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# Science, fiction, and Santa Claus: Hollywood creator and consultant perceptions of fictional science in film and television

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**Introduction:** From the high-stakes operating room of a Seattle hospital, to the shattered remains of a planet in a galaxy far, far away, Hollywood is often critiqued for its representations of scientific knowledge, methods, and/or technology. Existing research into Hollywood representations of science focuses primarily on those that do not align with expert consensus, and on how audiences engage with these representations – such as how misinformation in fictional narratives influences us. This paper, instead, approaches the matter of fictional science in fictional narratives (FiSci) from the perspectives of the individuals creating Hollywood content. We use the label of “FiSci” for any representation of science within a narrative which does not align with humanity’s current knowledge or technological capability.

**Methods:** Semi-structured interviews were conducted in late 2020 with a purposefully-selected sample of both Hollywood creators (writers, directors, and producers;  $n = 28$ ) and science experts who have served as consultants ( $n = 18$ ) across a range of film and television projects. Thematic analysis was used to explore how these creators and consultants perceive FiSci and its role within Hollywood narratives. Three themes were constructed from the interview data.

**Results and discussion:** Participants primarily spoke of FiSci as: (1) a storytelling tool, perceived either positively or negatively, depending upon how that tool is wielded; (2) a way to play within a constructed storyworld which does not resemble our own; and (3) a source of unrealistic “B.S.” which threatens to break audience suspension of disbelief and can signify a lack of effort in the creative process. This paper contributes to science communication research by providing access to minds behind the representations of science in Hollywood film and television. As such, it can be used to aid the creator-consultant relationship and the implementation of FiSci to the benefit of both groups. It may also inform creators who have yet to work with a consultant, experts looking to become consultants, audiences critiquing FiSci in the content they watch, and experts and science communicators who express concerns about the use of FiSci and the responsibilities of Hollywood.

## KEYWORDS

science communication, Hollywood, film and television, fiction, narrative, science, misinformation

## 1. An introduction to fictional science in Hollywood

Fictional depictions of science by the United States film and television industry—colloquially known as Hollywood—can produce negative, neutral, or positive effects in the real world. Hollywood has long been criticized for how such fictionalizations may negatively influence audience knowledge, attitudes, and/or behaviors (e.g.,

National Science Board, 2000; Greenbaum, 2009). Explicit fiction labels can be used as a disclaimer, to remind viewers that what they are viewing is fiction. These explicit labels do not necessarily prevent someone from absorbing misinformation (Green and Brock, 2000; Marsh and Fazio, 2006), and therefore Hollywood may miseducate its audiences, even though education is not the primary intent. Alternatively, Science Fiction narratives can encourage reflection and discourse about modern societal problems or possible consequences of new technology (Dill-Shackelford and Vinney, 2020). Audiences may be inspired to the point of invention (e.g., the pacemaker; Frayling, 2005) or to pursue STEM careers (21st Century Fox et al., 2018).

Science communicators may use such pop culture products as engaging hooks to reach uninterested publics, since some publics avoid science news but frequently view Hollywood stories that feature science (Funk et al., 2017). This is, in part, due to its pervasiveness in daily life. From 2009–2019, the North American box office generated over \$10 billion each year (Box Office Mojo, n.d.), and U.S. adults still spend, on average, over 30 h per week watching media on their television sets (The Nielsen Company, 2021). This includes both fiction and non-fiction content. It is useful for science communicators to have a better sense of how Hollywood perceives its own use of science in its productions in order to better work with and/or critique Hollywood production.

We use the term FiSci as an abbreviation for *Fictional science in fictional entertainment narratives*. A label of “FiSci” is applied to any representation of science within a narrative (i.e., not the narrative as a whole) which does not comport with humanity’s current knowledge or technological capability. Thus, it applies not only to so-called “bad” science, such as the depiction of sound traveling through the vacuum of space. It also includes hypothetical concepts (e.g., sentient artificial intelligence, natural or synthetic wormholes) which may exist on paper, but have yet to be demonstrated as physically possible. Individual experts<sup>1</sup> may have different standards by which they judge a futuristic/hypothetical representation to be plausible or possible.

Crucially, FiSci is inherently used as a neutral term, without judgment upon the representation itself with regard to its influence on the quality of a story, nor its influence on audiences out in the real world.

A given kind of FiSci may exist within a singular piece of media, or persist across multiple narratives—even across genre and decade. In some cases, the FiSci is a common misconception, such as urine being the ideal remedy for a jellyfish sting (Wilcox et al., 2017). Such advice was stated by the character Joey after Monica is stung in the *Friends* episode “The One with the Jellyfish” (Calhoun and Jensen, 1997); Joey says he learned it from the Discovery Channel. Kirby (2011) calls such misconceptions “folk science” (p. 101). In other cases, FiSci exists primarily as a narrative *trope*<sup>2</sup> that assists a

story. The use of faster-than-light technology, for example, allows characters to traverse the vast nothingness of space in a time frame that is sensible for the story. But also, given its ubiquity in pop culture, explicit references to “warp drive” or a visual effect of a spaceship jumping to warp acts as a shortcut that audiences already understand from previous media. Thus, creators don’t have to spend excess time on screen explaining how their spaceships travel through space.

While FiSci is often associated with the genre of Science Fiction (a.k.a. SciFi), it can be found anywhere science appears, such as (but not limited to) medical and forensic procedurals. FiSci can be found in a story’s very premise, a single line of dialogue, a physical prop, or any other narrative element native to the medium. However, the impact FiSci may have on audiences (in either positive or negative ways) may differ depending on the role it serves within a given story, and the kind of story being told. FiSci may appear more “obvious” in genres associated with sticking less closely to contemporary reality, and therefore be received more positively (or at least less negatively) in such contexts. For example, Hall’s (2003) focus groups identified six means of evaluating realism, and revealed that a narrative’s genre can influence which of the six are more meaningful. It’s more important for science in a Science Fiction story to be narratively self-consistent than it is to be factual. This may, in part, be due to the very premises of such stories relying upon some kind of FiSci. As such, FiSci may be recognized as fictional by audiences (general or expert), but simultaneously accepted as realistic within the context of a given story. Or, FiSci may go entirely unrecognized because it appears plausible enough. Perhaps unsurprisingly, Funk et al. (2017) found that U.S. adults are more likely to perceive medical dramas and forensic crime shows as representing science more accurately than SciFi.

