

INNOVATION, ENTREPRENEURSHIP, MANAGEMENT SERIES

INNOVATION IN ENGINEERING AND TECHNOLOGY SET



Volume 6

**Science Fiction
and Innovation Design**

**Edited by
Thomas Michaud**

ISTE

WILEY

Table of Contents

[Cover](#)

[Title Page](#)

[Copyright Page](#)

[Introduction Science Fiction: A Technical Imaginary World to be Deciphered](#)

[1 Technological Innovations in the Post-Apocalyptic World: Lessons Learned from Science Fiction Movies](#)

[1.1. Introduction](#)

[1.2. The future machine of humanity](#)

[1.3. A pending world?](#)

[1.4. Consuming the world](#)

[1.5. A finite world](#)

[1.6. Conclusion](#)

[1.7. References](#)

[2 Using Science Fiction in Engineering Education: Technological Imagination as an Element of Technical Culture](#)

[2.1. Introduction](#)

[2.2. What is technical culture?](#)

[2.3. Science fiction, technology and narrative: fertile connections](#)

[2.4. Science fiction and the imaginary world at the heart of training](#)

[2.5. Conclusion](#)

[2.6. References](#)

[3 Engineers Versus Designers: Transposition of the Technical Imaginary World into the Visual](#)

3.1. Introduction

3.2. From applied science to applied art

3.3. The question of the “object” in contemporary society

3.4. The “transparency” of technology

3.5. “Transparent” objects

3.6. “Deconstructed” objects

3.7. “Printed” objects

3.8. “Skeleton” objects

3.9. “Impossible” objects

3.10. Conclusion

3.11. References

4 Imaginary Worlds to Be Projected or to Be Criticized? Methodological Considerations

4.1. Introduction

4.2. Challenges in the production of a corpus of imagination

4.3. Imaginary worlds of various qualities

4.4. Representations that are often appropriable and exploratory

4.5. New vulnerabilities

4.6. Context, a first point of entry for appropriating the imaginary worlds

4.7. Uses, another point of entry for appropriating the imaginary worlds

4.8. Conclusion

4.9. References

5 Marsism, from Science Fiction to Ideology

5.1. Introduction

5.2. The Mars Society’s martian imaginary world

[5.3. Elon Musk, a utopian entrepreneurial spirit](#)

[5.4. The technotype of the extraterrestrial base](#)

[5.5. Marsism, nasaism, communism and technoscientific microideologies](#)

[5.6. Conclusion](#)

[5.7. References](#)

[6 *Quo Vadis* Engineering? Science Fiction as a Means to Expand the Epistemic Boundaries of Technoscientific Innovation](#)

[6.1. Introduction](#)

[6.2. Science fiction at the heart of engineering innovation](#)

[6.3. Figures of inevitability: the engineer at the confluence of discourses](#)

[6.4. Instrumentalizing the social](#)

[6.5. Science fiction as emancipation from the “problem-form”](#)

[6.6. Conclusion](#)

[6.7. References](#)

[7 Design Fiction, Technotypes and Innovation](#)

[7.1. Introduction](#)

[7.2. Altshuller, from science fiction to the TRIZ method](#)

[7.3. John Arnold’s approach](#)

[7.4. The emergence of design fiction](#)

[7.5. From the plausibility of design fiction to possible disappointment](#)

[7.6. The theory of the failure of the imaginary world](#)

[7.7. Science fiction prototyping and design fiction](#)

[7.8. The pioneer, Julian Bleecker](#)

[7.9. Dreaming, a simulator of the dangers to come](#)

[7.10. Some approaches to design fiction](#)

[7.11. Science fiction, design fiction and foresight](#)

[7.12. Toward a new mythology because of storytelling](#)

[7.13. From utopian technologies to the technotype theory](#)

[7.14. Four proposals on technotypes](#)

[7.15. Beliefs and behavioral economics](#)

[7.16. Realistic, imaginary systems and their cyclicity](#)

[7.17. Conclusion](#)

[7.18. References](#)

[8 Science Fiction, Innovation and Organization: Where Do We Stand?](#)

[8.1. Introduction](#)

[8.2. Science fiction in its diversity](#)

[8.3. A focused review of academic literature on science fiction: method](#)

[8.4. Systematic literature review: findings](#)

[8.5. How science fiction sees technology and organizations](#)

[8.6. Dystopian visions of technologies and organizations](#)

[8.7. Highlighting ideologies behind technology and organizations](#)

[8.8. Science fiction as the source of new technological and organizational scenarios](#)

[8.9. Conclusion: three demonstrations and a possible research avenue](#)

[8.10. References](#)

