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Science fiction and science futures: considering the role of fictions in public engagement and science communication work

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Abstract
The imagination of possible scientific futures has a colourful history of interaction with scientific research agendas and public expectations. The 2017 annual UK Science in Public conference included a panel discussing this. Emphasizing fiction as a method for engaging with and mapping the influence of possible futures, this panel discussed the role of science fiction historically, the role of science fiction in public attitudes to artificial intelligence, and its potential as a method for engagement between scientific researchers and publics. Science communication for creating mutually responsive dialogue between research communities and publics about setting scientific research agendas should consider the role of fictions in understanding how futures are imagined by all parties.

> *Do you see, then, that the important prediction is not the automobile, but the parking problem; not radio, but the soap-opera; not the income tax but the expense account; not the Bomb but the nuclear stalemate? Not the action, in short, but the reaction?*
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> Isaac Asimov, "Future? Tense!" (1965)

The Human Brain Project (HBP) is an EU-funded flagship computational neuroscience project in which research institutions across Europe collaborate to advance neuroscience through the use of computing to model neural processes, and reciprocally, to advance computing and robotics through the application of the insights of computational neuroscience to the development of computers. Philosophers and social Scientists included within this project take up the dual role of researching societal implications (a research role) and supporting other researchers within the project in their requirement to understand and apply their knowledge of potential societal impacts to improve the quality of their research, better addressing public concerns and values [Aicardi, Reinsborough and Rose, 2017]. The latter is a support role/but potentially also a research role when

exploring how best to support the integration of societal concerns and public values as a more regular practice, i.e. 'Responsible Research and Innovation'.[1]

At a most basic level this must involve science communication. Scientists must communicate with publics to inform them of future possibilities inherent in that research. And the communication must be two way. Publics must communicate with scientists how they feel about these future possibilities. This type of dialogic interaction is intended to shape research trajectories, i.e., various parties, researchers, investors, publics, other stakeholders are 'mutually responsive' to one another's concerns such that overall research systems adjust [Schomberg, 2012]. There are of course many difficulties in facilitating this type of 'mutually responsive' science communication.

One of the difficulties is that none of the parties precisely know the future and so they must negotiate between various images of the future that different parties have. As a part of the HBP Foresight Lab tasked with writing foresight reports on future medicine, future neuroscience, and future computing and robotics as relevant to the HBP, myself and Christine Aicardi were interested in how Science Fiction as a common cultural genre was influential in how people negotiated futures.

For this reason we organized a session at this year's Science in Public conference[2] and brought together discussion on this topic. The imagination of possible scientific futures has a colourful history of interaction with scientific research agendas and public expectations. Emphasizing fiction as a method for engaging with and mapping the influence of possible futures the panel set out to discuss the role of science fiction historically, its influence on public attitudes, and its potential as a method of engagement between scientific researchers and publics. The title of the panel was *Science and Science Fiction- the role of fiction in imagining the future, understanding public attitudes to technology, and engaging with scientific researchers*.

The first speaker, **Amanda Rees** (University of York) spoke about the ways in which science fiction could operate as a source of social critique in a very similar way to the strategies and concepts of historians and sociologists of science. **Rees** is the Principal Investigator for the AHRC funded project, *Unsettling scientific stories: expertise, narrative and future histories*,[3] which maps the ways in which social, cultural, political, economic, and moral interests and interactions shifted over the long 20th Century in relation to imagined futures. The University of York will host the conference "*Imagining the History of the Future: Unsettling Scientific Stories*" next year drawing out this research topic in much greater detail and bringing together scholars from a variety of disciplines (including science communication) to discuss science fiction.[4] A 2019 issue of the journal Osirus wil be on engagements between science fiction and the history of science.

Attention to and interest in the future has grown over the Twentieth Century, from H. G. Wells' call in 1932 for 'Professors of Foresight!' to the 1970s blossoming of semi-clandestine academic future studies research by experts and professionals, at

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[1]For a description see Stilgoe, Owen and Macnaghten [2013].
[2]https://sipsheff17.co.uk/ (accessed 6 September 2017).
[3]http://unsettlingscientificstories.co.uk/about-us (accessed 6 September 2017).
[4]http://unsettlingscientificstories.co.uk/imagined-futures.

the same time as very much more public conversations were happening such as Alvin Toffler's book *Future Shock*. Today, studies of the future proliferate, from stories of climate change to market narratives about the likely uptake of new technologies.