Past research has investigated the influences that mass media consumption may exert on audiences’ relationships with science (e.g., Gerbner, 1987; Shanahan et al., 1997; Nisbet et al., 2002; Besley and Shanahan, 2005; Dudo et al., 2011), as well as fictional Hollywood narratives more specifically (e.g., Adams et al., 1986; Morgan et al., 2010; Shen and Han, 2014; Dudo et al., 2017; Sisson et al., 2021). Research has also investigated the ways in which audiences consider the use of unrealistic science appropriate or acceptable in fictional entertainment narratives (Green, 2017). However, there is a lack of research exploring the matter of FiSci through the lens of the individuals involved with its inclusion in Hollywood content: writers, directors, and other creative individuals employed within the industry. These creators may employ the expertise of science consultants should they wish to ensure a certain standard of scientific accuracy (Frank, 2003; Kirby, 2011). Research which presents the role and experiences of science consultants is primarily framed through the lens of scientific accuracy—though, notably, Kirby chooses to interpret the accuracy of Hollywood science as flexible.

Our research asks the following question: How do Hollywood creators—and in comparison, the science experts who consult for

1 The term *expert* here refers to any individual whose knowledge of a particular scientific field allows them to identify FiSci in that field, while a member of the general public—or even an expert in a different field—cannot. It includes both training/current/former STEM professionals as well as what Kirby (2011) calls “lay experts” (p. 101).

2 While the traditional literary device is defined as “a figure of speech, especially one that uses words in senses beyond their literal meanings” (e.g.,

a metaphor; Baldick, 2015, para. 1), we use the more recently adopted definition as a recurring literary element or device, such as a character type or plot point (Oxford University Press, n.d.).

them—perceive the use of fictional representations of science in Hollywood film and television content?

## 2. Materials and methods

A series of 45 semi-structured interviews were conducted by the first author *via* Zoom during October–December 2020, consisting of 28 Hollywood creators (CRE) and 18 science consultants (CON). This total  $n = 46$  included one writing team who were interviewed simultaneously. Three interviews were audio, only. Three interviews were restricted to <1 h due to the participants' schedules, ranging from 25 to 40 min. The remainder generally ranged from 60–90 min, with one outlier of 167 min. Ethics approval (reference number D20/298) was granted by the University of Otago's Human Ethics Committee.

Purposive sampling was used to ensure a sufficiently heterogeneous sample with respect to career type (e.g., creator's role in production, film vs. TV, genre). Demographics (e.g., age, gender) were not considered as they were not main variables relevant to this study. Inclusion criterion for creators was at least one credit as a writer, director, or producer on a film which saw a wide theatrical release in the United States, or a television series which first aired on network or basic cable in the United States, prior to the start of the data collection period. A list of 84 consultants was compiled in an *ad hoc* manner by identifying movies and shows which used science consultants as well as accessing all consultants referenced on the Science and Entertainment Exchange's "Scientist Spotlight" blog posts.

To increase response rate, emails requesting a creator's or consultant's participation were sent directly, or to their agent or manager, instead of publishing a general advertisement looking for participants. Thirty-six participants were directly recruited in this manner (23 creators, 13 consultants). Snowball sampling from interviewees added another five creators and five consultants to the total participant count.

Initial transcripts were generated automatically during the interviews using the online software Otter.ai. Orthographic edits for the purpose of qualitative analysis were completed manually within the same software. This revision allowed for moments of reflexivity (Galletta, 2013). Quotes presented within this paper have been further cleaned and "rendered into a written style" (Brinkmann and Kvale, 2015, p. 315), taking care not to alter meaning.

Recognizing that both collection and analysis of interview data are influenced by the interviewee-interviewer relationship, these processes were informed by a social constructionist and social constructivist worldview, respectively (Young and Collin, 2004). As it acknowledges data are co-constructed, *Reflexive Thematic Analysis* (Braun and Clarke, 2022) was selected as the method of qualitative data analysis. Here, themes do not *emerge* from the data; rather, they are actively constructed. Braun and Clarke (2013) liken the researcher to a sculptor instead of an archaeologist. Transcript analysis (i.e., the identification of codes and themes) was completed in NVivo for the purposes of organization, only. Analysis was data-driven and initial codes were generated through complete coding, both semantic and latent.

Braun and Clarke (2013) assert that placing value in inter-rater reliability measures is "problematic" for qualitative data because it assumes both that "coding can and *should* be objective" (p. 279) and that "the themes are *in* the data" (Braun and Clarke, 2022, p. 239, emphasis in originals). Additionally, bringing in coders who are unfamiliar with the data often leads to a loss of analytic depth and nuance (Braun and Clarke, 2022). As such, we chose to discuss the analysis with other researchers, but not to recruit additional coders [cf. O'Connor and Joffe (2020), who review arguments for and against evaluating inter-coder reliability in qualitative research].

Due to the open-ended nature of the interview process, a less frequently referenced code or theme is not necessarily less meaningful (Braun and Clarke, 2013), nor is it necessarily less supported by creator/consultant populations. As such, this research avoids reporting results using exact numbers or percentages for frequency of mentions. To keep descriptions consistent, and for the sake of transparency, Table 1 summarizes the terms used for specific frequency ranges.

Due to participant recruitment and sampling methods, the data may be biased toward a subpopulation of creators who are more interested in how science is represented in Hollywood, and in representing science accurately. Ultimately, all interviewed creators had worked on at least one SciFi, medical, or forensic science film or television project. Recruiting creators who work exclusively in other, science-lite, genres (e.g., SitComs, prestige television dramas) may provide additional insights into Hollywood perceptions of FiSci.

It was anticipated that the creators most well-known to mass audiences, behind the most popular movies and shows, would not be able or willing to participate in this research. While many participants did indeed have high-ranking positions on popular projects, this sample of Hollywood creators is more representative of the wider population (i.e., TV writers who haven't been executive producers) than it would have been with a greater proportion of household names.

## 3. Results and discussion

Three themes were constructed in response to participant discussions of FiSci (Table 2): **FiSci as Tool**, **FiSci as Play**, and **FiSci as B.S.** (negative perceptions). **FiSci as Tool** is broken down into three subthemes: *FiSci as Improvement*, *FiSci as Compromise*, and *FiSci as Convenience*. **FiSci as Play** comprises the subthemes *FiSci as Symbol* and *FiSci as Imagination*. Each of these themes and subthemes is presented and discussed, followed by an intriguing connection made by six participants between FiSci and Santa Claus. Responses from the creator and consultant groups are then compared.

### 3.1. FiSci as tool

Participants primarily spoke of FiSci as a narrative tool used in service of a story (e.g., "Science, like anything else, is a device when used in the arts;" CON-8). This suggests a neutral stance on FiSci as a whole, and it is up to the actual method of implementation which affects whether a particular case is seen in a positive or negative

TABLE 1 Terms for qualitative abundance.