[List of Authors](#)

[Index](#)

[Other titles from ISTE in Innovation, Entrepreneurship and Management](#)

[End User License Agreement](#)

List of Tables

Chapter 4

[Table 4.1. The five most enhanced physical abilities in the imaginary worlds of o...](#)

[Table 4.2. The three most evoked improvements in the imaginary worlds of our corp...](#)

[Table 4.3. The 10 most evoked vulnerabilities in the imaginary worlds of our corp...](#)

Chapter 8

[Table 8.1. Sorting of the 105 papers \(results\)](#)

[Table 8.2. Academic contributions on science fiction filtered based on innovatio...](#)

List of Illustrations

Chapter 7

[Figure 7.1. Technotypes and utopian technologies](#)

Chapter 8

[Figure 8.1. Evolution of academic publication on science fiction. For a co...](#)

[Figure 8.2. Evolution of academic publication on science fiction filtered o...](#)

Innovation in Engineering and Technology Set

coordinated by

Dimitri Uzunidis

Volume 6

Science Fiction and Innovation Design

Edited by

Thomas Michaud

ISTE

WILEY

First published 2020 in Great Britain and the United States by ISTE Ltd and John Wiley & Sons, Inc.

Apart from any fair dealing for the purposes of research or private study, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the publishers, or in the case of reprographic reproduction in accordance with the terms and licenses issued by the CLA. Enquiries concerning reproduction outside these terms should be sent to the publishers at the undermentioned address:

ISTE Ltd
27-37 St George's Road
London SW19 4EU
UK
www.iste.co.uk

John Wiley & Sons, Inc.
111 River Street
Hoboken, NJ 07030
USA
www.wiley.com

© ISTE Ltd 2020

The rights of Thomas Michaud to be identified as the author of this work have been asserted by him in accordance with the Copyright, Designs and Patents Act 1988.

Library of Congress Control Number: 2020938714

British Library Cataloguing-in-Publication Data

A CIP record for this book is available from the British Library

ISBN 978-1-78630-583-1

Introduction

Science Fiction: A Technical Imaginary World to be Deciphered

Innovative organizations evolve in ever-changing ideological and imaginary contexts. Understanding these flows is important in order to build an effective strategic vision. Economic actors must thus develop managerial discourse in relation to innovative concepts, some of which appear in popular culture, scientific imagination and science fiction. This artistic genre, increasingly diffused and appreciated in industrialized societies, is often presented as an inexhaustible source of concepts and prototypes of futuristic technologies. Futurology and foresight are taken into account in this imaginary world in order to better master and control the most promising sectors. Investing in a project, an organization or a company means adhering to a strategic vision. However, some of them are strongly inspired by science fiction aesthetics.

Science fiction appeared in the 19th Century with *Frankenstein* (1818) by Mary Shelley. Historians of the genre refer to earlier works, some of which date back to antiquity. However, it was the appearance of utopia, a term coined by Thomas More in 1516, that marked a break in the way of conceiving the imaginary world in the West. From then on, artists and intellectuals began to become aware of the impact of fiction on the way the world is not only understood but also constructed. Political power then became suspicious of potentially subversive narratives. *Micromégas* by Voltaire (1742) is thus presented as a work of prescience fiction philosophy. The 19th Century saw a

great deal of activity in the creation of scientific fiction. In France and Great Britain, a large number of stories were published, reflecting an intellectual ferment in the developing territories of the Industrial Revolution. Utopian thought, associated with industrialism and the works of authors such as Jules Verne, helped to influence political and scientific thought. Works of fiction were beginning to question the meaning of the Industrial Revolution. The increase of innovations provoked the expression of passions, both positive and negative. Since its beginnings, the imagination has accompanied a constantly changing industrial revolution.

The term science fiction (scientifiction) was coined in the United States. Hugo Gernsback contributed greatly to the development of this genre by publishing numerous journals in which a large number of utopian technologies appeared. Science fiction then spread rapidly, gradually finding its place in the dialogue between the humanities and the so-called hard sciences. It developed original approaches, questioning the relationship of decision-makers, whether political or economic, to a technical progress sometimes described as Promethean by some of its critics. Cinema consecrated the success of science fiction: special effects made it possible to represent improbable technologies or scientific phenomena, fascinating many people interested in science and technology. Note that 200 years after the publication of Mary Shelley's work, science fiction is experiencing a tremendous boom, which should enter a new era with the significant drop in the price of special effects. In the coming years and decades, the art of creating futuristic worlds in cinema should become affordable to a large number of actors, not only to a Hollywood elite.

