SCIENCE FICTION

SHERRYL VINT

The MIT Press | Cambridge, Massachusetts | London, England



© 2021 Massachusetts Institute of Technology

All rights reserved. No part of this book may be reproduced in any form by any electronic or mechanical means (including photocopying, recording, or information storage and retrieval) without permission in writing from the publisher.

This book was set in Chaparral Pro by New Best-set Typesetters Ltd. Printed and bound in the United States of America.

Library of Congress Cataloging-in-Publication Data

Names: Vint, Sherryl, 1969- author.
Title: Science fiction / Sherryl Vint.
Description: Cambridge, Massachusetts : The MIT Press, [2021] | Series: The MIT Press essential knowledge series | Includes bibliographical references and index. | Summary: "An overview of how science fiction has grappled with the ways that science and technology shape and change human lives, emphasizing the challenges of the 21st century"—Provided by publisher.
Identifiers: LCCN 2020008515 | ISBN 9780262539999 (paperback)
Subjects: LCSH: Science fiction—History and criticism. | Science fiction—Social aspects.
Classification: LCC PN3433.5 .V55 2021 | DDC 809.3/8762—dc23
LC record available at https://lccn.loc.gov/2020008515

10 9 8 7 6 5 4 3 2 1

CONTENTS

Series Foreword vii

1 Introduction: Whose Science Fiction? 1
2 The Utopian Tradition 19
3 Futurology and Speculative Design 37
4 The Colonial Imagination 57
5 Robots, AI, and Transhumanism 75
6 Genomics, the Microbiome, and Posthumanism 97
7 Environment, Climate Change, and the Anthropocene 117
8 Economics and Financialization 137
9 Conclusion: Living in a Science-Fictional World 155

Acknowledgments 171
Glossary 173
Notes 177
Further Reading 193
Index 197

1

INTRODUCTION: WHOSE SCIENCE FICTION?

It has become axiomatic to say that the world is becoming like science fiction (sf). From mobile phones that speak to us (reminding *Star Trek* fans of tricorders), to genetically modified foods, to the Internet of Things and the promise of self-driving cars, people in industrialized nations live immersed in technology. Daily life can thus at times seem like visions from the pulp sf of the 1920s and 1930s—either a world perfected by technology, manifested in events such as the 1939 World's Fair, with its theme "The World of Tomorrow"; or a dystopian nightmare, such as Aldous Huxley's *Brave New World* (1932). How might sf help us conceptualize and respond to a world that has begun to resemble sf, in ways both marvelous and malign? This book provides an overview of how sf grapples with the ways that science and technology shape and change human lives. As introduced here, the genre is a tool for

thinking about and intervening in the world. This book is about what science fiction can *do*, not a catalogue of important authors and titles.

There are many competing claims regarding precisely how to define sf and how to determine when the genre began. Some argue for a long tradition of all speculative writing about science, dating back to Johannes Kepler's *Somnium* (1608) or even earlier. Others link it to utopian writing, beginning with Thomas More's *Utopia* (1516); later utopias offered visions of future societies in examples such as Edward Bellamy's *Looking Backward, 2000–1887* (1888) and William Morris's *News from Nowhere* (1890). Still others see H. G. Wells's scientific romances and Jules Verne's *Voyages extraordinaires* as the "fathers" of a genre whose origins are inextricably linked to science becoming culturally dominant in Western cultures during the late nineteenth and early twentieth centuries. In his insider history of the genre, *Billion Year Spree* (1973), Brian Aldiss influentially dubs Mary Shelley's *Frankenstein* (1818) the first sf novel, a work that fuses the latest innovations in science with a humanist tradition of thinking about society and ethics. A popular trend dates sf's origin to the American pulps of the 1920s, chiefly Hugo Gernsback's *Amazing Stories*, which tapped into an emergent, enthusiastic community of experimenters and technicians. Gernsback is responsible for popularizing the term *science fiction*, a less complicated version of his original "scientification."

The genre is a tool for thinking about and intervening in the world. This book is about what science fiction can *do*.

In the first issue of *Amazing Stories* (1926), he announced this was to be a "new sort" of fiction for a century that would chart a new path in literature and "in progress as well."[1] For original fan communities, the Gernsback era was foundational, and his technophilic pronouncements are the core of the genre, but his view represents only one facet of a complex tradition.

Rather than elaborate this history or take a position on the origins of science fiction, this book focuses on what they share at their core: a vision of the world made otherwise and the possibilities that might flow from such change. My goal is to provide neither a detailed history of the genre nor a comprehensive listing of its most important works. Rather, following John Rieder, I am interested in focusing on what science fiction can *do*, how it has been described by a variety of constituencies in distinct ways for multiple ends.[2] I plan to chart how sf is evoked and used by a range of authors and audiences and sketch an overview of how the genre has been—and continues to be—useful for grasping daily life in industrialized, technologized societies.