Term	Approx. % equivalence	Count (all, $n = 46$ )	Count (creators, $n = 28$ )	Count (consultants, $n = 18$ )
A few	< ~10%	3–4	3	3
Several	~10–30%	5–13	4–8	4–5
Many	~31–50%	14–23	9–14	6–9
A majority of	>50%	>24	>15	>10
Most	> ~70%	>33	>20	>13

TABLE 2 Hollywood creator/consultant perceptions of FiSci ( $n = 46$ ).

Theme	Participants perceive FiSci as...
FiSci as Tool	... a narrative tool used in support of a greater story. FiSci may be perceived as an explicit <b>improvement</b> to a more realistic representation of science, a necessary <b>compromise</b> where it isn't feasible to feature real science, or a <b>convenient</b> alternative which allows less time/effort to be spent representing real science
FiSci as Play	... an opportunity for creators to create scenarios beyond those found in the real world, including for the use of commentary (e.g., FiSci as a metaphor for societal ills)
FiSci as B.S.	... as unrealistic "magic" which, at its worst, threatens to break an audience's suspension of disbelief and/or take them out of the story

light. Participants provided examples of both. These results align with Kirby's (2011) exploration of science and consultants in Hollywood, though he focuses solely on film.

Three subthemes describe creator and consultant perceptions of FiSci as a storytelling tool: as an *improvement* to the quality of a narrative, as a *compromise* necessary to tell a given/desired narrative, and as a *convenient shortcut* requiring less effort on the part of the creator(s).

### 3.1.1. FiSci as improvement

More than half of our participants expressed the view that the scientific accuracy of a fictional entertainment film/television narrative is less important than the overall quality of said narrative. Therefore, FiSci is often perceived by Hollywood creators and consultants as the superior choice to a realistic representation of science—particularly when real science is seen as too boring, too complicated, or too time-consuming.

"There's actually not that much drama in real medicine... We artificially embellish that quite a bit for our show." (CON-9)

"CSI wouldn't be a very interesting show if they presented forensics in an accurate way. I think it'd be a very boring show." (CRE-11)

Most statements which fell under this theme were framed in terms of how participants anticipate audiences will experience a given film/show—FiSci is used to improve how audiences will respond to a given narrative, both in terms of affect (i.e., an emotional response in accordance with the intended genre, such as Comedy or Thriller) and in terms of their overall experience and perception of the story having some level of quality.

Perceptions of FiSci as improvement are necessarily impacted by the specific role a piece of FiSci plays within a story and the kind

of story a creator wants to tell. For example, CRE-19 highlighted how the tone of a given narrative can dictate whether or not FiSci is seen as an improvement.

"I don't think *Star Wars* would be as good if there were no sounds in space. It'd be more accurate. Would it be better? I don't think so. However, when you're trying to do a movie like *Gravity*, where you are going to be trapped in space and lost and not know if anyone's going to find [you]—That silence was spectacular. To see these things explode with no sound. It was chilling." (CRE-19)

Similarly, FiSci may better provide a heightened reality that action-packed stories demand. A larger-than-life protagonist needs a larger-than-life threat to tackle.

"It might be that the worst you can do with nanotechnology right now is, like, maybe someone will get a rash if they come in contact with it. I don't know. But it's way more interesting to think that they can get into your bloodstream and control your mind, because Tom Cruise doesn't need to save you from a rash." (CRE-20)

A few participants even likened the use of FiSci or real science to a battle for audience engagement, suggesting that to increase accuracy is to sacrifice story quality, and by extension, said engagement.

"Sometimes telling the more interesting story will mean that the science takes a backseat." (CRE-10)

"I think what I learned through all that was that it is a struggle to stay real to facts and still tell a compelling story." (CRE-23)

This perception contrasts with research that suggests scientific accuracy can increase audience enjoyment (Li, 2016; Green, 2017).

There may be a discrepancy between these Hollywood creator perceptions of audience experiences and audiences' perceptions of their own experiences.

It is worth noting that just over half of the creator participants reported taking at least one science-related course at a university level, and most were able to identify a particular field (e.g., "space science;" CRE-16) or subject matter (e.g., "how the brain is able to adapt;" CRE-10) that they were interested in, even if they were not writing stories that dealt with those topics. The challenge in storytelling is finding ways to incorporate that interesting science, and sometimes a decision is made that FiSci is simply *more* interesting.

### 3.1.2. FiSci as compromise

The subtheme *FiSci as Compromise* collects participant views that real science (or the spirit of real science) is often desired in Hollywood storytelling, but ultimately not entirely possible. Creators often have to let FiSci into their stories because they would not work without it.

" Oftentimes, you have a consultant saying, "It wouldn't happen that way." And you're like, "I know it wouldn't, but the story needs it to happen that way." (CRE-2)

For example, CON-13 stated that the *Star Trek* franchise's warp drive is "integral to the thesis of the show," and were the creators to feature a more realistic method of space travel (specifically sub-light speed), it would be "a totally different thing."

Considering FiSci to be necessary is distinct from the subtheme *FiSci as Convenience* (Section 3.1.3), which speaks to FiSci being seen as an "easier" choice (e.g., CON-13). In some cases, there is a fine line between FiSci being seen as necessary to a story and as an improvement upon a story, such as CON-16's mention of relative size in outer space:

"I have worked with writers who want to get it so right, then they end up realizing they're gonna have to compromise when they think through that vastness of space aspect... I'm like, "No, you literally won't be able to see that if you try to show the size scale, but I applaud you for trying." (CON-16)

In this example, one might perceive that it is more visually appealing to depict multiple spaceships at an unrealistic size on the audience's screen given their physical distance. However, one may also see it as a compromise if there's a realization that the ships would be so small the audience could not see them at all, and the unrealistic scaling is effectively forced upon a creator despite their original standards for accuracy. To that effect, CRE-14 also mentioned a preference to "defer to the truth," but needing to "[take] some license" when the story called for it.

FiSci was deemed necessary in specific genres of storytelling where storyworlds involve, for example, depictions of futuristic technology and/or characters whose biologies operate beyond the known laws of physics. It is unsurprising to conclude that Science Fiction would not exist without FiSci, nor is it surprising that participants acknowledged certain stories are predicated upon the use of FiSci. CRE-4 used an example of a superhero character saving

people in such a way that—were it the real world—those people would be severely injured or die. Without that FiSci, the character and his story could not exist.

However, even stories purportedly based in the real, modern world may see creators inventing a piece of technology for their story to move forward as intended.