The (increasingly recognized) study of science fiction could provide for those seeking to understand how our views of the future have changed over time, an important methodological resource. A more detailed, qualitatively rich, source for examining expert and sociological imaginations of the future from particular historical and cultural moments in the past is available in science fiction. Rees proceeded to illustrate this with a close discussion of the work of author John Wyndham. Wyndham's books, seemingly full of pulp monsters and easy catastrophe, demonstrate however a careful social analysis and critique of expert systems. Wyndham locates disaster in the failure of a modern society to react adequately to threats to its own safety, a confidence in the city's conquest of nature, rather than alien monsters themselves. "We brought it upon ourselves," Rees quotes one of Wyndham's characters as saying in the novel *The Dawn of the Triffids*. His critique of industrial modernity emphasizes the role of the common sense lay person making sense of scientific knowledge in a way that experts seem not to be able to do. For Rees, Wyndham's work shows, "not just the way in which science and society are co-constructed concepts, he situates both within a moral universe where the differential distribution of power — not just economic and political but also intellectual — is shown to profoundly inflect the nature of individual experience — whether expressed through class, gender or species." (from presentation). While the role of the imagination has become a recognised influence in social theory (Jasanoff and Kim's *Dreamscapes of Modernity* [2015] is one of several scholarly contributions drawing attention to the real work that imagination does), for Rees, many (including Jasanoff) seem to see science fiction as merely a source of inspiration for scientists. But for Rees, coordinator of the *Unsettling Stories* Project, it is a qualitatively rich, detailed and methodologically innovative source from which to begin *Unsettling Stories*' "modest" project of writing a 'history of the future.'

The second panel speaker was **Will Slocombe**, a scholar of 20th and 21st Century literature at the **University of Liverpool** focusing on science fiction representations of Artificial Intelligence. His presentation focused on cultural representations of artificial intelligence from the mid-Twentieth Century on. Looking at examples from books, T.V., film and video games Slocombe described a variety of representations of robots and artificial intelligence, providing some typology, and considering to what extent these may serve to inform public perception of the scientific research on these. In some cases, these perceptions are informing public debate more so than developments in the actual scientific research, suggested Slocombe [2016]. This raises an important challenge for science communication which hopes to create genuine participation of publics in deliberative democratic decision-making about research policy on A.I.

Slocombe sought to discern what influence science fiction might have on public attitudes to Artificial Intelligence. A broad variety of films, books, TV and videogames provide images of A.I. for public consumption. Notable films include *2001* (1968), *Blade Runner* (1982), *The Terminator* (1984), *Wargames* (1986), or more recently *Wall-E* (2008), or *Ex-Machina* (2015). Books range from classics such as Asimov's Robot Series (1939–1977), or Marge Piercy's *He, She, and It* (1991) to more

recent tales such as Kim Stanley Robinson's *Aurora* (2015). Videogames are now also an important part of fantasy and science fiction culture having broad distribution and use. Games like *Fallout* and *Mass Effect* include important roles for A.I. TV shows, for example *Doctor Who*, regularly address themes relevant to A.I. and robotics. To think about these stories the narratives could be organised along a variety of spectra each according to how A.I. is represented in relation to several analytic questions which Slocombe listed. These might include the level of autonomy or agency possessed by the A.I., the setting (far future or more 'plausible, near futures'), the relationship to organic life (friend or foe) that the A.I. possesses, what platform the A.I. exists upon (embodied as robot, android, or gynoid or disembodied as a distributed intelligence), the imagined history of its development, or who the intended audience for the story might be.

To consider what influence science fiction might have Slocombe looked at a recent public attitudes to 'machine learning' study commissioned by the Royal Society.[5] The study was carried out by Ipsos Mori (n=978). A majority (75%) indicated they had not heard of machine learning although when explained many seemed familiar with examples. The study provides little reference to science fiction. There was some suggestion that harm is more readily associated with machine learning when it is embodied. This is contrary to the most typical representations in science fiction, where disembodied intelligence is considered more threatening (for example, Skynet from the *Terminator* film series). There is clearly more work to be done in understanding how science fiction is and isn't informing publics about artificial intelligence. Slocombe asked, how do age, readership demographics, occupation or other factors affect public attitudes? The Royal Society study doesn't allow for a specific exploration of the role of science fiction in influencing public attitude. And of course there might be methodological challenges in developing such a study. One can imagine that many would either not admit to having been influenced by pop cultural representations or not recognise the influence, that these representations might have influenced them unconsciously. Here is an area of research that could bring together science communicators, literary scholars, and social scientists (even historians) to determine the relationship between science fiction, science fiction imagery and public attitudes towards A.I. and robotics. Slocombe articulated a number of possible questions: how does the popularity of individual representations influence publics? What is the relation between different mediums with different levels of claims to be real, from fictional narrative to the implied accuracy of journalism? How might the lineage of stories (which narratives inform others, conceptually, visually, or otherwise) be relevant? How will the role and significance of AI / human interactions within the narrative influence how readers and publics think of real world AI? Can we describe any type of feedback loop between inspiration and innovation? For example, Vernor Vinge, William Gibson were two early Sci-Fi writers who inspired internet pioneers like Marvin Minsky.