Although there may be no precise demarcation of what the term *science fiction* denotes, certain images or narratives immediately come to mind: enhanced mobility via rocket ships or flying cars; immersion in digitized environments, from virtual entertainments to perhaps digitally transferring one's consciousness to a new body; and

the idea of *the future*, which may include radically different citizens such as self-conscious robots or genetically modified people, perhaps even aliens. A set of images thus conveys the core of science fiction, even if the boundaries at its edges are indistinct, a situation further complicated by the fact that different communities have diverse ideas in mind when they claim the label and try to define the genre it describes. Many fans and scholars of sf, for example, argue that its print form is inevitably more nuanced than media versions, a claim confusing to twenty-first-century audiences for whom "science fiction" is often synonymous with widely known media texts such as *Star Trek*, which has been on television or film screens in myriad iterations since 1966.

Margaret Atwood's widely circulated claim that she writes speculative rather than science fiction, because she extrapolates from known science rather than inventing futuristic versions of it, embodies the confusion: not only would most readers recognize her most widely known works—*The Handmaid's Tale* (1985) and the *MaddAddam* trilogy (2003–2013)—as science fiction, but most practitioners and fans of science fiction would also agree that much (not all!) sf similarly extrapolates from known science.[3] Indeed, many people use the terms *speculative fiction* and *science fiction* interchangeably, recognizing that, despite the label, the relationship between science and science fiction is neither simple nor direct.[4] Idiosyncratic definitions

and squabbles about the minutiae of genre borders will thus not get us very far. Science fiction is better conceptualized as a tendency, a phenomenon Gary Wolfe describes as a style that evaporates into and permeates much cultural production today.[5] Istvan Csiscery-Ronay Jr. argues that we should understand sf as a mode rather than a genre, a way of experiencing the world that has become normalized in recent decades. He uses the term "science fictionality" to describe this way of perceiving and evaluating things as "if they were aspects of a work of science fiction."[6]

My preference is to understand science fiction as a cultural form that offers an "everyday" language for thinking about and responding to daily life in twenty-first century. Its engagement with science and with the motifs of sociotechnical culture—interplanetary travel, digitized experience and communications, genomic modification, artificial intelligence (AI), and more—is metaphorical, whether the worlds it posits might actually happen or not. The genre asks questions about the impact of science and technology on human experience, values, and ways of living, and even when it explores these issues through scenarios that science tells us are impossible, the genre uses such symbols to comment upon otherwise unnoticed aspects of our ordinary world. For example, Atwood suggests that the impossible Martian invaders in Wells's *The War of the Worlds* (1897) make his creative enterprise fundamentally different from Verne's plausible visions of

more powerful versions of existing transportation technologies. From a different angle, however, we can see that Wells engages contemporary sociotechnical culture just as much as Verne does, using the metaphor of a superior Martian civilization conquering London to raise questions about the role science and technology have played in colonial history.[7]

These struggles over terminology illuminate one of the central tensions that has shaped the sf community as long as we have used this label: Is science fiction predominantly a genre that has to do with plausible scientific extrapolation, perhaps even with educating the public in scientific literacy? Or is it predominantly a literature of social change, often using futuristic technologies to establish that its stories take place in different worlds, but remaining more interested in social than scientific change? Within a decade of the first issue of *Amazing Stories*, the science-inflected Science Fiction League fan group launched by Gernsback fragmented. A new organization emerged, originally called the Committee for the Political Advancement of Science Fiction, later the Futurisms, whose members included influential authors and editors such as Frederik Pohl, Judith Merril, Donald A. Wollheim, and a young Isaac Asimov, and called for sf to be less interested in new gadgets and more engaged in social critique. Claiming the opposite, conservative fan Sam Moskowitz founded New Fandom, dedicated to a vision of "hard" or

scientifically engaged sf that had little interest in social transformation. From its very beginnings, sf has included both science-focused extrapolations and politically engaged visions of the future—and arguments among its practitioners over which element was more definitive of the genre.

Under the influential editorship of John W. Campbell, in charge of the central magazine *Astounding Science-Fiction* from 1937–1973, a technocratic version of hard sf dominated the field mid-twentieth century, shaping long-term perceptions of the genre when the early years of Campbell's editorship subsequently became canonized as the Golden Age. Campbell's strong interventions and rigid views were undeniably a key force in shaping the emergence of American sf, but whether his influence established a Golden Age or was the "worst disaster ever to hit" the field remains a matter of debate.[8] In the 1960s and 1970s, a group of artists calling themselves the New Wave, thereby aligning themselves with the contemporary French *Nouvelle Vague* film movement and surrealism more generally, made efforts to push the genre toward similarly new aesthetics and themes, prompting another conservative reaction within the field—and so on. Science fiction is continually invented and reinvented, at times leaning more strongly on its connections to scientific extrapolation, at others emphasizing its literary qualities and formal capacity to challenge how we see the social world.