"We wanted to rescue these people who were trapped in a barn or something, and [other creators] wanted this cool piece of science to come and save the day... We checked all the consultants and there just wasn't anything... So we ended up just inventing our own device... It could have existed, but it didn't... We just embellished the rest to accomplish what they wanted it to accomplish." (CRE-21)

In addition to FiSci being considered necessary for plot or world-building purposes, a few participants also discussed occasions where FiSci arose from "simplification" (CRE-20)—a real science principle, or at least a hypothetically possible one, ended up being misrepresented because it would be too complex to dedicate the time to explain fully. Oversimplification as fictionalization does appear in real world science communication discourse, as well. Science journalism has been blamed for oversimplifying "to the point that the basic information conveyed is obscured or at worst, blatantly wrong" (Brownell et al., 2013, p. E6). For example, in his breakdown of how scientific studies are often misrepresented to the public, *Last Week Tonight* host John Oliver showed how a study which found "no significant difference in [rates of] preeclampsia or high blood pressure" between women who consumed high vs. low flavanol chocolate was soon discussed by news stations as "If you're pregnant, eating 30g a day of chocolate...could improve blood flow to the placenta and benefit the growth and development of your baby, especially in women at risk of preeclampsia" (*LastWeekTonight*, 2016, 5:55). While a majority of U.S. adults perceive the oversimplification of scientific research in news coverage as "a problem" (Funk et al., 2020), participants in our study who brought up oversimplification did not connect it to possible problems out in the real world, and it was not perceived negatively.

Finally, a couple of consultants mentioned that FiSci may indeed be necessary to tell a creator's story, and the acceptable compromise is to preserve the *process* of science.

"What I want is the process of science to be portrayed accurately... So as much as Tony Stark is not realistic, I thought that *Iron Man*, the original movie, was a great advertisement for science. He did experiments, he got things wrong, he worked in a lab, he asked questions... You can't actually build a suit and fly around like that, but the spirit of science I thought was very positively portrayed in that movie." (CON-7)

This may be due to the fact that consultants, being science experts, are more inclined to perceive science as a process than as a collection of knowledge. Indeed, when asked "What comes to mind when you hear the word *science*?" consultants were much more likely to (1) provide a definition of science, and then (2) define it as process. Meanwhile, creators who provided definitions were more likely to define science as knowledge or facts.

### 3.1.3. FiSci as convenience

The subtheme *FiSci as Convenience* incorporates both neutral and negatively-coded expressions relating to avoiding effort by using FiSci. Several participants made explicit references to laziness—statements that, in many cases, FiSci arises from a lack of care, or as a result of creators being unwilling to put effort into depicting science accurately.

“The stuff that I get upset about, with it being misrepresented, are things that you could just have googled.” (CON-16)

“I think that a lot of people are just lazy.” (CRE-2)

Unsurprisingly, most examples were about *other creators* being lazy, as opposed to self-identifying as such. Such a result may be explained by some amount of attribution bias (Hall, 2020). However, selection bias is also certainly at play. We suggest that creators volunteering to be interviewed about the use of science in Hollywood are likely to be more interested in science *per se*. They may thus be more likely than other creators to expend effort toward learning what the real science would be, and then potentially incorporating that real science when possible. CRE-20 doesn't perceive their use of FiSci as lazy because they have put at least some amount of effort into deciding it is ultimately needed:

“I will depart from reality the minute that it's causing me story headaches...but it's got to be legitimate headaches. You can't just be like, “Oh my god, it'd be so much easier if this thing didn't do this.”” (CRE-20)

Given the frequent use of “lazy” and related words, the use of convenient FiSci could be perceived as a personal failing. Alternatively, convenient FiSci (or the overuse of FiSci) was seen to harm the perceived quality of a story.

“That's a big thing for me, to just be really cognizant of how much are we relying on fictional science to just solve our story problems for us. That's not good writing. And also, it makes our Science Fiction...cheap.” (CRE-17)

However, associations between use of FiSci and bad story quality were rare. CRE-1—who directs mostly grounded television—referenced laziness the most throughout their interview.

“In Hollywood, if it gets up there, and it's wrong, that's laziness, because the resources are there to get it right. Or because the storytellers so badly want to tell a story...But usually...it won't be a good story.” (CRE-1)

CRE-1's belief in the abundance of “resources” (e.g., science consultants), combined with the association between accuracy and quality, suggests that they see creators as having no excuse not to get the science as right as possible. This belief was not reflected in most other interviews, though some (mostly creators) said creators have “a responsibility to at least know what you're bending” (CRE-27).

However, not all perceptions of convenient FiSci were so negative. The word “cheat” was used by several participants, though not with a tone of voice that implied they were ascribing FiSci's

use to a lack of effort. Instead, such expressions spoke to FiSci as a convenient storytelling shortcut.

“At some point, you know you're going to cheat because you know it's not a lecture. It's not an oral argument in front of the Supreme Court. It's a television episode, so you're going to take some shortcuts.” (CRE-3)

Some creators may choose to use FiSci to get around a constraint the laws of nature place upon how the narrative can play out. CRE-16 praised Shankar et al. (2015–2022)—the showrunner<sup>3</sup> of the Hard SciFi series *The Expanse*—for *not* making this choice. Instead, he and his creative team spend the extra time and/or effort to ensure the narrative comports with his high standard of realism.

“I applaud him for that. He doesn't take shortcuts.” (CRE-16)

While sometimes a shortcut might be perceived as lazy, it may also be seen as necessary to tell a story in a particular amount of time. Nearly half of participants cited a narrative time crunch, such as needing to solve a crime in 45 min of screen time, as a source for FiSci. For example, CRE-6 observed how *The Undoing's* (Kelley et al., 2020) characters spend an unrealistically short time in the therapy process so that the creators can move them more quickly through their character and plot arcs within the narrative.

In other cases, a shortcut may be a FiSci trope that audiences are already familiar with, so time doesn't have to be spent presenting an unfamiliar representation of a scientific topic, whether it's more accurate or not.

“You show somebody walking through something that looks like a portal, [the audience is] gonna understand that it's a portal. But if you're walking through something that doesn't look anything like anything anyone's seen before, then you have to have somebody explain what that is and how it works.” (CRE-13)

*Convenience* also refers to FiSci done for the sake of production, as some limitations in the real world make it more difficult to incorporate accurate representations of science. More time, more money, and/or more complex technology is often required to either figure out how to represent a piece of science as accurately as possible, or actually accomplish that accurate representation. In one example, CON-10 identified a common visual in Science Fiction where characters are connected to FiSci technology at the base of their skulls (e.g., *The Matrix*; Wachowski and Wachowski, 1999), which may be done to spare actors and their Hair and Makeup teams from spending extra time—and possibly money—on visual presentation.

“Why do they always do the brain implant jacks in the back of the brain? It's like the most primitive part of your brain?... It's convenient, rather than having a giant port in the middle of your forehead, which would be a nightmare for makeup and hair for the entire series” (CON-10).

<sup>3</sup> The lead creator (almost always a writer) on a television series; the person who runs the show.