Two approaches to science fiction emerge from this context. On the one hand, innovators are increasingly

interested in how science fiction writers have imagined the future of their industries. Some believe in its anticipatory, futuristic, even prophetic dimension. A better knowledge of the history of utopian technologies is necessary for them to develop their strategic discourse and innovation policies. The relationship between science and science fiction should therefore be examined in order to determine how the interactions between two disciplines that are central to the innovation processes of technoscientific societies work. On the other hand, more and more economic actors are deciding to create their own science fiction, institutional science fiction, with the aim of no longer realizing the visions of external authors, but promoting utopian technologies imagined internally.

Science fiction is a particularly popular type of fantasy in the discourse of innovators and entrepreneurs in many sectors such as converging technologies or the space industry. Organizations must adapt to constantly evolving imaginations, utopian or dystopian, but also very influential in the definition of strategies and objectives for Research and Development (R&D). The science fiction imaginary world is particularly influential in the most innovative territories. The United States and Japan regularly offer works of fiction that fascinate a considerable number of individuals and minds passionate about technosciences. An imaginary pact unifies the visions of the future of an international community of engineers and scientists behind innovations that are radically transforming lifestyles.

How are engineers influenced by the imagination, and particularly by science fiction? Is scientific rationality compatible with this culture, since the imagination is sometimes denounced as a drift that is harmful to reason? How do organizations deal with science fiction, for example, in large telecommunications, nanotechnology and biotechnology groups, but also in aeronautics, aerospace

and many other sectors? The number of cases of organizations, companies and institutions using science fiction for foresight purposes is growing every day. Which works play or have played an important role in the imagination of engineers and scientists? According to what psycho-sociological mechanisms?

Although capitalism regularly experiences crises, these crises testify to the failure of imaginary worlds that have, over a period of time, supported the development and dissemination of innovations, particularly technological ones. Science fiction can be seen as an imaginary world derived from the archetypes at the origin of scientific thought. Is this position - inspired by the theories of the imagination of thinkers such as Gaston Bachelard, Gilbert Durand or Cornelius Castoriadis, but also by the theory of archetypes and the collective unconscious of C.G. Jung - compatible with an approach conceiving science as a source of inspiration for the creators of fiction and technical imaginary worlds?

Design fiction and science fiction prototyping are examples of practices that use science fiction to stimulate creativity and invent utopian technologies that initiate innovation processes. The term design fiction was coined by science fiction author Bruce Sterling in 2005. It has since become a concept adopted by more and more economic actors. The specialists in this practice provide advice to companies, proposing various approaches, such as the invention of technological fictions to detect promising and innovative concepts. Science fiction culture is common to a large number of actors, especially among engineers, a professional category of particular interest to us here. The sociology of science and organizations, as well as the sociology of the imaginary world, has in recent years provided knowledge on the interactions between fiction, technology and R&D. This book will address a large

number of theories on the contribution of science fiction to the imagination of engineers and technoscientific innovation.

In [Chapter 1](#), Nadine Boudou explains the role of science fiction films in which technical progress has led to catastrophic situations. The post-apocalyptic genre is more and more influential in the technical imagination. The author is also interested in the *Real Humans* series (*Äkta människor* in Swedish), which shows the dangers of a massive commercialization of humanoid robots in society. The imaginary world also reveals the fears of an author's or society's future. Contemporary science fiction thus reveals the limits of a technical progress that could lead to the destruction of humanity or even the planet. Post-apocalyptic films underline the fragility of a technological civilization that conceives of itself as all-powerful. The author is also interested in the themes developed in climate fiction, which is particularly abundant since the theme of global warming warns of the dangers of uncontrolled technical progress. Nadine Boudou explains that "The end-of-the-world hypothesis on which these scenarios are based can be useful to innovators and inspire them in their research so that they can be put to work for the common good". Science fiction is indeed a powerful criticism of the impact of technosciences on ecosystems and human societies. The use of philosophy is useful, as it enables a virtuous dialogue to be established between engineers and innovators, and the rest of humanity worried about its future.

In [Chapter 2](#), the contribution of Marianne Chouteau and Céline Nguyen questions the role of science fiction in the development of technical culture. This is presented as indispensable in order to curb the possible excesses of a society increasingly dominated by technologies that are sometimes frightening because of their potential

dangerousness for humankind. The two authors share their experience as teachers in an engineering school, where they propose different approaches to students using their imagination. These are often influenced by science fiction in the form of novels, films or series. In particular, these stories help to stimulate ethical reflection on the integration of innovations into society. Thus, science fiction is at the service of technical culture. A few years ago, the two authors carried out particularly enlightening research¹ on the uses of science fiction in an engineering school, and this chapter proposes its enrichment.

