoke non-realist storyworlds but display differing commitments to narrative consistency.

Admittedly, for narratives with non-realist storyworlds that are uncommitted to narrative consistency, the narrative inconsistencies may be more likely to be contraventions of similarity class propositions rather than storyworld-specific propositions, making it possible to define the narrative contract in terms of degrees of commitment to external realism. For example, we could say that *Ex Machina* is uncommitted to external realism with respect to contemporary robotics but in most other respects is committed to external realism. By contrast, we could say that *I, Robot* is uncommitted to external realism with respect to both contemporary robotics and the physics of handgun accuracy (among other things). However, in my view it is clearer to conceptualise the narrative contract as a commitment to narrative consistency while recognising that the storyworld of a narrative often includes both storyworld-specific propositions and similarity class propositions.

A few additional points of clarification are necessary before proceeding further. My conceptualisation of the narrative contract is distinct from what Culler (1975) calls the “mimetic contract,” which is the “expectation that readers will, through their contact with the text, be able to recognize a world which it produces or to which it refers” (p. 192). Culler describes how the mimetic contract is confirmed when a text assures the reader that they “can interpret the text as about a real world” (p. 193). I interpret Culler as referring not simply to an expectation that a storyworld will be evoked but an expectation that the evoked storyworld will also be largely similar to the real world. The narrative contract (as I define it) shares the basic expectation that a narrative will evoke
a storyworld, but the narrative contract differs from the mimetic contract by representing a unique negotiation of each text’s commitment to narrative consistency rather than a default expectation of an externally realistic storyworld.

My use of the term narrative contract also differs from Barker’s (1989) conceptualisation of the narrative contract as “an invitation to readers to join in and use [media] contents in particular ways” (p. 257). For Barker, the narrative contract involves an agreement to enter into dialogue with a text about some aspect of the reader’s social life (p. 261). For example, a teen magazine might offer “an older-sisterly chat with girls about ‘true love’, giving them glimpses of something they won’t yet be able to experience for themselves” (p. 261). Barker is interested in how media effects might be determined by the extent to which readers accept the contracts offered to them by media texts. Although a text’s perceived commitment to narrative consistency forms part of any contract concerning how that text is to be used, Barker’s emphasis is on how readers use media content in their lives rather than what readers regard as acceptable violations of narrative consistency.

The reader’s perception of the narrative contract might be shaped by various considerations. In particular, the perceived aesthetic goals of a narrative are likely to be an important influence on the terms of the narrative contract. The genre of a narrative may also be informative. Indeed, Hazlett and Uidhir (2011) emphasise the role of genre in determining the acceptability of unrealistic elements in a narrative, but genre by itself can only ever be indicative. For example, Hazlett and Uidhir regard the externally unrealistic stunts in *Live Free or Die Hard* (2007) to be aesthetically acceptable, partly because the film belongs to the action genre. However, to assert that *Live Free or Die Hard* is an action film only goes so far in characterising the film’s narrative contract. As Hazlett and Uidhir themselves observe, there are also action films for which realistic stunts would be aesthetically meritorious. More specifically then, the externally unrealistic stunts in *Live and Free and Die Hard* might be regarded as aesthetically acceptable because the film seems to take spectacle and excess as aesthetic goals. It is true that genres can be divided into subgenres. For example, “hard science fiction” is distinguished from other subgenres of science fiction, in part by a commitment to scientific plausibility (cf. Cramer, 2003). However, even the most exacting subgenre is likely to include a range of different texts. Although genre may be informative, the narrative contract is likely to be negotiated with respect to the specific aesthetic goals of each text.
The narrative contract is also likely to be shaped by the texts that surround the narrative or what Genette (1987/1997) calls paratexts. Genette distinguishes between paratexts that are spatially co-located with the text, which he calls peritexts, and paratexts that are not spatially co-located with the text, which he calls epitexts. The title, cover, epigraph, and blurb of a book are examples of peritexts. Interviews with the author and promotional posters and trailers are examples of epitexts. Genette seems to characterise epitext primarily as something that is produced by the author and their promoters, but like Gray (2008, 2010), I prefer to define epitext more broadly as any form of discussion or commentary related to the text, which includes reviews and commentary on the text. In this way, paratexts are produced by the reception context as much as the author and their promoters. For Genette, paratexts function as a “threshold” through which a reader must pass to access a text. As Gray (2010) explains, paratexts produce expectations about a text and “provide the all-important early frames through which we will examine, react to, and evaluate textual consumption” (p. 26). Elsewhere this process has been referred to as “prefiguration” (e.g., Barker & Mathijs, 2012). Paratexts help communicate the genre and style of a narrative. Paratexts are therefore likely to be an early influence on the reader’s characterisation of the narrative contract.

There is likely to be some overlap between cues that influence the reader’s characterisation of the narrative contract and cues that influence the reader’s characterisation of the storyworld. For example, I have already highlighted how genre and paratext might influence the narrative contract; however, as Herman (2009, p. 114) observes, genre and paratext can also provide an early indication of the kind of storyworld that a reader will encounter in a narrative. For example, some genres, such as fantasy or science fiction, are commonly associated with non-realist storyworlds. Similarly, narrative openings may be important both for evoking the storyworld (cf. Herman, 2009) and for establishing the narrative contract. For Rabinowitz (1987, pp. 110–140), readers’ expectations about the plot in a novel are governed by what he calls rules of configuration. The first main rule of configuration states that something will happen (the rule of undermining); the second main rule of configuration states that not anything will happen (the rule of balance). The realism of the science in a narrative can influence readers’ expectations in both of these respects “by giving readers a sense of the scope of what can happen (by instigating and enabling the action) and by giving them a sense of what is out of bounds for the text (by restricting the action)” (Rabinowitz, 2011, p. 204). As Rabinowitz (2011) notes, if a narrative begins with realistic science, it establishes an
expectation that the narrative will continue to be realistic, not just with respect to its scientific content, but in other respects as well. In terms of my own framework, opening with externally realistic science might indicate both that the storyworld is similar to the real world and that the narrative is committed to narrative consistency. In this way, it may be more common to perceive a commitment to narrative consistency in what I call realist narratives. However, as I have outlined above, a narrative with a non-realist storyworld may still be committed to narrative consistency, such as *Ex Machina* (2015), and a narrative with a realist storyworld may have little commitment to narrative consistency, such as *Live Free and Die Hard* (2007). Characterisations of the narrative contract and characterisations of the storyworld may be influenced by similar cues, but they remain distinctive concepts.

Although the narrative contract is conceptually distinct from the storyworld of a narrative, both concepts can enter into the aesthetic evaluation of unrealistic elements in a text. Indeed, if a reader regards an unrealistic element as aesthetically acceptable, this might be due to their characterisation of the storyworld or their characterisation of the narrative contract. As Hazlett and Uidhir (2011) note, there are two ways in which the externally unrealistic action sequences in *Live Free and Die Hard* (2007) might be deemed acceptable in aesthetic terms. The first is to regard the externally unrealistic action sequences in *Live Free and Die Hard* as acceptable violations of perceived realism given the film’s apparent goal of “excess” and its position within the action film genre. The second is to assume that the storyworld of *Live Free and Die Hard* is one where real world constraints on physics and human capability do not apply. Interpreting the storyworld in this way means that *Live Free and Die Hard* achieves narrative consistency even though it is externally unrealistic. In this way, there are two hypothetical means by which externally unrealistic or inconsistent elements in a narrative might be deemed aesthetically acceptable. The first occurs when the reader perceives that the narrative is not committed to realism. The second occurs when the reader revises their assumptions about the storyworld such that the narrative still achieves narrative consistency.

Aesthetic evaluations of unrealistic elements might be justified with reference to either the storyworld or the narrative contract. However, the concept of the narrative contract only becomes redundant if the narrative is taken to be constitutive of the storyworld (for a discussion of the ontology of the storyworld, cf. Chapter 2). As long the storyworld is taken to exist (imaginatively or actually) independently of the specific narrative that evokes it, the narrative contract may play a role in determining the aesthetic
acceptability of unrealistic elements. As Hazlett and Uidhir (2011) note, it seems unreasonable to insist that all supposed cases of aesthetically acceptable unrealistic narratives are actually consistent narratives where the storyworld is conceptualised in such a way that ostensibly unrealistic elements are realistic in the storyworld (p. 46). This does not mean that the storyworld cannot be revised in response to new information, only that the reader must decide whether to revise their conceptualisation of the storyworld or characterise the narrative as inconsistent (i.e., readers do not inevitably revise their conceptualisation of the storyworld). As Hazlett and Uidhir note, this decision “will be a matter of interpretation and will depend both on the interpretive theory or strategies employed by the [reader] and on the specifics of the case” (p. 39). In this respect, Hazlett and Uidhir suggest that both genre and perceived intentionality are important (pp. 39–40). Readers may be more likely to revise their conceptualisation of the storyworld in horror, science fiction, or fantasy texts than in medical or crime dramas. Similarly, a reader may be more likely to modify their understanding of the storyworld if an apparent inconsistency is perceived as the author’s intention, whereas readers may be more likely to ultimately judge the narrative as inconsistent if the apparent inconsistency is perceived as an authorial error.

There is a further layer of complexity if we consider that the narrative contract might also be revised as the narrative unfolds. As Barthes (1975) notes, “narrative is both merchandise and the relation of the contract of which it is the object” (p. 90). Or as Gabriel (2004a) argues, “[s]tories are subject to programmes of truth which are continuously negotiated through the narrative contract between the storyteller and the audience in the course of the storytelling process itself” (p. 14, emphasis added). In other words, the nature of the narrative contract may not be immediately apparent, and it may be subject to revision. For example, consider the street-racing film 2 Fast 2 Furious (2003). Assuming that the reader is unfamiliar with the film and other films in the Fast and the Furious series, they may be uncertain at the outset about the film’s commitment to real world physics. The film opens with a street race that proceeds plausibly for the most part. However, as the street racers approach the end of the racecourse, they discover that the finish line is on the other side of an open drawbridge. Not only do the street racers drive off the open drawbridge, but the second place car jumps over the top of the first place car (while both cars are still in the air) to take victory at the finish line. If not implausible, this event is at least highly atypical. There is little reason to believe that the physics of the storyworld is different to the real world, so it seems unlikely that
the reader would revise their conceptualisation of the storyworld. However, the reader might choose to revise their perception of the narrative contract, thereby characterising *2 Fast 2 Furious* as a film that, like *Live Free or Die Hard*, is committed to spectacle rather than real world physics. Alternatively, the reader might still characterise the film as committed to real world physics and regard the bridge jump as aesthetically unacceptable.

The possibility of revising the narrative contract together with the possibility of revising the storyworld gives rise to the hypothetical decision tree illustrated in Figure 5.1. It is important to stress three points in relation to Figure 5.1. First, the narrative contract is a perceived contract. A text that one reader perceives as committed to narrative consistency another reader may perceive as uncommitted to narrative consistency. Second, even if a reader perceives an invitation in the narrative contract to overlook or reappraise unrealistic events with respect to some intended aesthetic goal, the reader will not necessarily accept the terms of the narrative contract. As Hazlett and Uidhir (2011) note, the unrealistic action scenes in a text like *Live Free and Die Hard* might still go too far for some readers and be regarded as aesthetically flawed despite the text’s apparent invitation to overlook realism in favour of spectacle (pp. 41–42). In this way, a narrative may be regarded as aesthetically flawed despite the narrative contract’s invitation to evaluate unrealistic elements in a particular way. Third, the narrative contract is not the only principle by which unrealistic elements might be judged as aesthetically acceptable (cf. Table 4.1 and Section 5.3.1 above). It is conceivable that the narrative contract might be overruled by a different principle of aesthetic judgement.

A final point of clarification is necessary before summarising this section. I should stress that the narrative contract is an implicit agreement between the author and the reader; it is not an agreement between the narrator and the reader. To discover that the narrator is unreliable is to discover that the narrative discourse is not necessarily a factual account of the story (i.e., the real or fictional events that the narrator is describing). It may also bring into question the factuality of other claims made by the narrator. For example, in *We Are Completely Beside Ourselves* (2013), the narrator initially fails to clarify that her sister is actually a chimpanzee. Throughout the novel, the narrator also refers to scientific research on chimpanzees, and since she has shown herself to be unreliable with respect to her own story, a reader might also regard this scientific information with some suspicion. When a reader encounters an unrealistic element in a narrative, they have two choices with respect to the narrative contract: they may revise the contract or consider it
breached (cf. Figure 5.1). By contrast, when a reader identifies that the narrator is unreliable, which may come about because of an unrealistic element in a narrative, the only recourse with respect to the narrative contract is to revise the contract. Unreliable narration might contravene the basic expectation that narrators are reliable, but it does not breach the narrative contract as defined here, only reconfigures it.

![Decision Tree](Image)

Figure 5.1. Hypothetical decision tree underpinning reader evaluations of unrealistic elements with respect to narrative consistency and the narrative contract.

In summary, I define the narrative contract in this context as a perceived agreement between the reader and the author about the extent of a narrative’s commitment to
narrative consistency, remembering that for realist storyworlds, narrative consistency and external realism are interchangeable. In this way, the narrative contract attempts to specify what represents an acceptable violation of narrative consistency. Although genre expectations are likely to inform the narrative contract, the contract may be uniquely negotiated for every text in accordance with the text’s specific aesthetic goals. The process of negotiation is likely to begin when readers first encounter the narrative’s paratexts. As for other principles relating to the acceptability of unrealistic science outlined in Section 5.3.1, the concept of the narrative contract described above is based on theoretical and prescriptive literature. In the next section, I report on the results of my empirical audience research, highlighting how the narrative contract and other concepts identified in the literature relate to the views and experiences of my participants.

5.4 Results

In this section I describe the principles that participants used to determine the aesthetic acceptability of unrealistic science in fiction. Each principle corresponds to a theme that I identified in my analysis. These principles can be consolidated into four higher-order “macro-principles,” which I have termed subservience, satisfaction, salience, and severity. Table 4.2 defines each principle and categorises it in terms of a macro-principle. In the text below, I begin by clarifying that my results relate primarily to the acceptability of externally unrealistic science rather than storyworld specific inconsistencies. I then describe each principle in detail before concluding with a discussion of how these principles can be consolidated into higher-order macro-principles.
Table 5.2  
*Principles for the aesthetic evaluation of unrealistic science in fiction identified in participant responses*

<table>
<thead>
<tr>
<th>Macro-principle</th>
<th>Principle</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subservience</strong></td>
<td>Narrative consistency</td>
<td>Externally unrealistic science is (more) acceptable if it is realistic in the storyworld.</td>
</tr>
<tr>
<td></td>
<td>The narrative contract</td>
<td>Unrealistic science is (more) acceptable if the narrative is not committed to realism.</td>
</tr>
<tr>
<td></td>
<td>Thematic functions</td>
<td>Unrealistic science is (more) acceptable if it is in the service of a theme or thesis.</td>
</tr>
<tr>
<td></td>
<td>Formal constraints</td>
<td>Unrealistic science is (more) acceptable if it is perceived as a reasonable compromise given the constraints of a narrative form.</td>
</tr>
<tr>
<td><strong>Satisfaction</strong></td>
<td>Aesthetic fulfilment</td>
<td>Unrealistic science is (more) acceptable if a narrative is perceived as aesthetically meritorious.</td>
</tr>
<tr>
<td></td>
<td>Enhancement</td>
<td>Unrealistic science is (more) acceptable if it makes a net positive contribution to the narrative.</td>
</tr>
<tr>
<td></td>
<td>Ideological congruence</td>
<td>Unrealistic science is (more) acceptable if it is congruent with a reader’s existing beliefs, attitudes, or values.</td>
</tr>
<tr>
<td><strong>Salience</strong></td>
<td>Plot centrality</td>
<td>Unrealistic science is (more) acceptable when it is peripheral to the plot.</td>
</tr>
<tr>
<td></td>
<td>Personal relevance</td>
<td>Unrealistic science is (more) acceptable when the reader regards the area of science as personally unimportant.</td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td>Harmful effects</td>
<td>Unrealistic science is (more) acceptable when it is unlikely to cause harm to other readers.</td>
</tr>
<tr>
<td></td>
<td>Complexity</td>
<td>Unrealistic science is (more) acceptable when it relates to areas of science that are difficult to understand or communicate.</td>
</tr>
<tr>
<td></td>
<td>Uncertainty</td>
<td>Ostensibly unrealistic science is (more) acceptable if it relates to an area of scientific uncertainty.</td>
</tr>
<tr>
<td></td>
<td>Historical context</td>
<td>Unrealistic science is (more) acceptable if it would be perceived as realistic in the historical context of the text’s production.</td>
</tr>
</tbody>
</table>
5.4.1 Externally unrealistic science versus inconsistent science

Before I describe the principles by which participants determine the aesthetic acceptability of unrealistic science in fiction, it is important to clarify whether these principles relate to the acceptability of externally unrealistic science or inconsistent science. As I outlined in Chapter 2, a storyworld contains a set of propositions that are unique to the storyworld and a set of propositions that are shared with the real world. I refer to the former set as storyworld specific propositions, and following Hazlett and Uidhir (2011), I refer to the latter set as similarity class propositions. Inconsistent science that relates to a proposition within the similarity class is indistinguishable from externally unrealistic science, whereas inconsistent science that is storyworld-specific depends on scientific concepts or principles that are uniquely established by the narrative.

For the most part, the examples of unrealistic science that participants volunteered in my study were cases of externally unrealistic science. Here are just a few illustrative examples that participants described when they were asked what comes to mind when they think of unrealistic science in fiction:

What about like in *Breaking Bad* the fact that you can’t have 99% purity [methamphetamine] and it be blue? Like blue meth does not exist. (Phoebe)

One thing that can come to mind is like science that isn’t real or proven at the moment. Like in *Star Trek* with the, I think it was the red matter or something like that, that they use to create a black hole to destroy planets and stuff like that, which is completely made up science. (Dominic)

We’re talking things, kind of common things, which you see in science fiction. I think, like, you’ve got time travel, you’ve got teleporters, you’ve got things that I suppose that we don’t, even faster than light travel which is talked about, which I [?understand?] is something that is theoretically kind of possible but like not something that we have any kind of understanding of how we could do. I suppose they’re my kind of things that spring to mind when we’re talking about unrealistic science in fiction. (Ethan)

Compared to externally unrealistic examples, storyworld-specific narrative inconsistencies were rarely shared in my interviews and focus groups. Ella described a scene in *Doctor Who* (1963–) involving the Doctor’s time travelling device, the TARDIS:

One I can think of off the top of my head is like the *Doctor Who* one where they were pretty much saying if you look into the heart of the TARDIS your brain will explode pretty much and then [the Doctor’s companion] looked into it and she was fine and it didn’t explain how that worked and I was pretty much going, “This wouldn’t happen.” So it’s pretty unrealistic.
Emma provided a further example from *Hancock* (2008), a film about a superhero with superhuman strength and an ability to fly:

Emma: [Hancock is] like some god dude or something and he flies around and he saves people, which is all fine. I can suspend reality for all that until the end when he draws a heart on the moon, and I just got so angry and I’m like how did he get up there? Can he breathe up there? How did he get the paint up there? Did he use paint or did he use his blood? How does he have that much blood? Like- (group laughter)

Rose: He’s a superhero!

Emma: No, it was outside the bounds that they had put on the world.

Phoebe: Of their reality, of their universe.

Emma: It was like adding another reality to their reality and I’m just like no! You can’t do that (laughs). It made me really angry.

For Emma, Hancock’s ability to draw a heart on the moon is unrealistic even in a storyworld where Hancock is capable of flying and performing various other externally implausible feats. Rose’s interjection suggests that she might conceptualise the storyworld differently to Emma, perhaps by regarding as plausible any action performed by a superhero. As I will describe below, some participants described how externally unrealistic science was acceptable because it was realistic in the narrative’s storyworld. However, examples of storyworld-specific narrative inconsistencies, like those from Ella and Emma above, were relatively rare in my focus groups and interviews.

There are several possible reasons why examples of storyworld-specific inconsistent science were mentioned less frequently than examples of externally unrealistic science. Storyworld specific examples might be less common in fictional media than externally unrealistic examples, making them less accessible for recall during interviews and focus groups. Alternatively, storyworld-specific examples might not coincide with participant conceptualisations of “science.” In practice, to speak of storyworld-specific inconsistent science involves appealing to rules or expectations that the text has established for a phenomenon (e.g., magic), technology (e.g., the TARDIS) or lifeform (e.g., Hancock) that uniquely exists in the storyworld. It is conceivable that some participants might not classify these rules or expectations as science. When describing a narrative inconsistency in the 1984 film *Gremlins* (i.e., gremlins should not be fed “after midnight,” but technically anytime is “after midnight”), Philip prefaced his response by stating that “it’s not really [an example of] unrealis[tic] science.” Thus, to the extent that science is associated with empiricism and reality itself, it is understandable why storyworld-
specific inconsistencies might be less accessible or might not be perceived as science at all.

In any case, given that most examples of unrealistic science provided by participants were examples of externally unrealistic science, the principles of aesthetic acceptability that I describe in this section might be best understood as relating to the acceptability of externally unrealistic science, though they may also generalise to storyworld-specific narrative inconsistencies.

5.4.2 Narrative consistency

Consistent with Hall’s (2003) results, many participants described the concept of narrative consistency (cf. Chapter 2). According to this principle, externally unrealistic science is acceptable if it is realistic within the storyworld of the narrative. Since Hall has described this principle previously, I only describe it briefly here.

Leo articulated the concept of narrative consistency explicitly in terms of what he calls verisimilitude:

The other one is verisimilitude, is a good word. It means consistent and realistic within the setting, even if not actually realistic to our world, the real world. So in a fantasy world where you’ve got magic, if it’s consistent magic then it has verisimilitude, even if not strictly speaking realism and that internal consistency makes it a lot more enjoyable cos it’s less things that jar you and go, “Wait, that’s not what happened last time he did that; that’s not how it works.”

Lucas articulated a similar conceptualisation when he was asked when the realism of science in fiction is most likely to affect his response to a work of fiction:

I guess the succinct answer to your question for me would be when it’s outside of the central premise of the medium. Like if it’s not already basically said that this is the case, this is how this world is different to the real world. If it doesn’t follow from that directly then it’s probably going to irk me in some fashion.

Later in the discussion, Lucas expanded on this point with specific examples:

Well, if your movie is a world in which everything explodes then like, in so many Michael Bay movies where you basically fall down a flight of stairs and there’s six explosions, it’s just not anything like the real world. If you make it [a] completely fictitious universe like Guardians of the Galaxy then you can do pretty much whatever you want and it’s fine. I have no qualms, that’s a terrific movie outside of the science realism, because it’s set in such a ridiculous world anyway, any science inaccuracies is basically put down to that’s what happens in this world. It all comes down to me, to the “gimme.” If a movie has a thing where the world is a crazy place and physics only kind of works a little bit, then, that’s fine [...]

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In this way, Lucas permits externally unrealistic science in a narrative like *Guardians of the Galaxy* (2014) because it clearly takes place in a storyworld that is distinct from the real world.

Participant responses in my study confirm that readers can conceptualise the storyworld of a narrative as different to the real world, and this conceptualisation of the storyworld can confer acceptability to externally unrealistic science. As I noted in Sections 2.2 and 5.3.2, a reader’s conceptualisation of the storyworld can in principle be revised as the narrative unfolds. My study did not investigate the necessary conditions for storyworld revision. However, the simple observation that participants expressed dissatisfaction with diverse examples of externally unrealistic science is enough to conclude that most readers are not infinitely willing to reconceptualise storyworlds to accommodate externally unrealistic science as realistic within the storyworld. The necessary conditions for storyworld revision warrant further research.

5.4.3 The narrative contract

For many participants in my study, unrealistic science was (more) acceptable if the narrative was not committed to realism. This principle corresponds to what I called the narrative contract in Section 5.3.2. The perception of a commitment to realism was informed by perceptions of a text’s aesthetic goals, tone, genre, and storyworld. It was also influenced by paratexts and the presence of detailed scientific explanations.

Many participants described how unrealistic science was less acceptable in a text that appeared to be committed to realism. Unrealistic science was less acceptable when a text was “purport[ing] to be realistic” (Philip), “trying to be realistic” (Renee), or “try[ing] to project [science] in a serious way” (Charlie). In other words, unrealistic science was less acceptable when realism was perceived as one of the text’s aesthetic goals or when realism was perceived as necessary to the text’s aesthetic goals. In the following quotation, Danielle contrasts the aesthetic goals of *The Avengers* (2012), a superhero comic book adaptation, with *Gravity* (2013), a film about a space accident in the Earth’s orbit:

> I think that it also depends on the intent of the movie, because sometimes you watch a movie and you know it’s just for fun, and it doesn’t matter, like it doesn’t bother me as much, but when a movie is actively trying to depict itself as a real situation, so something, say, *Gravity*, over something like *Avengers*. So *Avengers* you’re ha-, you can be like, whatever, it’s about watching people fight, really, and have fun, but when you’re watching something like *Gravity* it’s trying to kind of,
be like, “We’re real.” It’s trying to put you in a very real situation, and then when there’s scientific errors in that it bothers me a lot more.

Danielle characterised *The Avengers* as uncommitted to realism because the text was aiming to deliver exciting action sequences. In other words, realistic science was not necessary or desirable for achieving the aesthetic goal of “watching people fight.” By contrast, realistic science was necessary for *Gravity* where the perceived aesthetic goal of the text was to “put you in a very real situation.” Unrealistic science was less acceptable in *Gravity* than it was in *The Avengers* because of *Gravity*'s implied commitment to realism.

The sense of a perceived commitment to realism was also important to Leo. Indeed, Leo even used a contractual analogy in his response:

> It depends a lot on the setting. For me, if they’ve said, “This is realistic,” like, I don’t know, it’s a cop show and they’ve got, and they don’t have flying saucers and they don’t have ray guns and they don’t have anything else and then they enhance a pixelated photo. The worst one I’ve seen for that was at one point they zoom in on a photo, zoom in again, zoom in again, and then turn the corner to look down the corridor and see the person. It’s like, “What?” (laughs). The photo doesn’t contain information of what’s around the corner—it doesn’t matter how much you zoom in. But if it’s a *Doctor Who*, they could do almost anything and it wouldn’t worry me. I would be fine with it because it’s not scientifically rigorous. But I suppose if it was a meal, as an analogy, if I have ordered steak and I get steak that’s fine. If I’ve ordered steak and I find a rock in it then I’m going to get upset. If I order a plate of rocks then I’m fine with a plate of rocks. So yeah—[...] in any sort of science fiction fantasy thing it’s not going to bother me if they get the science wrong.

For Leo, there is an expectation that the narrative should deliver what was promised; it should adhere to the terms of the narrative contract. For Leo, a lack of external realism is not inherently problematic. Externally unrealistic science is only problematic when it appears in a narrative, such as a “cop show,” that otherwise appears to be committed to real world science.

Leo’s response above indicates that, beyond the perceived aesthetic goals of a text, perceptions of the storyworld can also inform the narrative contract. Leo perceived narratives with non-realist storyworlds—those with “flying saucers” and “ray guns”—as less committed to perceived realism than narratives evoking realist storyworlds. In my theoretical discussion of the narrative contract in Section 5.3.2, I argued that the narrative contract is best conceptualised as the degree of commitment to narrative consistency rather than external realism because this approach avoids conflating all narratives with non-realist storyworlds. However, I did not explicitly ask participants
whether they conceptualised a commitment to realism as a commitment to external realism or to narrative consistency. At least one participant, Heidi, appeared to share my preferred conceptualisation:

[...] Star Trek tries to take science quite seriously, and I’m quite happy to accept the premise, the premises of Star Trek, but every time they sort of slip up, it’s a bit more [of] a big deal because they try. Yeah, so I guess the importance, coming back to your question, eventually, the importance of the realism of science is very much linked to what, what sort of show it is, rather than necessarily what rules they’re breaking.

For Heidi, unrealistic science is more problematic in Star Trek because “they take science quite seriously” and “they try” to be realistic. At the same time, Heidi appears to conceptualise the storyworld of Star Trek as different to the real world—she accepts the “premises” of the storyworld. In this way, Heidi appears to conceptualise the narrative contract in terms of a commitment to narrative consistency. Her perception that the storyworld differs from the real world does not lead her to conclude that the narrative is uncommitted to narrative consistency. It was less clear whether other participants made a distinction between a commitment to narrative consistency and a commitment to external realism. In either case, perceptions of the storyworld can inform perceptions of the narrative contract, though a storyworld that differs non-trivially from the real world does not inevitably lead to the perception that a narrative is uncommitted to narrative consistency.

The similarity of the storyworld to the real world was only one of several factors that informed participant perceptions of the narrative contract. Various participants described how the tone of a narrative was an important influence on the narrative’s perceived commitment to realism:

And I guess also if the movie itself is giving a serious message that makes the whole tone of the movie more serious anyway, and with that you become, you expect every part of it to be serious. If comedy rocked up in the middle of a really serious movie like Interstellar it would be so out of place, much like if they didn’t take the science seriously that would feel out of place, so yeah. (Logan)

It’s difficult [to know whether a narrative is serious about the realism of its science]. Sometimes it’s obvious whether they’re just doing it and because they want it to look cool or be silly or what not. So for instance, the movie Pacific Rim, they had a lot of science in there to make their massive Jaeger robots and then the brain connection thing, but because it was, the tone of the movie was sort of a action, fun, let’s not try and think too hard about it movie, then it didn’t matter as much. But say if they tried to make it a super serious sort of, examining the moral and ethical implications of, you know, all the rest of it, and they try to make it a sort of deep worthy sort of film, it would have fallen over because the
tone is just not quite right for the content. And that’s not just with science in fiction, it’s just in any fiction I consume. If the tone and the content don’t quite match, it’s a bit jarring. (Marcus)

[If a movie is trying to be serious about realistic science], then it’s usually a serious movie altogether [...]. But yeah so if the entire movie and also the way it treats humans and treats the plot is serious I kind of maybe assume that they’re a bit more serious about the science as well. Doctor Who does both well though, which is weird. Doctor Who has both very silly plot lines and silly characters sometimes, but then it treats really deep existential questions as well, but they don’t take the science serious at all, that is just, like, they have an anti-gravitation motorcycle they drive up skyscrapers. (Leah)

For these participants, a serious tone is associated with a commitment to realism. Unrealistic science would clash with a narrative that otherwise seeks to evoke a serious tone. This sense of seriousness comes in part from the subject of the narrative. A narrative dealing with serious moral, ethical, or philosophical issues is more likely to exhibit a serious tone, though as Leah’s interpretation of Doctor Who suggests, some narratives might still engage with serious issues despite exhibiting a “silly” tone and despite lacking an apparent commitment to realism.

In addition to subject matter, Ethan described how colour and music can also contribute to a sense of seriousness in a narrative. In particular, Ethan associated darker visuals with a more serious narrative:

I suppose it’s very much everything from lighting to atmosphere to music [that contributes to tone]. For example, in the very beginning of Mass Effect it sets it up with a space ship being sent through like, going at ridiculous speeds in this bright over the top, with these kind of orchestral themes trying to drum up this epic feeling of, and they make no pretentions in the early stages that they’re, that the technology is something you’re not meant to kind of question. This is how it is, assume that that’s what it’s like. Whereas again for example in Orphan Black, it’s just, the difference there is that it’s very much setup to be normal modern day England and it’s got a very kind of, all the colours are kind of muted, there’s not much brightness in it, especially in the early stages. I guess that’s kind of would be my first kind of inkling to it, whether or not it wants to treat itself seriously or not depends a lot on colour I guess.

My study does not exhaustively explore how participants characterise the tone of a narrative. The roles of colour, music, subject matter, and other variables deserve further research. However, for my purposes, it is sufficient to observe that a serious tone can be associated with a commitment to realism, and as a result, unrealistic science is less acceptable in a serious narrative.
For many participants, genre was also an important influence on the narrative contract. Genre informed both the perceived aesthetic goals of a text and the overall tone of a text:

I think it’s just everything from the acting to the dialogue to the, it’s, I guess it boils down to the tone. If you were to look at something like, what was that Paul Verhoeven film about the space cadets? [Starship Troopers]. If you’re watching something and it’s clear that it’s an adventure film or a superhero film or an action film that’s not trying to be a serious drama then it doesn’t bother me as much if the science is unrealistic. (Philip)

I think also the genre the story is. I’m more likely to care if a science fiction film has realistic science than if a fantasy film occasionally does something unrealistic. Like I get really annoyed at The Matrix for using humans as fuel cells instead of using their brain power or something more realistic, whereas if that same thing was in a fantasy film I wouldn’t have cared as much I think. (Cameron)

Like if I was watching a horror movie that was based, like, the other day I think I watched [Pandorum], or something like [that], it doesn’t really matter what it was called, [...] it was like about them being trapped on like a space ship and then like the human population turns into cannibals; it was very strange. But if you’re watching something like that, you’re like horror usually doesn’t go for something serious, like it’s not, it’s meant to scare you, it’s meant to be, it’s what the genre aims to do. So I guess you can’t expect much more from it. But like, yes, if it was like a kids movie I guess, that’s ok too, but if it was something like, an autobiography, or like something that was like, something yeah, recent research or something that’s happening now, you’d be like, maybe you should be more [realistic]. (Freya)

[I’m more likely to tolerate unrealistic science when the narrative is] overly silly. When it’s so silly that, have you watched Red Dwarf? Old BBC comedy where it’s about a man who wakes up and his spaceship has been dead for a very long time and all the hundreds of people there are dead. And his only friends are one mutated cat and a hologram, and it is a sit-com, like and it’s a comedy and they do very silly things in that one that are just not at all, like cats, just because you’ve left them alone for a million years don’t mutate into humans. Why would they? It makes no sense. They could mutate, sure, and they could evolutionise, but why would they become humans? That’s just because they want human actors in it. Right? And they think it’s funny with a human that is bit cat-like. But that entire show is just supposed to be silly comedy. It’s supposed to be extremely silly British comedy, so then I accept it. (Leah)

Leah and Freya’s comments in particular highlight how genre can inform the perceived aesthetic goals of a text. For Freya, a horror film is not primarily intended to be realistic: “it’s meant to scare you.” Similarly, for Leah, some of the science in Red Dwarf (1988–) “makes no sense,” but it is acceptable because the show is “supposed to be extremely silly British comedy.” In general, participants listed horror, action, fantasy, comedy, and children’s narratives as genres that they associated with a reduced commitment to realism. Dramas, historical fiction, and science fiction (especially hard science fiction) were associated with a greater commitment to realism. However, notice that Freya
qualified her position by stating that "horror usually doesn’t go for something serious" (emphasis added); she did not assert that horror is never serious about realism. Similarly, Cameron stated that he is less tolerant of unrealistic science in a science fiction film like *The Matrix* (1999), but other participants listed *Doctor Who* (1963–), which is also commonly characterised as science fiction, as a text that is not serious about realistic science. Thus, genre categorisations influenced how participants perceived a text’s commitment to realism, and in turn, these categorisations also influenced the perceived acceptability of unrealistic science. However, participant responses also illustrated how texts that belong to the same genre or subgenre may display different aesthetic goals and a different tone. In this way, genre is an influence on the narrative contract but it is not the sole determinant of the narrative contract.