From its very beginnings, sf has included both science-focused extrapolations and politically engaged visions of the future.

Grasping what science fiction *is*, then, requires understanding that this tension between scientific extrapolation and social change lies at its heart. It adopts a range of aesthetic styles and thematic preoccupations as it explores how the world might be otherwise. My use of the acronym sf is not merely shorthand but reflects my sense that texts circulating under either label—science fiction or speculative fiction—are closely related. Indeed, the meaning of the term "speculative" as involving contemplation or conjecture aptly captures the approach to science and technology adopted by science fiction.

In academic study, definitions based in utopian studies have been influential, if also challenged. Most recognizable is Darko Suvin's contention that science fiction is "*the literature of cognitive estrangement*,"[9] developed in dialogue with works of cultural critique by Bertolt Brecht and Ernest Bloch. All are interested in the power of art to jar us out of commonplace associations or perceptions, to see the quotidian world not in all its self-evident naturalness but as one contingent possibility among many, the product of historical choice. Suvin argues that the best sf aligns with a transformative project of social critique and suggests that the cognitive dimension of sf's estrangement, which he correlates with science, ensures that its imaginative visions remain tethered to a practical possibility in the material world. For him, sf is thus politically enabling and oriented toward real-world change, in contrast

to works of fantasy, which he dismisses as mystifications. Although this rigid genre purification has been rejected in recent criticism—and indeed, never empirically described the bulk of sf in any case—the idea that the genre is about change persists. Suvin's ideal that sf would necessarily embody the perspective of those socially excluded from dominant culture, however, has been thoroughly debunked.[10]

Another influential academic conceptualization of sf comes from Fredric Jameson, who is equally interested in the genre's capacity to offer concrete images of different, ideally better worlds. For him sf's critical contribution is that it reframes the temporal experience of our contemporary moment, recasting the "present" as the "past" from the point of view of a text about the world to come. The genre's function is not to predict the future, as people sometimes imagine and as popular journalism often implies, but rather "to defamiliarize and restructure our experience of our own *present*."[11] For Jameson, what sf figurations of the future demonstrate is the atrophied state of our utopian imagination, the difficulty—perhaps impossibility—of envisioning the radically other, which, paradoxically, reignites this capacity by forcing us to confront our failures and thus "becom[e] unexpectedly transformed into a contemplation of our own absolute limits."[12] Like Suvin, Jameson understands the capacity of sf to push us toward utopian insights that seek to correct the problems of the present world.

Seeing what we take for granted—the "alien" perspective that puts things in a new light—is central to sf's rhetorical capacity. Although an empirical survey of the genre belies the hope that it inevitably gives voice to the marginalized, sf of any political persuasion emerges from this idea of change. This penchant is easily apprehended if we consider the proliferation of sf imagery as the lines between sf and other kinds of fiction blur. For example, a film such as *The Matrix* (1999), hugely influential upon its release, is easily categorized as sf, with its dystopian world of machines harvesting humans for their chemical energy while we remain obliviously trapped in a simulated matrix. Fast forward to the release of the BBC's *Black Mirror* (2011–) just over a decade later, which offers similar narratives about mediated worlds, AI, and surveillance technologies, and this blurring of digital and material identities now appears as a reflection of almost-everyday existence, just slightly askew from the real world. Taking this comparison one step further, we might consider the US Air Force's early 2010s advertising campaign under the slogan "It's Not Science Fiction; It's What We Do Every Day," an update of earlier slogans that emphasized action and adventure: "Do Something Amazing" and "We Do the Impossible." This use of "science fiction" suggests that the Air Force is already living in the future due to its cutting-edge technology. The last example sees sf evoked less as futuristic fiction and more as aspirational blueprint.

The contrast between *Black Mirror*'s dystopian warnings about digitally mediated futures and the Air Force's celebration of a similar technology reminds us that sf is equally about frightening nightmares and wondrous dreams. If on the one hand its images inspire us to achieve more, to transcend material limits (a frequent motif), then on the other it warns us of potential consequences that come with social change—that new technologies disrupt as much as they improve. Jameson's notion that sf positions us to think critically about the future we are making is relevant equally to scientific and cultural change. Aligning sf with discourses of economic profit and enhanced consumer products, advertisers embrace sf imagery to make their products seem to usher in the world promised by technophilic stories. This is beautifully captured, for example, by Megan Prelinger's *Another Science Fiction* (2010), a photo anthology of futuristic advertising imagery from the mid-twentieth century.[13] At the same time, activists critical of the status quo draw equally on sf techniques to articulate visions of a new world. Celebrated traditions such as feminist sf, now honored annually by the James Tiptree Jr. Award,[14] and *Afrofuturism*, a term used to describe sf works that envision futures rooted in African aesthetics and experience, are grounded on the belief that sf helps us see the given with new eyes, thereby to challenge systems of patriarchy, racism, and other injustice.[15]