## 3.2. FiSci as play

As much as participants spoke of FiSci as being a narrative tool used in service of telling a good story, they also spoke of FiSci as opportunity to play within a story.

It's just fun to do something, like the film *Lucy*, that really is just doing nothing more than playing upon an urban myth that you only use 10% of your brain. (CON-8)

It's a little bit of your imagination, it's a little bit of the kid in you playing. It's the desire to entertain people...and just tell stories. (CRE-4).

### 3.2.1. FiSci as symbol

The importance of metaphor in literary art appears all the way back in *Aristotle's Poetics* (ca. 350 B.C.E./2008): "The greatest thing by far is to have a command of metaphor...It is the mark of genius, for to make good metaphors implies an eye for resemblances" (XXII, para. 5). More recently, author *Le Guin* (1989, p. 154) wrote, "All fiction is metaphor". The literature has thoroughly discussed Science Fiction stories presenting audiences with analogies and metaphors (Le Guin's own work, included; e.g., *Schalk*, 2017), and similar views were reflected in this study. Several creators and consultants expressed perceptions of FiSci as some form of symbol. Of all participants, CON-8 was the greatest champion of this particular perception of FiSci, returning to it several times over the course of their interview.

"It's a symbol...You could replace Godzilla with forest fires, replace Godzilla with global warming, replace Godzilla with the response to a tsunami or hurricane and you've got it." (CON-8)

Examples provided by participants covered the standard categories of Science Fiction metaphors. Some commented on current social issues:

"We would take the word "mutant" and substitute, you know, "illegal alien"...Giving them a fantastical way to be different but trying to say something real to what people are really feeling right now." (CRE-22)

Others spoke of projecting modern concerns and/or fears of future situations—both technology and nature itself, the latter of which is seen in an abundance of dystopian climate-change based scenarios (*Leyda et al.*, 2016):

"There is one [kind of FiSci] that comes to mind that is currently a pet peeve of mine. And that is the idea of artificial intelligence waking up and becoming conscious and turning against its creators...I think it tells us more about the human psyche...than it does about the science of actually how AI works...Art reflects life in the sense that the things that are meaningful to us in the real world are threats...I guess we now play them out in stories to deal with them." (CON-4)

During the interview with CRE-27, the first author brought up the example of the FiSci in *Finding Nemo* (*Stanton*, 2003) where Marlin and Dory drop down a whale's throat to be expelled *via* the blowhole. In cetaceans, there is no connection between mouth and lungs like in humans; however, whales also cannot spit, rendering either method of ejection as FiSci (*Abbott*, 2004). The scene requires Marlin let go of the whale's tongue, plunging into an unknown fate, to continue on his emotional arc for the movie—to learn to "let go" of his son, Nemo.

"Not only is it a visualization of what [Marlin] needs to do, but also being shot out of there is an escape...or rebirth in a way. And so, that science, they've bent it enough so that we can still believe that it's possible, because I actually didn't know that [was FiSci] until you just said it right then." (CRE-27)

CRE-27's statement highlights that identifying this moment as FiSci is not an ability that audiences would likely have. The relationship between the use of FiSci symbols and audience expectations is explored in more detail elsewhere (*Davis*, 2022).

When compared against representations of real science, or FiSci used for other purposes, allegorical FiSci may provide audiences with a greater source of interest in a narrative. CRE-11, for example, mentioned that they enjoyed the original series of *Star Trek* (*Roddenberry*, 1966–1969), both as a child and an adult, for its use of allegory more than "the science." In this sense, *FiSci as Symbol* may overlap with *FiSci as Improvement*.

Science in the real world often relies on symbols (a.k.a. models). For example, the evolution of humanity's understanding of the composition and nature of the atom carries multiple analogies—from plum pudding, to a solar system, to a cloud (*Compound Interest*, 2016). Metaphors and analogies are necessary for humans to contemplate certain natures of reality, such as the imperceivable and weird world of quantum mechanics (*Boudry et al.*, 2022). However, using metaphors in the context of scientific concepts can have downsides—amplifying misperceptions and spreading misinformation—at least from the perspectives of experts (e.g., *Doherty*, 2020).

Imperfect models do fictionalize science. As such, some might consider them to be FiSci when they're found within fiction (e.g., any depiction of a DNA molecule, even if it manages to display the correct chirality and shape; *Jacobs*, 2013). Such FiSci might be a symbol in that it is a simplified version of itself, as opposed to a stand-in for some greater societal concept.

The necessity of analogy to the human experience of unfamiliar science highlights analogy's importance for FiSci. In this study, creators often perceived FiSci as needing to be explained to audiences when it is not already a well-established trope. Analogy can aid such explanatory dialogue by finding a concept audiences are already familiar with. CRE-9 highlighted this with the demonstration Sam Neil's character does to explain how a wormhole works in the horror movie *Event Horizon* (*Anderson*, 1997):

"He folds the paper and puts the pencil through...I know it's not right, but you explain [the science] in an emotional and visual and actually shocking way...There's a sound effect there. And there's a thrusting of a pencil and a ripping of a

paper... and he's got a chance to emote and act and everyone in the audience goes, "Oh, okay, I understand." You're not really understanding how to travel through a wormhole... [or] if it even is possible, but everyone got it." (CRE-9)

Analogous FiSci can also be a source of fascination for audiences, "prompting us to decode analogies between future narrative and present experience, and to make sense of the differences" (Wiegandt, 2017, p. 278). While participants did not explore this opportunity explicitly, this can contribute to positive reception of a film/show, because audiences have a positive emotional experience despite apparent contradictions between the storyworld and real world. It also speaks to how FiSci serves a role of opening up minds to let audiences imagine and take interest in worlds that are not our own, leading into the following subtheme.

### 3.2.2. FiSci as imagination

FiSci, at least within the context of stories *not* attempting to mimic reality, was seen as a way for creators to "fantasize" (CON-18), play "make believe" (CRE-13), or otherwise envision implausible or impossible alternate realities.

"Probably the biggest reason for using fictionalized science is to inspire the imagination... When our current laws of science are restrictive to the type of storytelling that you want to tell, having fictionalized science allows you to push those boundaries... You want to tell something new and innovative." (CON-16)

This was seen as a benefit in terms of the story quality, but also in offering audiences an "escape from what we are currently living" (CRE-10) or the constraints of real knowledge.

"Imagination is more important than knowledge... Knowledge constrains you to all that is known, whereas imagination can lead you into the unknown to discover things to make them known." (CON-4, paraphrasing Albert Einstein)

References to imagination indicate that FiSci is seen not merely as an escape, but as a temporary expansion of the boundaries of reality (Johnson et al., 2016). Indeed, Slater et al. (2014) propose that one source of motivation for why individuals engage with narratives is that narratives allow *Temporary Expanding Boundaries of the Self*. They argue that narratives offer a moment of respite from the cognitive and emotional demands of maintaining one's identity (both the personal and the social). A similar motivation could be ascribed to the use of FiSci. For the immersed, FiSci exists as a "What if" scenario that presents the impossible (or highly implausible) as real—at least for an hour or two.