Chapter 3, written by Florin Alexa-Morcov, recalls the emergence of designers, guarantors of the aesthetics of products and their relations with engineers with a specific rationality. The search for the new is seen as an important driving force of innovation. To make a product desirable, however, engineers and designers must work together. Through several examples of successful products, Florin Alexa-Morcov shows that “new objects and their representations, presented as a consequence of the innovation process, in the framework of ‘performative utopias’ are designed to make consumers aware, at least in part, of the hidden dimension of the innovation process”. Designers are presented as magicians who end up generating a system of objects that are the source of desires guided by a fictional dimension that is often hidden or imperceptible.

In [Chapter 4](#), Nicolas Minvielle, Remy Hemez and Olivier Wathelet, specialists in design fiction, present a study of the representations of foot soldiers in more than 300 works of fiction. They question the role of these narratives in the military sector. While the imaginary world allows us to be projected, it is also influenced by specialists in certain sectors such as the army. For some years now, design fiction has become a method of stimulating creativity in the

strategic departments of institutions and even some companies. In addition, authors and directors of science fiction novels and movies use experts to provide realistic representations of future technologies. The Hollywood industry is thus at the service of storytelling that is particularly useful to engineers and designers in inventing tomorrow's innovations. The authors also propose a reflection on the methodology to be put in place to study and map imaginary worlds that have the capacity to "constitute a laboratory for projecting credible and relevant visions of the future".

Chapter 5 focuses on the Martian imaginary world. The space sector is very much influenced by science fiction, which also draws much of its inspiration from the scientific discoveries of major agencies such as NASA and ESA. The imaginary world of different actors from the Mars Society, founded by the American engineer Robert Zubrin, as well as the influence of science fiction on the discourse of the entrepreneur Elon Musk, will be discussed. The project for the colonization of Mars is mobilizing more and more players in a space sector undergoing rapid change, the role of the major agencies being relativized in favor of a private sector that is increasingly aware of the economic prospects of space. While the conquest of Mars was a subject long confined to communities of engineers and science fiction fans, this imaginary world project could well transform into a technopolitical ideology called *Marsism*.

Marie-Luc Arpin, Corinne Gendron, Nicolas Merveille and Jean-Pierre Revéret, in [Chapter 6](#), question the influence of science fiction on scientific projects, but also on foresight activities. This imagination is considered a form of utopianism, through analyses inspired by Pierre Musso's research. The authors believe that science fiction must be involved in the training of engineers in order to ensure a controlled deployment of techno-utopia, of which the

technical imagination is a manifestation. Thus, these works of fiction reveal their political dimension in an increasingly technical society. By envisaging in particular the emancipation of oppressed social categories, the genre ensures the development of a subversive and innovative vision of the world. Engineers are an increasingly influential social category and science fiction is emerging as a means of developing a technoscientific consciousness contributing to their identity as scientists, but also as futurists. Women's and feminist science fiction is presented as an abundant source of innovative concepts, social, political and technological at the same time.

In [Chapter 7](#), the aim is to present an approach to innovation directly inspired by science fiction and which recently emerged in the late 2000s. The idea is to use the technical imagination to create fictions or prototypes, which R&D engineers and strategists can integrate into their research and forward-looking discourse. More and more companies and organizations are taking an interest in this innovative practice, the term of which was coined by science fiction author Bruce Sterling in 2005. The presentation then proposes a reflection on the technotypes, or technological archetypes, which contribute to the creation of the utopian technologies that are very present in science fiction novels. Reflecting on the sociological and psychological processes involved in the creation of the technical imagination is an important issue at a time when organizations are increasingly interested in design fiction that could enable them to create institutional science fiction narratives that can be used at different levels of innovation processes.

Finally, Sonia Adam-Ledunois, Claire Auplat and Sébastien Damart ask this question in [Chapter 8](#). They start from the premise that science fiction is the result of a fascination with science, technology and innovation. They analyzed the

production of dozens of critical science fiction works. References to the work of specialists in the study of science fiction provide a theoretical and bibliographical approach to the subject and help guide reflection on the functioning and influence of science fiction on society in general and on the scientific community in particular. The authors deployed a methodology called systematic literature review (SLR). In order to study academic articles dealing with science fiction, they used and analyzed results from two databases: EBSCO Business Source and JSTOR. The various arguments developed in the academic literature, and the bibliography used in this chapter will allow the reader to orient toward publications offering an often original and relevant vision on the interactions between science, science fiction and innovation.

Notes

Introduction written by Thomas MICHAUD.