Detailed scientific explanations can also signify a commitment to realism. Various participants described how a narrative that is committed to realism does not merely show a phenomenon but also explains how or why it works:

I guess some movies explicitly, or as explicitly as they can, make it clear that they are trying to go for something that is scientifically accurate. So if the movie is like two and a half hours long and half an hour of it is them repeating what relativity is to try and really drill it into the audience that “we are using this concept; you have to learn this concept if you really want to understand the film,” and at that stage, they go off and do something that’s not particularly scientific, then it’s sort of like a double standard almost where like, you know, are you trying to be realistic or not? (Owen)

I think with realistic is when they start giving a lot of explanations to the science, like when they actually start throwing in like, you know, scientific terms or, you know, physics rules or something like that. While the less serious stuff is kind of just thrown in there and is very vague. Like stuff when they are trying to be serious they give longer explanations and they tend to throw it into the stories a lot more throughout it. It’s not just whenever. (Ella)

[If a narrative is serious about the realism of science] I think first there will be a lot of descriptions about scientific facts or theories or data or anything else in the movie to try to get the audience to try to deliver the scientific information to the audience and that’s one thing [....] Well the other kind of movie will try to eliminate the use of really scientific words. Like a movie transformed from bestsellers called *The Wife of a Time Traveller* [*The Time Traveller’s Wife*]—I think that’s the name, I don’t know. Anyway, that movie’s about time travelling, but it is also a movie about love, about sacrifice, about stuff like that, so it’s not technically a science fiction. In that case even though the concept of time travelling is well demonstrated [...] there’s no[t] a lot of technologies and science jargons in that movie, and the contrary is like *Back to the Future* probably, another movie featured with time travelling, but that one has a lot of things, a lot of theories, science [?conductions?]. (Natalie)
This association between detailed scientific explanations and a commitment to realism is consistent with Westfahl’s (2005) observation that detailed scientific explanations are common in works of hard science fiction, a subgenre that is characterised by its commitment to scientific plausibility.

It is important to note that participants highlighted the role of explanation in the narrative contract rather than the role of general description. Barthes (1968/1982) argues that descriptive detail confers a “reality effect” to writing. Indeed, descriptive detail is characteristic of a “realist” writing style (Wood, 2008, pp. 172–175). Therefore, detailed description might also be associated with a commitment to realism. However, participants referred specifically to detailed scientific explanations (e.g., an explanation of how a technology works) rather than detailed descriptions (e.g., a detailed description of how a technology looks, sounds, or smells). Furthermore, verbal description is a property of prose narratives and oral narratives. In my study, Isla was the only participant to discuss prose style (see below). Most participants referred to examples from film and television. As I noted above in relation to tone, my study did not investigate how conventions of narrative discourse might contribute to perceptions of the narrative contract. This is an avenue for further research. In any case, it was detailed scientific explanation (not general description) that participants highlighted as a sign of a narrative’s commitment to realism.

It is also important to clarify that although detailed scientific explanations might signify a commitment to realistic science, this does not mean that detailed explanations are necessarily regarded as aesthetically meritorious. As Isla stated:

Some authors, you read them and you kind of, they’re using all the right words but they sound awkward, like, there are more informal words they could use that would sound better but because they’re desperately trying to make it credible they use the really proper word and it would actually sound more credible if they used the more colloquial word for it because that makes it sound like the characters know what’s going on. I’m not sure why that is. But just like, if it just feels more like how it would actually happen in the real world, not like it’s written from a textbook, and you know, if you don’t have to look up the word, five words of a sentence, in a dictionary to try and work out what they’re talking about also helps.

Isla nominated Anne McCaffrey’s series The Dragonriders of Pern (1967–) as an example where jargon was successfully minimised, whereas she regarded Doctor Who (1963–) as an example of excessive jargon. However, she also added that explanation is sometimes necessary in a work of fiction:
Sometimes it is very important for the story that you know exactly how something works because that could be the crux of, you know, how the hero saves the day or whatever and if it’s not explained and that’s how the hero saves the day you’re left sitting there at the end going, “It’s great we won, but what happened?” Cos you just don’t understand how whatever that is works. Other times it really breaks up the story. It gets in the way of everything. I can’t think of an example off the top of my head but it just, it just slows the story right down and you end [up], you know, wading through the first two pages and then going, “Well this is rubbish,” and putting it down and walking away. So it has a massive impact on the readability of the story as well.

For Isla, explanations may be necessary but they should be restricted to an appropriate length and level of detail. In this respect, Isla’s position reflects Schmidt’s (1991) view that science fiction authors should explain no more than is necessary because “[r]eaders won’t accept large blocks of lecture” (p. 98). This might also be why Rogers (2007) asserts that “stretches” of real world physics in fiction should be “explained with a minimum of scientific mumbo jumbo” (p. 6). Minimising explanation might also limit the likelihood of introducing something unrealistic as part of the explanation. As Logan described:

I think if the story starts to go into detail about the science, that’s when I, that’s the first indicator that they are taking it a bit more seriously. In Interstellar they talk about why wormholes are spheres, not circles as traditionally discussed, because they would be spheres, and they give a description of that and they do talk about what’s causing the time shift. It’s not just some weird time shift in space. It’s due to gravity and special relativity and they talk about the theories and all that kind of stuff. Star Trek’s another great one where they are always talking about why this thing works. Other movies like Star Wars—lightsabers, they just exist. No-one actually discusses how they worked. No-one even discusses that they are in fact made of light. Maybe that’s just what they’re called, you know, and it’s not suggested anywhere that they’re actually just pure light. So when you come across and you look [at] that and you’re like well, that’s impossible, it can’t possibly be made of pure light, you can explain that away by being like, well no-one said it was that so it’s not important. I guess when the science is shown to you but not described in any manner it doesn’t matter.

In other words, if a phenomenon is explained, its plausibility is linked to the provided explanation, whereas if a phenomenon is unexplained, the text leaves open the possibility of the reader providing their own explanation, or at least limits the likelihood of the reader outright rejecting the plausibility of the phenomenon if the provided explanation is unsatisfactory. In any case, irrespective of whether a detailed scientific explanation is perceived as aesthetically meritorious or aesthetically flawed, it may still signify a narrative’s commitment to realism.
Beyond features of the fictional narrative itself, paratextual information was a further influence on participant perceptions of the narrative contract. Various participants noted how reviews, commentary, trailers, interviews, advertisements, and informal discussions with friends could all signal that a narrative was committed to realistic science:

[I know House is aiming to be realistic] well because it's [...] real life just with fictional characters and the writers and things have said they’ve done a lot of research, tried to make it as accurate as possible. So it’s been said by the creators that they tried to do that. (Laura)

It’s to do with the hype I think that comes with the film or from what I’ve heard other people say about it. So because [Gravity] was, you know, winning all the awards and things like that I thought oh well maybe this one’s more realistic. (Valerie)

I feel like it’s more so when you have more public awareness of it. Like for Interstellar I think they kept to, they were very, there was a lot of articles about how they tried to make like the space scenes very realistic and like when they, when the public gains awareness of what the director’s trying to do, and what the director communicates, then you’re like, “Oh ok, well this is actually something that I could think is true.” So I think, yeah, it’s more about like the media and how they project it to the public. (Freya)

Cos like trailers for anything do their best, they’re trying to sell the product to you, and it’d be rare that they’re trying to sell it to you disingenuously, trying to sell you something that’s not what it is. So like again, Orphan Black, it’s very much, the trailers themselves set it up as a, I guess, kind of hard science fiction. They talk about that’s what you see when it’s described on all sorts of review sites as hard science fiction as opposed to the softer [science fiction], and again, Mass Effect is done as kind of middling ground. (Ethan)

These responses support my suggestion in Section 5.3.2 that paratexts can inform perceptions of the narrative contract. In other words, the terms of the narrative contract begin to be negotiated before readers encounter the text itself. Encounters with promotional material, reviews, interviews, and so forth serve to shape the narrative contract. Literary critics have long debated whether actual authorial intentions (i.e., as stated in interviews or elsewhere) should enter into the interpretation of a text (cf. Iseminger, 1992), but as the above responses illustrate, authorial intentions clearly influenced participant characterisations of the narrative contract, if not their specific interpretation of the meaning of the narrative. For these participants, unrealistic science was less acceptable if the author publicly stated or implied that they were intending to be realistic or if the reader otherwise perceived such an intention.
Science consultants represented a further form of paratextual influence. Leah and Oscar both observed that a text is more committed to realistic science if science consultants are promoted alongside the text:

[The Big Bang Theory is serious about scientific realism because] like Big Bang Theory invested a lot of prestige outside of the show establishing that they cared about science and they had scientists working with the show and they had actually some of the actors were educated scientists and they just invested a lot of prestige like that, so then I would know [it is serious about realistic science] even if that's obviously a silly show. (Leah)

So not to dwell on a single movie or anything, but you had like in Interstellar it was kind of like it was very hard sci-fi and very like, “Here we talked to the physicists about what the black hole would look like,” and all of that and then the kind of like stinger, not to like spoil the movie or anything, is effectively, like, love is a fundamental force like gravity. (Oscar)

Elsewhere in my interviews and focus groups, various other participants also demonstrated an awareness of science consultants in film and television production, though in these cases participants mostly referred to science consultants to substantiate their characterisation of a text as realistic rather than to describe a text as committed to realism. Nevertheless, an awareness of science consultants in the production of a text may influence perceptions of the narrative contract. Kirby (2010a, pp. 48–50) has observed that filmmakers may use science consultants in promotional material in an attempt to increase the scientific credibility of a film. The responses of Leah and Oscar above suggest that the presence of science consultants can serve to characterise a text as aiming for realistic science, but it does not inevitably confer credibility to the science in the text. Indeed, for some readers, the presence of a science consultant may act as an invitation to be even more critical of a text. As Oscar stated:

I think again, not to make myself appear too petulant, but it’s almost a challenge sometimes. Like if it is advertised as this sweeping IMAX like pseudodocumentary on the physical nature of reality, I can kind of see why it riles up some people who might be personally invested in that and the representation of that to the public [...]

In this way, some readers may be more critical (and less accepting of unrealistic science) when a text has been promoted as scientifically realistic.

For the purposes of the preceding discussion, I isolated individual factors that inform the narrative contract. In practice, however, these factors can act synergistically. For example, Aubrey characterised the comic book adaptation The Avengers: Age of Ultron (2015) as uncommitted to realism for the following reasons:
I suppose the fact that people can sort of just fly unaided and things. It’s basically cos they have a lot of gags and things in it, which makes it funny and, there’s lots of bright colours, and I suppose, yeah, the fact that it, and it comes from directors who are known for sort of doing fun stuff and it of course comes from the comic book genre, which is purely entertainment things. Admittedly a lot of nerds do like that and nerds do tend to be sciencey, but it’s yeah, I think it’s definitely more of a fun thing there.

By referring to people who can fly unaided, Aubrey seems to be referring to a storyworld that differs from the real world. The humour and bright colours in the film inform her characterisation of the film’s tone as “fun.” This characterisation is consolidated by her awareness of the director (Joss Whedon) as someone who typically creates “fun” films. Finally, for Aubrey, the comic book genre typically does not exhibit a commitment to realism. When taken together, these features communicate the film’s narrative contract.

The Avengers: Age of Ultron (2015) is an example of a narrative that, at least for Aubrey, is uncommitted to realism. By contrast, Interstellar (2014), a film about an interstellar journey to find an alternative habitable planet, was frequently nominated as an example of a narrative that is committed to realism. The popularity of Interstellar as a reference point in my focus groups and interviews owes partly to the timing of my data collection in the first half of 2015. Interstellar was released late in 2014 and was newsworthy again in early 2015 as a result of various Academy Award nominations. However, Interstellar also exemplifies a commitment to realism. The tone of the film is serious, dealing as it does with the aftermath of an environmental disaster and the personal sacrifices made by its characters. Interstellar also includes explanations of scientific concepts, such as relativity. Furthermore, the promotion of Interstellar highlighted the work of astrophysicist Kip Thorne as the film’s science consultant. Thorne appeared in interviews about the film (e.g., Billings, 2014) and released a book about the scientific grounding of the film titled The Science of Interstellar (Thorne, 2014). Thus, Interstellar meets all of the criteria that my participants described for a text that is committed to realism. However, this does not mean that unrealistic science in a narrative like Interstellar is inevitably unacceptable. As I will describe below, other principles of aesthetic evaluation can also come into play.

In closing, it is worth noting that in principle the narrative contract is subject to revision throughout the narrative (cf. Section 5.3.2). However, I did not investigate the extent to which participants revised their perceptions of a narrative contract or when they were more likely to do so. The warrants for narrative contract revision represent a direction for further research.
Various participants described how unrealistic science may be acceptable if it can be interpreted in terms of a thematic function. This is consistent with Ryan’s (2009) observation that cheap plot tricks may be more acceptable if they are interpreted thematically or symbolically. I use the term “thematic” here as an umbrella term for unrealistic science that serves the theme or thesis of a narrative. Participants described examples of unrealistic science that served both of these functions.

The concept of interpreting unrealistic science thematically was illustrated by Rachel’s response to *Monsters* (2010) and *District 9* (2009). *Monsters* is a film about aliens that crash to Earth in Mexico, giving rise to an “infected zone” near the US/Mexican border. *District 9* is a film set in South Africa where aliens are confined to a government controlled zone known as “District 9.” Rachel regarded the aliens in these films as unrealistic representations of what alien life forms might look like, but these representations were acceptable to her because the aliens functioned as a metaphor for human refugees and immigrants:

> It really depends on the purpose. Often it is quite clear that, thinking of a couple of examples, like, I guess, *District 9* and there was another film called *Monsters* that I watched by Gareth Edwards where they all concerned aliens, but there were a lot of obvious flaws you could poke in both of their plots concerning the fact that the aliens could survive on this planet and that they shared certain similarities with, you know, they’re obviously carbon based, etc, etc. But it was, they were both used as metaphors for [a] social phenomenon which is occurring at the moment. I think *Monsters* it was theorised that that was all about how Americans react to Mexican immigrants and that idea of that they’re not, they’re dehumanised, sort of, and I think that can make, I didn’t mind that at all, because I thought it was a very clever way to make a point, that you only really realised was being made after a couple of days when you were thinking about it like and you were like, “hmm.”

For Rachel, the film implies a metaphor: immigrants are monsters. Rachel uses the term metaphor in the conceptual sense (i.e., understanding one conceptual domain in terms of another conceptual domain) rather than in the more restrictive linguistic sense of metaphor (cf. Kovecses, 2010). The scientific realism of the aliens in the film is not important to Rachel because the aliens are understood metaphorically in terms of something else. In other words, the concrete scientific details of the aliens are irrelevant when the aliens are interpreted as an abstract concept. Furthermore, the metaphor at the centre of *Monsters* is in the service of a thesis. Rachel interprets the film as a critique of
social practices and attitudes that dehumanise immigrants. In other words, the film invokes the metaphor of “immigrants are monsters” in order to critique it.

An exchange between Cameron and Hannah provides a related example. The exchange was concerned with The Matrix (1999), a film in which futuristic robots use human beings as their power source—humans are entertained mentally in a virtual reality while their bodies are used as “batteries.” The problem, which Cameron seems to allude to, is that humans would likely consume more energy than they provide (cf. Rogers, 2007, pp. 40–44). However, for Hannah, this concern was subsumed by the thematic function of these “human batteries”:

Cameron: I think also the genre the story is. I’m more likely to care if a science fiction film has realistic science than if a fantasy film occasionally does something unrealistic. Like I get really annoyed at The Matrix for using humans as fuel cells instead of using their brain power or something more realistic, whereas if that same thing was in a fantasy film I wouldn’t have cared as much I think.

Hannah: But for that specific example I actually didn’t mind, that sort of idea of using humans as sort of fuel repositories cos that’s a recurring thing in the Wachowski films but for me the sort of message behind that, the concept and the idea, like the critique that they were making about how humans are used, really that was more important for me than the science. So that’s an example of when I don’t care.

For Hannah at least, the scientific question of whether humans would make serviceable batteries is largely irrelevant when the scene is interpreted metaphorically; that is, when the film is interpreted as implying that “humans are batteries.” As for the “immigrants are monsters” metaphor that Rachel described above, the “humans are batteries” metaphor is also in service of a critique. Although Hannah did not expand on what this critique entails, she may be referring to Marxist interpretations of the film wherein the human “batteries” under the robots are analogous to the exploited working class under capitalism (cf. Leary, 2004). In any case, it was the “message” or thesis underpinning the unrealistic science in The Matrix that made it aesthetically acceptable to Hannah.

The examples from Rachel and Hannah both involved a metaphorical interpretation of unrealistic science; however, unrealistic science can also facilitate thematic work without itself being interpreted as a metaphor or symbol. For example, consider Valerie’s account of Eternal Sunshine of the Spotless Mind (2004), a film where a man has a medical procedure to remove memories of his former girlfriend:
So for instance with *Eternal Sunshine of the Spotless Mind*, even though that isn’t realistic—cos they’re use a colander for the memory thing, the memory erasal, erasure—I don’t think that that science in that film is as important because it’s more about just the concept of what happens if you can erase your memories [...]

The memory-erasing device in the film resembles a cooking colander, which strikes Valerie as unrealistic. However, this lack of realism seems to be acceptable to Valerie because the film is more concerned with the theme of memory than with the plausibility of erasing specific memories. To take Valerie’s position a step further, the unrealistic science of memory erasure is what allows *Eternal Sunshine of the Spotless Mind* to take-up its thematic concern with memory. Leah provided related examples:

Have you [seen] *Children of Men*? It’s a movie where everyone stops having babies, something. There’s also, what is [it] called? There’s another one where all men die except for one. Every member of the species that has a Y chromosome dies [*Y: The Last Man*], and both of those use that as a backdrop to deal with completely other, well *Children of Men* deal[s] with racism and surveillance and how we treat refugees and they do that in a great way, actually, and that takes a long time. So from the time that everyone stops having babies to the time that the story takes place, Britain becomes this extremely xenophobic super-surveyed society which is kind of like *1984* and that’s what it’s about rather than, the major thing in the movie is that nobody’s having babies but that’s kind of a background of what happens to society when it becomes extremely threatened.

The fertility crisis in *Children of Men* (2006) might be interpreted as a metaphor for “extreme threats” to society, but Leah did not explicitly use the language of metaphor in her response. Instead, the fertility crisis seems to be functioning for Leah as the memory-erasing device was functioning for Valerie. The scientific plausibility of the fertility crisis is unimportant compared to the thematic exploration of “racism and surveillance” that the fertility crisis makes possible.

The principle of thematic functions is related to the principle of narrative consistency. For example, in *Children of Men* (2006), the fertility crisis could also be deemed acceptable by perceiving the storyworld as different to the real world (i.e., fertility crises are realistic in the storyworld if not in the real world). However, not all storyworlds are different from the real world in order to facilitate thematic work. Thus, the principle of thematic functions can be distinguished from the principle of narrative consistency.

Furthermore, thematic functions can inform the narrative contract. If the perceived aesthetic goal of a narrative is to explore a theme or argue a thesis, then the narrative might also be perceived as uncommitted to narrative consistency or external realism in service of that goal. However, thematic functions are distinct from the narrative contract
because a thematic function can confer acceptability to unrealistic science even if a
narrative otherwise appears to be committed to realism. For example, the serious tone
and subject matter of *Children of Men* (2006) arguably signifies a commitment to
narrative consistency. However, Leah regarded the global fertility crisis in the film as
acceptable not because the film was uncommitted to narrative consistency, but because
the fertility crisis served a thematic function (assuming for a moment that the fertility
crisis is perceived as implausible or atypical in the storyworld of the film).

5.4.5 Formal constraints

Unrealistic science may be more acceptable when it is perceived as a consequence of
formal constraints. A formal constraint can be understood as a limitation on what it is
reasonably possible or desirable to do, either in narrative generally or in specific
narrative media.

Laura was the only participant to explicitly describe how unrealistic science arising from
formal constraints was more acceptable. Initially, Laura stated that unrealistic science
was never acceptable to her, but she revised her position when she was asked if there
were any circumstances where she could “forgive” unrealistic science:

Yes. I guess if it’s, you know, if it’s a movie and you’ve only got an hour and a half
to do something, it’s not realistic for them to try and show everything step by
step or have a process that might take a little bit longer to take as long as it
would in real life. But that’s taking, you know, poetic licence and there’s a reason
behind that as opposed to someone just making up some science or not
bothering to research it. Yeah, like, aspects of space travel obviously will take
longer than they do in some movies and with *House* or whatever, medical fiction,
there are treatments and diseases that would take longer in real life but they
don’t, obviously can’t show that entire time. Otherwise you’d be bored and go do
something else. In those cases I would forgive being not accurate.

Laura’s response highlights constraints on both time and detail in narrative form.
Showing a scientific process in full is difficult or impossible not simply because of the
limited duration of a film or television show, but also because of the limited attention
span of the reader—too much detail might bore the reader. From a theoretical
standpoint, narrative discourse is inevitably incomplete (e.g., Ryan, 1991, p. 52). It would
be impossible to exhaustively describe every detail of a story and any attempt to do so is
likely to come at the expense of narrative engagement. Thus, unrealistic science in
fiction might be more acceptable if it is perceived as a reasonable compromise of detail
or complexity in the interest of narrative engagement.
5.4.6 Aesthetic fulfilment

For many participants, unrealistic science was perceived as more acceptable if the narrative was meritorious overall. In other words, unrealistic science can be overlooked or tolerated if a narrative provides a satisfying aesthetic experience. For most of the participants who described this theme, an engaging story appeared to be the basic precondition of aesthetic fulfilment.

Although focussing on Greek mythology rather than scientific realism, Alana articulated the principle of aesthetic fulfilment in the following discussion:

Alana: [Historical accuracy] bothers me, yeah, espec- like when they are talking about ancient Greece, cos I’ve read Homer’s Odyssey and I’ve read Iliad, so I’ve read both of those and those books are not short. So I’ve read those, and for me it bothers me when they get certain parts like wrong or they just blatantly ignore them. Yes it bothers me, but then at the end of the day I kind of sit back after I watch the movie, I sit down and I’m like, “Did I like the movie?” Yes? No? I decide there and then. If I did like it, what I liked about it, the bad stuff, ok let’s put it in some compartment in my brain, shut the draw, and ignore it because if you like the movie, so but.

Danielle: I think yeah, I think that happens a lot of the time.

Alana: Exactly.

Danielle: Yeah you just like, sometimes if you really like it you-

Alana: For example-

Laura: I refuse.

Alana: For example, Troy, not a great movie, but you have Brad Pitt and you have Eric Bana and Orlando Bloom. Did I really care that they got a whole bunch of it wrong?

Alana’s final question is rhetorical—she did not care about the lack of historical realism in Troy (2004), a film about the Trojan War. She noted that Troy was “not a great movie” but the presence of specific actors was sufficient for her to overlook its flaws, a comment that was possibly also intended for comedic effect in the context of the group discussion. Although she was cut off, Danielle seemed to agree with Alana’s view that unrealistic elements are more acceptable when she has an overall positive evaluation of the text. However, as Laura’s interjection suggests, not every participant was willing to overlook unrealistic elements in the same way.

Other participants described the concept of aesthetic fulfilment specifically in relation to science. For example, Bethany stated, “if the story is good enough [...] it doesn’t matter if
the science is wrong.” Similarly, Charlie “could easily forgive the science errors in [Interstellar] because the story was just really interesting and entertaining and that really caught [him] and [he] was easily forgiving it.” Ian also linked the acceptability of unrealistic science to the quality of the narrative:

I guess when I’m already not totally into a piece of fiction, [unrealistic science] can kind of be the thing that pushes me further away [...]. There are some series of Star Trek that I have liked because of the plot so I don’t really care that the science is mumbo-jumbo, whereas other series, they’re, I’m a little bit more, not finding myself as engaged.

Gabrielle articulated a related position, describing how unrealistic science would help drive her away from a work of fiction if the plot was not engaging, but an engaging plot was enough to make her tolerate unrealistic science:

Breaking Bad I liked to start with but then it was inaccurate, and then it got boring, and I’m like, “No, I’m not doing this anymore.” And I never finished watching it. Grey’s Anatomy kind of got repetitive so I stopped watching that. And if you add the unrealisticness and the plot’s not interesting enough to keep me interested then you’re probably not going to keep me watching or reading it, yeah. It depends on if I’m interested in what’s, if I can stay hooked with the plot, I think.

For these participants, the realism of the science was secondary to the appeal of the plot.

Realistic science can be overlooked when a narrative is sufficiently engaging, but this does not necessarily mean that realistic science can redeem a narrative that is insufficiently engaging. As Marcus stated:

Realistic science does benefit a story, but to base the entire story on realistic science without any of the other story writing things coming to the fore, it falls apart. So you can have the most accurate science you want, but if it’s boring as all hell and the character interactions are stilted and it’s all sort of a mess, then it’s going to be worse than something that gets the science slightly wrong but gets all the rest of it right. So it depends entirely on the context of the story, for me at least.

Valerie articulated a related position, describing how scientific realism is not enough to prevent her from becoming frustrated with a film if its story and characters are not good enough:

So for instance, even though in Doctor Who a lot of the devices are kind of just there to help the action along or there to allow the people to travel through time and so on, even though a lot of the time those things are quite unbelievable, or I guess unrealistic, is what I’m seeing them as, I don’t mind that. So for me it depends on, you know, whether I like the characters, whether I like the story, because I think for instance in Doctor Who episodes I find it more interesting
how they interact with the people, the aliens, who they’re with, so I find the
characters more interesting. Whereas in something like Gravity where that’s a
really, you know, impressive and realistic type of portrayal of science because all
the, you know, the digital effects were really interesting. They did the thing of
you can’t hear sound in space, which a lot of the previous films hadn’t done. They
got, you know, they were trying to be accurate, or least as far as I know they were
trying to be accurate. I still found that a bit frustrating because I wasn’t as
impressed by the story. For instance, [...] at the end of the film I really find it
quite ridiculous that she, that Sandra Bullock’s character survived when she
crashed into Earth, when she got back into Earth. So by that time I had lost
interest in the scientific aspects of it. Whereas early on in the setup of it I found it
really interesting that it was realistic but because I wasn’t happy with the plot
and the characters, I ended up not caring about it [...]. So for me it depends on,
whether I get frustrated depends on whether the story is a strong one or not,
whether I find it entertaining or not.

Valerie goes on to describe how her disappointment with the story in Gravity (2013)
also caused her to be more critical of the text’s scientific realism, which she initially found
impressive. In this way, scientific realism alone is not enough for aesthetic fulfilment, but
aesthetic fulfilment may be enough to tolerate a lack of scientific realism.

The concept of aesthetic fulfilment is distinct from the narrative contract. When
unrealistic science is deemed acceptable in terms of the narrative contract, the reader
recognises the aesthetic goals of the text and evaluates unrealistic science in light of
those goals. In the case of aesthetic fulfilment, the text must both achieve its aesthetic
goals and the reader must deem those goals worthwhile or meritorious. For the
participants quoted above, the main precondition for aesthetic fulfilment seemed to be
an engaging story. However, Hannah articulated a more specific expectation for good
science fiction:

That’s one of the things about science fiction that I enjoy about science fiction is
that it sort of takes already existing sort of logics of possibility and then sort of
brings them to their limits to kind of explore the implications, especially the
social implications, of a particular kind of science. So for something like Jurassic
Park, I really enjoyed Jurassic Park and it didn’t make me angry at all, because it
took the sort of the logic of the DNA extraction and sort of the determinism of
DNA and just kind of pushed that to its ends and then you know, human
apocalypse and crap like that. Whereas just because I’ve already talked about it
[...] Sunshine it doesn’t actually take any sort of interesting underlying logics of
like contemporary science, it just kinds of puts, it was like a space opera, like it
was just really boring. And the science was bad. So, I don’t know.

Hannah prefers science fiction that explores the implications of contemporary science
that is projected into the future. Jurassic Park (1993), a film about the implications of
genetic technologies, fulfilled this expectation. By contrast, Sunshine (2007), a film about
a futuristic mission to reignite the Sun, was merely a “space opera.” It is somewhat unclear what Hannah means when she states, “it was just really boring.” She may be implying that the film was boring because it failed to explore the implications of science and technology. Alternatively, she may be implying that the film’s inability to tell an exciting story was a further strike against it. In any case, unrealistic science was acceptable in *Jurassic Park* because unlike *Sunshine* it fulfilled her expectations of good science fiction.

Hannah’s response highlights how the principle of aesthetic fulfilment is likely to be dominated by normative expectations (i.e., what the readers expects from “good” fiction). However, my definition of aesthetic fulfilment remains open to the possibility that a reader may revise their normative expectations through an encounter with a narrative text. The defining feature of aesthetic fulfilment is a satisfying aesthetic experience, which may come about through fulfilling or reconfiguring a reader’s normative expectations.

### 5.4.7 Enhancement

Unrealistic science may also be deemed acceptable if it achieves an effect that could not be achieved (or achieved to the same extent) with realistic science. I have called this principle enhancement, which is synonymous with the concept of poetic license that I reviewed above in Section 5.3.1. I prefer the term enhancement because it is less ambiguous than poetic license. Consistent with Ryan’s (2009) economic approach to evaluating unrealistic events, the principle of enhancement is invoked when the net contribution of unrealistic science to a narrative is positive.

The principle of enhancement can be conceptualised globally or locally. In global terms, the hypothetical pool of stories available to authors is made richer (enhanced) when authors are permitted to base stories on externally implausible science. Mandating externally realistic science might exclude interesting and exciting stories. Various participants described enhancement in global terms. As Natalie stated:

> [They have unrealistic science] to make things cool (laughs), cos if everything is real then it will be the real world and the real world is not as cool as in the movies, and there are a lot of technologies we don’t have today, some due to the limitation of the technology that we just simply don’t have but we might have in the future, but some things are just impossible, like [time] travel, but we do want to see things, what things would happen, if the impossible happens. So that’s, I think that’s to make the impossible possible.
Thus, global enhancement may come into play whenever a reader perceives that a narrative simply could not be told without unrealistic science.

The principle of enhancement can also be conceptualised locally (i.e., on the level of a single text). The principle of enhancement operates on a local level when the reader perceives a set of creative alternatives where the same story (or an analogous story) could be told in more or less realistic ways, but the less realistic way is perceived to be the superior option. Logan’s response to *Interstellar* (2014) is the primary example of local enhancement in my data (Riley also alluded to enhancement in her response, which I discuss below in Section 5.4.15). In *Interstellar*, the film’s protagonist lands on a planet near a black hole, and due to the phenomenon of time dilation, every hour on the planet equates to around seven years on Earth. Returning to orbit after a few hours on the planet, the protagonist reviews a video log where he watches his daughter grow-up in the time he has been away. For Logan, the scale of time dilation in the scene was exaggerated, but the exaggerated scale ultimately enhanced the film:

> Occasionally things in *Interstellar*, the physics, is unrealistic. Not unrealistic, it’s not accurate. So this idea that when they go down to this planet and the time shift there is one hour to seven years is, that’s possible. It’s plausible. It is how relativity works. But it’s impossible to do what they did with it in terms of, if the gravity of a planet was so strong as to force that type of time scale, you wouldn’t be able to stand-up on that planet. You would be crushed instantly. You wouldn’t be able to take-off on a plane and leave. It’s not possible. So that’s obviously unrealistic. Everything on that planet would be just ripped off it. It would be bare. Because the biggest black hole we know of is one minute to two minutes. So the scale is just unfathomable. But you kind of, it’s still accurate. It’s realistic it’s just not accurate I guess. It’s a bad way of describing it. I guess the science is founded correctly it’s just that they’ve taken it to an extreme for the sake of storytelling, which I appreciate.

Elsewhere, in a focus group discussion, Logan also referenced this scene in response to another participant who found it difficult to be emotionally involved in *Interstellar*:

> What about that scene in *Interstellar* where he goes down to the planet and gets stuck down there, I think it was for two or three hours, comes back and then it’s 21 years later and he’s going through his logs? And that’s a direct comparison with people missing each other I suppose extremified, you know, people getting posted overseas for war and, you know, missing their children grow up [...]

In this way, Logan seems to appreciate the exaggerated time dilation in *Interstellar* because it heightens the emotional impact of the scene. To the extent that personal sacrifice is a theme of *Interstellar*, the exaggerated time dilation might also be
interpreted in terms of a thematic function. Indeed, as I will explain below, there is some overlap between the principle of thematic functions and the principle of enhancement. In any case, unrealistic science was acceptable to Logan on this occasion because it enhanced the narrative.

The principle of enhancement can be thrown into relief by an example where the net contribution of unrealistic science is negative. In the following example, Jake describes a scene in *Gravity* (2013) where two astronauts cling to a rope to prevent themselves from drifting off into space. After coming to a rest, one of the astronauts (played by George Clooney) is concerned that he will drag the other astronaut (played by Sandra Bullock) to her death. As a result, he sacrifices himself by untethering himself from the rope:

"So here we're talking about gravity and they're sticking to, semi-sticking to how gravity works in space then of all a sudden we have this bit—so we need to separate the two astronauts—so we have this bit where for some reason George Clooney's being pulled away and she has to let go [of Clooney], but that's not how gravity works, and at that point a movie breaks for me because it breaks the internal logic of what the movie is trying to do or say or what have you [...]. And to me that's just lazy storytelling. You could have done that in a better way. They could have had the thing rotating or whatever to get angular momentum and then it solves the problem, but yeah, it's annoying in that sense, that it's lazy storytelling; there's other ways to do it."

Jake recognises that the author intended for Clooney's character to be killed, but since Jake can conceive of more realistic alternatives that could achieve the same outcome, the net contribution of the unrealistic science in *Gravity* was negative.

The principle of enhancement can overlap with other principles of aesthetic evaluation but it is distinguished by the perception that unrealistic science has made a net positive contribution to the narrative. Although I am not suggesting a quantitative approach, enhancement can be illustrated conceptually in terms of the following equation:

\[ X = A - B + C \]

Where \( X \) = overall effect achieved by a narrative

\[ A = \text{positive contribution from unrealistic science} \]

\[ B = \text{negative contribution from unrealistic science} \]

\[ C = \text{contribution of other elements in the narrative} \]
For the purposes of this discussion, I share Hazlett and Uidhir’s (2011) assumption that unrealistic (inconsistent) science is a prima facie aesthetic flaw. As such, unrealistic science usually makes a negative contribution to a narrative, which is represented as B in the equation above. However, unrealistic science can also make a positive contribution to a narrative, which is represented by A in the equation above. The principle of enhancement comes into effect when the positive contribution of unrealistic science is greater than the negative contribution (A > B). What I have called aesthetic fulfilment occurs when unrealistic science does not make a net positive contribution to the narrative but because the narrative still succeeds overall, the unrealistic science is tolerated (A ≈ 0 and C >> 0). In many cases, unrealistic science that serves a thematic function might also be deemed acceptable in terms of enhancement, though this ultimately depends on whether the positive contribution arising from a thematic effect (A) outweighs the negative contribution of unrealistic science as a prima facie aesthetic flaw (B). Unrealistic science that is perceived to arise from formal constraints may also represent a form of enhancement, but perhaps only if the reader cannot formulate a more realistic solution to the formal problem. Similarly, the narrative contract can confer acceptability to unrealistic science because a narrative is not committed to realism, but enhancement only comes into effect when the narrative is enhanced because it is not committed to realism.

5.4.8 Ideological congruence

Various participant responses suggest that unrealistic science is less acceptable when it occurs in a narrative that conflicts with their way of seeing the world. This finding is consistent with Rowe’s (1997) observation that unrealistic historical detail may be less acceptable if it is perceived as immoral. I have termed this principle ideological congruence, but the principle applies to any occasion where a narrative conflicts with a reader’s beliefs, attitudes, or values. Furthermore, the principle of ideological congruence refers to both incongruent theses and incongruent incidental ideological content (cf. Chapter 2).

In the first instance, ideological conflict can arise when a text communicates a thesis that is ideologically incongruent, as the following discussion extract illustrates:

Rachel: I think it irritates me most when the movie in itself is very opinionated in one way and you’re watching it and you’re like but you’re logic doesn’t work so why are you trying to convince people when it’s not right and there’s a lot of incidences of that where you can’t [take] them seriously, or the argument
seriously, but it's also a flawed argument that people will pick up on and some people will latch on to, which is-

JLG: Are there any examples that come to mind?