CRE-15 considered the outer space setting of their upcoming Soft SciFi series "liberating," saying the writers "don't have a lot of rules. We can kind of do whatever we want." Indeed, the speculative question "What if" is one upon which many a Science Fiction story is predicated—for example, *What if we found a black hole out by Neptune that was actually a portal to Hell* (as featured in *Event Horizon*)? However, such a question might also be asked for FiSci in a story that would generally not be defined as Science Fiction

(e.g., *What if urine really were the ideal cure for a jellyfish sting?*). While some FiSci may arise from a lack of fact-check, or other unintentional misrepresentation of realistic science or knowledge, an alternative proposition is that all FiSci might be considered a speculation: *Within a given storyworld, what if this piece of FiSci were actually true?*

"The more crazy stuff you can come up with, the better, I think with the SciFi stuff. The *Avatars* or... the warp speed in *Star Wars*<sup>4</sup>... Who knows if that could ever exist, but it's super fun. And it makes you think, you know, "What if?" (CRE-12)

Many participants spoke to FiSci's tendency to depict possible future scientific knowledge and technology.

"We wrote this script 20 years ago... [It] had self-driving cars, electric vehicles... The thing we were the proudest of is everyone's carrying around a personal assistant... little devices that would do shit for them... You sort of don't even realize when reality has caught up with you... I'm seeing everybody in the world with a cell phone in their hand all the time and going, "Hey, that's our PA. We invented that in our heads." (CRE-7)

Because our real future has yet to be written, this offers a different kind of escape from the established rules of our universe. These "What ifs" are restricted to depicting what could be possible if science continues along current paths of knowledge acquisition and application. Whether creators are merely prognosticating what is already inevitable, or directly inspiring inventors to find ways to manifest fiction as fact, was acknowledged.

"Movies and TV have a tendency in some ways to kind of tell the future. Almost maybe a little bit of a self-fulfilling prophecy... I think [they] do a good job of giving us a glimpse of what's possible." (CON-18)

To that end, several creators also spoke to depictions of FiSci technology in past projects that came into existence, or into much more commonplace use, by the present day (e.g., self-driving cars; CRE-10 and CRE-19).

FiSci that might seem impossible to the point of breaking an audience's suspension of disbelief (or, as some academics argue, creation of belief; Worth, 2004; Busselle and Bilandzic, 2008) could be considered inspirational when one looks at current technology from the perspective of a person living sufficiently far in the past. In cases where FiSci is perceived as wholly unrealistic, such a point of view may lessen negative feelings caused by that perception. Thus, the line between the themes **FiSci as Play** and **FiSci as B.S.** is a fine one, dependent upon personal taste and vision.

"I like *The Fly*. [It] kind of works because on some level people think, well, someday somebody will find a way to... transport matter. I mean, it seems absurd now, but everything we do now would have seemed absurd, you know, 10,000 years

<sup>4</sup> Ships in the *Star Wars* franchise actually use hyperdrives for their faster-than-light propulsion; *Star Trek* ships use warp drives.



ago. I mean, we're living in a world of pure magic compared to where we started." (CRE-7)

With regard to the relationship between play and inspiration, several participants made statements that FiSci could inspire audience members—to investigate the possibility of said future science and technology, to go into STEM careers, and so forth. However, these statements were less abundant than those of general imagination.

"These spaceships on these shows are basically impossible... or we sure as hell don't know how to make them, yet... They're aspirational. They make people hopefully want to study science... and get us closer to those things." (CRE-3)

Thus, there's a distinction between play for play's sake and play with purpose.

### 3.3. FiSci as B.S.

The theme **FiSci as B.S.** describes the main negative perceptions of FiSci expressed by participants. The term *B.S.* is colloquially understood as the abbreviation for *bullshit*, and this word was used by several participants (e.g., "The premise is complete bullshit"; CRE-14). This theme therefore includes negative expressions that FiSci is nonsense—it lacks meaning or any relation to the real world—and expressions that suggest a lack of value or quality. It is worth pointing out that negative descriptions of FiSci were usually specific. That is, negative references to FiSci were more likely to reference a particular representation, rather than comment on FiSci as a whole. CRE-3 below highlights one of the less abundant cases, where they define FiSci as more often "nonsense," compare this to CON-6, who speaks of a specific example.

"Fictional science to me is when you get into, like, the science of warp drive... It's basically nonsense, a lot of it. You might as well be reciting Jabberwocky." (CRE-3)

"[Show] started using zero-point energy, which is basically magical energy that comes from nowhere. Oookay. There is some theoretical basis that could be plausible. I personally think it's bullshit, but you can go with it." (CON-6)

Both in general, and when speaking of specific examples, most participants used a negatively coded word at some point during the interview. By far, negative words were used as synonyms for a lack of perceived realism or lack of believability (e.g., "ridiculous" CRE-1; "absurd" CRE-11; "stupid" CON-15). This is another reason why the theme name uses the abbreviation "B.S."—to reference the perception that FiSci can **Break** an audience's **Suspension of Disbelief**, and pull them out of the narrative.

"*Armageddon* is so ridiculous and stupid. In fact, there's that one point when they're on the [asteroid], and they jump a cavern in that space car... **the movie lost me** way before that." (CRE-27, emphasis added)

CRE-27's statement reminds us that Hollywood creators and consultants do consume these stories as audience members, though other participants referenced a hypothetical audience response to B.S. FiSci (e.g., "You don't want the audience to go "Ugh. That's ridiculous.""; CON-13).

"Ridiculous," which was said by many participants over the course of their interviews, was mostly used in the context of comparing the scientific knowledge of the real world to that featured within a storyworld. However, CRE-3 used the word in reference to a lack of internal narrative consistency—a piece of technology was seen as "ridiculous" because it didn't comport with the other technology featured within the story.

"My favorite note I ever got... We had written a scene where one of the characters was fixing the starship and he was using a wrench, and the note [from the consultant] was "A wrench? Why not an antelope bone?" It was as ridiculous that they would be using a wrench on a starship as you would be using an antelope bone... Such a primitive tool to fix this advanced piece of equipment." (CRE-3)

To CRE-3's consultant, the wrench was B.S. because it wasn't FiSci *enough* for the storyworld. Usually, a piece of FiSci stands out for being *more* unrealistic than the rest of the story, and participants made many statements about perceived realism affecting their own decisions of whether or not to use FiSci. Perceptions of ridiculousness were also recognized as subjective, depending both upon the overall quality of the story, and one's own beliefs about whether or not a piece of FiSci is deemed plausible enough.