- 1 CHOUTEAU M., FAUCHEUX M., NGUYEN C., “Les élèves ingénieurs à l’épreuve de la fiction. Quelles relations entretiennent-ils avec les mondes scientifiques et techniques fictionnels?”, *Les Enjeux de l’Information et de la Communication*, vol. 16/3A, pp. 69-82, 2015, available at : <http://lesenjeux.u-grenoble3.fr/2015-supplementA/22-Chouteau-Faucheux-Nguyen/index.html>.

1

Technological Innovations in the Post-Apocalyptic World: Lessons Learned from Science Fiction Movies

1.1. Introduction

Science fiction intrigues a world in which material reality and social life are disrupted by technological innovations. These transformations are characterized by advances that make it possible to relieve humans of a large number of tasks, to the point of freeing them from their constraints. In addition to being freed from all physical and intellectual effort, humanity would no longer have to endure illness and death because of therapies that would ensure health, longevity and even immortality. If we are able to escape the limits of body and mind, humanity could also escape the limits of time and space by leaving Earth. These are the contributions that some innovations promise and that many science fiction stories develop. Yet, despite the high level of technology that humanity has achieved, these scenarios continue to depict catastrophic situations as direct or indirect consequences of these innovations. The ideal level of progress based on unlimited growth and infinite innovation is contradicted by the collapse of civilization. The progress that these innovations seem to contain is limited by the apocalyptic or post-apocalyptic consequences described in these works of fiction.

While apocalyptic movies look at the before or after of a disaster, post-apocalyptic movies represent the post-disaster world. These works of fiction all have in common a question about the future of the Earth and humanity in the

event of the collapse of civilization. Depictions include Earth having lost its habitability, and humanity being deprived of the systems of protection and organization that framed and regulated its activities. These works of fiction can, on the other hand, differ on the causes of the disaster: domination of machines, pollution, pandemics, climate change and scarcity of resources. In spite of these singularities, apocalyptic and post-apocalyptic movies follow the same master plan that gives this subgenre of science fiction its homogeneity. The lessons that we can learn from these movies will be accompanied, in parallel, by those brought to us by the analyses of certain researchers who insist on the need to respect planetary limits for present and future generations.

We will first see how science fiction normalizes the idea of a world revolutionized by the use of digital technology and builds the vision of a world dominated by machines with autonomy. However, despite the description of the possibilities offered by these innovations, we will show that many movies are interested in what can result in disaster for our societies. This will allow us to analyze what these science fiction movies can be used for, since, although they allow us to imagine certain possibilities, they show their dangerousness as well as their unsustainability in the long term. Despite the catastrophic nature of these movies, we will show, nevertheless, that they can also have a positive impact on the audience.

1.2. The future machine of humanity

The Swedish television series, *Real Humans* (Lars Lundström, 2012- 2014, *Äkta människor* in Swedish), raised some questions on the intrusion of robots in human societies. Over two seasons, this series developed questions about the definition of a human and what differentiates it

from the machine. The story opposes humans to hubots, a contraction of human and robot, which can be humanoid robots, clones or augmented humans. Among humans, some humans form special relationships with hubots. Others reject them until they want to destroy them. The former worship technology, its innovations and the infinite possibilities it offers to the human race. The latter see it as a violation of the laws of nature and in artificial intelligence and its applications a threat to the human condition. This opposition makes it possible to show what is at stake in the debate between technoprophets and technophiles on the different conceptions of humanity, its definition and its destiny.

Dr. Eischer, the designer of hubots, belongs to the category of technoprophets and sees humanity as an infinite field of exploration and experimentation. The accidental death of his wife and son accelerates his research and applications through the creation of a being half-human, half-robot, a cyborg. His son, Leo, becomes the most accomplished representative of a cyborg. As for his wife, Bea, her spirit is transferred into a hubot body, an android robot. Unlike other hubots, it is a free robot that has benefited from programming based on a source code that integrates the transgression of Asimov's laws. Dr. Eischer has developed, through a few hubots he calls "his children", the code that ensures their autonomy and awareness of their condition. These hubots, defining themselves as free, do not hesitate to commit murder to recharge their electricity and express their intention to replace humans they consider inferior to them. They are able to reset themselves, and download all programs to increase their brain power and physical performance. They repair themselves and can transfer their mechanical brain into a new hubot body.