Renee: (laughs) Now that I said that let's actually think and back it up. Again going back to-

Logan: Gen mods a good one.

Rachel: Yep.

Logan: Any movie [about] genetic modifications often ended up with something going horrendously wrong and it being portrayed as a bad thing, which there's not backing for that. I mean like all of the research that has been done in genetic modification has been immensely successful. We haven't had any screw-ups like that.

Rachel: Yeah I think there was one that I saw and admittedly it had zero science behind but it was about someone who tried to genetically modify human with some genes that they just happened to find lying around and then it turned into a psychopathic creature. I can't remember its name now [?Splice?]. It was a terrible movie. And then there's all the ones on nuclear power, I guess. Also zombie apocalypse films have sort of like this virus spread through the population wildly when you know even with something as terrible as Ebola, you know, it became contained, it, you know, didn't take over the world.

Rachel and Logan listed examples where narratives were perceived to either oppose specific areas of science and technology, such as genetic engineering and nuclear energy, or underestimate the efficacy of the scientific community in dealing with potential threats, such as viral pandemics. Ideological conflict can also occur with respect to the text's perceived orientation towards science in general. As Lily stated:

Also sometimes like the depiction of science within that story. If it takes a turn that I don't necessarily agree with, like for example, mad scientists, or like just science is bad, or this is really, really, old, like, almost like Batman comic book style, like, there's evil scientists, it creates a kind of stigma, then I'm like this is really stupid, this doesn't happen in real life. We don't have people in labs making two-headed horses or whatever it is.

In this way, unrealistic science may be less acceptable if it is perceived to be in service of—or co-existing with—an ideological position that is opposed to science in general or to a specific area of science and technology (assuming that the reader supports science and technology).

However, ideological conflict does not only reduce the acceptability of unrealistic science when the conflict relates to science. Other forms of ideological conflict might also reduce the acceptability of unrealistic science. In the following extract, participants
discuss *The Big Bang Theory* (2007–), a television comedy series about a group of scientists and their friends. Although the series’ orientation towards scientists and science was at issue in the discussion, participants also described ideological conflict in terms of the series’ representations of gender and developmental disorders:

Jasmine: I recall having a lot of heated arguments over *Interstellar* with a group of friends, a mix of science and non-science, and I’m not a physics expert but I was talking to a couple of friends who are really into physics. It was really interesting to see everyone’s interpretation of how realistic it was portrayed and, you know, I guess with that you are also taking the baggage of the outcome of the film as it was depicted so that would sort of influence how you take it. Whereas something like *Breaking Bad* or even *The Big Bang Theory* that kind of popular science that is based on realism or real science I should say, it’s not nearly as debated for the science content.

Abigail: But I think it totally should be. Like *Big Bang Theory* I really don’t like but that’s another issue, but I think a lot of the stuff that’s in that could be highly debated but I think a lot of the people that watch *Big Bang Theory* aren’t into science, or don’t have much science education-

Jasmine: No, it popularises.

Abigail: Exactly.

Dominic: Yeah it popularises it, yeah.

Abigail: They think that they’re learning science stuff and “oh it’s cool” but really they’re just like laughing at people who are into that stuff and laughing at, you know, autism, and whatever. But yeah, it’s also not necessarily teaching anyone anything so I don’t think there’s really any point of it being a show. It could be a show, but just don’t have it about science because it just kind of brings science down.

Dakota: I guess *The Big Bang Theory*, I don’t know. I’ve seen quite a few seasons. I don’t mind the show, but definitely with physics concepts quite a lot of it is true, except for Howard going into space, that part isn’t really realistic at all but definitely when Sheldon explains stuff, I know like Chuck [Lorre] he did a lot of research for that, and so the scripts have all been kind of, like evaluated by physicists so they are all somewhat true. But yeah I still don’t think people watch the show to learn stuff, but that’s one of the scientific, one of the science fiction, realistic science fiction shows that portrays physics in like a more accurate way, but not necessarily how they portray it, in terms of autistic Sheldon, Leonard like dealing with stuff, and a dumb blonde Penny and stuff—that part isn’t good. But in terms of the actual accuracy of the physics, like, a lot of it is true.

Abigail did not provide any examples of unrealistic physics to counter Dakota’s position that *The Big Bang Theory* is largely realistic with respect to physics. However, the actual scientific realism of the show is almost irrelevant. It is not unrealistic physics that motivates Abigail to demand more criticism of the show’s scientific realism—it is a sense of ideological conflict. Abigail’s opposition to the show is based not only on the assertion
that it “brings science down” by “laughing at people who are into that stuff” but also because it encourages readers to laugh at autistic people. Here she is referring to Sheldon, one of the main characters in the series. Although not explicitly identified as autistic, Sheldon exhibits some characteristics of Asperger’s syndrome. Irrespective of whether Sheldon should be labelled as autistic, both Abigail and Dakota characterised him in this way and they regarded the show’s representation of him as problematic. Dakota also took issue with the show’s gender politics in her reference to “dumb blonde Penny,” a female friend and romantic interest in the show who is characterised by her lack of scientific literacy. Dakota ultimately seemed sympathetic to *The Big Bang Theory*, but in Abigail’s case, the show’s distasteful humour seemed to warrant closer scrutiny of its scientific realism.

It may be possible to interpret Abigail’s response differently. Perhaps she was suggesting that *The Big Bang Theory* should be further critiqued for its politics rather than for its science. However, the argument that unrealistic science may be less acceptable when a text is ideologically incongruent (even when the point of ideological contestation is not related to science) is also borne out by Leah’s experience:

> But yeah, another thing I don’t, so like, *Big Bang Theory*, or *The IT Crowd*, and also *Red Dwarf*, are shows that are made not for nerds but about nerds for the mainstream public to laugh at them to a certain extent. And then I tolerate way less things in general. I just don’t like the way they stereotype people. I don’t like, and then when they on top of that, they make unrealistic, so a couple of cases like in *Big Bang Theory*, I think they publish a scientific discovery like in a blog post or something. Well that’s not science itself, but that’s like how academia works, but that’s not how academia works; you don’t publish a blog post. And the kind of science they do there sometimes I also find a bit weird, though I think *Big Bang Theory* is supposed to be unusually good at this, I’ve heard. And they also recently, did you see they announced that they’re gonna have a scholarship for some? Yeah, which is great. But when they do it, because there they’ve invested a lot of things in appealing to, they want to appeal to a nerd audience, but they also want to laugh at nerds. So because they invested so much in it I think I’m even less tolerant, definitely.⁸

For Leah, publishing scientific results on a blog is an unrealistic representation of how academia works. It is not clear which episode of *The Big Bang Theory* Leah is referring to. She may be referring to “The Troll Manifestation,” an episode where one of Leonard and Sheldon’s research papers becomes the subject of critique on a physics blog, but the

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⁸ Leah lists *Red Dwarf* (1988–) as a series where unrealistic science is less acceptable, a comment that seems to contradict her earlier view that unrealistic science is more acceptable in *Red Dwarf* because it is a comedy (cf. Section 5.4.3). This may be a contradiction, but it might also illustrate how principles of aesthetic evaluation can come into conflict (cf. Section 5.4.15 below) or be deployed strategically (cf. Section 5.5.4).
research paper itself is not published on a blog. In any case, the acceptability of unrealistic science in a series like The Big Bang Theory is reduced for Leah because of the way these shows stereotype people, particularly “nerds.” To the extent that nerd identity is associated with scientific interests (e.g., Woo, 2012), The Big Bang Theory might still be interpreted as ideologically opposed to science. Nevertheless, Leah seems to object to the series not simply because of its orientation towards scientists but because it is a show that deals in stereotypes. In this respect, Leah’s response suggests that the principle of ideological congruence operates for ideological conflicts over scientific issues but also (more tentatively) for ideological conflicts in general.

If it is true that unrealistic science is less acceptable when a text is ideologically incongruent, it follows that unrealistic science may be more acceptable if the text is ideologically compatible. For Renee, the unrealistic science in the climate disaster film The Day After Tomorrow (2004) was acceptable because the thesis of the film was compatible with her view that action on climate change is important:

I kind of feel like it’s, for in films, especially like recently there’s quite a lot of end-of-the-world films, like the one I remember is The Day After Tomorrow, which is about global warming is gonna cause, and the way they do it is like it’s not realistic and I think 2012 it’s the same thing, and you know, it’s generally known that it’s so unrealistic, but if it gets people thinking, you know, “Oh global warming is bad and it could have a horrible effect,” even if it is unrealistic to its scale I still think, like, it could be, you know, good, kind of. If some people watch that and are like, “Oh crap,” you know, “global warming, gotta do something about that,” then that’s kind of good and I don’t really care. It doesn’t really matter if it’s not to that scale, kind of thing.

Similarly, Nina regarded the unrealistic representation of dinosaurs in the Jurassic Park series as acceptable because she believes that the films generate excitement about palaeontology, an area of science that she is passionate about:

In a film that’s trying to purport itself as being a science film, [scientific realism is] pretty important, I would say, you know, it’s up around like eight out of 10. It will lose significant marks for me if it misrepresents itself. If it’s something fantastical like Jurassic Park I can, I’m happy to call myself a dino-nerd, I’m picking up issues in my text book that I’m currently using, you know, and sending emails to my lecturer and saying, “Hey, this information’s wrong.” So you know, I’m a dino-nerd. I’ll still be at Jurassic [World] on the eleventh of June squealing like a fan girl cos I just don’t care because it’s fun and because I like the fact that nine year old boys like dinosaurs and that girls see Jurassic Park and go, “Yeah, let’s do this, dinosaurs are awesome.” That’s cool. It shares something that I love with a lot of people and if I then spend the next six months correcting them, I don’t care cos everyone just has a good time, and for me, bringing
something that I love and making other people love it is more important in that context.

As for Renee, Nina regards unrealistic science as acceptable when it stimulates interest or awareness for a cause that is aligned with her own values.

5.4.9 Plot centrality

For many participants, unrealistic science was less acceptable when it was central to the plot of a narrative. Chatman (1978) uses the terms “kernel” and “satellite” to distinguish between major and minor events in a narrative respectively. Kernels are “branching points which force a movement into one or two (or more) possible paths,” whereas satellites “can be deleted without disturbing the logic of the plot” (p. 53–54). Adapting Chatman’s terminology, I make a distinction between kernel science, which is perceived as central to the plot, and satellite science, which is perceived as peripheral to the plot. In general, unrealistic satellite science was more acceptable than unrealistic kernel science, though the acceptability of kernel science also depended on the terms of the narrative contract.

The concept of satellite science is highlighted in the following focus group discussion:

Phoebe: I was thinking about this when they use instrumentation wrong in movies. Like, you know, they’ll use a mass spec machine to actually do like data analysis of the whole like DNA of the genomes of whatever (Emma laughs) and you’re like, hmm that’s not what it does. But at the same time, I think, like ha, that’s really funny, that they’re using something that looks, you know, a bit tech, or you know a bit sciencey but I don’t, it doesn’t put me off the rest of the movie or anything like that or, you know, they’ll have test tubes in the background and it’s like you wouldn’t store your chemicals like that if this was real (Emma laughs). It doesn’t take away from the realism of the film because again I’m just watching it not because of the background stuff. I’m watching it because the dinosaurs are taking over.

Damien: I think in those situations a lot when you notice equipment being misused, it’s not as distracting as kind of plot points that centre around the science, so it’s just like, oh it’s funny they are using this machine wrong but they could of used a different machine, right? So it doesn’t really matter.

Phoebe: Yeah, yeah. It’s something that still exists or like its equivalent.

Emma: Yeah.

Damien: Yeah. It’s like oh they could store those chemicals correctly but it doesn’t really relate to the anything so it doesn’t matter, yeah.
For these participants, scientific equipment is just “background” that could be replaced with a realistic equivalent but it would ultimately make little or no difference to the plot. In this case, scientific equipment is exemplary satellite science.

Unlike satellite science, kernel science is perceived to have ramifications for how the plot could or should unfold, as the following example from Philip illustrates:

The thing that always bothered me about *Gremlins*, not the realism of it all, but one of the things about the gremlin is that you’re not supposed to feed the gremlin after midnight, and even when I was like 12 when I first saw it, I was like, when is after midnight because after midnight is all the time and those are the kinds of things that stick in my craw about like the realism of something is like if the plot, if something really important in the plot hinges on a detail like that, which is inaccurate.

Philip was uncertain whether this example from *Gremlins* (1984) should properly be characterised as “science,” but he nevertheless illustrates how an unrealistic element that is perceived to be central to the plot may be perceived as less acceptable.

Unrealistic kernel science may also be perceived as unacceptable because it provides an unsatisfactory resolution to a major problem facing the characters in the narrative. Grace referred to this as “last minute science [that] ends up saving everyone.” In the literature, the term deus ex machina is used to denote this form of unrealistic event (cf. Ryan, 2009, pp. 63–64). Jordan provided the following example:

And then there are other [narratives] where [unrealistic science] kind of detracts because they used the bad science to cover a plot hole or something, like in the latest *Star Trek* movie, [*Star Trek Into Darkness*]. I think Kirk died in the middle of an irradiated reactor core but he was ok because they infused him with Benedict Cumberbatch’s blood, which may be magical, but you know, probably not.

Jordan seems to use the term “plot hole” to refer to a difficult situation, which is distinct from my definition of plot holes as narrative inconsistencies in Chapter 2. In any case, for Jordan, the blood transfusion in the film is essentially a “magical” solution to what in reality would be an intractable problem for one of the film’s main characters: radiation poisoning. At least for Jordan, the unrealistic science that saved Kirk was an unsatisfactory solution to a major narrative problem, and as such, the unrealistic science was deemed aesthetically unacceptable.

Unrealistic kernel science is less acceptable than unrealistic satellite science, but the acceptability of unrealistic kernel science is moderated by the narrative contract. For
Marcus, the acceptability of unrealistic science depended both on the seriousness of the narrative and the centrality of the unrealistic science to the plot:

It depends. Again it entirely depends because if it’s not trying to make itself out as serious then I just roll with it. So, say in Star Wars they’ve got all the space fighters act as if they’re manoeuvring in an atmosphere. So they bank when they turn and do all the rest of it instead of being able to do all the full range of three dimensional acrobatic stuff that they could be able to do in a largely weightless environment. And so but because Star Wars is that sweeping sort of space opera epic, the little nitty gritty things don’t matter as much because the story is not built on them and then I just sort of roll with it and it looks cool, so that’s fine. But say something like The Core where the entire movie is based on this, let’s build a, what was it? An ultrasonic shield for our train that can go through the core of the Earth and not care and because the entire movie is based on that but it’s still trying to make itself super serious it kind of falls over because the initial “that doesn’t make sense” then nags at you for the rest of the time. So I suppose my reaction is entirely based on how central the inaccurate science or the unrealistic technology, how much of an impact it has on the main story as a whole.

Marcus contrasts Star Wars (1977) and The Core (2003) on two dimensions. The physics of manoeuvring in space is less problematic both because Star Wars is a “sweeping sort of space opera epic” and because “the story is not built” on the “little nitty gritty” details of space flight physics. By contrast, the unrealistic science in The Core is doubly problematic for Marcus because it is both central to the plot and the film is “still trying to make itself super serious.”

5.4.10 Personal relevance

 Unrealistic science is less likely to be acceptable if it relates to an area of science that is personally relevant to the reader. Following Thomsen, Borgida, and Lavine (1995, p. 191), I define personal relevance as the degree to which a reader cares about an area of science or perceives it as personally important.

Many participants described how unrealistic science was less acceptable when it related to an area of science in which they had some interest, expertise, or personal experience. Harriet is representative:

I think am able to tolerate [unrealistic science] if isn't biologically, like, based, since I know, cos I'm like really a bio kid; everything I do is bio. So if it's not accurate with bio I do get frustrated [...]. But if it's something else that I don't really know that much about but I kind of have an understanding, I won't be as frustrated I think cos I still don’t know that much anyway. So I’m kind of in the same boat as my friends, I guess.
Participants were more knowledgeable about personally relevant science, but as several participants described, personally relevant science was also more important to them. As Esther stated, unrealistic science is less acceptable “when it gets personal, when it’s your field, when it’s something that you care about perhaps more than other fields.” Similarly, Damien described how unrealistic science is more likely to matter if “they kind of do wrong by something that is close to [him], close to [his] heart, like, scientifically.” Damien’s reference to science that is close to his “heart” signifies a connection to his chosen field of zoology that is emotional as well as intellectual. Natalie articulated a related position, describing how she is less likely to identify unrealistic science that is outside of her field, but even if she does identify it, she is less likely to be bothered by it:

I personally feel that I would be more critical or more strict to the sort of science knowledge that I am familiar with, like geology, some biology, because I used to study dinosaurs [...] And but for physics or astronomy, which I am not that familiar with, I’m quite ok with it, because I can’t tell if it’s right or if it’s wrong. Only when it is so ridiculous that even I can identify them then yeah, it doesn’t bother me. So that’s it to the public who doesn’t know the knowledge.

Outside of her field, Natalie regards herself as no different to a non-scientist. Other participants did not make the same explicit distinction between knowing and caring about an area of science; however, knowing and caring about an area of science are likely to co-vary to some extent. Thus, the personal relevance of unrealistic science appears to predict both its detection and its aesthetic acceptability.

Personal relevance can reduce the acceptability of unrealistic science, but it is important to acknowledge that personal relevance has various antecedents (Thomsen et al., 1995). In some cases, unrealistic science might be personally relevant simply because it has intrinsic interest or appeal for the reader. In other cases, unrealistic science might be personally relevant because the reader is a practicing or aspiring scientist who is concerned about fiction’s impact on public support for their field (cf. Chapter 4). Unrealistic science might also be perceived as personally relevant if it has a perceived potential to cause harm to other readers (cf. Section 5.4.11 below). In this way, the acceptability of unrealistic science may depend not just on whether the science is personally relevant but also why it is deemed personally relevant.

5.4.11 Harmful effects

As I described in Chapter 4, concern about media effects was one the reasons why participants regarded the realism of science in fiction as important. For various
participants, this concern also seemed to be reflected in the aesthetic evaluation of unrealistic science. In other words, unrealistic science was less acceptable if it was perceived to potentially give rise to damaging real world effects. Participants primarily highlighted medicine, public health, and climate change as consequential “real world” science. These areas of consequential science were contrasted with science that was perceived as less relevant to people’s everyday concerns, such as theoretical physics. Leah’s response is representative:

So I’ve heard, I’m not a med student, but I’ve heard that like House is pretty good at depicting their medicine, how people work, so I kind of have more trust in them. I’ve heard that other shows are worse. So that I care about, cos that has some im-, yeah, if it’s about medicine or climate change or evolution or things like that, that actually is involved in people’s lives. Like warp drive doesn’t matter to me right now. Neither does teleportation, but how you can live with cancer does.

This theme of concern with “harmful effects” may overlap to some degree with the theme of “ideological congruence” described in Section 5.4.8 above. For example, a text that is ideologically opposed to genetic engineering might also include examples of unrealistic science. A reader might regard the unrealistic science in the text as less acceptable because both the text’s overall ideological position and its specific examples of unrealistic science might have an effect on people’s attitude towards genetic engineering. However, as I suggested above, unrealistic science may be less acceptable even when the point of ideological contestation is unrelated to science. Moreover, a text may display a favourable ideological orientation to science while including unrealistic science that is perceived as consequential in the real world. For example, most medical dramas are favourably disposed towards medical science and yet may include unrealistic science that is perceived as having real world consequences. Thus, the theme of “harmful effects” is about distinguishing between consequential and inconsequential examples of unrealistic science independently of the text’s overall ideological position.

If unrealistic science is less acceptable when it has the potential to cause harm, it may also be true that unrealistic science is more acceptable if by virtue of being unrealistic it is less likely to cause harm. This possibility was raised by Dominic in relation to the television drama Breaking Bad (2008–2013), a series where a high school chemistry teacher uses his science knowledge to produce and sell methamphetamine. However, as the following focus group extract illustrates, there can be a tension between protecting the reader and patronising the reader:
Dominic: Relating to *Breaking Bad* as well I guess it’s ok to lie in certain situations in sci-fi, because you don’t want people, you know, you want to get it wrong so if they try to make [methamphetamine], you don’t want people to be like, “I know how to make meth” (laughs).

Abigail: But then they might frustrate people who do know how to make it and they’re like, “Oh that’s not true.”

Dominic: Yeah it’s this balance, so yeah.

Dakota: Yeah, I think movies do that all the time. This isn’t like sci-fi but in terms of counting cards it’s actually not illegal in the USA but everyone thinks it’s illegal just because of *21* and also *Rain Man*. They’re both movies that said counting cards is illegal. So basically lots of movies do stuff which isn’t true but that’s only because they don’t want a harm to happen in society, I think. So, yeah.

Abigail: I think in that like instance it depends, cos like I think, I get why they don’t want like harm to happen and stuff but I think it’s going to happen anyway and so it’s probably good, I don’t think it hurts to educate people the real way of doing things or of what’s legal or what’s not legal, instead of just lying to people cos I feel like that kind of is just patronising and condescending to the public. “We don’t want to tell you the truth because you will be hurting everyone.”

The acceptability of unrealistic science that seeks to protect readers might depend on perceptions of authorial responsibility (i.e., should authors seek to protect readers?) and perceptions of reader susceptibility (i.e., do readers need protecting?). If readers are perceived as responsible there is no need for authors to take responsibility for them, which appears to be Abigail’s position.

However, elsewhere in the discussion Abigail expressed concern that unrealistic representations of mental illness “might influence people to stigmatise illnesses” (cf. Section 4.2.2). She seems to make a distinction between how narratives might influence reader perceptions of mental illness and how they might influence readers to take-up illicit behaviours. For Abigail, the former seems to be more likely (and more important) than the latter. In this way, the principle of harmful effects presupposes certain beliefs about media effects. Unrealistic science is less acceptable according to this principle only if the reader believes both that the science in question is consequential in people’s everyday lives and that the representation of science in question will influence their perceptions or behaviours (for further discussion of media effects concerns, cf. Chapter 4).

It is important to acknowledge that there is some ambiguity with respect to the interpretation of participant responses associated with this theme. I interpreted participant responses to mean that unrealistic science with potentially harmful real
world effects was also more aesthetically damaging because of these potential effects, but it is possible that participants were not speaking from an aesthetic standpoint when they made these comments and were merely observing that unrealistic science matters more overall when it might have an impact on people’s lives. To the extent that feelings of concern related to media effects might interfere with a reader’s enjoyment of a text, it is certainly plausible that potentially harmful unrealistic science is less aesthetically acceptable than innocuous forms of unrealistic science. Nevertheless, my proposal of harmful effects as a principal of aesthetic evaluation should be regarded as tentative.

5.4.12 Complexity

Consistent with Rogers’ (2007) “guidelines for safe movie physics,” the complexity of fictional science was a further influence on its acceptability. Various participants regarded unrealistic science as less acceptable if it was something that they perceived as widely known or easily researched. As Logan stated:

I guess for the most part [unrealistic science is] redeemable unless it’s so easily avoidable. There’s a lot of science where it’s like seriously a quick google search would have told you that that’s not the case. Every time I watch a movie where they’re like, “Oh the human uses ten per cent of their brain,” I’m like, no, that’s unredeemable, you can’t come back from that because anyone, you just quickly google it—done, you’d find out that it’s not the case, the first paragraph on wiki. At that point I think it becomes unredeemable. If the science is potentially confusing or there’s a big barrier of literature that needs to be penetrated before you can really understand it, some things like I will give leeway because I know they’re movie producers; they’re not scientists.

Elsewhere Logan described how complex science can also be more difficult to communicate to a mass audience, a point echoed in Emily’s response:

I think like if the science in this film is simple or it’s what older people, or all of the science students or scientists have confidence, consensus, right, in that knowledge but they make it wrong. Yeah I think I will be angry about it, yeah. [...] But if the science knowledge is complicated itself it’s hard for you to show to the audience right. I think it’s ok. But something like the simple one, the easy science knowledge, you make it wrong, no I cannot accept that.

For both Logan and Emily, the relatively greater acceptability of “complex” science compared to “simple” science was tied to a sympathetic orientation towards the author, either because the author seemingly made an understandable mistake when dealing with complex material or because it might be more difficult to communicate complex science to a mass audience without introducing some inaccuracies. However, this sympathetic
orientation is likely to disappear when the author is perceived as deceptive (cf. Section 4.2.3). As Charlie stated:

I would sometimes use the term disrespectful because the moviemakers obviously assume that you don’t see and that’s a disrespectful way of telling a story, just try to bluff your way through and you hope that your audience doesn’t point at it.

Charlie’s perception is justified by research on film production. Kirby (2010a, pp. 95–117) argues that filmmakers are less likely to adhere to complex science—what he calls “expert science”—because it is less likely to be noticed by the majority of readers. Kirby also notes that filmmakers may adhere to “folk science”—science that is widely believed but not accepted within the scientific community—because it will be consistent with what the majority of readers believe. However, as Charlie’s response suggests, for the readers who do notice, furtive instances of unrealistic science are likely to be aesthetically damaging. In this way, the acceptability of unrealistic “complex” science may be moderated by perceived intentionality. Unrealistic complex science may be acceptable if it is perceived as unintended or unavoidable; however, it less likely to be acceptable if it is perceived as an intentionally furtive inclusion in the text.

5.4.13 Uncertainty

Alongside complexity, the settled or unsettled nature of science also influenced the acceptability of “unrealistic” science, a theme that is again consistent with Rogers’ (2007) guidelines. Many participants described how they were willing to accept ostensibly unrealistic science when it related to areas of scientific uncertainty or areas where there may be theoretical plausibility if not practical plausibility. Participants tended to volunteer examples that related to futuristic technology and theoretical physics, such as the science of black holes or the science of time travel. As Zach stated:

In regards of how I feel, [if] it’s certain aspects that have already been studied, have already been proved, I expect it to pretty much work as the way it scientifically should, but as for the things that, you know, are postulated or maybe years to come, you know, it gets me excited, because, you know, that could be a possibility. I remember watching, I think it was Stargate Atlantis, I was just like, “Oh, teleportation would be so cool.”

Dominic articulated a related position:

I feel if you are going to make a sci-fi film you have to base it on stuff that’s plausible. So like, worm holes for example. Mathematically they can exist but in
nature we haven't observed them yet. So you can take advantage of that. So it's still kind of real science, but it's not quite, you know what I mean?

Dominic's notion of science that is “kind of real [but] not quite” was echoed in Dakota's description of “unrealistic but potentially realistic stuff.” Despite an overriding sense that something is improbable (atypical) with respect to contemporary science and technology, it may be acceptable because it cannot be deemed externally implausible with absolute confidence. In this case, the plausibility dimension of realism is a greater influence on aesthetic acceptability than the typicality dimension.

5.4.14 Historical context

Consistent with Rowe (1997), unrealistic science may be more acceptable if the science in question was realistic at the time of the text's production.

Laura highlighted the importance of historical context in relation to Jurassic Park (1993):

They tried quite hard in that movie to make it accurate to the science at the time and I think that also touches on the effects of the science consultant on the movie but also with Jurassic Park a lot of the errors in that come from the science just being out-dated. It’s wrong now but at the time it was more of an extrapolation of the current science. Whereas now it's old we know that it's wrong. I think you also have to consider why it is wrong, what the source is for the wrongness of the science.

Although Laura did not explicitly state that the unrealistic science in Jurassic Park is more acceptable because of its historical context, it is implied by her response. Having said this, Laura described elsewhere how her enjoyment of the novel was “completely ruined” by her awareness of unrealistic science (cf. Section 4.2.1). Laura recognises why Jurassic Park is unrealistic, but this does not necessarily prevent unrealistic science from compromising her narrative experience. In this way, Laura's response highlights an important distinction between aesthetic acceptability and narrative engagement.

Laura was the only participant to imply that a text's historical context could confer acceptability to unrealistic science, but several other participants also described how scientific knowledge develops over time, suggesting that historical context might also play into their aesthetic evaluations of unrealistic science in fiction.

5.4.15 Conflict, synergy, and precedence of principles of aesthetic evaluation

The principles of aesthetic evaluation that I have outlined above may work synergistically in some cases and may come into conflict in others. In cases of conflict,
the principle of aesthetic evaluation that is valued more will overrule the principle that is valued less.

The interplay between principles of aesthetic evaluation is illustrated by an exchange during Riley’s interview where she described when the realism of science is most likely to affect her overall response to a narrative. I quote the exchange at length to capture the sense in which Riley moves between different principles of aesthetic evaluation:

Riley: Like if the science is just in the background, like, “Oh yes, la la la science and then this happened,” it’s less important. But if they’ve got something scientific as a core plot point and they get it wrong, it does tend to be very irritating and I prefer it to be realistic then. Like Interstellar has accurate physics, like, quite accurate physics until you get into the area where we actually have no experimental data to say it’s not accurate and that, like, helps to drive the plot and I feel like that was like, a real benefit to the film, whereas, you know, like, when you’ve got something that’s like, central to the plot but it’s completely inaccurate, it irritates me a lot. Yeah.

JLG: So you would regard Interstellar as an example of where it was central to the plot?

Riley: Yeah, cos you know, like, a lot of the drama arises from like time dilation and that was portrayed quite accurately and, you know, it was quite well researched and, you know, I felt like that was a benefit to the plot, whereas, you know, when like, it’s Doctor Who—so I suppose I should give it a free pass—but when they’re like, “We’re reversing the polarity of the neutron flow,” and I’m just like, but the neutron flow has no polarity, why? So yeah, that sort of stuff irritates me when it’s like, bad and central to the plot.

JLG: So you mentioned the Doctor Who example there, but also mentioned that you might give it a free pass. Can you tell me a bit more about that?

Riley: I think, also the tone that they’re trying to evoke. Like Interstellar was a serious film with serious science whereas Doctor Who was at heart quite ridiculous with, you know, monsters made out of shoelaces and like, a very, a not very serious plot line. And so the science there I can kind of be like, oh you know, they’re not trying to do anything of great drama, but like in films like Pulp Fiction, like, I normally love Tarantino films, but in Pulp Fiction, my mum is a nurse so this is how I know this, but in Pulp Fiction when they’re trying to revive Mia Wallace it’s like, that actually wouldn’t work, and they’re trying to build the drama on that. I’m like when you don’t know it doesn’t really matter, cos you’re just like, “Oh this is so intense,” but when you kind of do know it kind of suspends disbelief. So when films are being more serious about the thing they’re doing and they’re trying to lend real urgency using the science or the med or whatever they’re using and they get it wrong, it tends to be quite distracting and annoying. So I feel like if you’re trying to be really serious with your science and like how it’s affecting the plot, have good science and accurate science.

Riley begins by describing Interstellar (2014), a “serious” film where unrealistic science is central to the plot, but this unrealistic science is redeemed because it relates to an area
of scientific uncertainty. She also values the effect arising from the unrealistic science—it was “a real benefit to the film.” In this way, the narrative contract and the principle of plot centrality are overruled by a synergistic combination of uncertainty and enhancement. In the case of *Doctor Who* (1963–), unrealistic kernel science is redeemed (grudgingly) by the narrative contract. For Riley, *Doctor Who* is “at heart quite ridiculous”; it is not committed to realistic science.

By contrast, there is little to redeem the unrealistic science in *Pulp Fiction* (1994). In *Pulp Fiction*, the unrealistic medical science is central to the plot and the narrative is serious in tone, but unlike *Interstellar*, the science at issue is settled—Riley’s mother establishes its settled status through her authority as both nurse and parent. Furthermore, unlike *Interstellar* where the unrealistic science was of “real benefit,” the unrealistic science in *Pulp Fiction* diminishes the sense of drama—the principle of enhancement does not come into play. Riley later clarifies that she still “love[s]” the film overall. The aesthetic damage is done at the level of the scene rather than the film as a whole. However, the principle of aesthetic fulfilment does not seem to come into play here, since despite “loving” *Pulp Fiction* overall, Riley still regards the unrealistic science as unacceptable in the scene where it appears.

In this way, Riley’s response illustrates how readers may draw on multiple principles of aesthetic evaluation to determine the acceptability of unrealistic science in fiction. However, when principles come into conflict it is difficult to make confident conclusions about which principle will take precedence. The narrative contract was the most frequently reported principle of evaluation in my study. Yet, as Riley’s response illustrates, sometimes the narrative contract overrules other principles (as in *Doctor Who*) and sometimes the narrative contract is itself overruled by other principles (as in *Interstellar*). The relative precedence of principles of aesthetic evaluation warrants further research.

5.4.16 Macro-principles of aesthetic evaluation: Subservience, satisfaction, salience, and severity

The 13 principles that I have outlined above can be consolidated into four more fundamental “macro-principles” of aesthetic evaluation: subservience, satisfaction, salience, and severity.
The macro-principle of subservience assesses the aesthetic acceptability of unrealistic science in terms of the perceived aesthetic goals and intentions of the author. According to this principle, unrealistic science is deemed acceptable because it is subservient to the aesthetic goals of the narrative. Here there is sense of cooperation as the reader works with the author to help realise the narrative's aesthetic vision. In the case of narrative consistency, a reader recognises that the author is evoking a storyworld that is different to the real world; in the case of the narrative contract, the reader recognises that the author is not committed to realism; in the case of thematic functions, the reader recognises that the author is using unrealistic science in service of a theme or thesis; and in the case of formal constraints, the reader recognises that the author is working within formal constraints. The principle of cooperating with the aesthetic goals of a text can be traced to Aristotle (cf. Section 5.3.1), and as my results suggest, it remains an important principle of aesthetic evaluation today.

The macro-principle of satisfaction involves assessing the appropriateness of a text's aesthetic goals and the degree to which the text achieves those goals. Rather than cooperating with the text, the principle of satisfaction relates to whether the reader is satisfied with the text aesthetically or ideologically. The macro-principle of satisfaction is represented by the principles of aesthetic fulfilment, enhancement, and ideological congruence. In this way, unrealistic science is less acceptable if a narrative fails to provide a satisfying aesthetic experience or if it fails to accord with the reader's ideological position. The principle of enhancement straddles the border between subservience and satisfaction. Enhancement might be understood in terms of subservience since the reader recognises that the author is using unrealistic science to enhance the effect of the narrative. However, I prefer to characterise enhancement in terms of satisfaction, since the reader must perceive a net positive contribution from unrealistic science (i.e., they must be satisfied with its contribution) in order to invoke the principle of enhancement.

As for the principle of aesthetic fulfilment, the macro-principle of satisfaction is likely to be dominated by normative expectations, though normative expectations can be challenged and revised through encounters with new narratives. In circumstances where the perceived aesthetic goals of a text align with the normative expectations of the reader, the macro-principles of subservience and satisfaction are concordant. In other cases, subservience and satisfaction may come into conflict, in which case we might expect the principle of satisfaction to take precedence since a reader will likely value
their own aesthetic norms over the perceived aesthetic norms of the author. However, it is possible that some readers may be sympathetic to an author’s vision even if they do not share the same vision.

The acceptability of unrealistic science also relates to its salience. As I reviewed in Section 5.3.1, Hazlett and Uidhir (2011) introduce the concept of salience in their discussion of realism and aesthetics, but they do not clearly define what makes unrealistic elements salient. I operationalise the macro-principle of salience in terms of the principles of plot centrality and personal relevance. In other words, unrealistic science may be less acceptable if it is important to the narrative, important to the reader, or both.