Meanwhile, the word "stupid" was used by several participants, and also primarily used to suggest lack of realism or believability.

"It's funny. I go along with, like, oh, this is how spaceships work in space bullshit, to a certain extent. The one time I lost my mind on it was in [*Star Wars*] *The Last Jedi*... I just wanted to scream, "No, that's not how space works"... It was just stupid." (CRE-20)

As a more general slang term, there were also a couple of uses speaking to a generic lack of quality (e.g., CON-9; CRE-28). However, "stupid" may also speak to the ease with which a piece of FiSci could be replaced. CRE-11 spoke of wanting to avoid "stupid mistakes," and CRE-16 referenced the same concept in their desire to avoid using complex jargon or terminology incorrectly.

"You don't want to say anything stupid, you know? You don't want to invoke quantum entanglement when physicists really mean something else by that term." (CRE-16)

Thus, "stupid" could relate to some FiSci being seen as lacking effort, in this instance through using terminology incorrectly (*FiSci as Convenience*).

Regarding lack of effort, the word "embarrassing" was also used by a few participants. Perhaps unlike the more generic "stupid," "embarrassing" suggests a creator would or should experience some amount of personal shame having used a particular piece of FiSci. Perhaps affected by other narrative elements (e.g., a lack of engaging characters to compensate), the FiSci results in some kind

of failure—to a creator or consultant’s own standards, or to those of the target audience.

“We want to be, I think, medically sound, so nobody’s saying, “You guys are idiots. You have no idea what you’re talking about.” That would be embarrassing.” (CRE-14)

CRE-2 suggested that FiSci becomes embarrassing when it prevents the audience from taking the narrative around it seriously. They also used the term “goofy,” which suggests some FiSci carries an unwanted comedic tone. If FiSci is perceived as a mistake, any resulting comedy may harken back to ancient perceptions of laughter as mockery (the *Superiority Theory of Humor*; Morreall, 2020). However, CRE-2 clarified that intentionally goofy FiSci is acceptable, so they may instead be making reference to the *Incongruity Theory of Humor* (Morreall, 2020). Embarrassing FiSci is humorous when it doesn’t fit within the rest of the world the story has constructed, even if that world is already “crazy, batshit Science Fiction.”

There were also negative perceptions of FiSci as “magic” (CRE-17)—statements that FiSci operates using its own rules that creators make up as needed without caring what the real science is. CRE-2 noted how their own personal standards of wanting FiSci to be based on real science were distinct from their showrunner’s, who just wanted CRE-2 to make something up for a plotline. Thus, a negative perception of FiSci as magic or B.S. could stem from conflicting standards between two (or more) creators working on a single project. Their anecdote highlights that perceptions of FiSci don’t merely differ between creators and consultants on occasion, nor merely between Hollywood and its audiences.

“[Showrunner] had no interest in science...I remember when we were trying to think of the disease that this girl [had]...we did all this research to try to find, like, what are some really strange, lesser-known diseases... [Showrunner] had sort of a list of requirements, like she has to seem perfectly fine until she’s not, and then she could sort of drop dead at any time. And we ended up finding some strange disease, and then he was like, “Yeah, no, I don’t care about a real disease. You could call it lightswitchitis. Where we flip the switch and she’s dead.”” (CRE-2)

Finally, the term “pseudoscience” was used by a few participants in the context of FiSci. This is generally considered a negative term in the real world, but it is unclear if these participants were using it as such, or merely as an alternative term for “fake science.” CRE-10 distinguished such inaccurate science from anything that was made up entirely. The example they gave was the use of a made-up virus, as opposed to a misrepresentation of a real one.

“The showrunner, I think in an effortless way, really did keep the pseudoscience down to a minimum...He never put in something that a TV viewer could be like, “That’s wrong,” because it was kind of made up and it all sort of made sense.” (CRE-10)

Negative FiSci, to CRE-10, was FiSci that audiences could identify as inaccurate. This could suggest that explicit

misrepresentation is worse than “science” supposedly created from scratch. However, few participants made similar distinctions.

### 3.4. FiSci as Santa

While FiSci as Santa is not a theme in and of itself, it was surprising that six participants likened FiSci to Santa Claus. These references can be categorized into three types of comparison. The first was how Santa and FiSci are both symbols, which was discussed previously:

“[FiSci and Science Fiction are] nothing more than symbols that we recognize aren’t—I mean like Santa Claus. There is no Santa Claus...But the idea of even a guy on the street corner ringing the bell, it’s not that you really think that guy is Santa Claus... [But he] represents the goodness of mankind and the spirit of giving.” (CON-8)

Second, both FiSci (in particular, certain story-generating FiSci tropes) and Santa Claus exist as a common mythology. There is a relative paucity of literature about FiSci, which this study addresses. In contrast, the Santa Claus mythos has attracted vast and diverse study from many social science perspectives for many years (for just a few of many examples, see: Belk, 1993; Miller, 2017; Kürti, 2020). It is worth acknowledging the diversity in the Santa mythos. Santa may be conflated with, or adapted from, the historical figure Saint Nicola of Myra (Miller, 2017; FiSci may therefore act similarly when it is extrapolated from real science kernels). As CON-8’s comment suggests, Santa may be a winter-themed avatar—perhaps even an ideal toward which we should strive to be. In some families, Santa is a role through which real people perform “an unfolding series of good deeds and Christmas spirit” (Itkowitz, 2016, para. 5). Alternatively, Santa—given his likeness’s appearance in advertisements—may represent how a holiday has been corrupted by commercial, profit-seeking entities.

That being said, most depictions of Santa share similar features: a red suit and white beard; plump; lives above the Arctic Circle, if not the North Pole; often accompanied by reindeer or toy-making elves; gives coal to “naughty” children; and so on. Hollywood has its own part to play in propagating these Santa tropes.

The wide recognition of a recurrent piece of FiSci or Santa allows either one to serve as an effective method to garner an audience, while not requiring a bunch of screen time to explain how they work on a fundamental level. To the latter point, CRE-19 spoke of such a shortcut more in the positive sense than the subtheme *FiSci as Convenience* would generally suggest. They saw FiSci as a source of fascination and perfectly acceptable as long as the greater narrative does not treat the scenario as plausible.