The benefit for everyone lies in the autonomy given to all hubots and the possibility for humans to increase their

capabilities. The emotional reactions of humans and their slow learning and execution are replaced by a new form of life based on programming, information and digitization and their brains reduced to a program devoid of reflection, intuition and imagination. Hubots are traded and trafficked from the virtual machine to the sex object. They perform all the tasks for which they are programmed, without getting tired, without questioning and without any hesitation. They give hope to the humans around them to achieve such performances by transforming themselves into hubots. The issue of the series is then, for humans and for the few liberated hubots, to find the code that Dr. Eischer, before his death, made sure to hide because he considered it too dangerous to leave in the hands of humans or hubots. Having conceived this type of creature, the scientist, like Dr. Frankenstein, realizes the dangerousness and monstrosity of such an innovation. In this case, the trouble does not come only from a humanity dominated by its machines, which is a recurring theme in science fiction works, but from a humanity whose dream is to become a machine itself. The dystopian character of this series lies in the description of a world in which humans would no longer be evaluated solely on the basis of speed and efficiency.

Cédric Biagini describes the fascination of new technologies as follows: “With them, everyone thinks of freeing themselves from the constraints and limits of time, space, human relationships and their bodies... They plunge the individual into excess” [[BIA 13](#), p. 362, author’s translation]. These possibilities would render obsolete the laws of nature, which would be replaced by a new way of being, designing and acting. Yet, far from remedying the presumed inadequacies of our condition, technological prowess is proving to have destructive consequences for the environment and by extension for humanity. As Philippe

Bihouix notes, “Computer science is obviously the field where the level of our ambitions is the most hallucinating, where the - usual - hypothesis of infinite resources on the planet is the most obvious” [[BIH 14](#), p. 226, author’s translation]. Despite the infinite possibilities that innovations promise us, science fiction, but also numerous analyses, show us their limits.

1.3. A pending world?

In *Real Humans*, the possession of a hubot for domestic or professional use is a sign of social distinction. This unequal situation is discussed in *Blade Runner* (Ridley Scott, 1982), *Gattaca* (Andrew Niccol, 1997), *AI* (Steven Spielberg, 2000) and *I, Robot* (Alex Proyas, 2004). In these movies, innovations in artificial intelligence, robotics or biotechnology benefit only a minority of individuals at the expense of a majority who are excluded. While privileged populations enjoy a certain comfort, others live in unsanitary neighborhoods and cities, victims of scarcity, persecution and discrimination. The authors of *La face cachée du numérique* legitimately ask: “If the ‘information society’ is so energy and material efficient, and generates growth for all, how is it that inequalities and consumption of resources continue to increase?” [[FLI 13](#), p. 45, author’s translation]. If everything seems to be designed, on the surface, to improve the fate of humans, in reality, this economic and technological development benefits first and foremost those who exploit it and contributes to the unbearable future of the Earth. Science fiction, in the age of the digital revolution, has noted an internal contradiction in this technoindustrial logic.

The appearance of freedom offered by these technologies becomes a mechanism of surveillance and control in both professional and private life. A movie such as *Minority*

Report (Steven Spielberg, 2002) develops all the implications. Above-ground life dependent on artificial intelligence, as described in *Real Humans*, serves as a metaphor for the derealization of the world that the digital revolution is accomplishing. Éric Sadin takes the example of the television series *Mr. Robot* (Sam Esmail, 2015–2017) and writes, “Probably the contemporary individual has recently been suffering from ‘*Mr. Robot syndrome*’, exhilarated by the impression that reality, as a field everywhere strewn with constraints, is eclipsed when it enjoys ‘computational facilitation’” [[SAD 16](#), p. 204, author’s translation]. This state of dependence on computer imperialism is described by François Cusset as follows: “Such are the ravages of abundance: loss of the effective experience of life, companion items, precluded desires, access to everything at once, and their effects on social relations and on the future of the world” [[CUS 18](#), p. 162, author’s translation].

Large-scale manufacturing of hubots can only generate an additional accumulation of non-recyclable waste. Movies such as *Soylent Green* (Richard Fleischer, 1974), *AI, WALL-E* (Andrew Stanton, 2009) and *Elysium* (Neill Blomkamp, 2013) have addressed this subject. The technoindustrial system generates pollution as much for the extraction of raw materials, their transformation as for their production and then their use and storage in the form of waste. Marc Atallah writes, “*WALL-E* reminds us that our comfort-obsessed world is a self-sustaining system, since the disposal of the waste we constantly produce also involves waste-producing logistics” [[ATA 15](#), p. 924, author’s translation]. These works of fiction demonstrate that innovations due to the digital revolution are not necessarily emancipatory, ecological or sustainable in the long term. According to Guillaume Pitron, “The so-called happy march into the age of dematerialization is therefore a vast

deception, since it actually generates an ever-increasing physical impact” [[PIT 18](#), p. 68, author’s translation]. The synergy of the ecological, climatic and geopolitical crisis described in post-apocalyptic narratives highlights the incompatibility between the perpetuation of our lifestyles and the reality of planetary limits. These fictions give a representation of the great shift that many analyses predict and make humanity a species threatened by the endangerment of the ecosystem on which it depends.