Finally, the macro-principle of severity relates the acceptability of unrealistic science to the perceived seriousness of the unrealistic science in scientific and social terms. Is the unrealistic science likely to have harmful consequences? Is it an understandable mistake or an egregious error? Was it known to be unrealistic at the time of the text’s production? Can we even be sure that it is unrealistic? The macro-principle of severity brings together the principles of harmful effects, complexity, uncertainty, and historical context.

5.5 Discussion

5.5.1 Theoretical saturation

In this section I reflect on the extent to which I have reached theoretical saturation with respect to the research question of this chapter. As I described in Chapter 3, I define theoretical saturation as the point at which I have accounted for the major themes relevant to my research question and described those themes in suitable detail.

I have already noted several areas where there is scope to provide a richer description of some themes. In particular, my study did not investigate the warrants for storyworld revision or narrative contract revision. There is also scope for a richer description of how readers characterise the narrative contract, particularly in relation to how readers perceive the tone of a narrative and how conventions of narrative discourse (e.g., detailed description in prose narratives) might contribute to a narrative’s perceived commitment to realism. Indeed, it would be useful to clarify whether it is more common for readers to conceptualise the narrative contract as a commitment to external realism.
or as a commitment to narrative consistency. The principle of ideological congruence also deserves further exploration to more decisively conclude whether the principle applies to ideological conflicts in general or just science-related ideological conflicts.

Some of my existing themes would benefit from further research and more detailed description, but there are also themes that my study may have overlooked. One way of reflecting on overlooked themes is to compare the principles described in my results to the principles I identified in the literature. In the first instance, there was considerable overlap between my findings and the literature. In part, this might be attributed to the influence of the literature on my analysis. However, as the direct quotations provided in this chapter illustrate, the congruence between the literature and my participant responses seems to reflect a shared set of aesthetic principles and is not merely an artefact of my analytic method.

In some cases, the principles of evaluation articulated by my participants went beyond those found in the literature. The principle of formal constraints was not articulated in the literature that I reviewed, nor was the principle of harmful effects, though as I noted previously, it is possible that some participants were not speaking from an aesthetic standpoint when they observed that unrealistic science matters more when it has the capacity for harmful effects. The principle of aesthetic fulfilment was not articulated in the same way in the literature, though the principle of aesthetic fulfilment closely parallels Richter’s (2005) position that unrealistic elements are acceptable if a narrative still achieves its intended effect.

Rowe’s (1997) principle of intentionality is common to several of the principles of aesthetic evaluation in my results, namely those principles associated with the macro-principle of subservience. For example, a narrative that is uncommitted to realistic science may be perceived as intentionally unrealistic. A narrative that is evoking a storyworld that is different to the storyworld may also be perceived as intentionally unrealistic. However, intentionality alone is not sufficient to confer acceptability. As I discussed in relation to the principle of complexity, intentionally unrealistic science that is seen as furtive or lazy is less likely to be acceptable. In this context, a mistake arising from the complexity of the science was more acceptable than something that was unrealistic but intentionally concealed. Thus, the acceptability of intentionally unrealistic science is moderated by the nature of the author’s intention. Although
intentionality underpins several other principles, I do not regard it as principle of aesthetic evaluation in its own right.

Participants in my study did not explicitly articulate the idea that unrealistic science is less acceptable when it underpins the thesis of a narrative. If the aesthetic goal of a narrative is to communicate a thesis, then thesis-irrelevant unrealistic science should be more acceptable to an objective reader since it is less damaging to the narrative’s thesis, and in turn, less damaging to the realisation of the narrative's aesthetic goal. In practice, however, the principle of ideological congruence suggests that the acceptability of unrealistic science is determined in the first instance by the ideological congruence of the thesis rather than the relevance of the unrealistic science to the thesis. In other words, thesis-relevant unrealistic science may only be unacceptable when the thesis is also ideologically incongruent. I will expand on this point in more detail in Chapter 6.

Ryan’s (2009) assertion that conflict-creating unrealistic elements may be more acceptable than conflict-resolving elements was only glimpsed in my study. Participants certainly expressed dissatisfaction with conflict-resolving unrealistic science, but these comments were encompassed by the principle of plot centrality since unrealistic science that helps resolve a major conflict is also an example of kernel science. None of my participants explicitly contrasted conflict-creating unrealistic science with conflict-resolving unrealistic science. However, there was a brief discussion of conflicting-creating character actions. Emma observed that for some movies, “if [a character] didn’t do the stupid thing at the start of the movie the movie ends in thirty seconds.” At least for Emma, there was an acknowledgement that an unrealistic event might be necessary for initiating a narrative, but her response is still some way off from explicitly contrasting conflict-creating and conflict-resolving elements.

The principle of self-reflexivity was also absent from my data. Lily characterised Terry Pratchet as an author who “breaks his [own] rules.” Heidi agreed with this assessment, observing, “You get the feeling he does it on purpose.” However, Lily and Heidi’s discussion of intentional narrative inconsistencies in Terry Pratchet’s work did not amount to a clear expression of the principle that unrealistic science is more acceptable when it is self-reflexively acknowledged by the author.

Mole’s (2009) position that unrealistic elements are aesthetically flawed whenever they detract from the imaginative realisation of a work was also unexpressed in my study. As I described in Chapter 4, unrealistic science was indeed disruptive to participants’
imaginative realisation of a text. However, none of my participants went so far as to argue that any form of disruption was unacceptable. Many of the examples described by my participants may have initially entailed some form of disruption, but they ultimately seemed to be recouped by one or more principles of aesthetic evaluation.

There are several reasons why some of the principles appearing in the literature may not have been reported by participants in my study. The disparity might be attributed in part to sampling. My sample consisted primarily of participants with a science background. Concepts such as self-reflexivity may be more likely to be articulated by participants who are trained in film, literature, or aesthetics. Although my sample did include participants with backgrounds in these areas, participants with a science background made up the majority of my sample.

The disparity may also be attributed to my research methodology. My focus group discussions and interviews were open-ended and I did not provide specific fictional texts as stimuli. Principles that are less accessible may be less likely to be recalled in this context. For example, if I ran a focus group discussion using a self-reflexive text as a stimulus (e.g., Jurassic World, 2015, and its meta-dialogue about unrealistic dinosaurs), it is possible that my existing participants would have articulated the principle of self-reflexivity. Some principles may be less accessible in an open-ended discussion, but this does not mean that participants would not articulate them in a relevant context.

In the interest of transparency, there were three additional candidate themes that I did not report as part of my results, either because I did not have sufficient data or because I was not certain of conceptual distinctiveness. Conventionality was one of these candidate themes, but it was unclear whether a conventional form of unrealistic science was more or less acceptable. For example, Leah described how a conventional form of unrealistic science was more acceptable to her:

And if they, now I just realised something, if they explicitly use a well established conventionalised trope in fiction, like warp drive or pulling [tractor beam] and they just use that as a short hand for something, then I’m also more accepting. If they make up their own then I’m less accepting actually. I just realised. That’s not very nice, but it’s true.

By contrast, Alana described how a conventional form of unrealistic science was less acceptable to her:

For me it personally gets annoying if things that are constantly repetitive— for example, sound in space that just drives me nuts because everybody does it. And
it’s just, why? You know that it’s not supposed to happen and I get if it’s from inside the ship or from inside the space station, fair enough, but outside I don’t understand why. But people do what they do. That’s just something that’s constantly repeated, the same things that are constantly repeated and constantly done wrong. Those things just tend to annoy me the most.

Warp drives and sound in space are both forms of unrealistic science that might be regarded as conventional. However, these examples of unrealistic science serve different functions. A warp drive is a technology that provides a way around the constraints imposed by the speed of light and therefore affords novel storytelling possibilities. By contrast, sound in space primarily makes a stylistic contribution to a narrative. A warp drive is a conventional form of global enhancement (i.e., it makes possible stories that might not otherwise be possible), whereas sound in space is subject to the principle of local enhancement (i.e., it is possible to tell the same story with or without sound in space and as a result, the acceptability of sound in space depends on whether it is perceived to enhance the narrative). In this way, the acceptability of “conventional” unrealistic science seems to depend on other principles of aesthetic evaluation rather than being a principle in its own right. Nevertheless, the role of conventionality might be explored in further research either by directly questioning participants about conventionally unrealistic science or using a stimulus text that includes conventionally unrealistic science.

The second candidate theme that I did not report involved conferring acceptability to unrealistic science simply because it takes place in a fictional narrative. This candidate principle of “fictionality” was represented by a single comment from Bethany:

For me, science, I don’t know, I’m not that into sci-fi, that genre, but I would say that I have encountered science in fiction heaps, and what I thought of when I was doing this was *Frankenstein* and my response to *Frankenstein*—because obviously that’s the most unrealistic science ever when he makes a monster out of body parts or whatever—and my response to that is that it’s just a story and like it’s not real at all. Obviously in the book it’s not clear that it’s not real, it’s kind of portrayed as if it’s very real, but yeah, it didn’t make me angry, that’s for sure.

It is conceivable that some readers confer acceptability to all unrealistic science simply because “it’s just a [fictional] story.” Without asking an explicit follow-up question to clarify, this position cannot be attributed to Bethany, especially because her comments elsewhere in the focus group reflect a more nuanced position (e.g., I quoted Bethany in relation to aesthetic fulfilment). Nevertheless, it is conceivable that some readers who may hold this view, perhaps especially if they have limited interest, experience, or
training in the aesthetics of narrative fiction. All of the participants in my study demonstrated a non-trivial level of interest in narrative fiction as evidenced by their decision to voluntarily participate. Thus, even if these participants did not formally study fiction-related subjects at university (e.g., film, literature, creative writing, etc.), they may still have substantial informal learning or pre-tertiary study in aesthetics. Thus, it is possible that sampling participants with more limited experience, interest, or training in aesthetics, such as children or adolescents, may identify additional principles of aesthetic evaluation.

The final candidate theme that I did not report in my results involved conferring acceptability to unrealistic science because it can be interpreted metaphorically or symbolically (Ryan, 2009). I discussed examples of unrealistic science that were interpreted metaphorically in relation to the principle of thematic functions; however, there were no instances of metaphorical unrealistic science in my data that were not also in the service of a theme or thesis. Nevertheless, it is plausible that unrealistic science might also be conferred acceptability simply because it can be interpreted figuratively.

Sampling participants with different characteristics and using specific fictional texts as stimuli may serve to identify additional principles of aesthetic evaluation. However, perhaps the more important issue to examine here is whether an exhaustive sense of theoretical saturation is actually possible with respect to my research question. There is always the potential for individual readers to articulate idiosyncratic principles of aesthetic evaluation. For example, physicist Sidney Perkowitz once suggested that science fiction films should be restricted to no more than one violation of the laws of physics (Sample, 2010). To the extent that the most accessible principles of aesthetic evaluation are also the most important, my study provides a foundation for understanding the main ways in which readers evaluate unrealistic science aesthetically.

Moreover, it seems unlikely that additional principles of evaluation cannot be accommodated by the macro-principles that I have proposed. For example, the principles of self-reflexivity, conflict creation, and fictionality can all be understood as forms of subservience, and Perkowitz’s principle might be understood as a form of salience (i.e., one error is less salient than multiple errors). Whatever specific principles are at work, my research suggests that the acceptability of unrealistic science is fundamentally determined by a negotiation between the macro-principles of subservience, satisfaction, severity, and salience.
5.5.2 Generalisability

As for Chapter 4, there are two aspects of generalisability to consider in this chapter. First, are the principles of aesthetic evaluation identified in my sample likely to be shared by readers outside of my sample? Second, can the principles of aesthetic evaluation that I have described in relation to unrealistic science be applied to other forms of realism or to realism in general?

At the outset, it is worth repeating some basic observations about my sample. Most participants were from a science background; around half of the participants had studied science communication at university; all of the participants had relatively high levels of educational attainment (all participants were studying towards or had obtained a university qualification); and all of the participants demonstrated a non-trivial level of interest in narrative fiction. As I already suggested in Section 5.5.1 above, readers with more or less training and experience in aesthetics might articulate different principles of aesthetic evaluation.

The idea that children may articulate different principles of aesthetic evaluation is uncontroversial. For example, young children sometimes articulate a “magic window” conceptualisation of perceived realism where a media text is seen as a window onto actual events (cf. Busselle & Greenberg, 2000). However, among adult readers, it is unclear to what extent training or experience in the aesthetics of narrative fiction—what I will call aesthetic literacy—shapes the evaluation of unrealistic elements in fiction. It is also unclear how formal, tertiary-level training in aesthetics compares to informal learning in this respect. Both formal training and informal experience (e.g., reading and discussing fiction for leisure) represent ways of acquiring aesthetic literacy that may be applied to the evaluation of unrealistic elements in fiction. Indeed, it is unclear how much aesthetic literacy is needed to deploy the principles of aesthetic evaluation that I have described. It is possible that the threshold level of aesthetic literacy needed for most of these principles is attained by many readers even if they have not completed tertiary-level training.

There is some research to suggest that formal literary training affects how readers respond to unrealistic elements. In a quasi-experimental study with a sample of 28 tertiary students, Bortolussi and Dixon (1996) found that students who completed a course on magic realism were, consistent with their instruction, more likely to perceive unrealistic elements in a magic realist text as ordinary (not supernatural) in the
storyworld when compared to students who completed a course on science fiction. However, given the pedagogical context of the study, it is possible that students in the magic realism condition were performing the “right” answer. Taken together with the limitations of non-equivalent groups and a small sample size, Bortolussi and Dixon’s study provides only tentative support for the contention that tertiary-level literary training causes distinctive responses to unrealistic elements in fiction.

The overall similarity between the principles described in my study and the principles described in the literature (which is written by scholars of film, literature, and aesthetics) suggests that, although sampling participants with more formal training in aesthetics may identify some additional principles, the results may not be dramatically different to my existing sample. One of the limitations of my study is that I did not collect demographic information about the reading habits of my participants or their pre-tertiary studies in aesthetics-related disciplines. Given that each participant volunteered to participate in a study about fiction, it is likely that many of the participants in my study have a non-trivial level of interest in fiction and may have considerable informal learning in aesthetics even if they do not have formal tertiary training. Furthermore, as I noted above, it is difficult to conclude whether the differences between my findings and the scholarly literature are a consequence of sampling or methodology since open-ended interviews and focus groups favour the most accessible principles of aesthetic evaluation. The observation that some principles from the literature are “missing” from my results does not necessarily mean that participants would not articulate those principles in response to a relevant stimulus.

A further possibility is that readers with different levels of aesthetic literacy (acquired formally or informally) may emphasise principles of aesthetic evaluation differently even if they largely share the same set of principles. For example, readers with high aesthetic literacy may be more likely to emphasise the “thematic functions” principle of evaluation. As Ryan (2009) suggests, “From a literary point of view, the most significant criterion of acceptability for a plotting device is its thematic adequacy and symbolic value” (p. 72). The effect of aesthetic literacy on how readers articulate and emphasise principles of aesthetic evaluation is a direction for further research.

Around half of the participants in my study had studied science communication at university. As for the theme of “effects on other readers” that I discussed in Chapter 4, it is not surprising to find the principle of “harmful effects” articulated by participants who
have studied science communication. However, Leah articulated the principle of harmful effects despite being a non-scientist who has never studied science communication formally. Although the principle of harmful effects might be emphasised more among participants with a science or science communication background, there is little reason to believe that this principle is unique to readers who are trained in science communication.

The similarity between the principles of aesthetic evaluation described in my study and the principles described in the scholarly literature suggests that principles of aesthetic evaluation may be generalised to different forms of realism. The principles for evaluating unrealistic science described in my study accord with the principles for evaluating unrealistic events and factual errors described in the literature. As a result, the principles described in this study might be transferred to other contexts. Indeed, these principles may also be relevant to understanding the acceptability of omissions, exaggerations, and distortions in non-fictional narratives. Gabriel’s (2004b) notion of the narrative contract, which informs my work, was articulated in the context of non-fictional narratives, such as memoirs. Although non-fictional narratives are surely held to a higher standard of realism than fictional narratives, it is plausible that similar principles of evaluation are at work in the non-fiction context, differing as matter of degree rather than a matter of kind.

There is some evidence for the generalisability of the principle of personal relevance even within my study. For example, Liam described how he is less passionate about science than music, and as such, he may be less likely to regard unrealistic representations of music as acceptable:

I guess that, I don’t know, I feel a little bit like people who are watching a film and, you know, a science fiction film, and they don’t like it because the science wasn’t realistic or something, I feel like they’re missing the point a little bit, and maybe, you know, it’s not meant to be realistic, but you’re meant to suspend your disbelief for a bit. But I guess if people, you know, feel really passionately about science then maybe that can be hard to do, yeah. I know that if I was watching, not that I don’t feel passionately about science, but I know if I was watching a film about, I don’t know, something else that I was [passionate about], I don’t know, maybe music or something, if there was something portrayed in there that was not quite accurate or not quite realistic, it could probably really annoy me when I was watching it, but I guess with science related stuff I’m happy just to accept it, just to enjoy it more.

In this way, unrealistic elements may be less acceptable whenever the unrealistic element at issue is personally relevant to the reader.
However, the scope of my study was limited. Although the principles identified in this study might be transferred to other contexts, it is possible that with my focus on unrealistic science, I may have overlooked principles that might be more readily apparent in other contexts. Indeed, some unrealistic elements fall outside of the scope of unrealistic science. For example, most readers are unlikely to characterise unrealistic character actions as science (cf. Chapter 2). Furthermore, some participants did not characterise storyworld specific inconsistencies as science (cf. Section 5.4.1). Conducting interviews and focus groups with a broader scope (e.g., discussing realism in general) may identify principles of aesthetic evaluation that were overlooked by my focus on unrealistic science.

5.5.3 Further validating the findings

Participant responses related to this chapter’s research question were sometimes complex or difficult to interpret. When reporting my results I have attempted to signal where there are competing interpretations of a participant’s response. Given the complexities related to aesthetic evaluation and how participants conceptualise storyworlds, it may be appropriate to include member checks when conducting further research in this area. Member checks involve asking participants to read and comment on a draft of the research report (Mays & Pope, 2000, p. 51). In this case, it would be valuable to ask participants to comment on the overall appropriateness of my analysis as well as my interpretations of their specific views and experiences. The outcomes of a member check should be interpreted carefully since researchers and individual participants may be looking at a problem from different perspectives (Mays & Pope, 2000). Member checks can also pose logistical and ethical problems in terms of re-contacting participants and asking participants to volunteer more of their time (Barbour, 2001). I did not conduct member checks in this study due to time constraints. Nevertheless, member checks are worth considering as part of any further research in this area.

Conducting hypothesis coding on a new source of data might also validate the principles of aesthetic evaluation described in this chapter. Hypothesis coding refers to “the application of a researcher-generated, predetermined list of codes to qualitative data specifically to assess a researcher-generated hypothesis” (Saldana, 2013, p. 147). In this case, I could use the principles of aesthetic evaluation identified in this study to code another source of reader responses, such as an online forum or comment thread. For
example, a Youtube video titled “How accurate should movies be?” by the PBS Idea Channel (Rugnetta, 2015) has more than 100 comment responses. My results might be validated if the majority of relevant comments could be coded to the principles I have identified in this study.

5.5.4 Predicting aesthetic acceptability and understanding evaluative “moves”

The principles of aesthetic evaluation outlined in this chapter provide an indication of when unrealistic science is likely to be acceptable or unacceptable. In practice, however, different principles of aesthetic evaluation may come into conflict, and my study does not provide a clear basis for predicting which principle will take precedence. The relative importance of different principles might be investigated through further research. For example, participants could be asked to rank a set of principles in order of importance, both in abstract and in the context of specific fictional texts.

However, there are important limitations on any attempt to predict when unrealistic science will be aesthetically acceptable. The principles of aesthetic evaluation described in this chapter do not (for the most part) take into account the social context of reception. Even if we might expect unrealistic science to be deemed acceptable on the basis of one or more principles of aesthetic evaluation, readers may have social motivations for criticising unrealistic science. To fully predict the acceptability of unrealistic science in a social context it is necessary to understand the personal and social functions of discourse about unrealistic science (which is the subject of Chapter 6).

Moreover, predicting when unrealistic science is aesthetically acceptable may be less important than recognising how readers construct the aesthetic acceptability of unrealistic science. The framework introduced in this chapter provides a catalogue of evaluative “moves” that readers can deploy in response to unrealistic elements in fiction. Rather than viewing conflicts between principles of aesthetic evaluation as a problem to be solved, these conflicts can be understood as a rhetorical resource—readers may choose whichever principle of aesthetic evaluation is most conducive to their rhetorical purposes.

I will explore the concept of unrealistic science as a rhetorical resource more fully in Chapter 6. Briefly, if unrealistic science is taken to be a prima facie aesthetic flaw, bringing attention to unrealistic science is a strategy of critique. If a reader is unsatisfied overall with a narrative and they wish to further critique it, they may deploy a principle
of aesthetic evaluation that reduces the acceptability of unrealistic science. By contrast, if a reader is satisfied overall with a narrative and they wish to defend the narrative against critique, they may choose a principle of aesthetic evaluation that increases the acceptability of unrealistic science. For example, in Interstellar (2014), Logan recouped a scene involving what he perceived as unrealistic time dilation through an appeal to the principle of enhancement (cf. Section 5.4.7). However, given that participants commonly characterised Interstellar as a film that was committed to realism, it is easy to imagine how other readers would appeal to the narrative contract (cf. Section 5.4.3) to characterise the same scene as aesthetically unacceptable, especially if they disliked the scene or the film as a whole.

The use of unrealistic science as a rhetorical resource is related to but distinct from the principle of aesthetic fulfilment. Whereas the principle of aesthetic fulfilment involves overlooking unrealistic science because the narrative is a fulfilling aesthetic experience overall, using unrealistic science as a rhetorical tool involves a strategic selection of evaluative principles to render unrealistic science acceptable or unacceptable because the narrative is (respectively) a fulfilling or unfulfilling aesthetic experience overall.

In conclusion, my main contribution in this chapter is to introduce a new framework of evaluative principles that readers can use to assess the aesthetic acceptability of unrealistic elements in a narrative. This framework provides a tentative guide to when unrealistic elements are likely to be aesthetically acceptable, but perhaps more importantly, it catalogues a set of evaluative “moves” that readers can deploy when they critique or defend unrealistic elements in fiction.

5.6 Summary

In this chapter, I addressed my second research question: When is unrealistic science most likely to affect the aesthetic evaluation of narrative fiction? I identified 13 distinct principles underpinning participants’ aesthetic evaluations of unrealistic science in fiction. These principles can be grouped according to the macro-principles of subservience (i.e., unrealistic science is acceptable because it is subservient to the narrative’s aesthetic goals), satisfaction (i.e., unrealistic science is acceptable because the narrative is aesthetically or ideologically satisfying), salience (i.e., unrealistic is acceptable because it is unimportant to the narrative or the reader), and severity (i.e., unrealistic science is acceptable because it is an understandable or innocuous error). The framework of evaluative principles introduced in this chapter catalogues a set of
evaluative “moves” that readers can deploy when responding to unrealistic science and serves as a tentative guide to when unrealistic science is likely to be aesthetically acceptable.
6. The functions of discourse about scientific realism in narrative fiction

My aim in this chapter is to answer my third research question: What are the functions of discourse about the realism of science in fiction? I begin by reviewing relevant literature before describing the results of my participant research. I then discuss the implications of my results, including questions of theoretical saturation and generalisability.

6.1 Literature review

Insights into the possible functions of discourse about scientific realism in fiction come from various research areas. In this section I review relevant research from science communication, fan studies, audience studies, cultural sociology, and social psychology.

6.1.1 Rhetoric, boundary work, and social control

Previous research in the area of science communication (broadly construed) has identified three interrelated functions of discourse about science in fiction: (1) discourse about scientific realism is a form of boundary work that asserts and maintains the epistemic authority of scientists, (2) discourse about scientific realism can be used to undermine or endorse the thesis of a narrative, and by extension, (3) discourse about scientific realism can be used to assert control over who can legitimately speak about science and what counts as a legitimate concern about science.

The concept of boundary work (Gieryn, 1999) refers to a rhetorical process where scientists (or other groups) establish discursive boundaries between science and non-science. For Gieryn (1999), the credibility of science and scientists is not guaranteed simply by scientific methodology, however that may be defined. Instead, the credibility of science is maintained, extended, and challenged through rhetoric, and the boundaries of science are drawn and re-drawn in moments of contest. It is through rhetoric, Gieryn argues, that science attains epistemic authority, “the legitimate power to define, describe, and explain bounded domains of reality” (p. 1). Gieryn has described boundary work processes in various contexts, such as John Tyndall’s demarcation of science from both religion and mechanics in the Victorian period (pp. 37–64). Gieryn describes how
Tyndall characterised science as empirical to distinguish it from religion while he characterised science as theoretical to distinguish it from mechanics, highlighting how the characteristics of “science” can shift in the service of different rhetorical goals.

The concept of boundary work also underpins what Hilgartner (1990) calls the dominant view of popularisation. According to this view, popularisation involves the simplification of genuine scientific knowledge for a public audience, which usually results in the distortion of that knowledge. For Hilgartner, there are major limitations to this view. In the first instance, the dominant view overlooks how even communication between scientists involves simplification, such as when scientists communicate with other scientists from different disciplines. Furthermore, it overlooks the problem of distinguishing “appropriate simplification” from “distortion.” For Hilgartner, simplification and distortion cannot be distinguished objectively and ultimately the distinction rests on a judgement of “what is ‘good enough’ under the circumstances” (p. 529). Precisely because of these ambiguities, Hilgartner argues that the dominant view of popularisation is a rhetorical resource for scientists. Representations that are conducive to the strategic goals of a scientist can be labelled as “appropriate simplification,” whereas representations that are opposed to their goals can be labelled as “distortions.” Moreover, “the dominant view establishes genuine scientific knowledge, the epistemic ‘gold standard’, as the exclusive preserve of scientists; policy makers and the public can only grasp simplified representations” (p. 520). In this way, the dominant view of popularisation is inextricably connected to boundary work.

As various scholars have observed (S. A. Cole, 2015; Kitzinger, 2010; Mellor, 2003; Michael & Carter, 2001; Von Burg, 2005), boundary work processes are also at work in discourse about fictional science. When scientists endorse or critique the scientific realism of fictional narratives, they are participating in boundary work that re-asserts the epistemic authority of scientists over authors and readers of narrative fiction. Commentary on the scientific realism of fiction in panel discussions, reviews, tweets, and so forth, implicitly reinforces the status of scientists as the authoritative source of genuine scientific knowledge, and although narrative fiction might sometimes represent genuine scientific knowledge, it is only through reference to the commentary of scientists that its status as such is verified.

On first inspection, the epistemic authority of scientists over fictional narratives seems self-evident and inviolable. It would surely be perverse to suggest that narrative fiction is
a more reliable source of scientific information than scientists and peer-reviewed scientific publications. However, it is also important to recognise that when it comes to epistemic claims, scientists are not inevitably “right” and narrative fiction is not inevitably “wrong.” The observation that fiction can anticipate or inspire new technologies serves as a warning against the wholesale dismissal of narrative fiction’s epistemic claims. For example, in a 1946 public lecture, Leo Szilard, a key figure in the development of the atomic bomb, observed that the discovery of artificial radioactivity was “predicted not by any physicist” but by a fiction writer, H. G. Wells (Szilard, 1972, p. 187). Szilard recalls how he first read Wells’ The World Set Free, a 1914 novel about nuclear war, in 1932, and at that time he “did not have the notion that it had much to do with reality” (p. 187). Yet, by the time of Szilard’s public lecture in 1946, artificial radioactivity and nuclear weapons were indeed a reality, illustrating that epistemic claims are not inevitably false by virtue of first appearing in a fictional text.

To suggest that scientists who comment on scientific realism are participating in boundary work does not necessarily mean that they do so with full self-awareness. As Gieryn (1999) notes, “it makes little sense to argue that [scientists] are indifferent about how epistemic authority is allocated or that they would deliberately prefer tactics designed to lose it. Neither are they omniscient or deceitful” (p. 24). Boundary work is “strategic practical action” (p. 23) because it can serve the strategic interests of scientists, such as protecting their autonomy or securing research funding, but it is not necessarily a fully deliberate or self-aware activity.

Boundary work can also take place within the scientific community. For example, Kirby (2003a) argues that paleontologist Jack Horner’s consulting work on Jurassic Park (1993) was a way of communicating and popularising the evolutionary connection between dinosaurs and birds. As Kirby notes, scientists who publicly criticised the scientific realism of Jurassic Park were “presenting their own concepts as ‘real science’ and labelling Horner’s interpretation as ‘fiction’” (p. 254). In this way, discourse about scientific realism can also be a way for scientists to compete against other scientists for epistemic authority.

In addition to serving as a form of boundary work, previous research suggests that discourse about scientific realism can also be used to endorse or undermine the thesis of a narrative. In particular, Von Burg (2005, 2012) has demonstrated how the relationship between scientific realism and the fidelity of a narrative’s thesis (cf. Section 4.1.2) can be
emphasised or downplayed depending on whether readers wish to validate or invalidate the thesis. This process is illustrated in Von Burg’s (2012) analysis of the reception of the 2004 climate disaster film, *The Day After Tomorrow*. Climate activists endorsed the film’s call to action on climate change while conceding that many of the scientific aspects of the film were exaggerated or inaccurate. By framing the film as “not untrue,” Von Burg argues that climate activists were able to acknowledge the film’s unrealistic elements “without indicting the underlying [thesis]” that climate change is a real and serious problem (p. 20). Meanwhile, climate sceptics referenced the film as an illustration of climate alarmism, arguing that, like the film itself, climate change is a “fiction.” Whereas climate activists argued that *The Day After Tomorrow* had a valid thesis despite its unrealistic elements, climate sceptics argued that the film’s unrealistic elements undermined the validity of its thesis. In this way, climate activists sought to downplay the connection between scientific realism and fidelity in an attempt to rescue the film’s thesis from critique, whereas climate sceptics sought to undermine the film’s thesis by insisting on the relationship between scientific realism and fidelity. In this way, Von Burg’s analysis suggests that the relationship between scientific realism and fidelity is not fixed or essential. Like the relationship between “appropriate simplification” and “distortion,” the relationship between scientific realism and fidelity is a rhetorical resource that can be emphasised or downplayed depending on the strategic goals of the reader.

The observation that critiques of scientific realism can be used to undermine the thesis of a narrative has further implications. In particular, scientific realism-based critiques can be used to undermine a narrative thesis even when the validity of the thesis is not reducible to the scientific realism of the narrative. As Von Burg (2005) notes, when a reader “finds the values in a film objectionable, his or her rhetorical efforts cent[re] on undercutting the film’s coherence, thereby disqualify[ing] the film from public discussions of science and, by extension, the values the film advances” (p. 50). Hansen (2016) makes a related observation in a review of accuracy-themed research in science communication, suggesting that concerns with accuracy may serve as a “proxy (or euphemism, perhaps) for disagreement about the values and ideological messages being conveyed by particular ‘uses’/representations of science in popular film and entertainment media” (p. 767). In this respect, discourse about scientific realism can assert authority over not only what represents “real” science (i.e., knowledge-based
claims) but also over what represents a “real” concern about science and technology (i.e., values-based claims).

To illustrate this point, it is useful to return to Von Burg’s (2005) account of the reception of *The China Syndrome*, a 1979 film about safety concerns at a nuclear energy plant. The narrative can be interpreted as communicating a thesis that the risk of a nuclear meltdown at a nuclear power plant is unacceptable. As Von Burg details, proponents of nuclear energy sought to undermine this thesis by emphasising the atypical nature of a nuclear meltdown, whereas opponents of nuclear energy defended the thesis by emphasising the plausibility of the events in the film. As I noted in Section 4.1.2, the acceptability of a risk is not necessarily reducible to a technical definition of risk (i.e., a calculation of probability multiplied by consequence as determined by technical experts). Nuclear energy scores highly on “dread risk,” a variable associated with limited or no personal control and potentially catastrophic consequences (cf. Slovic, Fischhoff, & Lichtenstein, 1980). Dread risk tends to reduce risk acceptability irrespective of technical risk (Slovic, 1987). To the extent that *The China Syndrome’s* anti-nuclear thesis is predicated on dread risk, correctives of technical risk alone do not necessarily invalidate the film’s thesis. Yet, as Von Burg (2005, pp. 177-178) argues, critiques of *The China Syndrome’s* scientific realism were intended precisely to discredit the film’s anti-nuclear stance, a rhetorical move that conflates the typicality of the story with the normative claims that the narrative makes about nuclear energy.

The more general conclusion of Von Burg’s (2005) analysis is that discourse of scientific realism can be a way of limiting the contribution of narrative fiction to public discourse about scientific issues. This has important implications because narrative fiction may convey viewpoints that are uncommon or absent in other media. Crichton (1999) argues that fiction is valuable space where “the fears, the concerns, [and] the downside[s] of technology [can] be expressed” (p. 1462), and this position seems to be borne out by content analyses. In an analysis of the representation of human genetics research in the UK media during the year 2000, Kitzinger, Henderson, Smart, and Eldridge (2002) found that cinematic and televised fiction diverged from the news media in its treatment of the ethical and social implications of research. Fiction, they argue, placed a greater emphasis on risk and demonstrated a less deferential attitude toward scientists. Questions of accountability and democracy were more prominent in fiction, so too were representations of non-scientists as citizens and activists rather than as patients.
Crucially for Kitzinger et al., fiction may provide a more flexible and creative space for imagining the future than non-fictional media.

J. A. Fisher and Cottingham (2016) arrive at a similar conclusion based on a content analysis of 65 films and television episodes depicting medical human-participant research between 2004 and 2014. Fisher and Cottingham found that the narratives in their sample primarily depicted negative outcomes of research participation, but unlike some commentators, they did not characterise these depictions as an “assault” on medical research. Instead, they suggest that these narratives highlight important issues for readers relating to conflicts of interest, the risks of participation, and the possibility of failed therapies. They conclude provocatively by suggesting that entertainment media “might provide a more truthful representation of the associated risks as well as the lack of clear benefits of research” than some medical researchers (p. 13).

The point here is not to generalise and assert that fiction is more critical of science than the news media—such a conclusion could only be based on sufficiently comprehensive and methodologically sound content analyses. Moreover, fiction can be profoundly optimistic about science and technology. For example, screenwriter Drew Goddard describes The Martian (2015), a narrative about an astronaut stranded on Mars, as “a love letter to science” (Hassan, 2015). The point is that fiction may provide an alternative space for exploring the implications of science and technology that differs from the representations found in news media. As Kitzinger (2010) argues, “fictions about science do not inevitably enrich the debate,” but they may provide a space in which “some of the limitations of the news genre can be addressed” (p. 83). As a result, attempts to exclude fiction from public discourse about science and technology are also attempts to constrain the availability of alternative ways of framing scientific and technological issues.

The practice of critiquing fictional science is closely related to expressions of concern about the influence of fictional science on the public. Kitzinger (2010) describes a “sci-fi alibi” in public discourse where fiction is blamed for public concerns about science and technology. This act of attributing blame to fiction is, for Kitzinger, a way of delegitimising public concerns about science and technology; it is a rhetorical move that characterises public concern as the product of “trivial” fiction rather than “real” science fact. The tendency to blame fiction for public concerns about science and technology echoes the media violence debate where, as Barker and Petley (2001) argue, blaming the
media for violence overlooks “a whole variety of complex social and political reasons” that might explain acts of violence (p. 14). The “sci-fi alibi” similarly characterises public concerns about science and technology as a simple effect of fiction rather than a product of various influences, such as non-fictional media, prior experiences, values, and so forth. Kitzinger (2010) does not deny that fictional representations of science may have some influence, but she is critical of discourse that constructs fiction as an almost omnipotent influence. Characterising public concerns about science and technology as a product of fiction ultimately means that those concerns can be more easily dismissed.