As of this writing, science fiction is widely and diversely embraced by many communities of practice, often to significantly divergent ends and with correspondingly different aesthetic and formal strategies. Following the success of feminist and African American engagement with the genre, other marginalized groups have turned to sf as a vital mode of critique, including Indigenous sf, Latinx sf, and Asian diasporic sf. The past decade has seen a significant increase in sf works by writers of color, among them N. K. Jemisin, Rebecca Roanhorse, Junot Díaz, and Ted Chiang, to name just a few. Activists are also overtly embracing sf as a tool, emblematized by works such as *Octavia's Brood* (2015), edited by adrienne maree brown and Walida Imarisha, a book of activist strategies and new fiction inspired by sf author Octavia E. Butler; and by Shelley Streeby's *Imagining the Future of Climate Change*, a book that highlights how environmental activists draw on sf imaginary.[16] The Civic Imagination Project, founded by fan studies scholar Henry Jenkins, charts how people draw on sf texts in their work to articulate collective visions and practices for a better world.[17] A recent collection of new fiction, *Resist: Tales from a Future Worth Fighting Against* (2018), was published as a fundraising effort, with all proceeds going to the ACLU.

Science fiction is also increasing becoming—in many cases, becoming recognized as—a global genre. Attempting to comprehensively map what sf is or is not, Andrew

Milner draws on world systems theory to argue that sf emerged from a cultural dialectic between Enlightenment and Romanticism, and thus appeared first in European countries as they industrialized.[18] Setting aside Milner's larger arguments about innovation and influence, I want to focus on this relationship between a cultural turn toward sf and the intensification of technological innovation. Into the twenty-first century, as more and more of the world becomes industrialized, urbanized, and especially linked into global networks of information and capital, we see speculative fiction emerge in new locations. The global embrace of sf, which includes the emergence of sf traditions in China, the Middle East, Latin America, Korea, India, and beyond, is among the most exciting ways the field is changing. Numerous websites are devoted to tracking and cultivating these developments, and the Apex Book Company (founded in 2004), a publisher focused on speculative texts, is now on the fifth volume of its World SF series, which translates stories from around the world into English.[19]

Joining Apex, Rosarium Publishing (founded in 2013) is dedicated to promoting a multicultural tradition in sf, while the online sf magazine *The Future Fire*, launched in 2005, focuses on social and political themes. As well as establishing a correlation between the widespread proliferation of technology and the appeal of sf, this burgeoning of world sf tells us something about traditional gatekeeping functions in the history of Anglo sf. Influential editors

such as Campbell imposed restrictions on the genre as it developed, encouraging some voices and perspectives, while attenuating those of others. Often these were voices of women and people of color.[20] Previously the control of editors or other industry gatekeepers was a barrier to participation in the field, but in an era of digital publishing options and on-demand printing, diverse communities can establish their own venues for distribution. Had the genre always embraced such pluralistic voices, we might have a very different set of images that spring to mind when we hear the term *science fiction*. The increased prominence of these new voices suggests that sf into the twenty-first century will be a very different thing from sf of the past.

The transformation of daily life by technology has intensified in the West as well, marked by the increased convergence of sf and other literatures and by the dominance of sf scenarios in other media, especially video games. Moreover, sf techniques are increasingly embraced as a tool in industry, with terms such as "sf prototyping" and "design fiction" being adopted by technology companies to describe the importance of imagination and play in the development of new products. Universities have begun to offer programs in "innovation studies," which, while not strictly sf, clearly draw upon its strategies and aesthetics. I agree with Roger Luckhurst who argues that sf as an identifiable form appeared in the mid- to late nineteenth century, just as the pace of technological change visibly

disrupted social norms within a lifetime.[21] The pace of change has only accelerated since then, and the more we expect the future to differ from the present, the more sf becomes a dominant cultural form. For example, institutions such as Arizona State University's Center for Science and the Imagination position themselves to speak equally to industry and to artistic communities, often commissioning new fiction to further conversations about technological change.[22]

In this book, I will map out the current critical discussion regarding science fiction, especially as the genre intersects with areas of current research in science and technology. My main goal is to demonstrate that sf is an extension of what science studies scholar Sheila Jasanoff calls the sociotechnical imaginary, which she defines as "collectively held, institutionally stabilized, and publicly performed visions of desirable futures, animated by shared understandings of forms of social life and social order attainable through, and supportive of, advances in science and technology."[23] She recognizes sf as one site of such visions, but I want to suggest that sf also does something more that is urgently needed—namely, it critically interrogates who is part of the collective creating these "shared understandings." Social as well as technological change is at stake in sf, which helps us think through whether "advances in science and technology" are also always advances in civic and social life.