“You try to tap into something that people know, but they don’t know too well. And that kind of mythology makes people lean in. Do I actually think aliens built the pyramids? No, I don’t. But almost everybody has heard it... To me, that’s the

scientific equivalent of Santa Claus. I don't think there's a real Santa Claus, but we can make some really cool movies about Santa Claus." (CRE-19)

Third, FiSci was related to Santa by being a kid version of science. Eventually, audiences have to grow up and learn it's fictional and enter the real world of what is actually possible (yet "we all want to believe" FiSci could still be possible; CRE-22). This connects to [Busselle and Greenberg's \(2000\)](#) discussion of realism, wherein they recognize "at some stage children come to understand that people and events appearing on the television, at least in fictional programs, exist for the purpose of creating a representation of something that does not exist in the real world" (p. 253). To children growing up in some households, Santa is an entity that operates within the world according to certain rules, and explains certain phenomena (e.g., *How do those stockings get filled with treats?*). Eventually, one must realize that Santa does not, in fact, exist. Yet, fictional media likes to continue to represent Santa as real.

"Nobody ever says on television Santa Claus doesn't exist. Never. Because nobody wants to be the one to tell those under-7-year-olds that that's what's going on. Everybody gets to get over that little bit of naivety themselves." (CRE-6)

The idea of having to grow up and realize FiSci is fictional seems to contrast with sentiments that some FiSci could be seen as inspiration or hope that translates into people wanting to recreate what they see in the real world. Hope was briefly referenced in CRE-21's and CRE-22's back and forth about Santa/FiSci, with the latter seeing FiSci-filled worlds as an escape from reality, which aligns with perceptions of *FiSci as Imagination*. But they suggest reality *needs* to be escaped every once in a while to keep humanity's hopes for the future up (à la Slater et al.'s [2014] TEBOTS model).

"Especially seeing the rise of all the Marvel films, The *Star Wars* films... When you set things not in this world, or in a slightly alternate world, I think you can tell stories with more hope... As much as we know in real life right now, I think now we want an escape. We were talking today about Santa... because [CRE-21] was talking about whether to show [their child] *Miracle on 34th Street*..." (CRE-22)

"...It's not gonna hold up if you start picking the logic out of it... And I think as they get older, they sort of demand a more scientific explanation for things. Like back to Santa it's like, just saying Santa is magic is starting to become not enough for [my child] who wants to understand exactly how that works." (CRE-21)

Compare also the notion that taking a break to watch a movie featuring Santa allows us poor, jaded adults to return to our childhoods and pretend for 90 min that magic is real. Discussion by these few participants highlights one important role fictional science plays within fictional entertainment narratives. FiSci may indeed provide a source of childlike wonder, evoking not a desire to sneak out of one's bedroom to catch a parent red-handed eating the cookies and milk, but a desire to engage with other science

communication content and learn how FiSci connects to the real world's alternatives.

### 3.5. Creators vs. consultants

It might have been predicted that creators and consultants would have significantly different perspectives on FiSci in Hollywood, due to differences in their level of formal scientific education and their role within Hollywood (e.g., many consultants consult to help Hollywood get the science right). Yet, this study demonstrates similarity in attitudes and beliefs across creator and consultant groups. A plausible explanation for this may simply be that only those consultants whose perspectives generally align with creators will last in Hollywood; thus, the overall population of consultants may be collectively biased in their perspectives when compared to the greater population of science experts.

Despite general similarities, there were minor differences in the thematic codes that creators and consultants were more likely to address in their interviews. Those pertinent to the results presented in this study include that consultants were more likely to ascribe neutral intent (e.g., narrative shortcuts) to convenient FiSci, whereas creators were more frequently negative. Perhaps creators felt more comfortable with criticizing their fellow creators, whereas consultants did not wish to use words that could come across as insulting members of Hollywood who were willing to invite them into the fold. There was also a noticeable difference in perceptions of science itself, with consultants preferring to describe it as a process of acquiring knowledge (e.g., the scientific method), and creators more likely to describe it as a collection of knowledge (e.g., facts). This may have influenced their discussions of FiSci even after providing our definition of the term FiSci.

## 4. Conclusion

This study presents a preliminary guide to the current state of Hollywood creators' and consultants' perceptions of FiSci. As such, it can inform creators and consultants alike about how the other thinks, and possibly dispel preconceptions held by creators who have yet to work with a consultant, experts looking to become a consultant, or for that matter, armchair critics in the audience on the lookout for FiSci in the content they watch. It also answers, in part, the questions posed by [Kirby and Ockert \(2021\)](#): "How do scriptwriters approach science?" and "What role does science play in storytelling?" in the context of fictional representations of science (p. 91).

According to the creators and consultants interviewed, Hollywood perceptions of FiSci are generally context dependent. Primarily, participants spoke of FiSci being a tool to support engaging storyworlds and the characters that live in them—FiSci may be used to improve upon what realistic science can offer, or as a necessary compromise, or as a method of convenience to avoid devoting more time and/or effort to explore real science concepts (both in the production of a project, and within the narrative itself). Consultants were more likely to ascribe neutral intent (e.g., narrative shortcuts) to convenient FiSci than creators, who were more likely to simply evoke perceptions of laziness.

Participants spoke of FiSci positively as opportunity for exploration and imagination and as symbols which can evoke audience reflection or discussion. *FiSci as Symbol* may also be connected to the use of symbols in real science, helping people understand complex topics by way of a simplified representation. Related to **FiSci as Play**, there arose an interesting contrast between statements that FiSci exists to provide an escape from reality, and that FiSci inspires us to recreate fiction in reality. This manifested in multiple unprompted discussions of fictional science being likened to Santa Claus. Comparisons between FiSci and Santa also revealed a perception of FiSci as a naive version of science we must eventually move on from (in terms of belief), but occasionally return to for our benefit.

Negative perceptions of FiSci primarily spoke to a perceived lack of effort behind its implementation (including that a representation is creatively stale), or that a given representation is too “ridiculous” (i.e., too implausible or internally inconsistent) within the context of a storyworld.

As the media landscape continues to evolve and the lines between fact and fiction grow increasingly blurred, there is enormous potential for further research on this topic. Hollywood’s fictional depictions of science aren’t going away anytime soon. Nor should they, as long as they are used to positive effect. Increased awareness and understanding of perceptions of FiSci held by creators, consultants, and audiences (including science communicators) can help produce those effects.

## Data availability statement

The datasets presented in this article are not readily available because they could be used to identify participants, thus abrogating our responsibility to maintain anonymity, as approved by our institutional ethics committee. Requests to access the datasets should be directed to JD, [jdvoeyek@gmail.com](mailto:jdvoeyek@gmail.com).

## Ethics statement

The study was approved by the University of Otago Human Research Committee (reference number D20/298).

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Participants provided written informed consent to participate in this study.

## Author contributions

Conceptualization, interviews, and manuscript—first draft: JD. Methodology: JD and NL. Analysis and review and editing: JD, NL, and GS. All authors have read and agreed to the published version of the manuscript.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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