As a result, science communication research suggests that discourse about scientific realism can not only represent a form of boundary work that maintains the epistemic authority of scientists, but it can also form part of a rhetorical strategy that attempts to exclude some fictional narratives—and the theses and values they communicate—from public discussions about science and technology.

Although valuable, existing science communication literature is only one of several lenses for thinking about the functions of discourse about scientific realism in fiction. As I describe in the next section, further insights are suggested by fan research and audience research.

6.1.2 Discussions of perceived realism among fans and families

Research examining the functions of audience discourse about realism (and scientific realism specifically) is uncommon. Although there is considerable research in the uses and gratifications tradition that highlights the social utility of consuming narrative fiction (e.g., McQuail, Blumler, & Brown, 1972), this research generally does not examine the specific functions of talking about realism. However, some insights can be drawn from fan research and Lull’s (1980) ethnographic work on television audiences.

Fan research suggests that discussions of narrative consistency are an ordinary part of fan engagement with fictional narratives. Commentary and criticism related to narrative consistency and scientific realism can occur both during and after reading a text (Amesley, 1989; Jenkins, 1992). As Jenkins (1992) notes, fandom is, “perhaps first and foremost an institution of theory and criticism” (p. 82). Furthermore, one of the key pleasures of fandom, writes Duffett (2013), is “simply enjoyment through engagement” and the active process of “making meaning and participating” (p. 178). In this way,
discourse about scientific realism may be motivated in part by the sense of satisfaction and engagement that comes from participating in textual criticism with other fans.

In other cases, Jenkins (1992) notes, fan discourse may go beyond simply identifying narrative inconsistencies and represent an effort to explain those inconsistencies in such a way that they are no longer inconsistent. Jenkins describes how one Star Trek: The Next Generation (1987-1994) fan provided a detailed account of the otherwise unexplained disappearance of a character named Dr Pulaski between seasons two and three of the series. As Jenkins notes, “The fan’s desire for continuity, consistency, and completeness mandated attempts to explain Pulaski’s departure, even if such explanations could not be adequately anchored to the primary text” (p. 102). Rather than seeing Star Trek episodes as self-contained, Jenkins describes how fans developed a Star Trek “meta-text,” a coherent, trans-episode conceptualisation of events and existents in the series. Many fan discussions, Jenkins writes, “develop and elaborate these meta-textual constructs, consolidating information the series explicitly provided and offering speculations and extrapolations to better explain the motivation and context of narrative events” (p. 101). These meta-textual explanations related to various aspects of the series, including its scientific and technological content, such as the “warp drive, transporter system, and the chemical composition of Vulcan blood” (p. 101). In this way, discourse about scientific realism may represent a way of repairing or elaborating on a narrative as much as criticising it.

Beyond forms of fan engagement, Lull’s (1980) research on television audiences also provides insights into discourse about scientific realism. Based on an ethnographic study of 200 families in the US, Lull describes two fundamental social uses of television: structural uses and relational uses. Structural uses relate to using television to modify the reader’s environment (e.g., as background noise) or structure the reader’s time (e.g., scheduling activities around viewing times). Relational uses are based on television’s function in relationships between readers. Lull describes four types of relational use, including communication facilitation (e.g., television provides common reference points for discussion), affiliation/avoidance (e.g., television provides a time for families to be together or not be together), social learning (e.g., readers can learn information from television), and competence/dominance (e.g., parents demonstrating their parental competence by regulating children’s viewing of the television).
Of the four relational uses of television that Lull (1980) describes, the final dimension of competence/dominance is of particular relevance. Lull describes several ways in which readers can use television or television content to demonstrate their competence. Of particular interest to my research is Lull’s observation that critical commentary on television can serve as a display of intellectual competence. Lull documents how one reader verbally corrected news reports while he watched television, critiquing the presenters for their ignorance of the “real facts” (p. 205). Another reader, a French language major, “repeatedly corrected the poor pronunciation of French words uttered by an American actor who attempted to masquerade as a Frenchman” (pp. 205–206). In Lull’s scheme, these objections function as a display of competence. As Lull notes, “Vocal criticisms of programs or commercial announcements [...] serve as ways for viewers to reassure one another that, despite the fact that they are now watching, they know how bad television is, a self-promoting evaluation” (p. 205, emphasis in original). In a further example, Lull describes how adolescent girls competed to be the first to identify the historical period of costumes featured in a television show about fashion. As Lull notes, “Correct identification gave status to the girl who guessed right, validating her as a relative expert on women’s fashions and placing her in an esteemed position in the eyes of her peers” (p. 206). Discourse about scientific realism may serve a similar function by displaying a reader’s scientific competence, which may in turn confer status, especially among science-valuing peers.

In summary, the audience research reviewed in this section suggests that discourse about scientific realism can form part of fan engagement with a narrative or serve as a display of reader competence. In the final two sections of the literature review for this chapter, I describe how Lull’s (1980) notion of competence can also be understood from sociological and social psychological perspectives.

6.1.3 Cultural capital and distinction

In this section I introduce Bourdieu’s work (and related work from cultural sociology) as a lens for thinking about Lull’s (1980) notion of competence (see Section 6.1.2 above). In particular, I will describe how Bourdieu goes beyond Lull by asserting that responses to cultural objects reflect a reader’s position in social space.

In Distinction (1984/2010), Bourdieu proposes that aesthetic taste is a product and reflection of a reader’s social background. Responses to art, Bourdieu writes, are “very closely linked to the different possible positions in social space and, consequently, bound
up with the systems of dispositions (habitus) characteristic of the different classes and class fractions” (p. xxix). In other words, readers from different class backgrounds acquire different ways of thinking and behaving as a result of their socialisation in school and family life. These differences ultimately manifest in expressions of aesthetic taste, and taste functions as a signifier of class.

At this point it is necessary to introduce several concepts that are important in Bourdieu’s work. The first of these concepts is a field, which in simple terms can be understood as an arena of social contest (cf. Bourdieu & Wacquant, 1992, pp. 94–140; Thomson, 2012). Bourdieu analysed various fields over the course of his career, including the field of class relations (Bourdieu, 1984/2010), the field of literature (Bourdieu, 1996), and the field of scientific research (Bourdieu, 1975). There are various positions within a field, and these positions differ in terms of power and status. The position that a reader occupies within a field depends on the amount of capital that they possess. Although different fields may have unique forms of capital, Bourdieu (1986) distinguishes between three fundamental forms of capital. Economic capital refers to money and property; social capital refers to social connections; and cultural capital refers to knowledge and skills. Indeed, Bourdieu suggests that “to give the notion its full generality,” cultural capital might also be termed “informational capital” (Bourdieu & Wacquant, 1992, p. 119). Bourdieu (1986) further divides cultural capital into three forms: embodied, objectified, and institutional. Embodied cultural capital is embodied knowledge and skills or what Bourdieu describes as “long lasting dispositions of the mind and body” (p. 47). Bourdieu seems to define objectified cultural capital as cultural objects that are owned (e.g., books or paintings); however, objectified cultural capital is commonly interpreted more broadly to refer not just to what is materially owned but also to what is consumed (e.g., Holt, 1998). Finally, institutional cultural capital refers to the cultural capital conferred by formal qualifications, such as a university degree. Each of the three fundamental forms of capital—economic, social, and cultural—can be recognised and valued as symbolic capital within a given field (Bourdieu & Wacquant, 1992, p. 119).

Having introduced some of Bourdieu’s key terminology, it is now possible to return to Bourdieu’s (1984/2010) work in Distinction. In particular, Distinction is concerned with the field of class relations. Cultural capital also takes on a specific meaning in Distinction. As Bennett notes in his introduction to Distinction (1984/2010), cultural capital in this context refers to “the distinctive forms of knowledge and ability that [readers] acquire—whether at home, at school, or in the relations between the two—
from their training in the cultural disciplines” (p. xviii). With this definition in mind, it is again possible to distinguish between objectified cultural capital (i.e., the cultural objects that are consumed) and embodied cultural capital (i.e., how cultural objects are consumed) (e.g., Friedman, 2011).

Based on empirical work conducted in France during the 1960s, Bourdieu (1984/2010) distinguishes between social classes not only on the basis of the art that they consume (i.e., objectified cultural capital) but also on the basis of their responses to art (i.e., embodied cultural capital). The dominant class is characterised by legitimate taste, which is expressed not only by the consumption of legitimate culture (i.e., high culture, such as opera) but also by a disinterested “aesthetic disposition” that focuses on form rather than content. By contrast, the working class is characterised by popular taste, which is expressed by the consumption of popular culture (e.g., popular music) and an aesthetic response that is more concerned with content than form. For example, when shown a photograph of an old woman’s hands, working class respondents in Bourdieu’s study typically provided an affective and ethical response (e.g., “I feel sorry seeing that poor old woman’s hands”), whereas dominant class respondents gave more abstract and allusive responses (e.g., “I find this a very beautiful photograph. It’s the very symbol of toil. It puts me in mind of Flaubert’s old servant woman”) (pp. 36–37). Bourdieu goes on to illustrate these class differences (and others) with various other examples throughout Distinction.

Bourdieu’s (1984/2010) work in Distinction has been expanded and challenged in various ways. Bourdieu emphasises the role of social class as a determinant of taste, but more recent research finds other variables, such as gender and age, are also important influences (Bennett et al., 2009). The association between class position and “legitimate taste” has also been challenged, with Peterson and Simkus (1992) introducing the term cultural “omnivore” to refer to readers who achieve distinction through the breadth of their cultural consumption rather than an exclusive taste for legitimate culture. Furthermore, Bourdieu’s account of taste implies a close correspondence between objectified and embodied cultural capital because the former follows in large part from the latter (Daenekindt & Roose, 2017). However, various scholars have argued that aesthetic preferences and aesthetic responses are not as closely related as Bourdieu seems to imply (e.g., Daenekindt & Roose, 2017; Friedman, 2011; Holt, 1998). Embodied cultural capital, they argue, is more discriminating than objectified cultural capital. It is
possible to like and consume the same cultural objects while deploying embodied cultural capital to respond to those objects in different ways.

At last it becomes possible to return to Lull’s (1980) observation that critical commentary of television can be a display of reader competence. As a display of scientific competence, discourse about scientific realism might be understood as a reflection of a reader’s embodied cultural capital, where cultural capital is understood in its most general sense as “informational capital.” The ability to fluently discuss and critique scientific realism depends to a considerable extent on education in the sciences. This is especially true for rarefied forms of this discourse (e.g., articulating the problems or merits of a film’s representation of general relativity). In the field of class relations, discourse about scientific realism may reflect a reader’s class position because the ability to participate in esoteric forms of this discourse depends on education, which in turn is associated with social class.

A. R. Bell (2011) has also observed how scientific competence may represent a form of cultural capital in her analysis of the children’s non-fiction series Horrible Science (e.g., Arnold & De Saulles, 1996). Bell argues that the series invites children to accrue scientific competence as a form of cultural (and symbolic) capital, though the books also offer a further sense of distinction by “sampling critical discourses” about science (p. 510). However, whereas Bell is interested in how reading a text is a way of acquiring cultural capital, I am interested in how responding to a text is a way of displaying cultural capital.

The field of class relations is not the only field in which scientific competence may serve as a form of embodied cultural capital. Scientific competence is a form of cultural capital in the scientific field (Albert & Kleinman, 2011, p. 268). It may also serve as a form of cultural capital in the field of nerd culture. As J. Fiske (1992) and Thornton (1995) have observed, Bourdieu’s work focuses on dominant social fields, but subcultures can also represent fields within which there are positions of varying status. Furthermore, as Thornton (1995) notes, positions within a subculture do not necessarily correspond with class positions. Woo (2012) provides the following definition of nerd culture:

“Nerd culture” denotes a set of interests and hobbies that includes reading or collecting comic books; playing certain kinds of games (e.g., role-playing games (RPGs); collectable card games (CCGs); miniatures games, “German” board

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As a point of clarification, I use the term scientific competence to refer to scientific knowledge and skills, which is distinct from Bourdieu’s (1975) use of scientific competence (or scientific capital) to refer to epistemic authority.
Drawing on J. A. Brown’s (1997) account of comic book fandom, Woo describes how knowledge and collections are forms of cultural capital within nerd culture. In the first instance, knowledge in this context seems to refer to knowledge of nerd-related cultural objects. However, to the extent that nerd culture is associated with engagement in science and technology, it is conceivable that scientific competence is also a form of embodied cultural capital within the field of nerd culture.

Alternatively, science fandom may be a field in its own right. Although there is limited research on “science fans,” there is some evidence to suggest that science fans represent a distinctive group. Lachney (2014) describes how fans of the late scientist and science communicator Carl Sagan produce texts that celebrate Sagan’s “secular religiosity” (e.g., music videos\textsuperscript{10} that incorporate auto-tuned quotations from Sagan and other science celebrities). Based on her experience attending a convention held by the Search for Extra-Terrestrial Intelligence (SETI) Institute, C. J. Cole (2013) similarly describes a form of fan that is committed to science. These fans, Cole writes, are “primarily fans of science; any affinity for its fictionalization or creative representation [is] secondary” (pp. 170–171). A distinction between the science fan and the fiction fan is suggested by Cole’s experience at two different conventions: SETIcon, a science-focused convention, and Dragon Con, a fantasy and science fiction-focused convention. Cole describes how both conventions involved a reading from Di Justo and Grazier’s (2011) book, The Science of Battlestar Galactica. The reading entailed a dialogue between a “smartass fanboy” and a “real scientist” in which the real scientist explains the science of the series to the enthusiastic but scientifically naïve fanboy. In contrast to SETIcon, Cole writes, the more diverse Dragon Con audience “responded less to the specifics of the science, and more to the attitude of the Fanboy” (p. 172). The fact that the same reading was performed at both conventions attests to the overlap between science fans and fiction fans, but Cole’s anecdotal observation of different responses at the two conventions suggests that these two forms of fandom should not be conflated. If science fandom does represent a field in its own right, then scientific competence would likely serve as an important form of embodied cultural capital within that field.

\textsuperscript{10} See “Symphony of Science” videos on John Boswell’s Youtube channel, melodysheep: https://www.youtube.com/playlist?list=PLFC4EE4355ADEBDB1
As a result, scientific competence may operate as embodied cultural capital in more than one field, though its conversion into symbolic capital may differ for each field. In the field of class relations, Bourdieu (1984/2010) operationalised cultural capital as fluency with legitimate culture. It is unclear whether scientific knowledge expressed through discourse about scientific realism converts to symbolic capital in the same way as knowledge of legitimate culture. Similarly, it is unclear how scientific knowledge compares to knowledge of nerd-related cultural objects within the field of nerd culture. Scientific competence is surely important in the field of scientific research, and responses to narrative fiction may reflect a reader’s position in the scientific field. As I noted in Section 6.1.1, Kirby (2003a) argues that science consulting and critiques of scientific realism can be a form of inter-specialist communication between scientists. However, it is unclear how important responses to narrative fiction are in the field of scientific research, especially compared to other ways in which scientists can display embodied cultural capital, such as presenting at conferences or writing scholarly papers. Scientific competence expressed through responses to narrative fiction may represent a more valuable form of embodied cultural capital within the non-professional field of science fandom rather than the professional field of scientific research, though professional scientific researchers may also be science fans.

The more general insight that stems from Bourdieu’s work is the proposition that a reader’s aesthetic responses are a manifestation of their position within a social field, which in turn reflects their possession of capital that is valued within that field. For Bourdieu (1989), differences in aesthetic taste and response function “as signs of distinction, positive or negative, and this happens outside of any intention of distinction, of any conscious search for ‘conspicuous consumption’” (p. 20). Yet, Bourdieu also recognises that aesthetic responses are not only a reflection of a reader’s objective position within a field; they can also be an act of self-presentation. For Bourdieu (1989), fields are sites of symbolic struggle, particularly “in the intermediate positions of social space” where “the indeterminacy and objective uncertainty of relations between practices and positions is at a maximum” (p. 20). Drawing on Goffman (1959), Bourdieu (1989) describes how individual symbolic struggle involves strategies of self-presentation “that are designed to manipulate one’s self-image and especially—something that Goffman overlooked—the image of one’s position in social space” (p. 20). With this in mind, I now turn away from Bourdieu’s work to review social psychological perspectives.
on impression management and how these perspectives may also be useful for understanding discourse about scientific realism.

6.1.4 Impression management

Discourse about scientific realism may also be important for how readers present themselves to other readers. Impression management can be defined as “any behavior by a person that has the purpose of controlling or manipulating the attributions and impressions formed of that person by others” (Tedeschi & Riess, 1981, p. 3). E. E. Jones and Pittman (1982) distinguish between five motivations for strategic self-presentation: self-promotion, ingratiating, intimidating, exemplification, and supplication. Of these motivations, self-promotion is of particular relevance to my research. A reader is engaged in self-promotion when they seek “the attribution of competence, whether with reference to general ability level (intelligence, athletic ability) or to a specific skill (typing excellence, flute-playing ability)” (E. E. Jones & Pittman, 1982, p. 241). In this respect, discourse about scientific realism may serve as a generalised display of intelligence or a specific display of scientific competence.

Although discourse about scientific realism does not always involve criticism, critical forms of this discourse may be particularly important from an impression management perspective. Several studies suggest that negative evaluations are associated with competence. For example, Gibson and Oberlander (2008) found that participants were more critical of a dramatic short film or an essay when instructed to appear intelligent. Similarly, Amabile and Blazebrook (1982) found that participants were more critical of their peers’ writing when the audience of their evaluation was relatively high in status (e.g., a university professor) compared to when their audience was relatively low in status (e.g., a first year graduate student). In a follow-up study, Amabile (1983) found that participants perceived a book reviewer as more intelligent and competent when the review was negative compared to when the review was positive. These studies suggest that negative evaluations, and by extension, criticisms of scientific realism, can be used strategically to display competence.

However, displays of competence can come at a cost. Indeed, in the study cited above, Amabile (1983) also found that a negative book reviewer was perceived as less fair, likable, open-minded, and kind than a positive book reviewer. This finding is consistent with impression formation research where warmth (e.g., friendliness) and competence (e.g., intelligence) are commonly perceived as inversely related and compensatory (Judd,
Scientists are exemplary in this regard since they may be perceived as high in competence but low in warmth (S. T. Fiske & Dupree, 2014). Furthermore, Holoien and Fiske (2013) found that participants downplayed their warmth when instructed to appear competent and downplayed their competence when instructed to appear warm. These studies suggest that if discourse about scientific realism is a strategic display of competence, this strategy may also entail a trade-off in terms of perceived warmth.

In addition to displays of competence, discourse about scientific realism might also serve as a display of social identity. Tajfel (1974) defines social identity as “that part of an individual’s self-concept which derives from [their] knowledge of [their] membership of a social group (or groups) together with the emotional significance attached to that membership” (p. 69). Social identity theory (Tajfel & Turner, 1979) proposes that readers derive self-esteem from a positive social identity. The desire for positive social identity can lead to intergroup bias (R. Brown, 2000; Hewstone, Rubin, & Willis, 2002). In particular, inter-group behaviour can manifest as in-group positivity (i.e., positively evaluating an in-group), favourable intergroup comparison (i.e., evaluating one's in-group favourably in comparison to an out-group), and out-group hostility (i.e., actively derogating or behaving aggressively towards an out-group) (Brewer, 2001). In the absence of opportunities to identify with a higher status social group, social identity theory proposes that these inter-group behaviours serve to affirm the positive distinctiveness of a reader's existing social group, thereby enhancing self-esteem.

Drawing in part on a social identity perspective, J. Berger and Heath (2008) propose an identity signalling approach to understanding cultural taste. In particular, they argue that readers abandon tastes to avoid being misidentified as members of a dissimilar out-group. For example, in one study, Berger and Heath found that students living in a university dormitory abandoned charity wristbands when members of an out-group dormitory (the academic or “geek” dormitory) started to wear the same wristband. An identity signalling approach has been used to understand the abandonment of risky health behaviours (J. Berger & Rand, 2008) and the abandonment or adoption of cultural tastes (J. Berger & Heath, 2007, 2008; Chan, Berger, & Van Boven, 2012). Although it has

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a Social identity theory (Tajfel & Turner, 1979) and self-categorisation theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) are commonly paired in what is termed a social identity perspective or social identity approach (Hornsey, 2008). Self-categorisation theory is effectively an extension of social identity theory, which, as the name suggests, expands on the processes by which readers categorise themselves into groups. For further discussion, confer Hornsey (2008).
not previously been applied to understanding modes of cultural reception, an identity signalling approach might also be applied to discourse about scientific realism. From this perspective, discourse about scientific realism might serve to communicate a reader’s science identity.

The concept of a science identity is common in educational research that seeks to understand how identity impacts on student engagement with science in a formal education setting (e.g., Archer et al., 2010). However, the concept of a science identity may also be relevant to the reception of narrative fiction. Carlone and Johnson (2007) define science identity in terms of three dimensions: performance, competence, and recognition. Performance relates to the “social performance of relevant scientific practices [...] e.g., ways of talking and using tools”; competence relates to “knowledge and understanding of science content”; and recognition entails “recognizing oneself and getting recognized by others as a ‘science person’” (p. 1191). Discourse about scientific realism may represent a way for readers to perform their science identity by exhibiting their scientific knowledge and skills.

In conclusion, there are various perspectives that can be used to think about the possible functions of discourse about scientific realism. Science communication-related literature highlights how this discourse serves boundary work and social control functions. Audience research highlights how discourse about realism can form part of fan engagement with a narrative or serve as a display of reader competence. This display of competence can in turn be understood through complementary sociological and social psychological perspectives. However, with the exception of science communication-related literature, previous research does not investigate discourse about scientific realism specifically. Moreover, I am not aware of any existing studies that investigate readers’ self-reported motivations for discussing scientific realism. In the remainder of this chapter, I report on the results of my research into readers’ self-reported motivations for discussing scientific realism and how these self-reported motivations relate to the literature reviewed above.

6.2 Results

In this section I describe the results of my participant research. I identified nine self-reported functions of discourse about scientific realism. These self-reported functions are consistent with three latent functions of discourse that have been identified in previous research. Table 6.1 summarises the results of my analysis. It is important to
emphasise at this point that the functions of discourse described in this chapter are not mutually exclusive. A given instance of discourse may serve a single function or it may serve multiple functions simultaneously. I will describe each discourse function in detail below; however, I begin by describing the social contexts in which discussions about scientific realism take place.

Table 6.1

<table>
<thead>
<tr>
<th>Discourse function</th>
<th>Definition</th>
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<tr>
<td><strong>Self-reported functions:</strong></td>
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<tr>
<td>Catharsis</td>
<td>Discourse about scientific realism provides an outlet for a reader’s emotional response to the scientific realism of a narrative.</td>
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<tr>
<td>Critique</td>
<td>Discourse about scientific realism is a rhetorical tool for critiquing a narrative that is perceived to have failed aesthetically or ideologically.</td>
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<tr>
<td>Conciliation</td>
<td>Discourse about scientific realism explains ostensibly unrealistic elements in a narrative in order to defend the narrative or maintain engagement with the narrative.</td>
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<tr>
<td>Continued engagement</td>
<td>Discourse about scientific realism provides a form of continued engagement with a narrative beyond reading the text itself.</td>
</tr>
<tr>
<td>Curiosity</td>
<td>Discourse about scientific realism satisfies a reader’s desire to participate in science-related enquiry.</td>
</tr>
<tr>
<td>Communication</td>
<td>Discourse about scientific realism intentionally communicates science in order to elicit a response to science, such as learning or persuasion.</td>
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<tr>
<td>Change</td>
<td>Discourse about scientific realism seeks to increase the standard of scientific realism in narrative fiction.</td>
</tr>
<tr>
<td>Competence</td>
<td>Discourse about scientific realism expresses scientific competence, which in turn communicates the positive distinctiveness of an individual reader or the scientifically competent social group to which the reader belongs.</td>
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<tr>
<td>Connection</td>
<td>Discourse about scientific realism highlights shared science-related characteristics that function as a basis of social attraction.</td>
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<tr>
<td><strong>Latent functions:</strong></td>
<td></td>
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<tr>
<td>Credibility</td>
<td>Discourse about scientific realism asserts and maintains the epistemic authority of science and scientists.</td>
</tr>
<tr>
<td>Control</td>
<td>Discourse about scientific realism asserts control over who can contribute to public discourse about socio-scientific issues.</td>
</tr>
<tr>
<td>Concern</td>
<td>Discourse about scientific realism expresses and perpetuates concerns about powerful media effects.</td>
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</table>
6.2.1 Contexts for discussion

It is possible to distinguish between three main contexts in which participants discussed scientific realism: incidental discourse, committed discourse, and professional discourse. Incidental discourse arises spontaneously; it is part of the ordinary ebb and flow of conversation among friends and acquaintances (e.g., during or after watching a film). By contrast, committed discourse is actively sought out (e.g., by joining an online forum). Laura mentioned re-watching *The Core* (2003) “every couple of years” with other geology students “just to sort of sit and cry about how awful it is.” In this case, *The Core* was selected specifically because it would provide an occasion for critiquing scientific realism. Finally, professional discourse is motivated by professional communication goals or interests, such as building public awareness of science, and takes the form of public lectures, school visits, and so forth. For the most part, participants in this study described experiences with incidental discourse, though as I will describe in relation to the discourse functions of continued engagement (Section 6.2.5) and communication (Section 6.2.7), some participants also engaged in committed and professional discourse respectively.

In the first instance, discussions about scientific realism can be an ordinary part of responding to a science-themed narrative, irrespective of the reader's scientific background or the composition of the group involved in the discussion. As Valerie, a non-scientist, described:

> When, yeah, so when it depends on the science for a lot of its plot in the ones set in the future and so on, we're likely to discuss those as well as in the virus ones we're likely to discuss how likely it is with what's going on at the moment. So for instance a friend of mine was doing medicine at the time that *Contagion* came out and she was telling me about how if, and I don’t know whether this was her exaggerating it or not, but she was saying that yeah, if avian flu becomes human bound then we're basically all screwed and there's lots of ideas about, you know, the types of vaccinations, I'm not sure if that's the right word, but the types of medicines that are available, but there's only a certain amount of stock. So we're likely to talk about that because she was privy to that knowledge. Yeah, so we're likely to talk about them when the science is a big part of the plot and when they're playing on ideas and concepts and events that are prevalent in the media at that time too.

Valerie is more likely to discuss scientific realism in her friendship group when science is pertinent to the narrative or pertinent to real world events and issues. *Contagion* (2011), a film about a viral pandemic, fulfilled both of these criteria. Valerie's friend who was studying medicine facilitated this discussion because she was “privy” to relevant
scientific knowledge; however, for the most part, the discussion seemed to arise because *Contagion* was a timely, science-themed narrative, not because Valerie’s friend was a medicine student.

Although discussions about scientific realism can arise whenever scientific realism is relevant to the reception of a narrative, many participants described how these discussions were more likely in specific social groups:

Like if you are with science friends you’re like, “oh,” you know, you see something scientific and then everyone picks it up and you talk about it. If I was going with my family I think I really wouldn’t. I probably would just enjoy it and then we’d discuss it, and maybe if they were saying something inaccurate then I’d put my two cents in, cos I can. But otherwise yeah, I don’t think like if it wasn’t someone who was interested in science then you wouldn’t bother. (Freya)

I definitely discuss it with my friends who are taking engineering or science but with my, say my family, or anyone else, we would discuss other things, not necessarily realism of science, but maybe, just other aspects of the film or fiction. (Lily)

Yes, absolutely. [I discuss scientific realism] in large part because of my social group and my friends tend to be fairly highly science literate and with diverse areas of expertise. And we’re also nerds and consumers of pop culture. And so yeah, we’ll often go see a movie and then it will quickly turn into a discussion after the fact of the science of something. (Ian)

As the foregoing quotations illustrate, participants move between different social groups and reception contexts. Discussions about scientific realism are most likely among friends who are interested in science, whereas discussions with other friends are more likely to focus on other aspects of the text.

Participants used different language to describe the social groups that were conducive to discussion of scientific realism. Several participants referred to “nerds” while others referred to “science friends” or “sciencey” people. The meanings attached to terms like “nerd” and “geek,” are highly context dependent (Mendick & Francis, 2012). In general, however, the term nerd is associated with an interest in popular culture, science, and technology (Kendall, 1999; Woo, 2012). Nerd is often a pejorative term that carries negative connotations, such as social awkwardness, but it can also be reappropriated to emphasise its positive connotations, such as intelligence (Mendick & Francis, 2012). I did not investigate in detail how participants conceptualised terms like “nerdy” and “sciencey” or how these terms might differ. Tentatively, the term “sciencey” may relate to science identity in Carlone and Johnson’s (2007) sense. As I described in Section 4.2.3, some participants (e.g., Logan) expressed very strong personal connections to science.
Furthermore, the term “sciencey” may relate to readers who are primarily fans of science, whereas the term “nerdy” may relate to readers who are primarily fans of nerd-related cultural objects (cf. Section 6.1.3). However, without explicitly investigating this issue, it is important not to make assumptions about the meanings that participants gave to terms like “nerd” or the extent to which particular participants identified with a nerd identity or a science identity. Nevertheless, it is clear that participants used terms like “nerdy” and “sciencey” to refer to social groups that exhibit a degree of affinity with science.

Discussions about scientific realism may be more likely to take place in “sciencey” or “nerdy” groups for several reasons. In the first instance, members of these groups have the requisite interests and knowledge to sustain a discussion. As Natalie stated:

[I discuss scientific realism with other science students] cos first of all we all know some science, even though maybe in different areas, but at least it’s science. And also, I think picking the scientific inaccuracies from movies is kind of a nerd or geeky behaviour among the science culture. I don’t think I have [e]ver done such things with people from the non-scientific group. No, because that would just be weird, and the other person won’t understand anything what I was talking about.

Furthermore, members of these groups are understanding of “nerdy” or “sciencey” behaviour that in other social contexts might be unwelcome. As Leah stated:

[I wouldn’t discuss scientific realism with] like non-nerdy people that don’t in general form part of the same [group], but that’s the other thing, so I’m an academic and most of my friends are nerds in one way or the other, and even though they’re not nerdy about the same things as I am, they understand the obsessive behaviour of being a nerd so they indulge me even if that’s not what they’re nerdy about a lot of the times.

Leah’s “nerd” friendship group is a tolerant space for discussion, but other social contexts do not offer the same degree of acceptance. As Ethan stated:

I have like close friends from political organisations and I wouldn’t raise the topic with them for fear almost of being ridiculed. This is kind of, they’re very much grounded in reality and so science fiction as a whole to them is kind of alien and so I feel as though I could come up there and try and make these discussions but they wouldn’t have any kind of, they wouldn’t get anything out of it. There’s kind of no investment for them. [.... Their response] would vary between kind of dismissive and annoyed about the fact that you’ve even bother[ed] to discuss things that aren’t grounded in reality, that aren’t, well look, “Why aren’t you talking about the politics of this or this or this? Why bother devoting any of your mental capacity to these fictional words and things?”
Marcus also described concerns about the self-presentational risks of discussing scientific realism:

I suppose [it] just comes down to any interaction really. If you start ranting something people will be like, “Let’s get away from the crazy person.” But science is a little stigmatised in that because there’s a perception that people who are into science are also nerds and people who are nerds have very poor social skills and are likely to basically grab your ear and talk into it for years about something they’re passionate about. So for me at least, I’m trying to, trying not to project that sort of, what’s the word? Aspect.

From an identity signalling perspective (J. Berger & Heath, 2008), Marcus sometimes avoids commenting on scientific realism to avoid being misidentified as a socially inept “nerd.” Similarly, for Ian, a degree of caution is warranted when initiating discussions about scientific realism in unfamiliar contexts:

I tend to hang around with the people who like these sort of discussions and I guess if I were in a social setting with people who weren’t as, you know, the same, and they were like, “Oh, whatever, oh my god, you’re such a wanker,” then it would become more annoying and I guess, disenchanting. [...] I wouldn’t discuss scientific realism with] I guess anyone who early on in the conversation does not express an interest. I guess I would play it more case by case and a bit more by ear in that sense. Yeah, I don’t know. I suppose it would also depend on, you know, in an awkward social setting or where I’m surrounded by people I don’t know and I’m less secure about things, then I’m less likely to offer topics of discussion.

In this way, discourse about scientific realism may be deployed or withheld depending on the receptiveness of the social context. “Sciencey” and “nerdy” friendship groups seem to represent the safest and most amenable contexts for this form of discussion. This finding is consistent with Denham’s (2004) suggestion that responding to media in a homogenous social group permits forms of discourse that might not be possible in a heterogeneous social group for fear of social discomfort or social conflict.

However, several participants also described how even within “sciencey” or “nerdy” groups it is important to be discerning when selecting a conversation partner. These participants described how discussions of scientific realism are best pursued with a conversation partner who maintains a compatible degree of seriousness, openness, and civility. As Isla stated:

[I wouldn’t discuss scientific realism with] anyone [if] I didn’t know about their sense of humour because I think you do have to have a reasonable sense of humour to have a fun discussion about it. If you don’t and you take it too seriously then the conversation’s over really fast, because you say, “Well that’s not possible,” and then you just, that’s it—there’s no exchange of ideas or bonding experience or anything else. So it’s, yeah, I definitely have to pick
someone that I knew reasonably well, or at least knew well enough to know their sense of humour and had enough of a background in science to understand [...]. I probably wouldn’t want to have a discussion with someone who had a level of understanding over mine because then I just feel stupid, but that’s probably less important. It’s the sense of humour and the basic understanding I think that there needs to be to have a discussion about that.

Although discussions about scientific realism may depend to some extent on scientific knowledge, the value of the discussion can be diminished if it becomes a contest over scientific authority. After a particularly “heated” debate about the science of space combat, Marcus concluded that discussing scientific realism with some of his friends was “not worth it anymore.” Similarly, Ella described how she avoids discussions of scientific realism with her uncle because “he’s very strict about, like, you know, his way’s right.” These responses are consistent with Woo’s (2015) research on geek culture. Without “reasonableness and breadth of interest,” Woo writes, “nerdy enthusiasm can become fanatical and narrow minded” (p. 31). The most enjoyable discussions of scientific realism therefore seem to depend on readers displaying a compatible level of “sciency” or “nerdy” enthusiasm.

However, the boundary between acceptable and unacceptable enthusiasm is a matter of perspective. As Woo (2015) writes, boundaries of this type are “neither given nor stable but, rather, perspectival and relative” (p. 32). For example, Natalie described how it is important to find conversation partners who are not too pedantic or captious, but in a self-reflexive turn, Natalie recognised that she displays the very characteristics that she seeks to avoid in others:

Natalie: [I don’t discuss scientific realism with] people with a non-science background and people who are too scientific, probably. I mean, this is a personal thing. I don’t like discussing stuff with people who are too picky about every single detail. So it’s like, sure, there are some mistakes, but who cares? When you are dealing with mistakes like that I just don’t want to talk about it with people who are criticising everything, so probably not those too scientific guys.

JLG: Have you been in any conversations like that? Do you recall any times where you have been talking with someone who was too picky?

Natalie: I guess I’m mostly that guy (laughs), cos I’m, but people do sometimes feel it is a bit annoying, like when we are watching a soap opera and people are holding a bomb which is gonna explode if you stop, if you drop it, and this is a real scenario from a TV soap opera in China and I just feel like it is ridiculous because it’s man and it’s a woman and they are holding this really heavy bomb and they still have time to chit-chat and flirt a little bit maybe (laughs). I was like when they’re watching—by “they’re” I mean my classmates—they’re watching the show, I was like this is ridiculous, that is ridiculous. And people find this
behaviour a bit annoying. So I agree, I just have different level of tolerance with them.