In the final panel presentation there were three speakers describing a collaborative project. **Michael Reinsborough** (**University of the West of England, Bristol**) and **Christine Aicardi** (**King's College London**) had as researchers in the Human Brain Project Foresight Lab co-organized with near-future fiction author, **Stephen Oram** (published by Silverwood Books, resident author for the **Virtual Futures Salon**),

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[5]https://royalsociety.org/topics-policy/projects/machine-learning/ (accessed 6 September 2017).

the project *Science and Science Fiction: Versions of the Future.*[6] In this project hree science fiction writers were taken on a tour of the Bristol Robotics Laboratory (given by **Professor Alan Winfield** of the **University of the West of England, Bristol**) where they saw the work going on in the lab and met several roboticists and talked to them about their work. The sci-fi writers then had one month to write a short story. These stories were read on stage at the Bristol Literary Festival and then the roboticists (also on stage) responded to the stories. The audience was then given the opportunity to comment or ask questions. A full discussion happened between the various participants facilitated by the moderator, Sarah Lefanu, author of the book *Chinks in the World Machine, Feminism and Science Fiction* [1988]. The stories are now published as *Science and Science Fiction: Versions of the Future*, Silverwood, 2017, ISBN 9781781326312).

Part of the responsibility of the Human Brain Project is to collect public opinion about future developments in neuroscience, computing, and robotics and channel those opinions back into the research & development process so that the outcomes of publicly-funded research are broadly-speaking beneficial to the public.

Since so much public discussion of robotics is informed by science fiction Reinsborough, Aicardi and Oram, had chosen to co-organise an event linking writers to roboticists and then public discussion. Robotics, perhaps more than most scientific research fields, has been heavily imagined in fictional representation influencing public expectations and even to some extent the culture of and recruitment to the research field of robotics. Even the name robot comes from a fiction: Czech writer, Karel Čapek, created the word in a fictional story from 1920. Isaac Asimov's robot series is widely known within the robotics community. Asimov's (fictional) 'Laws of Robotics' are a staple of robot ethics discussion in the roboticist community.

The Bristol Literary Festival event was also an experiment in engagement methodology. Reinsborough and Aicardi took empirical data about outcomes by interviewing all the participants and collecting anonymous feedback from audience. There are a number of questions a researcher might be interested in exploring: does writer-scientist interaction help bring about public discussion (hopes and concerns) about the future of scientific research in robotics, computing, and neuroscience? If so, what are the best methods by which this might be set up in order to be successful? Can discussions of science fiction reveal what kind of imagination different actors within research/writing/& publics have? What motivates these images of futures? How does this help us understand research economies, planning, and action in science and science policy? This was an Art-science collaboration (mediated by social scientists). Too frequently in art science collaborations the artist is the poor cousin to the scientist and what the artist gets from the collaboration is not considered. So in this case, it was of interest to ask what motivates participation. What was in it for the sci-fi writer? For the audience? For the scientist? And perhaps also for the social scientists? This attention to the motivations and incentive structure of different parties in a collaboration is an insight of social science work.

Perhaps most importantly for science communication and policy work, *imaginations of the future shape research agendas in the present*. How one imagines a future may have social relevance. For example, it might provoke excitement about a particular project and thus help to distribute research money in certain ways. Or it might include some but not others in the vision or planning of the future. What happens when you arrive at a future where none of the planners imagined you to be there? So much of yesterday's imagined architecture continues to fail the elderly, wheel chair users and others with specific mobility differences.

So the method used in developing futures matters. Speculative futures have little method. Someone asks, wouldn't it be interesting if...? And the imagination and interests of the individuals tend to fill in the rest. While they may (depending on who does the speculating) provide interesting futures, they often fail to be inclusive. The HBP Foresight Lab uses more rigorous methods, working with a variety of experts in the field about what's possible, avoiding hype, applying sociological knowledge to potential new scenarios, and consulting with stakeholders and users of potential new technologies. Science communicators when talking about the possibilities of future research need to be attentive to whose version of the future is being brought to the public, what level of plausibility this future has and whose interests it may be in to promote it. And of course to ask what level of dialogue with the public and other stakeholders brought about this imagined future scenario.