This book is neither a history nor a survey of sf, but a selective description of the genre as something like a toolkit for thinking through urgent issues in social life today. My examples will come predominantly from recent texts published in English: I want to highlight how and why sf is relevant to conversations at this moment, and I recognize that many other examples could be used. For those interested in a history of the genre and arguments about sf's canon, excellent published histories are already in print as detailed in the further reading section. This short book can offer only illustrative examples of the concepts I outline here, not a full listing of every important text in the sf canon. Indeed, my hope is that readers build on this brief sketch, to fill in and augment my theorization of what sf can do by putting it in dialogue with a wider range of texts drawn from even more communities of practice. The chapters that follow look at sf's dialogue with the utopian tradition, its relationship to colonialism, how sf has become the poster child for speculative design, how it has anticipated and responded to innovations in key contemporary industries of robotics and genomics, and how it illuminates two important social forces shaping our world, climate change and speculative finance. If we are living in a science fiction world, this book aims to help us articulate more precisely what that means and to prompt us to think about actively managing—rather than passively awaiting—this future.

3

FUTUROLOGY AND SPECULATIVE DESIGN

Chapter 2 looks at sf's relationship to a long tradition of imagining other worlds for purposes of social critique and at academic frameworks for studying sf that have built on this foundation. In the popular imagination, however, sf is synonymous with the pulp magazine tradition pioneered by Hugo Gernsback. The Hugo Awards that honor the best sf achievements annually, voted on by members of the World Science Fiction Society, a global fan organization, are named for him. Yet before he gained fame as the chief promoter of this new literary genre, Gernsback was enthusiastically involved in a number of projects that aimed to usher in the technologized future as quickly as possible, publishing essays in venues such as *Scientific American*, *Modern Electrics*, and *The Electrical Experimenter*, the latter two of which he founded and edited, in 1908 and 1913, respectively. In *The Perversity of Things* (2016),

a compendium of Gernsback's writings on emergent new technologies, tinkering and patent seeking, broadcast regulation, and the promises of wireless radio and television, Grant Wythoff argues that "the project of science fiction as Gernsback understood it" was an extension of his promotion of communication technologies, pioneering "a way of thinking about and interacting with emerging media."[1]

Reframed in this way, we can chart a different history of sf through the twentieth century, one less interested in science fiction as a new aesthetic mode that might prompt us to see our social world differently and more focused on how the strange devices or scenarios sf describes may soon be part of material existence. To be clear, I am not suggesting that either framing is "better" or "truer" for describing the genre; rather I seek to foreground this tension between an emphasis on "science" and an emphasis on "fiction" as central to shaping the range of texts recognized as sf today. Beginning with Gernback's interest in fiction as a tool to promote the understanding and embrace of the new possibilities afforded by a changing media landscape, this chapter traces another genealogy of sf that connects the genre to social practices such as futurology. As Wythoff suggests, Gernsback's enthusiasm for then-emergent technologies of radio and television and his desire to think about their world-transforming effects in both fictional and practical ways is familiar to twenty-first-century readers who have lived through a similarly

transformative period in the development of the Internet and other social media technologies.

Magazines such as *Omni*, *Wired* and even *Popular Mechanics* mix articles on new scientific breakthroughs with editorial pieces considering their economic or political implications and with reviews of sf fiction and film. They also frequently publish new fiction as well. The sf titles most likely to make a "top 10" list in a magazine such as *Popular Mechanics* are often very different from those awarded Hugos and different again from those receiving accolades in more literary venues such as *Locus* or *Strange Horizons*, reflecting the multiple ideals of sf and the related communities of practice that constitute the genre. In addition to Gernsback's interests in emerging media technology, the first generation of sf fans overlapped significantly with those involved in rocketry clubs, who experimented with rocket launches and used fiction to imagine a coming future of interplanetary travel.[2] This mix of visionary narrative with practical tinkering exemplified Gernsback's own contributions to radio and sf, and would be echoed later in the century with the first generation of personal computers and an equally enthusiastic generation of hands-on experimenters who embraced both this new technology and stories inspired by it.

Acknowledging that imaginative speculations have their place in scientific histories and in discussions regarding policy making, the preeminent science journal *Nature*

began to publish short original works of sf in 1999, initially as a project to reflect on the turn of the millennium, but adopted as a regular feature, *Nature*'s "Futures," beginning in 2005; more recently, it started the *Future Conditional* blog to allow commentary on the stories and the science behind them. The online cultural commentary magazine *Slate* has recently partnered with ASU's Center for Science and the Imagination to offer Future Tense, which publishes original fiction focused on the transformative effects of emergent technologies; each new work of fiction is published alongside a response by someone involved in related research and industry. To list just one more example among many, MIT Press, the university press affiliated with America's first academic institution specializing in science and technology, has since 2013 published the *Twelve Tomorrows* anthologies, curating original fiction focused on the potential impacts of near-future technologies.