JLG: You mentioned that they found it a bit annoying. How did your classmates react when you pointed out the, these problems?

Natalie: It’s like, “I get it, but who cares?” Things like that.

Natalie’s response to readers who she regards as “too picky” is echoed verbatim in the response that other readers give to her: “but who cares?” Leah demonstrated a similar form of self-reflexivity with respect to nerd identity. At first, she distanced herself from nerds who are overly concerned with scientific detail:

Yes, I do [discuss scientific realism]. Well partially because I watch a lot of these shows with my boyfriend who’s a physicist and but both of us are very like accepting of it and just like not really angry about it at all. We just think it’s funny. But I don’t go into, I know some people who take it, how do I say this in a good way? A lot of nerds have sort of aspy obsessive behaviour and can go into obsessive mode and want to figure out exactly why it’s unreal or write long blog posts about why it’s unreal and I don’t do that. I don’t think it deserves that much attention. It’s ok. It’s silly. I get it. I don’t need to understand exactly why it’s silly.

Later in the interview, Leah identified herself as a nerd and conceded that she may be too harsh on other nerds:

I’m a bit judgemental about other nerds I think, when I think they go off in obsessive rants that I don’t understand or that I don’t care about, but I do the same thing and other people think the same thing of me so I shouldn’t be so judgemental I guess.

As a result, Natalie and Leah self-reflexively demonstrated how the boundaries between “normal” and “aberrant” discussions of scientific realism depend on perspective. As Jenkins (1992) notes, “there is always someone more extreme whose otherness can justify the relative normality of one’s own cultural choices and practices” (p. 19). Indeed, in her research on Star Trek fans, Amesley (1989) observed that none of her participants self-identified as “hardcore Trekkies.” The idea of the “hardcore Trekkie” exists only in theory, Amesley argues, but it nevertheless shapes fan behaviour. Although there may be objective differences in the seriousness with which readers discuss scientific realism, the idea of a more captious “other” is always available (actually or perceptually) to normalise these discussions for the readers who participate in them.

So far I have highlighted how readers may be selective about the social contexts in which they engage in discourse about scientific realism. However, such selectivity is not
People that I don’t know. That’s really it. If I even know someone by name, some aspect of something will definitely come up, and I would have to, I would feel the need to correct them or have a conversation about that particular thing and go, “Well it’s not true. You need to google that because it’s wrong.” Yeah, it’s maybe not the best thing to be doing, but I do it anyway.

For Laura, any concerns about social or self-presentational risks appear to be outweighed by “the need to correct” whoever she is talking to. Even if remarking on scientific realism is “not the best thing to be doing” socially, it is important for Laura to communicate the “correct” scientific knowledge (for further discussion, cf. Section 6.2.7 below). In this way, Laura illustrates that initiating a discussion about scientific realism involves assessing perceived benefits as well as perceived risks.

One further caveat is worth highlighting before concluding this section. Most of my data relates to face-to-face discussions about scientific realism. It is important to recognise that social risks may be diminished or take different forms in computer-mediated communication. For example, Ethan’s face-to-face discussions are largely limited to “close friends” who have “gravitated towards having similar opinions on the most kinds of contentions issues and things.” In online forums, however, it is less important for Ethan to avoid conflict:

I find that, yeah, the people when you’re discussing face to face, the discussions are over a lot quicker. The discussion you kind of end up, for the sake of keeping the discussion civil, you agree to disagree and that’s kind of the end of it, whereas in these online discussions, [that’s] less kind of necessary. In a lot of cases you have no idea who the person on the other end is and they’re just as, they don’t know you, and you’re just as able to kind of really, what do you call it? Really dig into the arguments for the discussion, whereas I guess in face-to-face interaction that’s not as do-able for the sake of not upsetting one another.

Ethan’s experience suggests that computer-mediated discussions of scientific realism may involve different dynamics than those occurring in face-to-face situations. In particular, the perceived need to maintain civility may be tempered in these environments.

In summary, participant responses suggest that discourse about scientific realism arises from a shared interest in a text’s scientific content, either because the text itself is concerned with science or because readers bring a personal interest in science to the text. A threshold level of generalised scientific knowledge may be necessary to fully
participate in some discussions, but knowledge appears to be secondary to interest in terms of initiating a discussion. Sharing a compatible approach to scientific realism further facilitates discussion by reducing the likelihood of an overly serious, captious, or hostile exchange. Given these considerations, discourse about scientific realism was commonly reserved for “sciencey” or “nerdy” friendship groups. Initiating discussion in unfamiliar social contexts entails greater social risks, such as conflict, disinterest, or misidentification.

Having described the social contexts of discussions about scientific realism, I now turn to describing the functions that are served by this discourse.

6.2.2 Catharsis

Discourse about scientific realism can serve a cathartic function. I use the term “catharsis” to refer to the perceived relief associated with the social sharing of observations about scientific realism. The function of catharsis relates to what Duprez, Christophe, Rimé, Congard, and Antoine (2015) call venting and what Kowalski (1996) calls cathartic complaining, but this theme should not be confused with the Aristotelian concept of katharsis, which, among other interpretations, refers to the relief of excess emotions through art (cf. Heath, 1996).

Several participants described how commenting on scientific realism is a way of venting the negative emotions that can be associated with unrealistic science in fiction. As I described in Chapter 4, unrealistic science can prompt feelings of annoyance, anger, disappointment, frustration, and disrespect. These feelings stem from a disruption to the narrative experience, a sense of authorial disrespect for the reader, or a concern about the effects of unrealistic science on other readers. Remarking upon scientific realism is therefore a form of “release” and a way of “getting [emotions] off your chest”:

It can be fun [to discuss scientific realism]. It’s, you know, it’s just a way of sort of airing out your grievances, so it’s not stewing underneath the surface. You can be, “I can’t believe they did this,” and just, you know, let it all out and you can come away from the conversation being, “Oh yes, that felt good.” So it’s not so much of an issue anymore. I guess it’s similar to when you’re complaining about anything else, parking or whatever, to other people and you can just sort of have a good complain about it and then just walk away and feel a whole lot better. So it’s like release. (Aubrey)

Well, if I saw something and it really bothered me, then I would discuss it with whoever was around, because it would bother me. I just think to get it off my chest. [...]. But yeah, like I say, if it was something that was really bothering I
would just go up to anybody and just be like, “This, this, this, this, and this bothered me about the movie.” Once it’s off my chest I’m happy. I don’t have to talk about it anymore. But yeah, you just need to acknowledge that it was there, that it was wrong, or if it was right, or whatever. (Alana)

Alana’s response suggests that a sense of satisfaction or relief can also come from sharing observations about an aspect of the science that was “right.” However, the compulsion to share observations about scientific realism seemed most pertinent when the text was “wrong.”

For Alana and Aubrey, a sense of relief was associated simply with sharing observations about unrealistic science. However, in some cases, a sense of relief may stem not simply from the social sharing of an observation but from a sense of undoing the perceived damage that was the cause of the negative response. Gabrielle described how she comments on unrealistic science because “people have the right to have the correct information presented to them.” She expressed concern that “incorrect information is shared then it just breeds a level of [...] incorrect knowledge in people.” In this respect, Gabrielle’s discourse is motivated in part by the communication function of discourse that I will describe below (cf. Section 6.2.7). Gabrielle’s remarks seem to be cathartic in part because they also serve as a corrective to the misinformation presented by the narrative. In the following extract, Gabrielle describes the contexts in which she comments on scientific realism:

Gabrielle: Probably like movies and stuff, like often, sitting on the couch watching a movie like, “That’s inaccurate that’s actually not how that’s going to work.” And I usually get told to shut up after that, but usually when I’m just sitting watching movies with people and if it pops up I’ll just go, “That’s not how it works; it’s actually this.” And yeah.

JLG: Yeah, so do you think you would say that while the movie is on?

Gabrielle: Yeah (laughs). Whilst the movie’s going. Yep, yep. Cos I’m not going to sit there and remember it and fume for the whole movie usually.

JLG: Right, right.

Gabrielle: But like that’s wrong, and I’m like, “Yeah, ok this is why it’s wrong,” and then yeah, move on. If it really annoys me then I’ll probably take [that feeling] with me from it.

Gabrielle’s response highlights how corrective remarks may be associated with personal catharsis; however, her companions do not necessarily appreciate the corrections or share the sense of catharsis—they usually tell Gabrielle to “shut up.” Furthermore, Gabrielle’s response also highlights how corrective remarks are not always sufficient to
fully resolve negative feelings: sometimes a feeling of annoyance will remain and she will “take it with [her].”

In summary, the participant responses above suggest that discussing or commenting on unrealistic science is a way of partially or fully relieving the negative emotions that can be associated with unrealistic science in fiction. This relief may come from sharing alone, but in some cases it may also arise from the perceived performativity of discourse about scientific realism wherein remarking on unrealistic science is seen to undo the perceived misinforming effects of a narrative. Cathartic responses to unrealistic science may take place in the absence of a receptive audience (as in Gabrielle’s case), but as I will suggest in Section 6.2.10 below, a shared sense of catharsis might also serve as the basis of social connection between readers.

6.2.3 Critique

Discourse about scientific realism can also be used to critique a fictional narrative. This critique may be motivated by ideological conflict (either with respect to the thesis of a narrative or its incidental ideological content) or aesthetic failure, bearing in mind that ideological conflict may be regarded as a form aesthetic failure. In this respect, the critique function of discourse is an extension of the satisfaction principle of aesthetic evaluation that I described in Chapter 5. Criticisms of unrealistic science can be muted if a narrative succeeds, but if a narrative fails (ideologically or aesthetically), criticisms of unrealistic science can be marshalled as part of a generalised critique of the narrative, even if the reader’s negative evaluation of the narrative does not arise primarily from its scientific realism.

In Chapter 4, I introduced a modified version of W. R. Fisher’s (1987) narrative communication paradigm where narratives are assessed as rhetorical communication in terms of their coherence and fidelity. Drawing on McAdams (2006), I defined coherence in terms of formal coherence and narrative consistency. Following Rowland (1989), I defined fidelity as an assessment of a narrative’s thesis based on informal logic. As I described in Chapter 4, narrative fidelity is intrinsically related to narrative consistency, though the former is not reducible to the latter. I also described how assessments of narrative fidelity for non-realist narratives may entail an assessment of external realism, not just narrative consistency. As Von Burg (2005, 2012) has illustrated (cf. Section 6.1.1), the relationship between scientific realism and narrative fidelity is ultimately a rhetorical exigency. The relationship between scientific realism and narrative fidelity can be
emphasised or downplayed depending on the reader’s rhetorical goals. Indeed, if a reader wishes to undermine narrative fidelity, they can emphasise unrealistic elements in the narrative, irrespective of whether those unrealistic elements should normatively be regarded as relevant to the validity of the narrative’s thesis.

Similarly, as I noted in Chapter 5, readers may use principles of aesthetic evaluation strategically to emphasise or deemphasise the status of unrealistic science as a prima facie aesthetic flaw. If a reader wishes to critique a narrative, that may select an evaluative principle that reduces the aesthetic acceptability of an unrealistic element; if a reader wishes to defend or praise the narrative, they may select an evaluative principle that increases the aesthetic acceptability of an unrealistic element (cf. Section 5.5.4).

The critique function of discourse about scientific realism is implicitly supported by the satisfaction principle of aesthetic evaluation that I described in Chapter 5. However, the critique function was also self-reported by several participants. For example, Valerie described how she did not like the plot in Avatar (2009). She also found Avatar’s use of the term “unobtanium” to describe a sought-after mineral to be unrealistic. Critiquing the film’s use of the term “unobtanium” was another way for Valerie to express her overall dissatisfaction with the film. As Valerie stated:

Sometimes talking about the science and whether or not the science was realistic, for instance in Avatar, it’s more of a way to talk about how crap the film plot was rather than to talk about the science per se.

In this way, highlighting Avatar’s unrealistic science further bolstered Valerie’s negative evaluation of the film even though her negative evaluation of the film seemed to arise in the first instance from her objections to the plot.

Logan similarly recognised that commentary on unrealistic science can be a discourse of critique when he described how he censors his realism-based observations in some social contexts:

If I go see a movie with someone who has no science background, I won’t be critical of the movie. If it was, if they enjoyed [it], I guess. Because I don’t want to detract from their enjoyment of the movie and I think that it’s totally ok that their enjoyment of the movie is not based around any of the science. If they enjoy a movie tonnes I won’t tear it apart in front of them. However, if I’m—it goes the other way—if I’m with a friend, even if they don’t appreciate the science and it was terrible, I’m happy to go that step further and be like, “Well it was also terrible because of all of this bad science and none of this is possible.”
Logan’s response suggests that a shared evaluation of a text may be more important than a shared set of criteria for evaluating the text. If Logan’s friend enjoys the text, critiquing the text’s scientific realism is inappropriate because there is not only a mismatch of evaluative criteria (i.e., scientific realism is relevant for Logan but not for his friend) but also a mismatch of evaluations (i.e., positive versus negative). By contrast, if Logan’s friend does not enjoy the text it is possible to deploy different evaluative criteria so long as the evaluations are consistent (i.e., both negative). In this way, Logan’s experience suggests that readers can recognise discourse about scientific realism as a form of critique even if they do not normally regard it as relevant to aesthetic evaluation.

The critique function of discourse about scientific realism was also reflected in Isla’s experience. For Isla, discussions of scientific realism are a way of exercising scientific curiosity and bonding with her friends who study science (cf. Section 6.2.6 and Section 6.2.10 respectively). Isla recognises that these discussions are a form of critique, but she distinguishes her approach from other readers who she regards as too heavy handed:

> The only other reason I can think of for actually discussing the realism would be to completely trash it and I don’t think that’s as fun as having like a buoyant conversation where you do end up trashing it but you have fun along the way. Whereas there are some people when they discuss stuff they sort of just stomp it into the dirt and they may derive pleasure from it but it’s not like a bonding experience or an experience that opens your mind to other things. They’re just using their closed mind to, you know, bash this amazing creative idea someone’s had. And it, yeah I can’t imagine it’s any fun, that’s all.

For Isla, having a “buoyant conversation” is fun; completely “trashing” the text is not. Isla’s response suggests that discourse about scientific realism can be perceived as a mean-spirited and closed-minded discourse that serves no other function than critique. Although not articulated explicitly by the participants in my sample, it is possible that being perceived in this way is a further self-presentational concern that warrants the reservation of discourse about scientific realism for amenable audiences (cf. Section 6.2.1 above). Indeed, this may be a further reason why Logan deploys his criticism of scientific realism only when his conversation partner is already engaged in a critical form of discourse.

### 6.2.4 Conciliation

Discourse about scientific realism can be used to critique a narrative, but in the conciliation function, it may also be used to defend or repair a narrative. This conciliation function is consistent with Jenkins’ (1992) observation that fans desire
narrative consistency and will produce “meta-textual” explanations to achieve consistency when a text fails to provide a satisfactory explanation of its own. Like formal coherence (cf. Section 4.1.1), narrative consistency is a product of interpretation and is not simply an objective property of the text. In other words, narratives can be made realistic or consistent through interpretation and explanation. Conciliatory discourse is a way of fortifying a text against criticism or a way for a reader to continue enjoying a text despite its ostensible faults.

Ethan was one of several participants to describe the conciliation function of discourse about scientific realism. Ethan described how his online discussions of scientific realism are motivated by curiosity and conciliation rather than critique:

[On the forums] I guess [I talk to] other science fiction enthusiasts. More people who’re really committed to usually one particular fiction or universe or setting rather than people that are like, “Oh look let’s analyse the science in general.” It’s like, ok we’ve got this example and I enjoy it so much or I care about it so much that I either want it to be plausible, I want it to be real, or I want to find out how could it be or if it could be. Alternatively, in critics of the kind of hard science fiction go the other way and say, “Oh look they’re trying to be so serious and real and yet there is A through Z of flaws.”

Ethan describes working with the text rather than against it. Motivated by his enjoyment of the text, Ethan wants to “find out how it could be or if it could be” realistic. These are slightly different scenarios. Wondering if the text is unrealistic entails uncertainty, whereas wondering how the text can be realistic entails recognising textual elements that are likely unrealistic but might be made realistic by a suitable meta-textual explanation. In either case, the desired outcome of the discussion is clear: Ethan wants to find the text to be realistic. In this case, discussing scientific realism is motivated by a desire to affirm a text’s scientific realism rather than to identify its flaws.

Aubrey’s experience provides specific examples of conciliatory discourse at work. During a focus group discussion, Aubrey recounted two instances where she rationalised unrealistic science in order to sustain her enjoyment of a text. In the first example, Aubrey regarded a medical procedure in an episode of Firefly (2002–2003) as unrealistic, but her fondness of the series motivated her to provide a meta-textual explanation for the scene:

Aubrey: One example, actually but, then there was a thing, one of the episodes of Firefly where they did that, you know the hospital episode?

Alana: Firefly yes, I’ve seen Firefly.
Aubrey: Yep, and they and then Simon goes on and uses electrodes on this patient.

Alana: Oh yes I remember that.

Aubrey: Because I do enjoy Firefly a great deal I sort of had to talk myself through that.

Alana: That scene, yeah.

Aubrey: I was like, well yes, medicine in the future, that might not actually be using the defibrillator it might be giving them a shot of some tranquiliser or whatever and that that’s what I had to, because Firefly.

Her second example related to Star Trek. As for Firefly, Aubrey’s meta-textual explanations in Star Trek are motivated by a desire to remain engaged with the episode that she is watching:

Aubrey: I usually find when I like something I’ll try to come up with stories or excuses for it, like the ion storm in Star Trek that always happens when they really need the transporter. It’s sort of like, well yes, I’ll just come up with this history of how ion storms happen and just roll with it, and you know, that means I [am] sort of able to, you know, sit through that bit and watch what’s going on.

Laura: It’s not always ion storms though. Sometimes they come up with something else.

Aubrey: Yeah that’s true. I’m still working on trying to come up with a bad story for the nexus though, so.

Aubrey’s comment about “ion storms” highlights an important definitional issue with respect to conciliatory discourse. Aubrey demonstrates awareness that the ion storms serve a narrative function: the storms occur to complicate the plot and prevent the characters from using the transporter. However, she goes beyond this narratological justification to devise a meta-textual explanation, a “history” of why ion storms occur within the storyworld. A meta-textual explanation seeks to transform ostensibly inconsistent science into consistent science, whereas a narratological justification provides an authorial motivation for inconsistent science but the science in question ultimately remains inconsistent. I restrict my definition of conciliatory discourse to meta-textual explanations.

Aubrey’s comment about the “nexus,” an extra-dimensional realm that features in Star Trek Generations (1994), is also significant. Aubrey’s experience suggests that a satisfactory meta-textual explanation cannot always be produced. Although narrative consistency may be an interpretive construct, any interpretation must ultimately be
feasible within the constraints of the storyworld or the real world. Conciliatory discourse cannot necessarily resolve all narrative inconsistencies.

6.2.5 Continued engagement

Discussions about the scientific realism of fiction can serve to extend the experience of a text beyond reading the text itself (e.g., reading a novel or watching a film). In the broadest sense, any discussion about a text can be a form of continued engagement. However, this function may be best illustrated by fan practices, such as participating in online forums, which reflect a higher level of investment than an incidental discussion of a text immediately after reading it. The continued engagement function of discourse is consistent with fan research where discussion—and criticism—of a text is a fundamental fan practice (e.g., Duffett, 2013).

For Ethan, participating in online science fiction forums is a form of continued engagement with texts that he values:

I’m not really sure what I intend to get out of [online forums]. I mean on the one hand it’s just kind of socialising and allows you to discuss about something that you enjoy. I’m not sure what I, what kind of the reason behind it is but it’s kind of I guess it’s personal interest, you look at the thing, you’re like, “Oh, ok what do these people have to say about that and they’ve got this point.” And you’re like, “Oh, well no actually, I disagree.” And so it’s kind of just discussing for the sake of discussing so that in some ways I guess you can hold on to that kind of enjoyable fictional experience for longer than its kind of intended life span once you finish the book. If you go into this it allows you to still kind of be there and be engaged with it.

Ethan’s online discussions take place with other people who are “really committed” to a fictional text rather than people who “analyse the science in general.” Consistent with a desire to remain engaged with the storyworld, Ethan described how discussions in this context focus on questions of narrative consistency rather than external realism (cf. Section 6.2.4 above). Ethan’s discussions are also partly motivated by socialisation, and in this respect, the continued engagement function of discourse is closely related to the connection function of discourse that I will describe in Section 6.2.10 below. In short, the desire to remain connected with a fictional text may also serve as a basis for social connection among fans.

Ella described a related experience of continued engagement through online discussions of The Irregular at Magic High School (2011–), a light novel about students who learn to use magic with the technological assistance of casting assistant devices (CADs):
Ella: It’s pretty much like they have, like, you know, a set thing, sort of thing, where magic is pretty much the alteration of something because it’s based on like psionics and that kind of stuff, but, you know, they have like devices to use it, which, to use the magic, which, and since the guy’s like an engineer they discuss, he talks a lot about it, about the CADs and, the, each magic thing has its own effect on the world and all this sort of stuff. And there’s a lot of discussion over how it works and how it would work against another type, for example, or how it can be countered and all that sort of stuff.

JLG: Yeah, ok. So what do you get out of those discussions, or what do you hope to get out of them?

Ella: Well it’s not really like, I don’t really know. It’s kinda like, it’s just interesting, you know, to speak with other people about the kind of things, they get really intense, and it becomes, I don’t know how to put this. Yeah, it helps you understand the story more because you start getting more like nuances out of like what you’re reading and find how, you know, you can create your own scenarios in your head of like how this could work against what, or what could be discovered next and all sort of stuff.

Like Ethan, Ella’s discussions of scientific realism centre on narrative consistency. The discussion does not seek to establish the plausibility of magic in the real world, but rather seeks to explore how magic functions within the storyworld. For Ella, these discussions ultimately result in a richer and more nuanced experience of the text.

Ethan and Ella’s responses illustrate how discussions of scientific realism can be an enriching experience. However, discussions of scientific realism do not inevitably enhance the overall experience of a text. As Hannah stated:

I have some friends who really they take the view that if it’s a movie or a TV show or whatever that it’s really just for pure enjoyment so you shouldn’t critically assess it. That’s really a very strong position they have, which is fine. I don’t care if they want to do that, whatever. So we just don’t talk about it, we talk about whether the story was good and that’s equally valid I think.

Of course, evaluating the story in terms of enjoyment is also a form of critical assessment. Discussion and critical assessment still seem to form part of the reception process for Hannah’s friends, but the type of discussion and the detail and focus of the assessment differs. As I described in Section 6.2.1, compatibility of approach can be an important prerequisite for discussing scientific realism. Indeed, even for Ethan, a reader who does value an analytical orientation towards fiction, his preference is for conciliatory discourse rather than finding faults with external realism (cf. Section 6.2.4). In this way, continued engagement through discussion may depend on a compatible understanding of what continued engagement through discussion should entail.
6.2.6 Curiosity

Beyond continued engagement with a storyworld, discourse about scientific realism can also be motivated by curiosity about the real world. The curiosity function of discourse about scientific realism entails learning about established science and technology or making hypotheses and speculations about uncertain or futuristic science and technology. Curiosity can be difficult to define (cf. Kidd & Hayden, 2015). Here I define the curiosity function loosely as any discourse about scientific realism that is motivated by science-related enquiry.

Many participants described how discussing scientific realism was a way to consolidate, challenge, or extend their scientific knowledge:

Sometimes I feel like it’s a little pedantic, like, you know, discussing whether or not something that happened in Doctor Who is, like, goes against the laws of physics is a bit ridiculous, but, you know, they’re fun discussions and, like, you do get to bring a lot to the table. Well you do get to bring a lot of prior knowledge, so it’s a fun way of, you know, seeing how much I know and how much more I want to research. So, you know, they’re good. They’re good. (Riley)

In more general view I would say I would not discuss the correctness of science with people who don’t want to basically learn. Cos you have people who ask the correctness of science and people want to at some point want to understand something [...] If you don’t even ask questions, it’s like, “meh.” So generally I think that these people are not the people who would ask questions and so you would not mainly go towards them with like, “Oh is it scientifically correct or not?” (Caleb)

I hope to find out more. So when we do talk about it I hope to find out and I hope to find out more about the actual science and about how likely the film or the book's depiction of that, you know, scenario is. So I do like to find out, you know, more about what’s really happening in those types of events or those types of pieces of technology in the real world and to imagine what they could do in the future. (Valerie)

Valerie’s allusion to imagining the future connects to the more hypothetical or speculative function of discourse about scientific realism. Beyond assessing whether fictional science is realistic according to current science, it is also possible to ask what might be possible in the future or whether ostensibly unrealistic science could actually be achieved in reality. Isla described how the forensic drama Bones (2005–) depicted what she regarded as an unrealistically fast characterisation of a human skull, but this depiction then prompted her to discuss whether it might actually be possible to characterise a human skull as quickly as the text depicts:
It’s kind of fun like pointing out all these loopholes and then, you know, getting into the kind of nitty gritty of if that did work, how would it work? Like if, you know, the director is actually, you know, hyper-advanced in his science and he somehow knows what is possible, you know how could you look at a skull and be able to tell age, race, and gender—age, race and sex—you know, within thirty seconds of picking it up? So that’s kind of where the conversations tend to lead. It tends to be quite a fun experience actually. It feels good.

Logan described a related experience, highlighting how discussions of scientific realism can serve as a way to “practice” scientific thought:

It’s good practice, I guess. It’s interesting to hypothesise about what could be possible potentially, you know. Interstellar is a great example. You know, you [are] always inevitably talking about the different theories of gravity and whether any of these suggest that it is possible that you could go backwards in time and communicate using, you know, gravitational forces. That’s always interesting because, well, I’m interested in science, that’s why I choose to pursue it. A lot of the time the really serious sciencey stuff, like Interstellar where they did have professionals as part of their team trying to create a balance between good literature and good science, movies that take themselves that seriously often for conversations end [up] being not about the movie anymore. They migrate away to the ideas that the movie uses but manages to [inaudible]. We usually dig our teeth into that because that’s what we love. That’s what we like doing.

In this way, discourse about scientific realism can be a forum for exercising, celebrating, and satisfying scientific curiosity.

For the participants quoted above, learning more about the science underpinning a fictional text represented a positive outcome. However, this was not necessarily the case for other participants. For Nina, learning more about the scientific realism of a text is generally a positive experience. However, her enjoyment or appreciation of a text can be diminished if she discovers that it is unrealistic:

It depends on the film. Like with [Gravity] I kind of just sat on the edge and listened cos I don’t have any great background in physics and so sitting there with someone who’s doing his honours in like high level physics, I find it really interesting cos it’s a point where I can learn cos, you know, it’s something that I watch and just go, “Wow, this is fantastical,” but I don’t know how accurate it is. And to be able to sit there with people who know its accuracy and can sit there and go, “Ok, well this could happen, this wouldn’t happen, or this is just a greater example than what would really happen but the process that they’ve used is correct,” is informative, and I guess it gives me a deeper understanding of it and, you know, in some ways maybe it grates a little bit but it also gives me a deeper appreciation of maybe where the filmmakers have tried to make it accurate or to base it on a concept. Yeah, in reality that concept wouldn’t expand in that way but they’ve tried and I kind of think that’s nice. And of course sometimes it just goes the other way and it just ends up with me going, “I actually enjoyed that film until we started talking about it and now I just feel disappointed and betrayed and I’m never watching that film again.” Yeah. So it can go either way.
Nina’s response highlights how learning more about the science related to a fictional text can risk compromising a reader’s experience or evaluation of the text. In some cases, the risk of a compromised narrative experience outweighs the benefits of scientific curiosity. For example, when Phoebe watched *Interstellar* (2014), which is concerned with Einstein’s theory of general relativity, she “didn’t want to google relativity because [she] didn’t want to ruin the story.” If she did “want to learn about that” she would “learn about it on another day, not after seeing [Interstellar].” The risks of learning too much about the scientific realism of a text were also illustrated by Zara’s experience with *Now You See Me* (2013), a film about a group of magicians involved in a bank robbery:

There was a lot of like magic tricks in *Now You See Me* and I guess those tricks are based on like kind of scientific illusions and stuff, so, I personally, I don’t know. I would like to know how the illusions work in like a scientific way but then I wouldn’t because then that might like have wrecked the way I’ve watched the movie again, cos part of the excitement of the movie is to try and guess how they do the illusions but not being able to know, I guess.

Zara’s experience with *Now You See Me* provides a useful metaphor for thinking about the role of scientific curiosity in the reception of narrative fiction. If fiction is understood as a construct—an illusion—then learning more about fiction’s constructedness (including the flaws in its construction) can shatter the illusion. Isla described how some of her friends are averse to discussing scientific realism for this reason:

Isla: I don’t know honestly how someone without a background in science would view science fiction. I know lots of them are pretty chilled about watching it because I have a few friends who are quite geeky and they watch a lot of science fiction, you know, the old *Alien vs. Predator* and stuff like that. And I’ve watched them and they’re entertaining. They’re not very scientifically valid but they are very entertaining. But the way they watch them, kind of, if I try and have a discussion with them afterwards, they’re very closed off about discussing it, like discussing it’s going to burst their little bubble or something of like the fantasy realm that they’re in. And I think you need a level of understanding to let the conversation stretch that bubble but not necessarily break it. If that makes any sense at all?

JLG: Are you ever concerned about breaking the bubble for yourself?

Isla: (laughs) I think if I manage to break the bubble then whatever I was watching or reading wasn’t good enough. Like that’s kind of, as I watch it, I sort of think about it and analyse it. I mean sometimes I don’t. Sometimes I am just watching a fun funny movie set in space and I don’t think about, you know, how that pod is moving somehow through the space and how there are sounds in space and stuff like that, but, yeah, those tend to be movies I watch with other people as kind of just entertainment. Whereas the ones I watch by myself tend to be as an escapism. So I’m kind of happier to-, the bubble doesn’t really exist for the entertainment ones because I accept that they’re just fluffy and stuff in space,
but for the ones I pick for escapism, they have to be burst proof essentially. And if I pick the wrong one and it bursts then I have to find another one.

There is a hint of condescension in Isla's description of the “little” bubble occupied by her friends who do not have a science background. As I will describe in relation to the competence function below, scientific competence can be associated with a sense of superiority. Nonetheless, the bubble also exists for Isla, at least in her more serious engagements with fiction that she terms escapism. For these escapist texts that she watches alone, the narrative needs to be “burst proof.” If she does manage to break the bubble then the text “wasn’t good enough.” Unlike her friends who fear bursting the bubble, Isla tests the limits of the “bubble” as a way of assessing the quality of a fictional text.

The examples above illustrate how the desire to learn more about scientific realism through discussion can be tempered or overruled by a concern for compromising one’s enjoyment or appreciation of a text. However, curiosity can also be diminished in contexts where learning about or discussing the science related to a text would be too uncomfortable. As Zach stated:

If it’s particularly bad, but there are some examples where like it’s things are either used just very comp-, like, you’re not sure if it’s impossible simply because of like the visual effects that they use. So for example, in The Human Centipede they say, [someone groans]—I know I managed ten minutes—they say that it’s anatomically correct and you’re inclined to believe that simply because of how grotesque the whole science behind it is, but I personally don’t know if it’s possible, like, and you wouldn’t want to know if it’s possible simply because of its subject matter and I think in that sense, some science in films, are, you know, distorted.

Here Zach is referring to The Human Centipede (2009), a horror film about three people who are surgically joined together via their gastrointestinal tracts. Zach’s experience illustrates that beyond a concern for the enjoyment of a text, curiosity about scientific realism can be diminished if the subject matter is too confronting.

As a result, the reception of narrative fiction is an important context for exercising scientific curiosity. However, scientific ignorance can be preferred over scientific knowledge for some readers some of the time. This is consistent with Michael’s (1996) observation that readers may choose to remain ignorant of science. This choice may owe to a perception that science is irrelevant to the issue at hand, a perception that the reader is incapable of learning science, or a perception that it is not the reader’s responsibility to learn science. For example, Michael describes how an electrician at a
nuclear reprocessing plant preferred not to know about the effects of ionising radiation because knowing about radiation was the responsibility of the plant’s health physicists and knowing more might cause them to panic in an emergency. As Smithson (1989, p. 7) notes, ignorance can arise from error (i.e., “being ignorant”) or from irrelevance (i.e., actively “ignoring’). My research highlights how the reception of narrative fiction is a context in which scientific knowledge is sometimes deemed irrelevant in Smithson’s sense. However, I did not explore in detail when science was most likely to be deemed irrelevant. The factors contributing to the irrelevance of science in the reception of narrative fiction warrant further research.

6.2.7 Communication

Various participants described how discourse about scientific realism can be put in the service of science communication. There is no consensus definition of science communication, but for my purposes I will adapt Burns, O’Connor, and Stocklmayer’s (2003) definition:

The use of appropriate skills, media, activities and dialogue to produce one or more of the following responses to science: awareness, including familiarity with new aspects of science; enjoyment or other affective responses (e.g., appreciating science as entertainment or art); interest, as evidenced by voluntary involvement with science or its communication; opinions, the forming, reforming, or confirming of science-related attitudes; [and] understanding of science, its content, processes, and social factors. (p. 191)

I restrict the definition above to the intentional use of skills, media, activities, and dialogue to produce particular responses to science. Without this restriction, any form of discourse about scientific realism might be regarded as science communication. For instance, an incidental discussion of scientific realism among friends at the cinema has the capacity to elicit various responses to science, and in the broadest sense, this could be construed as science communication. To distinguish the communication function of discourse from other functions, especially the curiosity function, I define the science communication function as the intentional use of discourse about scientific realism to elicit a response to science.

In the first instance, fictional texts can serve as a useful reference point for the purposes of communicating scientific concepts in structured communication settings (e.g., public lectures). The idea of using fictional texts as a tool to teach and communicate science is already well-recognised in the literature (e.g., Avraamidou & Osborne, 2009; Negrete &
Lartigue, 2004; Van Riper, 2003, p. 1107). However, this approach was also reflected in the experiences of several participants in this study. Jake, a PhD student in biology, described using an example from *Harry Potter and the Philosopher’s Stone* (2001) to explain the anatomy of snakes to school students:

On the science communication front I find broken science in movies a really good point for jumping off and telling the real science [...] *Harry Potter* is a great point to take generally [to] primary school or secondary school kids because most of them have seen it and I can use that to leverage a science talk. So well, “Have you seen a snake wink?” And they say, “Yes, I saw *Harry Potter* and the snake winks.” Well, “Snakes can’t wink because they don’t have eyelids.” And you can go into the real science. So certainly in that, in the science communication context, I talk about those things to work out strategies to obviously promote a piece of real science that you are talking about.

Charlie similarly endorsed the idea of using fictional texts as a science communication tool:

I’m also using it in presentations which I give to high school kids or college kids, just those beautiful books, public, or commonly known movies which they all adore and love. You just pick them out and make them think for a moment and as they’re, they’re all clever enough to take your point if you just put your finger on it and make them think for a minute and that in fact is a beautiful starter to go into the actual science of it and make them think a bit more deeper and seriously about it. It’s a beautiful vehicle.

In a study investigating how scientists, teachers, and students conceptualise science in fiction, Michael and Carter (2001) describe how, for the scientists and teachers in their sample, narrative fiction seemed to be conceptualised as “an inferior but more exciting source of knowledge. Science is true but boring; [fiction] is less true but exciting” (p. 18). Jake and Charlie’s responses are broadly consistent with this view. Fiction is a useful source of interest and excitement but a flawed source of science. Science communication therefore entails an edifying movement towards real science that uses popular but unrealistic fictional science as its starting point. I will discuss the implications of this practice in Section 6.2.11 below.