Reinsborough began as the first of three speakers in the final panel presentation, by outlining findings from the writer-scientist public engagement event done as an experiment. The writers showed an enthusiasm for the opportunity to present writing and meet with scientists. The writers also evidenced an interest in thinking of themselves as engaging the public, raising debate. The scientists had some initial concern about whether the stories were dystopian or more positive about the product of their profession, robots. There was also evidence that the premise of the event helped the roboticists to think reflexively about the role of fiction in their work. Said one, "I hadn't realised how much we are doing this [modelling research on science fiction] in our lab".

The second speaker in this panel presentation was one of the writers from the event Stephen Oram, a near-future fiction writer, read a short piece, from his new book *Eating Robots and Other Stories*, published by Silverwood Books. From his website he describes himself as "...working with scientists and future-tech people to write short stories that create debate about potential futures."[7]

The provocative story focused on how robots in the future might digest organic matter and how this might give them the type of autonomy that makes them seem more life-like. The story followed a developing conflict when an elderly woman's personal robot had been out on its own and had eaten her neighbour's robot. When a local police officer's investigation brings the threat that the robot, for whom the woman had developed considerable personal attachment, might be deactivated and reprogramed, the woman chose her robot rather than the police officer. Bad luck for the officer who is eaten by the robot on the instructions of the old woman. In part the story was inspired by actual research. The Bristol robotics laboratory is

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[7]http://stephenoram.net (accesses 6 September 2017).

investigating organic matter digestion to create power for small robots, for example by digesting a fly. And it was this research that inspired the story.

It is worth noting that the story does not imply autonomous human devouring activity by a robot. Rather it is the robot's owner, an elderly woman empowered by robotic support devices and with a strong relation to her robot pet, who uses the robot illegally to commit/authorize the crime. Robots serve as mediation of social power between different human actors rather than key social actants themselves. But nevertheless, hearing the story brings to the researchers some knowledge (and perhaps also some concern) about how some activities by robotics researchers, more-so than others, are poignant to the human imagination. Putting roboticists into this type of situation, with a public present when the story is first presented, potentially encourages reflexivity and learning about public attitudes. For the Science In Public conference the interlude of creative fiction reading, counterpoint to three days of academic presentations, was a direct illustration of one of the outputs of an unusual experiment in public engagement, providing a quite different way to think about science communication.

The final speaker in the last presentation, Aicardi, discussed subsequent outcomes from the event,[8] notably further activities she and Oram are working on in collaboration with scientific labs at King's College London, thanks to a grant- and logistical support- from King's Cultural Institute. Aicardi explained the rationale of these future projects, which was informed by the initial findings from the Bristol event. While writer-scientist interaction would still be used to develop a public engagement event where scientists would discuss with audience and writers their work and how it might inspire (or be inspired by) fictional futures, there will also be social science, arts and humanities represented on the discussion panels. It is hoped that having social scientists and historians present on a panel will allow for additional emphasis on the social implications of technologies, provide additional mediation across the 'expert-lay public' dynamic that typical-scientist-speaking-to-audience engagement exercises often acquire, and hopefully draw out the 'social science fiction' nature of what might otherwise be thought of as merely 'science' fiction.

A possible further development of the role of writing stories was to encourage scientists and social scientists to themselves engage in near-future fiction writing as an alternative method of collaboration. Aicardi had herself experimented in developing fiction as an opportunity to articulate some of the subtle sensibilities of interdisciplinary work in science communication. She sought to write 'social science fictions' of artificial intelligence expressing challenges and encouraging 'mutual responsiveness' between research communities (A.I., social science, and others) in an imaginative and potentially productive manner, addressing issues that might fail to have affective resonance when presented in an ordinary research report format.

As the three presentations from this panel demonstrate, fiction can be a method for engaging with and mapping the influence of possible futures. There is more to learn from examining the role of science fiction historically, the role of science fiction in public attitudes, and its potential as a method for engagement between

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[8]Video of Event available at https://www.youtube.com/watch?v=XFOrEZeZbDw (accessed 6 September 2017).

scientific researchers and publics. Science communication with the intention of creating and supporting mutually responsive dialogue between research communities and publics in order to deliberate upon and set scientific research agendas must also consider the role of fictions in understanding how futures are imagined by all parties.

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