These various projects continue what Gernsback began in founding both popular science and sf magazines, and especially with his editorial work and letters forums that created a space of community and exchange among his readers. In the one hundred plus years since, the cultural status of technology and especially the degree to which most people rely on its infrastructure and devices in daily life has changed dramatically, propelled mainly by information technologies and globalized trade. Conversations

about self-driving cars or cashless futures, about AI assistants or GMO foods, are not subjects that concern only a small group, presciently focused on engineering and industry, conditions that characterized the world Gernsback addressed. Rather, such topics are mainstream concerns, as is the future, whether anticipated with fervor by aspiring Silicon Valley entrepreneurs or regarded with dread by the truck driver anticipating the loss of work due to driverless vehicles. While Gernsback had to stage his conversations in the letters pages of ephemeral pulp magazines, the venues for such conversations today are well-funded and mainstream, enabled by the very technological transformations only fleetingly glimpsed by Gernsback and his contemporaries. From the beginning of the information age in the 1980s, and intensifying with social media technologies into the twenty-first century, interest in near-future technologies has become a mainstream obsession, and sf is at the center of this imaginative—and social—transformation. The genre's role is emblematized by websites such as io9, subtitled "We Come from the Future," which is one part sf media reviews, one part emergent technology watch, and one part reflections on intersections of science and politics. This and similar venues are where a new generation of sf is being invented.

Today sf is unquestionably a multimedia affair, and all of film, television, comic books, and digital games are discussed with the same attention paid to print. Many

contemporary conversations are cultivated by institutions, such as programs in innovation studies established over the last decade at several universities. Many of them explicitly frame their work in ways clearly linked to science fictionality, such as ASU's Center for Science and the Imagination or the Future of Humanity Institute at the University of Oxford. While many of these research initiatives would not wish to embrace the label "science fiction," their focus on thinking imaginatively about technology, their emphasis on the future, especially the near future, and their interest in how daily life will be changed by new inventions or new scientific paradigms are all preoccupations shared by sf. True, those working in innovation studies hold themselves to a more rigorous standard regarding the plausibility of their extrapolations and the scope and provenance of the data they use, but like sf authors they seek to understand the entangled set of outcomes that will flow from a postulated technological change.

There are differences, too, of course: innovation studies often prioritizes economic and infrastructure change, trying to anticipate how innovations will disrupt business-as-usual and to advise corporations—and sometimes governments—on how to prepare for these transformations and thus ensure profitability; sf, on the other hand, tends to be more interested in how an innovation will change individual humans and their communities, which may, of

course, include changes to the availability of work. To give just one concrete example, connections between innovation studies and sf traditions are evident when looking at the table of contents of the *International Journal of Innovation Studies*. At the time of this writing, the most recently uploaded paper is about additive manufacture, that is, 3D printing in which the object is built layer by layer from "printed" material deposited. Like many sf stories, this article looks to a future when such techniques can be used to print living tissue, as it considers market opportunities related to such technologies.[3]

If we turn to sf, we might think first of *Star Trek*'s replicator or later the matter compiler in Neal Stephenson's *The Diamond Age* (1995), texts imagining how social organization might be different if needed items can be printed on demand. In both cases, ending the suffering caused by economics of scarcity is key, showing how sf's orientation remains distinct from that of innovation studies. If we want to look at sf works published when 3D printing was a material possibility rather than an imagined fantasy, we might turn to William Gibson's *The Peripheral* (2014) or Kim Stanley Robinson's *Aurora* (2015): in the former, 3D printing is used to make drugs, pharmaceutical and illegal, with implications for health-care access and law enforcement; in the latter, it is one of the strategies that makes intergenerational space travel achievable, as one need not anticipate in advance every needed item. Here

the existence of 3D printing is not the novelty that makes this world different from our own, as in the earlier examples, but nonetheless we see sf authors thinking more capaciously about the changes such technology could entail. Science fictional thinking fosters disruption and welcomes the openness of a different future; innovation studies is often interested in minimizing change, or at the very least it seeks to channel innovation to ensure power dynamics already at play persist.

Two important observations emerge from this comparison. The first is the degree to which narrative and the imagination are recognized as important tools for negotiating a contemporary world characterized by rapid change and a pervasive reliance on technology. The second is that there *is* a relationship between science fiction and science, albeit not the simple fantasy that science fiction inspired specific inventions such as television or communication satellites or robotic labor or even the Internet, all of which have precursors in sf that predate their material emergence. Instead, as Colin Milburn argues in "Modifiable Futures," we might think of how scientists engage sf as analogous to fan practices of making their own meanings, often their own texts and art, in dialogue with the sf they love.[4] He argues scientists similarly draw from sf in three ways: blueprints, which seek to materialize something imagined in the fiction; supplements, that use alternative technologies to accomplish an end achieved by fictional