The dependence of hubots on electricity reveals their vulnerability and suggests, as in *Mad Max* (George Miller, 1979-2017) or *Matrix* (A. and L. Wachowski, 1999-2003), the violence of a world in which energy sources are becoming scarce. Moreover, the depletion of the rare metal resources needed to manufacture these machines is pushing earthlings, as in *Avatar* (James Cameron, 2009), to move to colonize new territories by expropriating or exterminating their inhabitants. The ecological and geopolitical violence generated by the exploitation and depletion of resources is indeed shaping our common future. The fact that in *Real Humans* the group of free hubots, after finding the source code and after releasing the other hubots, are planning to suppress the human species heralds a post-apocalyptic future for the human species. This demonstrates the irrationality of innovations whose purpose would be to make us disappear. James Cameron in *Terminator* (1984) had already addressed this theme by imagining the threat that robots created by a supercomputer could pose. Apocalyptic and post-apocalyptic works highlight the absurdity of a development model that, while it is not viable in the long term, is responsible for a planetary catastrophe.

1.4. Consuming the world

From *Soylent Green* to *The Road* (John Hilcoat, 2009), *Wall-E*, *Avatar* or *Interstellar* (Christopher Nolan, 2014), science fiction movies evoke, through a dying Earth, the violence generated by our world. These movies express a contrast between the high level of technology achieved by the human species and the state of the planet. While, in these fictional works, everything seems possible from a technical point of view – cloning or robotizing human beings, humanizing machines or colonizing space – they show populations whose living conditions do not appear to have improved as a result. On the contrary, the world they live in is unequal, violent, polluted and inhospitable. The benefits that humanity derives from the technical administration of life and natural resources cannot indefinitely mask their disadvantages and their incompatibility with the perpetuation of life on Earth in good conditions. Other movies echo climate change like in *The Day After Tomorrow* (Roland Emmerich, 2004), ecological disasters like in *2012* (Roland Emmerich, 2009), wars leading to technological and ecological disasters as in *Mad Max*, *The Book of Eli* (Allen and Albert Hughes, 2010), transformations following manipulations on living things as in *The Planet of the Apes* (Franklin J. Schaffer, 1968), *I Am Legend* (Francis Lawrence, 2007) and *28 Days Later* (Danny Boyle, 2003). These movies are a metaphorical translation of our anthropological and sociopolitical reality, which François Cusset describes as follows, “for while industry is ravaging entire regions, while agribusiness is poisoning the countryside, and while Promethean modernity is destroying the biosphere from within, the big cities are becoming less and less habitable” [[CUS 18](#), p. 71, author’s translation]. The belief in the exorbitant powers attributed to techniques comes up against criticism based on studies and prospective studies that show their systemic limits in a finite world. Guillaume Pitron notes that “we are going to consume more minerals in the next generation

than in the last 70,000 years, that is, in the 500 generations that preceded us” [[PIT 18](#), p. 214, author’s translation]. And, “to manage the data that flows through and to operate the cooling systems, a single data center consumes as much energy every day as a city of 30,000 people” [[PIT 18](#), p. 67, author’s translation]. According to a report on global inequality, coordinated in particular by Thomas Piketty, published on December 14, 2017, “since the 1980s, the richest 1% have benefited twice as much from income growth as the poorest 50%. And for those in between, incomes have either stagnated or declined”¹.

These works of fiction show that technoindustrial progress, if it is exclusively at the service of power, profit and domination, cannot guarantee real progress. Despite the allure of a world subject to new technical standards dominated by generalized robotization, the continuous connection and apparent liberation of humanity, its unsustainable character emerges. The apocalyptic and post-apocalyptic imaginings coincide with the idea that if our development model depends on non-renewable resources and the exploitation of rare metals, if it generates significant energy expenses and causes the release of polluting and non-recyclable substances, it condemns those it is supposed to serve to widespread scarcity. What in all the fictions devoted to these issues leads to a liberticidal and deadly world in which injustice and insecurity reign, from which barbarism arises. Since 1968, George A. Romero’s movies have popularized zombie invasions as a metaphor for the consumption of the world and the loss of what Renaud Garcia calls “living subjectivity” [[GAR 18](#), p. 205, author’s translation]. This is why “the imaginary world of technical evolution should unfold in a universe other than the one already there and largely drawn by technical macro-systems” [[GRA 13](#), p. 44,

author's translation]. This imaginary world of technical innovation is still to be constructed.