Charlie and Jake’s experiences relate to science communication within structured communication settings, such as lectures or school visits. However, discourse about scientific realism can also be directed towards science communication goals in unstructured social settings. Motivated by a concern that unrealistic science in fiction will contribute to public misunderstandings of science, Nina described how she feels a sense of responsibility for correcting scientific inaccuracies in everyday conversation even outside of her role as a professional science communicator:
I’ll sort of go out of my way if someone mentions, “Oh I saw this really cool film and it had this science in it.” If I know it’s incorrect, I’ll be like, “Ok, actually that was a cool film. I really enjoyed this bit, this bit, and this bit, but that bit was actually a bit wrong.” And then I can sort of educate the next person who will then in turn tell five of their friends when they next have a conversation with them. I kind of feel it’s a responsibility if you know the science is wrong if it comes up and someone’s like, “Yeah isn’t this cool?” to be like, “Well that is cool; it would be awesome if we could do it.”

Nina is employed as a science communicator, but this form of unstructured and informal science communication is not in principle limited to professional science communicators or professional scientists. Indeed, as I described earlier in Section 6.2.2, Gabrielle (a science student who does not have a background in science communication) also described a compulsion to correct unrealistic science in the course of her routine responses to fiction.

In the examples above, science communication discourse was directed towards explaining or teaching scientific concepts and principles. However, fictional examples can also be directed towards persuasion. William described this strategy in relation to climate change. Initially, however, he expressed concern that appealing to fiction would compromise his position:

You need hard scientific facts, hard scientific evidence when you’re talking to a climate denialist rather than, “Oh well in this book you could see that there the climate was rising a lot.” But it’s fiction so they might just be like, “Oh this is just more fiction that you’re talking to me about. I don’t need to believe about this.” So yeah, I think that would really be the only person that I wouldn’t talk to [about science in fiction] because they’re already very dismissive of the science and I think the tactic that you need to use when talking to someone like that is showing them the actual hard scientific realities.

William’s concern is not unjustified. During the reception of The Day After Tomorrow (2004), climate sceptics used the film to argue that climate change was just a fiction (cf. Von Burg, 2012; Section 6.1.1). However, after further consideration, William softened his stance:

Although having said that, I’m just thinking because [climate denialists] don’t really relate to much you could try and relate the science fiction, or relate something that they might have read or watched or seen recently, like Interstellar because that does, even Game of Thrones sort of has, I don’t want to spoil anything, but the new Game of Thrones has a bit of a climate, climate change element to it with the White Walkers, they can sort of be seen as an embodiment of a change in climate and pretty much everyone knows about Game of Thrones and watches Game of Thrones. So I guess for me the jury’s still out on whether I would, but I think I probably, if they had watched Game of Thrones I would bring that up and say, “Oh do you realise that Game of Thrones has a bit of a message?”

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Because then you're reaching them at a different level than “here are the scientific facts” that you just get everyday that people would hand you, and they dismiss those anyway. I guess in that sense you would be approaching them from a different level and you could relate to them with something that's fictional but still carries an important political and scientific message about climate change. So I guess the answer to that question would be that there's no, probably nobody I wouldn't have that discussion with because, coming back, even someone like a climate change denialist you could still talk to about something like Game of Thrones.

In the fantasy series Game of Thrones (2011–), the approach of winter is attended by the threat of White Walkers, a powerful army of warriors who march with the reanimated dead among their ranks. William interprets the approaching winter in Game of Thrones as a climate change analogy. For William, Game of Thrones might not involve realistic science but it does express a real socio-scientific thesis. Furthermore, rather than appealing to scientific facts, a popular fictional text presents William with an opportunity to reach his audience on a “different level.” Unlike Jake and Charlie, who used fictional examples in their communication only to delegitimise fiction as a source of science, William contemplates appealing to fiction as a legitimate source of socio-scientific theses. Nevertheless, for William, appealing to fiction ultimately remains a risky strategy, since appeals to fiction are always liable to be dismissed as “just fiction.”

6.2.8 Change

Discourse about scientific realism can also call for changes in the way that fiction is produced. This discourse seeks to shape the reception context of narrative fiction, encouraging authors to make scientifically realistic narratives by critiquing unrealistic science and celebrating realistic science. My research does not assess the actual influence, if any, of this discourse of change. Nonetheless, discourse about scientific realism may function as an attempt to increase the standards of scientific realism in narrative fiction.

Laura was the only participant to characterise her discourse in terms of the change function. For Laura, greater attention to scientific realism would not only lead to more enjoyable fiction but also to more socially responsible fiction:

I think that having correct, making the effort to have correct science in your fiction is important. I know that it's important to me and other people that I've talked to about whether or not they can fully enjoy the media but I also think that if people are putting the incorrect science, people are going to know it, they're going to learn it regardless and I think that we shouldn't be setting up a
precedent of people being allowed to teach people incorrect science. I think you should make the effort to make it correct.

In the case of medical dramas, Laura notes, unrealistic science “could be life threatening.” For Laura, highlighting unrealistic science is a way of holding authors to account: “I think if people don’t go, ‘look, in this movie this is wrong and you need to stop doing this,’ they’ll continue to do it.” As a result, Laura makes a point of correcting scientific inaccuracies in everyday conversation, even with people who she does not know well:

No just in terms of talking to people that I don’t know as well, there might be a conversation we’re having and then there will be this very long tangent of me ranting about something that’s not right, usually in things like Jurassic Park, but I think that if people, makers of the fiction, aren’t going to be bothered making things accurate and having incorrect science, then we should be having conversations about it. We should pull people up on it all the time because I don’t think it’s a good precedent to have.

Elsewhere Laura clarified that she does not expect all science in fiction to be realistic. For example, she described how it would not be possible to “show everything step by step” for a lengthy laboratory procedure (cf. Section 5.4.5). Laura acknowledged there that may be “a reason behind” some forms of unrealistic science, but she cannot tolerate “someone just making up some science or not bothering to research it.” She is not necessarily advocating for absolute scientific realism but for a higher standard of thoughtfulness and responsibility than what she currently perceives in the production of fiction.

Although she did not characterise her own discourse in terms of the change function, Nina echoed Laura by describing a perceived push for greater scientific realism in the production of fiction:

There’s a greater push to improve the accuracy and to improve the content and I think maybe that’s one of the reasons why we’re seeing such a swell in shows that are based in science is because it’s something people don’t feel they have access to. These shows do make [science] accessible and when they look into it more they realise, “Oh no, this is actually a thing and how much cooler is that? It’s not just something they’re making up.” So I think that’s a really positive push that’s going on in, especially in the television and film industries at the moment.

Nina described how television shows like Criminal Minds (2005–) and Bones (2005–) provide audiences with access to scientific ideas that they would not otherwise be exposed to or have access to. Whereas Laura described the importance of holding authors to account for getting fictional science “wrong,” Nina seemed to be referring to
the influence of readers who reward authors for getting fictional science “right.” At least for Nina, there is a discourse of change that she believes is influencing the kinds of films and television shows that are being produced.

For the purposes of this study, it is sufficient to observe, based on Laura’s experience, that discourse about scientific realism can be intended as an influence on the reception context for narrative fiction, and in turn, as an influence on authors. However, it is possible that discourse about scientific realism does have some actual influence in this respect. For example, astrophysicist celebrity Neil deGrasse Tyson is well known for tweeting about the scientific realism of fiction (e.g., Child, 2013; Watercutter, 2013). At the time of writing, Tyson has more than six million followers on Twitter. Furthermore, articles about scientific realism appear even in mainstream news outlets, such as The New York Times (e.g., Keltner & Ekman, 2015) and The Guardian (e.g., Hone, 2016). Kirby (2010a, p. 102) suggests that authors must make a judgement about the potential costs of negative publicity from the scientific community, particularly if they have invested in scientific realism and have promoted a text as scientifically realistic. Kirby uses the example of Finding Nemo (2003), an animated film set on Australia’s Great Barrier Reef. Biologist Adam Summers served as a science consultant throughout the production of the film. As A. Abbott (2004) relates, one of the directors asked Summers about the “one thing the film might get wrong that would really disturb him” (p. 673). Summers replied that it would be intolerable to see kelp, which grows in cold water, growing on a tropical coral reef. This exchange came late in the production process, at which point the film did in fact feature kelp growing on a coral reef. It was too late to remove kelp for the cinematic release; however, the kelp was removed prior to the DVD release. Kirby suggests that this change was made to ward off negative commentary on the film’s scientific realism:

The animators were not being altruistic by correcting this error. They understood that if this mistake was “intolerable” to [Summers] it was likely to be problematic for every marine biologist […] Realism in regard to the animation and the scientific depictions was a major selling point. They were not going to risk the potential box office boost engendered by the scientific community’s good will by including an error that would undercut the film’s other scientific accuracies. (p. 102)

Frank (2003) similarly observes how some authors hire science consultants “because it is the only way to avoid massive negative fan response” (p. 447). In conclusion, discourse

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about scientific realism may have some influence on authors, but the extent of the actual influence of this is discourse is ultimately a question for future research.

6.2.9 Competence

Discourse about scientific realism can serve as an expression of scientific competence (defined as the possession of scientific knowledge and skills). This theme echoes the notion of competence articulated in Lull’s (1980) ethnographic research on television audiences. In impression management terms (E. E. Jones & Pittman, 1982), displays of scientific competence through discourse about scientific realism can be understood as a form of self-promotion. They can also be understood as a performance of social identity (E. E. Jones & Pittman, 1982). In terms of social identity theory (E. E. Jones & Pittman, 1982), discourse about scientific realism can serve as the basis for implicit or explicit intergroup comparisons where observations about scientific realism are perceived to be exclusive to a scientifically competent in-group and beyond the reach of a (real or imagined) scientifically incompetent out-group. In this way, discourse about scientific realism serves to communicate the positive distinctiveness of an individual reader or the scientifically competent social group with which the reader identifies.

Leah explicitly described how discourse about scientific realism supports a sense of belonging in a scientifically competent in-group:

It makes me feel like I learn something about the world and that I’m creating an in-group identity that I’m connecting with somebody else saying, “You know and I know that this is wrong and therefore we can share something.” I think that’s why people communicate in general [...] So in this case, I guess, you know, collectively it’s just sharing in a group that is different from the others, the people that don’t get it, or the show that is stupid, which I’m assuming most shows that have implausible science know that. And I don’t think that most, I think they know that, I think they’re very well aware. So I guess it’s trying to show, I guess, it’s feeling that you’re smarter than everyone else that don’t get it (laughs).

For Leah, a sense of positive distinctiveness comes from being part of a group that can identify “something little in a story that is scientifically wrong but not obvious to everyone.” A similar sense of in-group identification was apparent in Alana’s account of discussing scientific realism with a friend after watching a movie with her family:

[When I discuss scientific realism it is] like, “Ah, I’m not the only one that realised.” Because with me, I’m, I do, like, my family, no-one in my family is very science-oriented. So when I’m at home and we watch a science fiction movie they don’t notice a lot of things and I notice a lot of things and I just and they’re like,
“That’s a good movie.” And I’m like, “No it wasn’t, it really wasn’t.” Cos you notice these little things, these flaws that just eat at you, and you’re like, “Oh no.” So when you find someone that can, that saw the same thing and it bothered them, then yeah, fantastic. It’s like, ok yeah, we have something to talk about. So we can agree that people are just in general not very smart when it comes to these things and that, you know, things need to be done, but how to go about it, you know, that’s something we never really go into.

Alana is differentiated from her not very “science-oriented” family both by her capacity to notice scientific flaws that her family overlooks and by her overall evaluation of the movies that they watch together: her scientific competence manifests itself in a distinctive aesthetic taste. Furthermore, discussing scientific realism with another member of a science literate in-group allows for favourable inter-group comparisons—other people are “not very smart”—and these comparisons further support the perceived distinctiveness of the group to which Alana belongs.

The sense of positive distinctiveness that can arise from discourse about scientific realism was also illustrated in an exchange between Charlie, Jake, and Sebastian (all with science backgrounds). The discussion centred on Isaac Asimov’s three laws of robotics, which were originally set out in Asimov’s fictional short story, “Runaround” (1942). Here humour is used by a scientifically competent in-group to disparage a scientifically naïve out-group:

Charlie: The robot effect is usually that people explain the laws of, the three laws of robotics. They’re part of science right? (Jake laughs). They’ve been set down as laws? And nobody is aware that Asimov was writing them down in one of his early novels, and not a very good one at that.

Sebastian: But he’s a scientist (group laughter).

Charlie: That’s just how it works, right?

Jake: If you call the UN science committee, it’s there. It’s the first set of rules in their books.

Charlie: Exactly.

Although these participants did not self-report a sense of distinctiveness, I interpret their participation in disparaging humour as a form of in-group behaviour (cf. Ferguson & Ford, 2008). As for Alana, there is a sense that scientific competence confers a more discerning aesthetic taste. For Charlie, Asimov’s laws are not a valid basis for actual robotics, nor can their popularity be redeemed by aesthetic merit since the story in which they appeared was “not a very good one.”
Discourse about scientific realism can also assert the positive distinctiveness of an individual reader. As Emma stated:

This is a really horrible thing to say, but [I feel] superior (laughs). Like, I never thought about it until now but I think there is a bit of like, “I recognise that; I bet other people don’t” (laughs). I’m a snob (laughs). [...] It’s not that I particularly care. I think I’m just being a snob: “Did you notice this? I did” (laughs). I’m never seeing a movie with you guys, by the way, because you are all just going to be like, “Ha, you’re being a snob” (laughs).

Whereas in the preceding examples, discourse about scientific realism seemed to be about sharing a sense of superiority with other in-group members, for Emma, discourse about scientific realism functions as a display of her individual superiority. Elsewhere in the discussion, Emma observed how “making snide remarks [...] possibly increases [her] enjoyment of [a movie] and decreases the enjoyment of the person who is sitting with [her].” In this respect, Emma recognises that other readers will not necessarily appreciate her remarks. However, the important thing seems to be how these remarks mark her feel superior even if they do not actually confer superiority.

Other participants also recognised how critiquing science realism can be a way of “showing off” scientific competence, as the following discussion extract illustrates:

JLG: Ok so for those people where you do you have a discussion, why do you think that you discuss it?

Heidi: Because they care normally.

Lily: Yeah, they care. Sometimes it’s almost like they want to show off their scientific knowledge, I feel like, occasionally, especially physics people.

Oscar: I also have witnessed that on a particularly large scale. Every single-

Heidi: They want to show they know science better than the movie, so they’ll tell you, yeah.

Lily: “We spent a couple of grand for a good reason, so we can spot the plot holes in science films.”

Heidi: Where else would you use it? (laughs).

Lily: Also for the humour aspect I guess. They just want to poke holes in it just for fun. Just because they can.

Lily and Heidi, both science students, distance themselves from readers who earnestly critique scientific realism. The tone here is almost aloof; such behaviour seems to be beneath them. Lily and Heidi deride those readers who critique fictional science, but by joking about the value of a science degree, their humour is also self-deprecating. This
self-deprecation seems to further elevate them above those readers who engage in impassioned critiques of scientific realism. Discourse about scientific realism may be a way of reinforcing the positive distinctiveness of a scientifically competent in-group when compared to a relevant out-group, but this behaviour does not necessarily translate to positiveness distinctiveness within a scientifically competent peer group.

So far I have described how discourse about scientific realism can assert the positive distinctiveness of a scientifically competent social group with respect to a relatively incompetent out-group. I have also noted how this same discourse is not necessarily a guarantee of status within a scientifically competent peer group. However, discourse about scientific realism can also confer positive distinctiveness to individuals within friendship groups that are not formed on the basis of a shared interest in science. Both Leo and Harriet described how they occupy valued roles in their friendship groups through being the “science person” to whom others can turn with their science questions:

I get, because science is kind of what I do, in my friendship circle, if someone does have a thing of, “Oh I went and saw this movie and they did this. Is that even vaguely plausible?” And I will, you know, and so we’ll talk about it. Rather than googling it they will bring me the question because, you know, they know that I can answer that sort of question most of the time and occasionally I’ll mention things of, you know, “Ooh they actually got that bit right,” and you know, “No, that’s completely wrong.” Normally I will only mention it myself if it was particularly significant one way or the other. (Leo)

Some of my friends go to me, like we watch TV sometimes, and they know I’m like the science person, cos they all do, my main group no-one really does science except another person, but she’s not into like biology or anything. So they’ll ask me stuff like, “Oh is this actually true?” Or, “I don’t understand this part in the movie, like I really don’t get it.” When we watched Interstellar I had lots of questions that I didn’t know how to answer them, which was awful, but mainly yeah most people won’t know the answers anyway [...] I don’t have a problem with it or anything. It’s kind of cool that they come up to me and they ask me cos I have no idea, and they wanna know more, but in a way I am kind of forced to learn more about it too, because to explain it to someone you kind of have to know even more than what you explain to have an understanding. So in a way I’m kind of like, ok cool, you want to know actually what happens, so I don’t have a problem with that. And you’re just like interested in it. So yeah, it’s ok. (Harriet)

Although differing in their confidence with respect to knowing the answers, both Leo and Harriet are valued in their friendship groups as a source of science information, or at least as a source of science-based conversation. Discourse about science realism does not seem to be functioning for Leo and Harriet as a form of in-group behaviour or as a form
of “showing off.” Nonetheless, Leo and Harriet both achieve positive distinctiveness within their friendship groups through their valued role as the “science person.” Even if their friends do not share a science identity, Leo and Harriet’s distinctive science identities are nevertheless valued within their friendship groups.

With the exception of the focus group exchange about Asimov’s laws of robotics, the participants quoted above demonstrated self-awareness with respect to how discourse about scientific realism communicates scientific competence, thereby imparting them with a sense of perceived positive distinctiveness. In principle, however, discourse about scientific realism can communicate scientific competence even in the absence of intentionality. Furthermore, whether it is deployed strategically or unconsciously, discourse about scientific realism is not inevitably interpreted as a positive reflection of scientific competence. As I described in Section 6.2.1, discourse about scientific realism may inadvertently communicate undesirable traits, such as obsessiveness, closed-mindedness, or social awkwardness. As a result, displays of scientific competence through discourse about scientific realism do not necessarily confer positive distinctiveness in the eyes of other readers even if the readers who are engaged in this discourse believe themselves to be positively distinct.

In closing, it is worth noting that although I reviewed Bourdieu’s work in the introduction to this chapter (cf. Section 6.1.3), I have ultimately situated the competence function within a social psychological framework. This is not to say that a Bourdieusian framework is inappropriate for understanding discourse about scientific realism. As I suggested in Section 6.1.3, scientific competence might be seen as a form of embodied cultural capital that is valued (or potentially valued) within the field of class relations, the field of scientific research, or (in particular) the fields of nerd culture and science fandom, assuming for a moment that science fandom is a field in its own right. However, my empirical data ultimately add little to what I already suggested in my literature review. Ultimately my study was not designed as a field analysis. For Bourdieu at least, a field analysis should first situate the field of study within the field of power (i.e., the most abstract form of field that is divided along axes of economic and cultural capital), before mapping the objective positions within the field and analysing the habitus (i.e., socialised ways of thinking and behaving) of the agents within the field (Bourdieu & Wacquant, 1992, pp. 104–105). A rigorous field analysis is beyond the scope of my research, though my results suggest that such an analysis may be a fruitful direction for future work in this area.
6.2.10 Connection

The connection function of discourse relates to how mutually enjoyable discussions of scientific realism can contribute to a sense of perceived bonding between readers, perhaps especially among members of “sciencey” or “nerdy” social groups. Discourse about scientific realism can highlight shared characteristics that serve as a basis for establishing and maintaining social relationships. The connection function is an extension of the other functions of discourse that I have described above. Connection can in principle arise through shared catharsis, shared curiosity, shared competence, shared critique, and so forth. In this respect, the connection function is consistent with social psychological research that highlights how similarity is a predictor of interpersonal attraction (Montoya, Horton, & Kirchner, 2008).

Laura described the connection function of discourse about scientific realism explicitly:

In particular classes, particular science classes, certain fiction pops up in those classes. And you go, “You know that movie that we just watched that’s got some aspect of geology in it and it’s all wrong? Let’s have this big argument about why it’s wrong,” which I think is fun. You bond with people and you can hash out things that might be bothering you about it. Even though it doesn’t change the fact that they got that thing wrong in [The Core], or something, I think it makes you feel a bit better about it.

Here Laura highlights how discussing (indeed debating) scientific realism leads to bonding with other science students. This discourse provides a forum for shared catharsis because “you can hash out things that might be bothering you.” It also provides a forum for exercising shared scientific interests and competences by having a “big argument about why [the text is] wrong.”

Isla also described how discourse about scientific realism can support social relationships. For Isla, a biology undergraduate student, critiquing the forensic drama Bones (2005) is a form of bonding with her friend who is studying psychology:

Anyway, so we’ll be watching [Bones] and she’ll comment on the inaccuracies of the psychology part and I’ll comment on the inaccuracies of the biology part. So that sort of, it’s almost a bonding exercise, laughing at the forced realism and all that kind of stuff [...] I suppose it’s a little bit like, like disparaging a third party or something. You kind of sit there and you’re both agreeing but you’re both disagreeing with something else at the same time. And it’s just kind of, it’s you versus, you know, whatever you’re disagreeing with. So it kind of, if you’re both on the same side of the fence, I don’t know, it just feels “bondy,” if that’s a word. Yeah, so it is fun.
Isla’s experience is consistent with social psychological research that demonstrates how shared attitudes can be conducive to interpersonal attraction (Montoya et al., 2008). There is also some evidence to suggest that sharing a negative attitude can be more influential on interpersonal attraction than sharing a positive attitude, though this may only be true for weakly held attitudes (Bosson, Johnson, Niederhoffer, & Swann, 2006; Weaver & Bosson, 2011). In any case, Isla illustrates how a shared critique can serve as the basis of social connection. Indeed, this critique might also be interpreted as an implicit display of shared scientific competence.

In closing, it is important to emphasise that the fulfilment of the connection function likely depends on a mutually enjoyable discussion. As I described in Section 6.2.1, not all discussions of scientific realism are successful in this regard. Some can lead to too little engagement in the form of disinterest or dismissal; others can lead to too much engagement in the form of hostile debate or alienating enthusiasm. A sense of connection therefore depends on a compatible discussion partner.

6.2.11 Credibility, Control, and Concern

The discourse functions described above were self-reported by one or more participants. In this section, I will outline how the self-reported functions identified in this study are compatible with latent functions that I call credibility, control, and concern. These latent functions were first identified in the science communication research that I reviewed in Section 6.1.1 (e.g., S. A. Cole, 2015; Kitzinger, 2010; Mellor, 2003; Michael & Carter, 2001; Von Burg, 2005).

In the first instance, discourse about scientific realism asserts and maintains the epistemic authority of scientists (the credibility function). As I described above, the communication function of discourse characteristically involves a movement from fictional science to real science. The curiosity function involves an analogous movement. Fiction may arouse curiosity but curiosity can only be properly satisfied through reference to a scientific source, typically a scientist or science literate friend. In this way, the epistemic claims made or implied by fiction are verified through reference to scientists, and this process of consultation and communication implicitly maintains the epistemic authority of scientists. This authority is further assured through the critique function of discourse, which serves to directly undermine the authority of fiction as a scientific source. Scientists may compete among themselves for scientific authority through discourse about scientific realism, but as Gieryn (1999) observes, debates over
the nature of real science only serve to consolidate science’s epistemic authority. While readers debate who can legitimately claim scientific authority, scientific authority itself is not only uncontested but further consolidated by the contest to possess it.

By highlighting the credibility function of discourse about scientific realism, I am not suggesting that fiction should be regarded as an authoritative source of scientific information or that readers of narrative fiction should not consult scientists for scientific information, though as I noted in Section 6.1.1, the epistemic claims of fiction are not inevitably false by virtue of first appearing in fiction. What I do wish to emphasise, however, is how discourse about scientific realism benefits scientists by implicitly maintaining the epistemic authority of scientists over authors (and readers) of narrative fiction. As Gieryn (1999) argues, science does not accrue epistemic authority by default. Instead, epistemic authority must be asserted and re-asserted through rhetoric. Discourse about scientific realism forms part of this rhetorical process.

However, discourse about scientific realism can represent more than just an assertion of epistemic authority. As the critique function illustrates, discourse about scientific realism can be used to critique fiction that is ideologically incongruent with the reader. As Von Burg (2005) has argued, critiques of scientific realism can be used to delegitimise works of narrative fiction, and in turn, minimise their contribution to public discourse. In principle, this practice can occur even when the validity of a narrative’s thesis is not reducible to the scientific realism of the narrative from which it is derived. In this respect, discourse about scientific realism can represent a form of social control (the control function) by attempting to exclude authors of narrative fiction (and the values and publics they represent) from public discussions about science and technology.

Beyond asserting credibility or control, discourse about scientific realism might also serve to propagate concern about media effects (the concern function). As I discussed in Chapter 4, concerns about media effects were one of the major reasons why participants cared about scientific realism in fiction. If discourse about scientific realism involves the expression of media effects concerns, it may serve to amplify those same concerns, thereby contributing to the tendency to blame fiction as the root cause of public reservations about science—what Kitzinger (2010) calls the “sci-fi alibi.”

Of the latent functions described in this section, the concern function is the most tentative. The propagation of media effects concerns through discourse about scientific realism depends on such concerns being explicitly articulated or implied as part of
commentary on scientific realism. Although concern over media effects was a common reason why scientific realism was important to participants in my sample, it is unclear to what extent media effects concerns are routinely expressed in everyday discourse. The prevalence of media effects concerns in mediated forms of discourse (e.g., blogs, newspapers, or Youtube videos) is unclear and can only be properly established through an appropriate content analysis. Nevertheless, to the extent that discourse about scientific realism is sometimes accompanied by concerns about powerful media effects, it may serve to perpetuate those same concerns.

6.3 Discussion

6.3.1 Theoretical saturation

In this section I reflect on the extent to which I have reached theoretical saturation with respect to the research question of this chapter. As I described in Chapter 3, I define theoretical saturation as the point at which I have accounted for the major themes relevant to my research question and described those themes in suitable detail.

In addition to identifying themes that were not emphasised in the literature that I reviewed (e.g., catharsis, curiosity, and connection), the themes that I identified in participant responses account for the themes suggested by my literature review. This is a tentative indication of saturation with respect to the total number of themes identified, but there remains scope to learn more about individual themes. In relation to the curiosity function, I did not characterise when readers are most likely to eschew scientific curiosity in favour of scientific ignorance. In addition, it may be possible to further investigate the competence function in terms of a Bourdieusian field analysis. Finally, only one participant articulated the change function. My account of the change function would likely benefit from interviewing additional readers who see themselves as shaping the reception context of narrative fiction.

It is worth noting that there are other themes that I considered during the course of my analysis, but I did not ultimately regard them as distinct themes. For example, many participants described how discussing scientific realism can be fun or enjoyable. However, to say that readers discuss scientific realism because it is fun ultimately says very little because it does not explain why it is fun. On closer inspection, attributions of fun and enjoyment seemed to stem from other more fundamental functions. For example, discourse about scientific realism can be enjoyable if the reader regards
learning about science as fun, but this sense of enjoyment is not sufficiently distinct from the curiosity function. Similarly, discourse about scientific realism might be characterised as a form of complaining. Yet, as Kowalski (1996) notes, complaining can serve multiple functions, including catharsis and self-presentation. Like fun, I do not regard complaining as a distinct function of discourse because complaints about unrealistic science ultimately serve more fundamental functions, such as relieving negative emotions (catharsis function) or displaying scientific competence (competence function). Humour similarly fails to distinguish itself from other more fundamental functions (Martin, 2007).

6.3.2 Generalisability

As in previous chapters, it is possible to discuss generalisability in two respects. First, to what extent do the themes identified in my analysis generalise to readers outside of my sample? Second, to what extent do the themes identified in my analysis generalise to other forms of realism?

In the first instance, it is important to recognise that even within my sample, the functions of discourse that I have described are of varying relevance to individual readers. For example, the competence function presupposes a degree of self-assessed expertise in science. Discourse about scientific realism is unlikely to serve a competence function for readers who regard themselves as incompetent in science. Furthermore, although any discussion of scientific realism can represent a form of continued engagement, the continued engagement function may be more important for fans of a fictional text than incidental readers. Thus, there seems to be little reason why the themes that I have identified in this chapter would not generalise to readers outside of my sample, bearing in mind that some functions are already associated with particular kinds of readers.

The question of generalising my results to other forms of realism is more complex. Most of the self-reported functions seem to represent fundamental forms of response that are likely to be at work in other contexts, though the change function may be limited to forms of realism, such as historical realism, where readers perceive a sense of both authorial neglect and social responsibility. The latent functions of discourse (i.e., credibility, control, and concern) seem especially relevant to science, though they may generalise to other professions or disciplines that seek to maintain epistemic authority with respect to a given knowledge domain. Again, historical realism may be relevant in
this respect. Indeed, historian Inga Clendinnen (2006) once expressed concern that in Australia novelists are trying to usurp the role of historians:

Novelists writing on historical topics and historians writing history used to jog along their adjacent paths reasonably companionably. More recently [...] novelists have been doing their best to bump historians off the track. It seems that they have decided it is for them to write the history of [Australia], and to admonish and nurture its soul. (p. 16)

Discourse about historical realism might similarly serve to assert and maintain the epistemic authority of historians, assert control over who can speak legitimately about history, and exacerbate concerns about the effects of unrealistic historical fictions, though of course, the actual generalisibility of my findings to the context of historical realism can only be properly assessed through additional research.

6.3.3 The risks and benefits of discourse about scientific realism

The participant responses explored in this chapter highlight the multifaceted nature of discourse about scientific realism. Talking about the realism of science in fiction means different things to different people in different contexts. What becomes clear from my research is that participation in discourse about scientific realism is not limited to scientists, though scientists are some of the most active and purposeful participants in this discourse and potentially its greatest beneficiaries.

Echoing my findings in Chapter 4, discourse about scientific realism can be an ordinary part of responding to narrative fiction, especially science themed fiction. Narrative texts can arouse readers' scientific curiosity, and readers may discuss the scientific realism of a narrative even if they do not have a scientific background or a strong affinity for science. Although my research does not provide a basis for understanding the prevalence of such discussions, this finding is a reminder to science communication scholars that popular culture is an important context where non-scientists may encounter and discuss scientific concepts and issues.

Discourse about scientific realism is also relevant to fans of narrative texts. Fans may discuss scientific realism to critique a narrative that has failed to meet their expectations. Alternatively, they may discuss scientific realism to disarm such critiques by resolving apparent inconsistencies in the story world. In either case, discourse about scientific realism can represent a form of continued engagement with a story world, extending and
enriching the fan experience beyond reading the text itself. In this respect, discourse about scientific realism forms part of a wider set of fan discourses and practices.

Beyond readers who value a specific narrative text, discourse about scientific realism is also important to readers who value science. Scientific competence is a valued attribute in the related contexts of nerd culture and science fandom. Discourse about scientific realism is a way to communicate scientific competence, highlighting the positive distinctiveness of scientific in-groups and reinforcing social connections between science-valuing readers. However, the role of scientific competence in fulfilling these functions places important limits on the inclusivity of discourse about scientific realism. Indeed, some of the pleasures of discussing scientific realism are derived from the exclusivity of the discourse. Especially in its more esoteric forms, discourse about scientific realism—as a form of critique, as a communication tool, as an expression of positive distinctiveness, or as a basis of social connection—is closed off to readers who do not characterise themselves as scientifically competent.

Discourse about scientific realism has benefits and pleasures but it also presents social risks. Discussing scientific realism may lead to a perception of being too nerdy (in the most negative sense of the word), too pedantic, or too closed-minded. Being nerdy or sciencey is safest and most productive around other readers who exhibit a compatible degree of nerdiness or scienceyness. For scientists who use discourse about scientific realism to achieve their communication goals, their efforts may be undercut if their audience perceives them as cold and unimaginative (I will discuss this issue more fully in Section 7.3). Whatever benefits may be associated with discourse about scientific realism, the decision to engage in this discourse is also influenced by an assessment of the perceived risks.

Just as there are risks and benefits for individual readers, discourse about scientific realism may make both positive and negative contributions to public discourse at large. In many cases, discourse about scientific realism is likely to be a positive contribution to public discourse, especially if it serves as an accessible and engaging platform to discuss scientific topics with diverse social groups. It is also important to recognise the extent to which scientific culture is coterminous with popular culture. Discussing scientific realism is in many ways an ordinary aspect of discussing narrative fiction, especially science-themed fiction. However, discourse about scientific realism is more likely to impoverish public discourse if it is used only as a crude tool to delegitimise public
concerns about science or constrain who can participate in public discourse about socio-scientific issues.

In conclusion, discourse about scientific realism is about more than pedantry, though it can certainly be perceived as such. My main contribution in this chapter is highlighting how discourse about scientific realism serves multiple functions for diverse readers. Any reader can participate in and benefit from discourse about scientific realism. However, the benefits and rhetorical affordances of this discourse are ultimately most accessible to readers with self-assessed scientific competence.

6.4 Summary

In this chapter I answered my third research question: What are the functions of discourse about scientific realism? I identified nine self-reported functions, including catharsis, critique, conciliation, continued engagement, curiosity, communication, change, competence, and connection. These self-reported functions underpin three latent functions of discourse identified by previous research, namely credibility, control, and concern. Discourse about scientific realism performs diverse functions for diverse readers, though it is likely to be of the greatest utility to readers with self-assessed scientific competence.

In the next and final chapter of this thesis, I summarise the key findings and limitations of this study and outline the implications of my findings for science communication practice.
7. Conclusion

In this chapter I summarise the key findings of this study and describe its contribution to science communication and audience reception research. I then restate the major limitations of my study before describing the implications of my findings for science communication practitioners and highlighting directions for further research.

7.1 Key findings and contributions

Although various studies have investigated unrealistic science in fiction from a media effects perspective (e.g., Barnett et al., 2012; Lowe et al., 2006), this thesis is (to the best of my knowledge) the first participant-based study dedicated to how audiences discuss and evaluate unrealistic science in fiction. My aim was to answer three research questions: (1) Why is the realism of science in narrative fiction important to some readers? (2) When is unrealistic science most likely to affect the aesthetic evaluation of narrative fiction? and (3) What are the functions of discourse about the realism of science in fiction? I answered these questions based on interview and focus group responses from 55 participants who demonstrated an interest in science, fiction, or both.

In relation to my first research question, participants reported scientific realism to be personally important for its effects on the narrative experience, its effects on perceived authorial respect for science and the reader, its potential persuasive effects on other readers, and its relevance to assessing narrative as rhetorical communication. Participant responses highlight how scientific realism can be an ordinary part of engaging with science-themed fiction for any reader and a deeply personal concern for readers who value science. These findings provide a basis for understanding concerns with scientific realism as something more than mere pedantry.

The importance of scientific realism for the narrative experience is consistent with narrative comprehension research where unrealistic elements can make it more difficult for readers to construct a coherent situation model of a story (e.g., Busselle & Bilandzic, 2008; Graesser, Olde, & Klettke, 2002). Participant concerns with media effects echo popular commentary where fiction is perceived as both a positive and negative influence on the public (e.g., Greenbaum, 2008; Milburn, 2010). Consistent with the third person effect (Davison, 1983), negative effects were mostly perceived to happen to other people, and consistent with the observation that media effects concerns depend on a more
vulnerable “other” (Gauntlett, 2001), these concerns seemed most salient among participants with a science background and an insulating sense of scientific competence. The importance of scientific realism for rhetorical evaluation, as suggested by the narrative communication paradigm (W. R. Fisher, 1987) and story appraisal theory (C. R. Berger et al., 2016), was only explicitly highlighted by one participant, possibly suggesting that participants conceptualised narrative fiction primarily as entertainment rather than rhetorical communication. I am not aware of previous research highlighting the importance of realism for perceived authorial respect for science and the reader. This theme is a novel contribution of my research and illustrates how readers may interpret scientific realism as a signifier of authorial values.