There *is* a relationship between science fiction and science, albeit not the simple fantasy that science fiction inspired specific inventions.

science; and speculations, where the fiction inspires future research. The interest in fostering dialogue between sf creators and scientists in venues such as *Nature*'s "Futures" or "Future Tense" acknowledges that the imagination has played a larger role than has been previously acknowledged, both in fostering scientific innovation and in helping scientists think about their research beyond the laboratory. This is also where science and the larger public meet, when innovations become part of a complex world in which, to use Gibson's evocative phrase from a story first published in *Omni* magazine, "the street finds its own uses for things."[5]

Indeed, Sheila Jasanoff's notion of sociotechnical imaginaries cited in the introduction comes from her conviction that science and technologies studies scholars have paid insufficient attention to the role of the imagination in shaping both the history of scientific practice and how the public has understood and responded to science. Recognizing that "imagination is a social practice,"[6] she cites sf as a rich source of sociotechnical imaginaries that have coproduced, with scientists, the specific policies, technologies, and lifeways of modern life. Her aim is "to investigate how, through the imaginative work of varied social actors, science and technology become enmeshed in performing and producing diverse visions of the collective good, at expanding scales of governance from communities to nation-states to the planet."[7] A number

of scholars working at the intersections of science and popular culture focus on such exchanges between sf and research cultures, often emphasizing how fictional texts become a shorthand, drawn upon by both journalists and scientists, as they seek to connect the feelings people have about a fictional text to a research agenda—the dream of glorious futures cultivated by the Space Race, or fear of monstrous creations associated with cloning and GMO foods. Examining the history of nanotech research, Milburn theorizes a specific way of conceptualizing what he dubs "nanovision" that relies on speculative language and futuristic rhetoric to constitute its field of study.[8] From a slightly different point of view, David Kirby argues that science advisors to sf film often engage in what he calls "diegetic prototyping," a chance to be more playful and speculative as they imagine the material form of a possible technology.[9]

In both Milburn's and Kirby's analyses, the exchanges between science and sf are dialectical. The sf extrapolates from known science and technology to imagine even more powerful versions in the future, while the narrative world of sf introduces the public to a vision of cutting-edge technology that has become normalized, just part of everyday life in such futures. Fiction can induce belief in and excitement about specific possibilities, often an important element for securing material support for the research in the first place or for ensuring consumer desire for new

products when they appear.[10] Perhaps the most famous example of this is the original advertisement for Apple's Macintosh computer, aired during the Super Bowl on January 22, 1984. Directed by Ridley Scott, renowned in the sf world for his influential *Blade Runner* (1982), the commercial alludes to Orwell's *Nineteen Eighty-Four* in a single minute of narrative to establish a contrast in the popular imagination between IBM (linked to corporate overlords, inflexibility, and conventionality) versus Apple (associated with youthful energy, creativity, and freedom of choice)—characterizations that persist thirty-five years later.[11] A less dramatic, but frequently discussed example is the gestural interface used to manage multiple screens of data in Steven Spielberg's *Minority Report* (2002). Not only did it anticipate—perhaps inform—a coming world of smart phones and smart homes, but it also became a standard way to display data in high-tech worlds both in and beyond sf.[12]

From midcentury on, with sensationalizing books such as Alvin Toffler's *Future Shock* (1970) and with strategy planning initiatives, such as that of the RAND Corporation (founded in 1948), oriented toward an increasingly globalized world following the Second World War, governments, corporations, and individuals have conceptualized the world in terms of rapid change driven by technology and a need for futuristic thinking to be prepared for such change. About the same time the discipline of futurology

or future studies began to have some institutional purchase, often drawing on the speculations and commentary of sf writers. Futurologists and think tanks took on questions of environmental or population change—such as the widely discussed Club of Rome report *Limits to Growth* (1972)—and contemporary sf asked similar questions. The practice of corporate foresight is based on methodologies that could as easily describe the practice of extrapolating to write a science fiction story: conducting research to anticipate change; using scenario analysis to map out and compare a range of possible futures and the factors that influence which materializes; and prototyping, more recently specifically "science-fiction prototyping" (a term proposed by Brian David Johnson), which uses narrative to think through the possibilities and risks of the new design.[13] This builds on a history of sf authors being invited to participate in think tanks and government advisory panels, mostly notoriously President Reagan's Citizens Advisory Council on National Space Policy, which gave us the Strategic Defense Initiative (aka Star Wars) and a pro-nuclear proliferation argument dubbed *Mutually Assured Survival* (1984), in fixed counterpoint to the prevalent nuclear disarmament slogan "mutually assured destruction."[14]