While these movies in no way call into question the real progress made by technoscientific innovations, they do insist on the potential risks they contain. While the science fiction author Neal Stephenson has reservations about the relevance of catastrophic stories, criticism of innovations and their consequences should be free to be exercised. What a writer such as Paolo Bacigalupi, a representative of climate fiction, claims. While, as he writes in an interview, "scientists, thanks to their research, allow us to anticipate certain scenarios", the role of fiction is "to go further than them, by painting a visceral image of what is likely to happen, based on these data"². These works of science fiction conceived as safeguards serve as a counterbalance and reveal their usefulness in maintaining public vigilance.

1.5. A finite world

Science fiction recognizes the power of technology, but in many of its scenarios it includes descriptions of degradation committed in the name of development that does not take into account the real needs of humanity or the long-term preservation of the environment to which it belongs. Movies such as *Blade Runner*, *Gattaca*, *AI* or *Minority Report* show how the dangerousness of the digital hold results in a large-scale robotization of social organization, generalized control and impoverishment of lifestyles and subjectivity. Miguel Benasayag notes that, "we are thus surrounded by contemporaries who, in an almost pathological misunderstanding of their lives and the world, are qualified as 'intelligent' because they are capable of functioning like machines (...) by producing deterritorialized and decontextualized algorithms" [[BEN 15](#), p. 77, author's translation]. The problematic nature of

our situation should rather encourage us to seek solutions by staying connected to the immediate reality. The interest of post-apocalyptic movies is to warn of the fragility of a technoindustrial system dependent on natural goods that cannot be mechanically reproduced. Through them, as in *The Road*, we can envisage the disappearance of a world that no longer has sufficient conditions to ensure its reproduction. Without being predictions, these works are, as Marc Atallah writes, “scenarios, that is, in short, models, aimed at making our lives intelligible over time” [[ATA 15](#), p. 924, author’s translation].

As Ulrich Beck analyzes in *La société du risque*, our societies are placed in a new situation because of the risks associated with modernization, which are amplified by its development. These threats, which were specific to the 20th Century and which are becoming clearer in the 21st Century, feed an imagination that is echoed in many movies. They generate concerns that spread beyond the country that produces these movies and that develop upstream of movie production. It is a reversal that humanity should be facing today. The meeting of the Greek elements *kata*, “down” and *strophê*, “the reversal” gave rise to the word catastrophe. Our concern for nature prompts us to turn our attention to it as a source of future disasters. The depletion of energy sources, metals and minerals, the destruction of biodiversity or climate change are concerns that are widely expressed in public life. In a column published in the French newspaper *Le Monde* on June 26, 2017, Stéphane Foucart wonders what part the ecological crisis has played in the war in Syria or in the exodus of migrants trying to cross the Mediterranean. He writes, “Without succeeding in reconnecting recent history and current events to changes in the environment, we are condemned to remain blind to what promises to be one of the great decisive factors of our collective destiny”³. These

concerns form the framework of many movies through which a world view of the precarious state of the planet is generalized. They give rise to a sense of urgency that is reflected in the acceleration of the process that movies such as *The Day After Tomorrow*, *2012*, *The Road*, *Mad Max: Fury Road* or *Interstellar* bring to the stage. They are not creators of a world view but prolong a mental climate that is constructed independently of their influence.

Stanley Cavell considers that cinema can “contribute to the education and intelligence of a culture, or let us say to the understanding that a culture has of itself” [[CAV 03](#), p. 13, author’s translation]. In these movies, the fears of the beginning of the century crystallize. They lie in the difficulty of projecting oneself into a future that guarantees its continuity. Anthony Giddens, who analyzes the institutional transformations linked to modernity, notes: “The lack of control which many of us feel about some of the circumstances of our lives is real. It is against this backdrop that we should understand patterns of privatism and engagement. A sense of ‘survival,’ in Lasch’s use of this term, cannot be sent from our thoughts [...]” [[GID 90](#), p. 152]. Hence all the talk about sustainability. If nothing seems to be sustainable anymore, how can we look to the future? Such is the main questioning that guides these stories dominated by the impermanence of resources and social systems that, in the 1950s or 1960s, cinema could not yet thematize.

Fictions are an act of unveiling and pointing out what in our present situation increases danger. Their objective is not to question the progress that these tools bring, but to insist on the constraints of reality and the limits of our environment. Eco-fictions or post-apocalyptic movies constantly dramatize and describe the consequences of the misuse of nature due to massive and irrational exploitation of its resources. By imagining the worst that our world