In relation to my second research question, participant responses suggest that the aesthetic acceptability of unrealistic science depends on four overarching principles of aesthetic evaluation: subservience (unrealistic science is acceptable because it is subservient to the narrative’s aesthetic goals), satisfaction (unrealistic science is acceptable because the narrative is aesthetically or ideologically satisfying), salience (unrealistic science is acceptable because it is unimportant to the narrative or to the reader), and severity (unrealistic science is acceptable because it is an understandable or innocuous error). These four overarching principles are underpinned by various lower-order principles of aesthetic evaluation. The framework of evaluative principles described in this study catalogues a set of evaluative “moves” that readers can deploy when responding to unrealistic science and serves as a tentative guide to when unrealistic science is likely to be aesthetically acceptable.

Various scholars dating back to Aristotle have examined the aesthetic acceptability of unrealistic elements from a theoretical or prescriptive perspective (e.g., Hazlett & Uidhir, 2011; Mole, 2009; Richter, 2005; Ricks, 1996; Rowe, 1997; Ryan, 2009). However, none of these scholars conducted empirical audience research to investigate the extent to which other readers supported their ideas. In addition to identifying novel principles (i.e., formal constraints, aesthetic fulfilment, and harmful effects), my research shows how many of the principles of aesthetic evaluation described in existing theoretical and prescriptive accounts are also at work for contemporary readers in their responses to unrealistic science in fiction. My study contributes to reception research by synthesising previous theoretical studies and introducing a consolidated empirically-based framework for understanding how readers evaluate unrealistic elements in fiction. As Ryan (2009) notes, narrative fiction is often characterised by a tension between realism and the
“tellability of extraordinary events” (p. 72). The principles of aesthetic evaluation described in this study provide a foundation for understanding how readers navigate this tension.

In relation to my third research question, discourse about the realism of science in fiction served nine self-reported functions, including catharsis, critique, conciliation, continued engagement, curiosity, communication, change, competence, and connection. These self-reported functions underpin three latent discourse functions identified in previous research. Discourse about the realism of science in fiction is a form of boundary work that not only maintains the epistemic authority of scientists (i.e., the credibility function) but also asserts control over public discourse about socio-scientific issues (i.e., the control function). Furthermore, by highlighting media effects concerns, this discourse may perpetuate and legitimise the practice of blaming fiction for public opposition to science and technology (i.e., the concern function). The framework of discourse functions introduced in this study highlights how discourse about scientific realism serves multiple functions for diverse readers. Any reader can participate in and benefit from discourse about scientific realism. However, the benefits and rhetorical affordances of this discourse are ultimately most accessible to readers with self-assessed scientific competence.

The credibility, control, and concern functions of discourse were first identified in previous studies (e.g., S. A. Cole, 2015; Kitzinger, 2010; Mellor, 2003; Michael & Carter, 2001; Von Burg, 2005). Although these studies capture the big-picture rhetorical processes at work in the way scientists talk about science in fiction, they do not provide an account of what motivates discourse about scientific realism in everyday contexts of reception. My research contributes to the field of science communication by providing such an account and linking everyday discourse to the big-picture rhetorical processes identified previously. Some of the self-reported “everyday” discourse functions that I describe have parallels in previous research, such as Lull’s (1980) research on television audiences (competence), Jenkins’ (1992) research on fan practices (conciliation and continued engagement), and Von Burg’s (2005) research on the reception of science-themed films (critique). However, prior to this study, potential insights into the everyday functions of discourse about scientific realism have existed in disparate forms of research, much of which is not directly concerned with scientific realism or science communication. My study therefore contributes to science communication research by providing a dedicated empirically-based framework for understanding the functions of
discourse about scientific realism. My study also contributes to reception research by providing a preliminary framework for understanding the functions of discourse about unrealistic elements in general, though the change function may only transfer to contexts where readers perceive a need for greater socially responsible realism, and the credibility, control, and concern functions may only transfer to domains of epistemic and social contest.

When taken together, the frameworks introduced in this study for how readers evaluate and discuss unrealistic elements in fiction affirm that responses to realism, aesthetics, and ideology are inextricably related. In the context of narrative theory, Phelan and Rabinowitz (2012) have previously observed that mimetic responses (i.e., relating to realism), thematic responses (i.e., relating to theme and thesis), and synthetic responses (i.e., relating to narrative as a construct) are interrelated (for similar observations, cf. Phelan, 2008). However, in the context of empirical audience research, the interrelatedness of different forms of reader response has been underemphasised. Based on a synthesis of various reception models, Michelle (2007) distinguishes between four modes of reader response: transparent (text as life), referential (text as like life), mediated (text as production), and discursive (text as thesis). Although Michelle acknowledges that readers may move between these modes, she underemphasises their fundamental interrelatedness. Consistent with my review of the literature, my empirical findings highlight how a text often must be sufficiently “like life” in the storyworld (referential mode) to be engaged with as “life” in the storyworld (transparent mode). Furthermore, recognising the constraints of text as a production (mediated mode) is one way of conferring aesthetic acceptability to texts that fail to be sufficiently “like life” in the storyworld (referential mode). Finally, when a text is ideologically incongruent (discursive mode), the text’s failure to be “like life” (referential mode) can be mobilised as a rhetorical tool to undermine the narrative’s thesis, irrespective of whether the text’s unrealistic elements are relevant to the text’s thesis based on normative criteria.

In summary, the main contribution of my research is the introduction of novel frameworks for understanding how readers evaluate and discuss unrealistic elements in narrative fiction. These frameworks provide a new foundation for any scholarly research that seeks to categorise, interpret, and understand reader responses to unrealistic elements in fiction, particularly unrealistic science in fiction. In Section 7.3 below, I describe the implications of these frameworks for science communication practice. However, first it is important to highlight some of the limitations of this study.
7.2 Limitations

This thesis reports on an exploratory qualitative research study using generic purposive sampling. Given that I did not use a probability sampling method and given that semi-structured interviews and focus group discussions do not lead to reliable “counts” of themes, my study is not a rigorous basis for estimating the relative frequency of the themes that I have described (cf. Chapter 1; Chapter 3).

Furthermore, my sample consisted of tertiary-educated participants, largely from a science background. I did not collect data about participant reading habits or their pre-tertiary education in aesthetics, making it difficult to conclude how much informal or pre-tertiary learning these participants might have in the aesthetics of narrative fiction. However, by virtue of volunteering to participate in a study about fiction, participants demonstrated a non-trivial level of interest in narrative fiction, which may suggest higher levels of aesthetic literacy than typical readers. My findings may have limited transferability to readers with more or (in particular) less aesthetic literacy than the participants in this study.

Although the majority of participants in this study had a science background, I do not regard this as a major limitation, since the objective of my research was to understand the experiences of readers who care to some extent about the realism of science in fiction, and scientists are an important group in this respect. Nevertheless, it is possible that recruiting more non-scientists would provide additional insights into how discourse about scientific realism is perceived and used by non-scientists.

For the most part, participants in this study volunteered examples from film and television to support their responses. This is understandable given the popularity of these media. In a focus group context, widely known texts are more likely to be familiar to other participants and are more likely to engender discussion. Given the relevance of my results to story rather than narrative discourse (cf. Section 1.4), I argue that the findings of this study are likely to generalise across narrative media. Nevertheless, it is possible that research focussing on other forms of narrative fiction, such as novels, comics, and games, may offer additional insights. This is particularly pertinent for understanding how conventions of narrative discourse may shape the narrative contract (cf. Chapter 5).
Finally, interpreting participant responses in relation to the aesthetic evaluation of unrealistic elements can sometimes be complex. Member checks (e.g., Mays & Pope, 2000) are worth considering for future research in this area. I also suggest asking participants explicitly about how they conceptualise storyworlds, particularly with respect to the ontology of the storyworld (cf. Chapter 2; Chapter 5). Although not always necessary, understanding readers’ assumptions about storyworlds can provide helpful context for interpreting responses that relate to narrative consistency and the narrative contract.

7.3 Implications for science communication practice

The results of my research have several implications for science communication practice. First, my findings with the respect to the aesthetic acceptability of unrealistic science may serve as a guide to decisions about scientific realism during the production of narrative fiction. Second, my findings with respect to the functions of discourse about scientific realism can inform the practices of science communicators who use fictional examples in their communication activities.

As I described in Chapter 5, my research cannot reliably predict aesthetic acceptability because it is not always clear which principle of aesthetic evaluation will take precedence when two or more principles come into conflict. Furthermore, as I described in Chapter 6, even if there are normative principles of aesthetic evaluation, readers may still object to unrealistic science for social reasons, such as displaying scientific competence. It is ultimately impossible to insulate a text from criticism. Indeed, what counts as realistic may also be contested. Nevertheless, the principles of aesthetic evaluation outlined in Chapter 5 may serve as a tentative guide to what represents more or less acceptable forms of unrealistic science. These principles are relevant to both authors of narrative fiction and science consultants who wish to influence authors of narrative fiction.

Kirby’s (2010a, p. 101) research on science consultants working in film production suggests that some filmmakers are primarily concerned with producing fiction that the majority of the audience will perceive as realistic. In this respect, filmmakers may be more interested in what readers will perceive as unrealistic rather than how they might evaluate it once it has been perceived as unrealistic. However, since expert commentary on scientific realism appears even in mainstream news outlets, it may no longer be feasible to assume that unrealistic science will escape the attention of the general reader. If unrealistic science is necessary to a work of fiction and it is no longer possible to
assume that readers will be unaware of it, the emphasis for the author must shift from what the reader will notice to what the reader will perceive as aesthetically acceptable.

Kirby’s (2003a, 2010a, 2010b) research on science consultants also highlights how fiction can be used as a communication tool. By acting as a science consultant, a scientist may promote their ideas in popular culture and build support for their work not just among the general public but also in the scientific community. However, Kirby also illustrates how the science in a work of fiction is the result of a process of negotiation between the science consultant and the author. If a scientist is to be influential in these negotiations, they must make a case for not only what is scientifically realistic but also what is aesthetically meritorious. In this way, the principles of aesthetic evaluation outlined in this chapter may help scientists to negotiate with authors. A successful negotiation not only furthers the scientist’s personal communication goals but also contributes to the shared goal of producing a satisfying work of fiction.

Science communicators also use fictional examples to communicate science in contexts such as public lectures, panel discussions, and blog posts. My research on discourse about scientific realism highlights some of the risks that may be associated with this form of science communication. The discourse functions that I described in Chapter 6 are interrelated. Indeed, discourse about scientific realism is not necessarily interpreted in the way that it is intended. As a result, a science communication activity (e.g., a public lecture) that is intended as a discourse of science communication might be perceived as a discourse of critique. Also as I described in Chapter 6, discourse about scientific realism may inadvertently communicate negative traits, such as obsessiveness and closed-mindedness. Demonstrations of competence can be accompanied by a diminished sense of warmth (e.g., Judd et al., 2005). In this way, science communicators who use fictional examples may risk alienating their audience if their science communication is perceived as a critique of a text that their audience values. Critiquing unrealistic science in fiction might also come at the expense of the communicator’s perceived warmth.

Fortunately, however, it is possible to suggest some strategies that may attenuate the risks described above. To avoid science communication being misrecognised as a form of critique, it may be beneficial for a communicator to establish that they are a fan of the text that they are discussing. This means highlighting what they value about the text (scientifically and aesthetically) rather than just describing why the science in the text is
unrealistic. Of course, if the target audience of the communication is opposed to a fictional text, then amplifying the perception of critique may be a more appropriate strategy. To avoid appearing as unimaginative and literal-minded, it might be beneficial for communicators to demonstrate their familiarity with the principles of aesthetic evaluation that I described in Chapter 5. For example, if a science communicator is explaining the science of a fictional narrative that is not aesthetically committed to realism, it may be beneficial to demonstrate their awareness of the narrative contract. These are suggestions implied by my research. However, as I will describe in Section 7.4 below, the reception of fiction-based science communication activities is an avenue for further research. Such research could investigate whether the risks I have identified are significant, and if so, whether the strategies I have suggested for attenuating those risks are effective.

7.4 Directions for further research

Throughout this thesis I have highlighted various areas where there is scope for additional research. In this section I review some of the most pertinent questions that my research raises.

To what extent are the findings of this study generalisable to other readers and other forms of realism? In each of my results chapters, I have commented on the transferability of my findings to other forms of realism or realism in general. However, this is ultimately a question for further research. Of particular interest is how a study framed in terms of generic realism might identify additional lower order principles of aesthetic evaluation that may have been overlooked by my focus on scientific realism. Furthermore, there is also scope to investigate how literacy in the aesthetics of narrative fiction (acquired formally or informally) may influence the ways in which readers articulate and emphasise principles of aesthetic evaluation.

How do readers establish the precedence of principles of aesthetic evaluation when these principles come into conflict? My results do not provide a clear basis for identifying which principles of aesthetic evaluation are most influential or prevalent. Investigating how readers rank these principles would provide a clearer guide to authors of narrative fiction about what represents acceptable or unacceptable forms of unrealistic science, though as I noted in Section 5.5.4, it is important to recognise that principles of aesthetic evaluation are ultimately a rhetorical resource that readers can pick and choose
depending on whether they wish to critique or defend the unrealistic elements in a narrative.

What are the most common functions of discourse about scientific realism? In Chapter 6, I described various functions of discourse about scientific realism; however, it is unclear which of these functions is the most common in general or the most common among specific groups of readers. The relative importance or frequency of self-reported functions might be investigated through survey research. The frequency of discourse functions might also be investigated through content analyses of film and book reviews, blog posts, and other forms of digital content, though this approach would only be suitable for discourse functions that could be suitably operationalised in a content analytic methodology.

Is the narrative contract most commonly perceived as a commitment to external realism or narrative consistency? In Chapter 5, I argued that the narrative contract is best conceptualised as a perceived commitment to narrative consistency rather than a perceived commitment to external realism. Defining the narrative contract in this way allows for distinctions between narratives that evoke non-realist storyworlds. However, as my results in Chapter 5 showed, participants did not necessarily share this conceptualisation. It would be useful to clarify whether the narrative contract is more commonly perceived as a commitment to external realism or as a commitment to narrative consistency.

What are the warrants for storyworld revision and narrative contract revision? As I described in Chapter 5, unrealistic science in fiction may be deemed aesthetically acceptable because it is perceived as realistic in the storyworld that is evoked by the narrative (the principle of narrative consistency) or because the narrative is not committed to realism (the principle of the narrative contract). In principle, however, both the narrative contract and the storyworld can be revised as the narrative progresses. Investigating the warrants for storyworld revision and narrative contract revision would make for a more complete understanding of how readers evaluate unrealistic elements aesthetically.

How do conventions of narrative discourse shape perceptions of the narrative contract? As I noted in Chapter 5, I did not investigate how conventions of narrative discourse (e.g., detailed description in prose narratives or continuity editing in film) may shape reader perceptions of the narrative contract. These conventions may be medium-specific and
may change over time. Investigating how conventions of narrative discourse shape the narrative contract would contribute to a more complete understanding of how the narrative contract is interpreted by readers.

Who are the science fans and is there a field of science fandom? In Chapter 6, I described how discourse about scientific realism can represent a display of scientific competence, which in turn may represent a form of embodied cultural capital in the field of science fandom. However, there is currently limited research on “science fans” or how a “sciencey” social identity is similar to or different from related identity labels, such as “nerd” or “geek.”

Does discourse about scientific realism characterise a viewing space? Barker and Brooks (1998) use the term “viewing space” to refer to how readers orient themselves towards the experience of a fiction film, though the concept can also be generalised to any form of narrative fiction where reception occurs socially. A viewing space consists of “reasons for going [to the cinema], expectations of the film, preparations; choice of cinema (or video) and company; way[s] of participating in the film; pleasures and dislikes, surprises, disappointments; judgments, and wind-down and aftermath” (p. 154). In the context of the Sylvester Stallone film Judge-Dredd (1995), Barker and Brooks distinguish between seven viewing spaces, including the action-adventure space, which consists of readers who engage with the film for the pleasures of its action scenes, and the Stallone-follower space, which consists of readers who engage with the film to understand how it fits into Stallone’s career.

Discourse about scientific realism may characterise a “science” viewing space. This hypothetical space is occupied primarily by readers who exhibit a science identity. Texts are selected for their potential to support discourse about scientific realism, especially discourse about external scientific realism. This discourse—critical, admiring, or speculative—is one of the primary pleasures of the space.

The existence of a “science” space is hinted at by Laura’s allusion to watching The Core (2003) every few years with other geology students “just to sort of sit and cry about how awful it is.” However, I did not investigate this aspect of Laura’s experience in any detail. Ethan and Ella, both non-scientists, described their participation in online forums where discussion centred on questions of narrative consistency and conciliation (cf. Section 6.2.5), but their experiences more closely align with a “fan space” than the “science space” that I am proposing here. Based on my research it is difficult to assess the
commonality of a premeditated science space. Do “sciencey” friends deliberately see films together in order to discuss scientific realism? If so, what kinds of preparations are made for this experience? What is the preferred setting for this space and what kinds of texts are valued most? Barker and Brooks’ (1998) notion of viewing space is an interesting direction for further research on the role of scientific realism in the reception of narrative fiction.

When is scientific knowledge deemed irrelevant in the reception of narrative fiction? In Chapter 6, I described how learning more about the scientific realism of a text can come at the expense of comfort or narrative engagement. However, my research does not investigate when readers are more likely to avoid or seek out scientific information that is related to a fictional text. The reception of narrative fiction may represent a useful context for investigating judgements of irrelevance (Smithson, 1989) with respect to scientific knowledge.

To what extent does discourse about scientific realism affect authorial practice? In Chapter 6, I described one participant who conceptualised her responses to narrative fiction as an influence on the reception context that might ultimately shape the production of narrative fiction. Kirby (2010a) and Frank (2003) have suggested that some authors do take this discourse seriously. Nevertheless, there is scope to further investigate the actual influence of discourse about scientific realism on authorial practice. It may also be interesting to investigate the extent to which this discourse has become more prominent in recent years.

How do readers evaluate narrative theses and when does realism matter most for the validity of a narrative’s thesis? In Chapter 5, I described when unrealistic science matters most for the aesthetic evaluation of narrative fiction. The theme of ideological congruence showed how unrealistic science was less acceptable when it was in service of an objectionable thesis. In Chapter 6, I described how, as Von Burg (2005, 2012) has argued, the relationship between scientific realism and the validity of a thesis can be emphasised or downplayed depending on whether the thesis is congruent or discrepant with a reader’s existing position. Nevertheless, there remains scope to further investigate how readers evaluate narrative theses and the extent to which the narrative communication paradigm (W. R. Fisher, 1987) or story appraisal theory (C. R. Berger et al., 2016) account for the relationship between perceived realism and thesis validity.
Do individual differences affect the acceptability of unrealistic elements in fiction? The influence of individual differences, such as personality, on the acceptability of unrealistic elements is an interesting direction for future research. There is some research examining the relationship between personality and media preferences (e.g., Hall, 2005; Kraaykamp & van Eijck, 2005; Rentfrow, Goldberg, & Zilca, 2011). However, I am not aware of any research examining how personality affects responses to unrealistic narratives. The openness to experience dimension of the Big Five model of personality (cf. Wiggins & Trapnell, 1997) may be of particular interest. Openness is associated with creativity and imagination. In a meta-analysis of personality-based research, Feist (1998) found that scientists scored higher on openness than non-scientists, and artists scored higher on openness than non-artists, though the effect size was greater for the latter comparison. Tentatively, openness may be related to a more accepting orientation towards unrealistic elements. Need for cognition (Cacioppo & Petty, 1982; A. R. Cohen, Stotland, & Wolfe, 1955), a tendency to engage in thinking, might also be relevant to understanding reader responses to unrealistic elements. Tentatively, a reader who is high in need for cognition may be more likely to reflect on narrative inconsistencies than a reader who is low in need for cognition.

How do audiences respond to fictional examples in science communication? Research on using fictional examples in science communication has typically focussed on the formal education setting (e.g., Vrasidas et al., 2015). Studies examining fiction-based science communication in informal settings is extremely limited, though there is some research in the context of science centres (Murmann & Avraamidou, 2016) and university outreach (Lewis, Bisson, Swaden Lewis, Reyes-Galindo, & Baldwin, 2017). My research suggests that fiction-based science communication may come with particular risks and challenges, such as being perceived as closed-minded or overly critical. However, additional research is needed to investigate the risks and benefits of using fictional examples in science communication and what is best practice in this area.

7.5 Concluding thoughts

I opened this study with an anecdote about the reception of Jurassic World (2015). Even before its cinematic release, the reception of Jurassic World was characterised by a concern with scientific realism. Among other critiques, commentators highlighted how the film’s featherless dinosaurs contradicted current paleontological research. At the
conclusion of this study it is now possible to understand how featherless dinosaurs can cause such a flap.

My research highlights how readers might personally care about the realism of dinosaurs in *Jurassic World* for various reasons. Featherless dinosaurs might disrupt narrative engagement or elicit a concern that other readers will acquire misconceptions about what dinosaurs looked like. Featherless dinosaurs might even be perceived as a sign of disrespect to paleontological research. However, the film’s featherless dinosaurs need not diminish the narrative’s aesthetic appeal. My framework for the aesthetic evaluation of unrealistic elements suggests various ways in which *Jurassic World*’s representation of dinosaurs might be deemed aesthetically acceptable. For example, drawing on the principle of plot centrality, the omission of feathers might be characterised as acceptable if it is seen as a case of inconsequential satellite science. Appealing to the principle of enhancement, featherless dinosaurs might represent a net benefit to the film if they are perceived as more visually interesting than the feathered alternative. Conversely, featherless dinosaurs might be deemed aesthetically unacceptable if the science at issue is perceived as settled or if the film is perceived as ideologically incongruent with the reader’s position on genetic engineering.

Irrespective of which principles of aesthetic evaluation are used to characterise the aesthetic acceptability of the featherless dinosaurs in *Jurassic World*, my framework of discourse functions provides insight into why the film’s representation of dinosaurs generated so much discussion. For some readers, critiquing featherless dinosaurs might be a way to further express their disappointment with a film that did not live up to their expectations. For others, discourse about featherless dinosaurs might be a way to demonstrate their scientific competence and communicate their science identity. For scientists and science communicators, the release of a major blockbuster is an irresistible opportunity to advance their communication goals and reach a large audience. Whatever its motivation, this discourse participates in ongoing boundary work processes where claims of epistemic authority are asserted, maintained, and contested. However, claims of authority over fact can subtly transform into claims of authority over value, and then discourse about scientific realism in narrative fiction becomes a site through which readers attempt to validate their positions on socio-scientific issues and delegitimise their opponents.
Remarking on a tendency to praise factual accuracies while overlooking factual inaccuracies, Ricks (1996) observes that discourse about factual accuracy in fiction is “not [literary] criticism but public relations” (p. 287). In light of the present study, Ricks’ observation takes on additional implications and becomes a worthy aphorism with which to close this study. Discourse about scientific realism is indeed a form of public relations, broadly construed. Among readers it is a form of self-presentation through which readers both affiliate with one another and mark their distinction. Among scientists it is a way of managing the image of scientific authority in the domain of popular culture and the public sphere at large.


Graesser, A. C., Olde, B., & Klettke, B. (2002). How does the mind construct and represent stories? In M. C. Green, J. J. Strange, & T. C. Brock (Eds.), Narrative impact: Social and cognitive foundations (pp. 229–262). Mahwah, NJ: Lawrence Erlbaum.


Green, M. C. (2004). Transportation into narrative worlds: The role of prior knowledge and perceived realism. Discourse Processes, 38(2), 247–266. doi:10.1207/s15326950dp3802_5


Green, M. C., & Brock, T. C. (2002). In the mind’s eye: Transportation-imagery model of narrative persuasion. In M. C. Green, J. J. Strange, & T. C. Brock (Eds.), Narrative impact: Social and cognitive foundations (pp. 315–341). Mahwah, NJ: Lawrence Erlbaum.


Kitzinger, J. (2010). Questioning the sci-fi alibi: A critique of how “science fiction fears” are used to explain away public concerns about risk. *Journal of Risk Research, 13*(1), 73–86. doi:10.1080/1369870903136068


Phelan, J., & Rabinowitz, P. J. (2012). Narrative as rhetoric. In D. Herman, J. Phelan, P. J. Rabinowitz, B. Richardson, & R. Warhol (Eds.), *Narrative theory: Core concepts and critical debates* (pp. 3–8). Columbus, OH: Ohio State University Press.


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Szu, E., Osborne, J., & Patterson, A. D. (2016). Factual accuracy and the cultural context of science in popular media: Perspectives of media makers, middle school students, and university students on an entertainment television program. *Public Understanding of Science.* Advance online publication. doi:10.1177/0963662516655685


doi:10.1080/09523987.2015.1075102


Wellcome Trust. (2016, September 26). The science of The Last of Us [Youtube video]. Retrieved from https://www.youtube.com/watch?v=lzGOdJoFsrM&t=2s


Bibliography of fictional texts

21 (Film dir. by R. Luketic, 2008)
1984 (Novel by G. Orwell, 1949)
2012 (Film dir. by R. Emmerich, 2009)
2 Fast 2 Furious (Film dir. by J. Singleton, 2003)
Adaptation (Film dir. by S. Jonze, 2002)
Alien vs. Predator (Film dir. by P. W. S. Anderson, 2004)
Apollo 13 (Film dir. by R. Howard, 1995)
Avatar (Film dir. by J. Cameron, 2009)
The Avengers (Film dir. by J. Whedon, 2012)
The Avengers: Age of Ultron (Film dir. by J. Whedon, 2015)
Back to the Future (Film dir. by R. Zemeckis, 1985)
Back to the Future Part II (Film dir. by R. Zemeckis, 1989)
The Big Bang Theory (Television series created by C. Lorre & B. Prady, 2007–)
Bleak House (Novel by C. Dickens, 1852–1853)
Bones (Television series created by H. Hanson, 2005–)
Breaking Bad (Television series created by V. Gilligan, 2008–2013)
Children of Men (Film dir. by A. Cuarón, 2006)
The China Syndrome (Film dir. by J. Bridges, 1979)
Citizen Kane (Film dir. by O. Welles, 1941)
Contagion (Film dir. by S. Soderbergh, 2011)
The Core (Film dir. by J. Amiel, 2003)
Criminal Minds (Television series created by J. Davis, 2005–)
The Day After Tomorrow (Film dir. by R. Emmerich, 2004)
Death of a Salesman (Play by A. Miller, 1949)
Dick Tracy (Comic book series created by C. Gould, 1938–)
District 9 (Film dir. by N. Blomkamp, 2009)
Doctor Who (Television series created by S. Newman, C. E. Webber, & D. Wilson, 1963–)
The Dragonriders of Pern (Series of novels created by A. McCaffrey, 1967–)
Ex Machina (Film dir. by A. Garland, 2015)
Eternal Sunshine of the Spotless Mind (Film dir. by M. Gondry, 2004)
Eugene Onegin (Novel by A. Pushkin, 1833)
Finding Nemo (Film dir. by A. Stanton & L. Unkrich, 2003)
Firefly (Television series created by J. Whedon, 2002–2003)
The Flash (Television series created by G. Berlanti, A. Kreisberg, & G. Johns, 2014–)
Forrest Gump (Film dir. by R. Zemeckis, 1994)
Frankenstein (Novel by M. Shelley, 1818)
Game of Thrones (Television series created by D. Benioff & D. B. Weiss, 2011–)
Gattaca (Film dir. by A. Niccol, 1997)
Genius (Film dir. by M. Grandage, 2016)
Girls (Television series created by L. Dunham, 2012–2017)
Godzilla (Film dir. by I. Honda, 1954)
Gravity (Film dir. by A. Cuarón, 2013)
The Great Gatsby (Novel by F. S. Fitzgerald, 1925)
Gremlins (Film dir. by J. Dante, 1984)
Grey's Anatomy (Television series created by S. Rhimes, 2005–)
Guardians of the Galaxy (Film dir. by J. Gunn, 2014)
Hancock (Film dir. by P. Berg, 2008)
Harry Potter and the Philosopher's Stone (Film dir. by C. Columbus, 2001)
House (Television series created by D. Shaw, 2004–2012)
House of Sand and Fog (Film dir. by V. Perelman, 2003)
The Human Centipede (Film dir. by T. Six, 2009)
I, Robot (Film dir. by A. Proyas, 2004)
The Imitation Game (Film dir. by M. Tyldum, 2015)
Inside Out (Film dir. by P. Docter & R. del Carmen, 2015)
Interstellar (Film dir. by C. Nolan, 2014)
The Irregular at Magic High School (Light novel by T. Satō, 2011–)
The IT Crowd (Television series created by G. Linehan, 2006–2013)
Judge Dredd (Film dir. by D. Cannon, 1995)
Jurassic Park (Film dir. by S. Spielberg, 1993)
Jurassic World (Film dir. by C. Trevorrow, 2015)
Live Free or Die Hard (Film dir. by L. Wiseman, 2007)
Lucy (Film dir. by L. Besson, 2014)
The Martian (Film dir. by R. Scott, 2015)
Mass Effect (Game developed by Bioware, 2007)
The Matrix (Film dir. by L. Wachowski & L. Wachowski, 1999)
Michael Collins (Film dir. by N. Jordan, 1996)
Middlemarch (Novel by G. Eliot, 1871–1872)
Monsters (Film dir. by G. Edwards, 2010)
A Murder of Crows (Film dir. by R. Herrington, 1999)
My Sister's Keeper (Novel by J. Picoult, 2004; Film dir. by N. Cassavetes, 2009)
Never Let Me Go (Novel by K. Ishiguro, 2005; Film dir. by M. Romanek, 2010)
Now You See Me (Film dir. by L. Lettieri, 2013)
A Number (Play by C. Churchill, 2002)
Orphan Black (Television series created by G. Manson & J. Fawcett, 2013–)
Outbreak (Film dir. by W. Petersen, 1995)
Pacific Rim (Film dir. by G. del Toro, 2013)
Pandorum (Film dir. By C. Alvart, 2009)
The Perfect 46 (Film dir. by B. R. Bonowicz, 2014)
Possession (Novel by A. S. Byatt, 1990)
Pulp Fiction (Film dir. by Q. Tarantino, 1994)
Rainman (Film dir. by B. Levinson, 1988)
Red Dwarf (Television series created by R. Grant & D. Naylor, 1988–)
Roes (Television series created by The Trimbos Institute and VPRO, 2008)
"Runaround" (Short story by I. Asimov, 1942)
*Schindler’s List* (Film dir. by S. Spielberg, 1993)
*The Shallows* (Film dir. by J. Collet-Serra, 2016)
*The Sixth Sense* (Film dir. by M. N. Shyamalan, 1999)
*Speed* (Film dir. by J. de Bont, 1994)
*Splice* (Film dir. by V. Natali, 2009)
*Star Trek Into Darkness* (Film dir. by J. J. Abrams, 2013)
*Star Trek Generations* (Film dir. by D. Carson, 1994)
*Star Wars* (Film dir. by G. Lucas, 1977)
*Star Wars: The Force Awakens* (Film dir. by J. J. Abrams, 2015)
*Starship Troopers* (Film dir. by P. Verhoeven, 1997)
*Sunshine* (Film dir. by D. Boyle, 2007)
*The Terminator* (Film dir. by J. Cameron, 1984)
*Time for the Stars* (Novel by R. A. Heinlein, 1956)
*The Time Traveller’s Wife* (Novel by A. Niffenegger, 2003; Film dir. by R. Shwentke, 2009)
*Troy* (Film dir. by W. Petersen, 2004)
*The Very Thought of You* (Film dir. by N. Hamm, 1998)
*We Are All Completely Beside Ourselves* (Novel by K. J. Fowler, 2013)
*The World Set Free* (Novel by H. G. Wells, 1914)
Appendix A: Interview guides and demographic questionnaire

Demographic questionnaire

The information on this form will be used to describe the relevant background details of each participant. You may skip any question that you do not wish to answer.

What is your first name/nickname?* __________________________

*Please don’t include your full name. This question has only been included to match your background information to your focus group contributions. Your name will be replaced by a pseudonym or code in the discussion transcript and in any published research.

What is your age? __________________________

What is your gender? __________________________

Have you completed a university degree, diploma, or certificate? *Please circle.

No

Yes: What was your degree/diploma/certificate? __________________________

What were your major area(s) of study? __________________________

Are you currently studying towards a university degree, diploma, or certificate? *Please circle.

No

Yes: What is your degree/diploma/certificate? __________________________

What are your major area(s) of study? __________________________

Including your current course(s), have you ever studied science communication at university? *Please circle.

No

Yes

Are you currently employed in a science, technology, engineering, or mathematics related job? *Please circle.

No

Yes: Please specify __________________________
Focus group discussion guide

What comes to mind when you think of unrealistic science in fiction?
- Can you give any examples of unrealistic science in fiction?

How do you respond when you encounter unrealistic science in fiction?
- How does it make you feel emotionally when you encounter unrealistic science in fiction?
- To what extent does unrealistic science affect your response to a fictional story as a whole?

How do you respond when you encounter science in fiction that IS realistic?

When is the realism of the science MOST likely to affect how you respond to a fictional story?
- When is the realism of the science LEAST likely to affect how you respond to a fictional story?

Why is the realism of science in fiction important or unimportant to you personally?

Do you discuss the realism of science in fiction with other people? If so, why? If not, why not?
- For those of you who discuss the realism of the science with others, who do you discuss it with?
  - Is there anyone you don’t discuss it with?
  - In what kind of situations do you discuss it?

Is there anything else you would like to add?
Interview guide

What kinds of fiction do you enjoy?

Have you encountered any science in fiction recently? Can you tell me about it? Was it realistic?

What comes to mind when you think of unrealistic science in fiction?

- Can you give any examples of unrealistic science in fiction?

How do you respond when you encounter unrealistic science in fiction?

- How does it make you feel emotionally when you encounter unrealistic science in fiction?

When it comes to your overall enjoyment of a fictional story, how important is the realism of the science compared to other aspects of the story?

- Does the realism of the science in fiction affect your overall enjoyment of a fictional story?

When is the realism of the science MOST likely to affect how you respond to a fictional story?

- When is the realism of the science LEAST likely to affect how you respond to a fictional story?
- When are you most likely to tolerate unrealistic science in fiction?
- Is there anything that can make-up/compensate for unrealistic science in a fictional story?

How do you know when fiction is trying to be serious about realistic science?

- Can you think of any examples?
- What aspects of a fictional story suggest that it is being serious about realistic science?
- How do you know when fiction is NOT serious about realistic science?

How do you respond when you encounter science in fiction that IS realistic?

Why is the realism of science in fiction important or unimportant to you personally?

Do you discuss the realism of science in fiction with other people? If so, why? If not, why not?

- If yes, who do you discuss it with? Why?
  - Is there anyone you don't discuss it with? Why not?
  - When (in what contexts) are you most/least likely to discuss the realism of science in fiction with other people?
  - How does it make you feel when you discuss the realism of fictional science with other people?
• Why do you think other people like to discuss the realism of science in fiction? Do you think other people talk about the realism of science in fiction for the same reasons as you?

• If no, do you know of other people who like to discuss the realism of science in fiction?
  o Why do you think they discuss it?

Why do you think fiction sometimes depicts unrealistic science?

Is there anything else you would like to add?