As in exchanges between science and science fiction, practitioners in fields such as future studies desire to designate their use of narrative extrapolation as more serious or rigorous than that done by sf. Certainly, they address

their work to different audiences and with significantly divergent stakes attached to their interventions; nonetheless, serious commitment to extrapolating the future of technology and thereby building a better world has always been a part of sf writers and communities. The increased institutional legitimacy of these new rubrics is what is most novel. Some sf writers, most prominently David Brin and Bruce Sterling, have become known as much for their nonfiction commentary on the future as for their fiction, while many newer writers in the field, such as Annalee Newitz and Anne Charnock, turned to fiction after establishing themselves as science journalists and commentators. In such circles, narrative is just one of many discourses through which to grapple with the intersections of science, technology, human values, and our coming future. A similar blurring of lines among fictional extrapolation, sociotechnical forecasting, and the persuasive power of narrative is evident in a number of recent television programs that are hybrids between sf drama and documentary, produced by specialty channels associated with education content: *Futurescape* (Science Channel 2013), *Mars* (National Geographic 2016, 2018), and *Breakthrough* (National Geographic 2015, 2017).

A similar set of conversations about imagination, technology, narrative, and the future constellates around the term "design fiction," proposed by Julian Bleeker. Design is a creative practice, Bleeker argues, that can "[r]eveal new

experiences, new social practices, or . . . reflect upon today to contemplate innovative, new, habitable futures."[15] He argues for the design practice exemplified by these television series: stories somewhere between fact and fiction, both plausible and speculative. Bleeker contends that science fact and science fiction are "two approaches to accomplishing the same goal—two ways of materializing ideas and the imagination" and calls for a practice of "speculative design" that, like Johnson's sf prototyping, creates contexts for conversation and further contemplation.[16] What is distinctive about Bleeker's vision is his emphasis on making physical objects, on the tactility of design, which for him is as important as narrative for pushing ideas from abstract concept to real-world use.

In *Speculative Everything* (2013), Anthony Dunne and Fiona Raby take this idea even further, arguing that speculation is a way to reinvent the practice of design, pushing it from techniques used to improve the functionality and consumer appeal of products, toward "design as a catalyst for social dreaming."[17] In their preface, they offer an "A list" of qualities of design as conventionally practiced and a "B list" of what it might become, conceived speculatively. Among the difference they chart are designs "in the service of industry" (A list) vs. "in the service of society" (B list); design "for how the world is" (A) vs. "how the world could be" (B); design that addresses the individual "as consumer" to make us buy (A) vs. design that

conceives of the "citizen" and makes us think (B). Dunne and Raby put science fiction on the A side, perhaps thinking of the ways that some sf has championed technocratic views or how futurology's use of sf techniques seeks to reinforce the political and economic status quo. On their B side they list "social fiction," a term they do not define. As I argue above, many works of science fiction are consistent with Raby and Dunne's speculative design project, aimed at disrupting the power structures of the given world to make way for a better one. Indeed, as one reads further into their book, the language they use echoes the language of Blochian utopian studies: for example, they write, "By acting on peoples' imaginations rather than the material world, critical design aims to challenge how people think about everyday life. In doing this, it strives to keep alive other possibilities by providing a counterpoint to the world around us and encouraging us to see that everyday life could be different."[18] This might also be a description of the utopian tradition in sf discussed in chapter 2.

The key motif that persists across these various futuristic speculative discourses—science fiction, speculative design, foresight, advertising, utopianism, activism—is the relationship between present choices and future worlds. All are premised on the belief that the choices we make *now* shape the world to come. More importantly,

however, they insist on the crucial importance of the imagination to the activity of choosing, in a doubled and dialectical way. Visions of possible futures, positive and negative, promote affective attachments, inform ways of seeing, and marshal attention and energy to projects, nurturing them into materiality or resisting their arrival. The struggle to shape the future is not only material: it is equally affective and imaginative, and sf modes of extrapolation and narrative immersion are powerful tools in this endeavor. Speculative projections through sf narrative prepare us for the future, enabling us to experience aspects of new technologies or new social arrangements vicariously in narrative so that we are ready to engage with them in practice. The particular content of these futures and the destinations they have in mind vary; some deploy science fictionality to reinforce the status quo and ensure that the same elites, corporations, and industries remain profitable despite change, while others use speculation to show us how seemingly immovable fixtures of the given world are open to redesign.

This promiscuous mingling of science fact and science fiction has intensified into the twenty-first century, as both science practitioners and science studies scholars recognize the importance of imagination and narrative. Especially since the emergence of social media, daily life has started to resemble worlds anticipated by the sf of an

The struggle to shape the future is not only material: it is equally affective and imaginative, and sf modes of extrapolation and narrative immersion are powerful tools.

earlier generation, reminding us that those who built the infrastructure of the networked world grew up in a culture with an established tradition of sf. Science fiction has moved from being a niche genre at the beginning of the twentieth century to a widely shared cultural vernacular for describing the twenty-first. In many ways, sf is no longer a specialized genre, but now the dominant way to analyze a world in which our technology changes faster than we do.