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THREADS THAT PULL THE FUTURE

Science fiction and technological advancements:
cases and reflections

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ABSTRACT

Science fiction has been considered a vector of extrapolating current technological trends since its inception. This dissertation thesis aims to explore this relationship between science fiction and technology, specifically through the lens of popular culture (*Jenkins, 2006*), and how this amalgamation catalyzes technoscientific ideologies into consolidation and, ultimately, acts as a lighthouse guiding which technologies are developed, diffused and accepted by the general public.

This dissertation is divided into four parts. The first one, called theoretical research, is dedicated to the explanation of the fundamental concepts through which the entirety of the work is built upon: material culture, popular culture and science fiction. The production process of popular culture is made bare and is tied with the origins and functions of science fiction. Exploring these functions further, it's explained how they culminate into technoscientific microideologies that are later adopted, supported and replicated by decision makers in society.

The second part is a phenomenological investigation into science fictions and materiality. Its goal is to understand, through a contemporary and historical perspective, the manifestation of the technotypes that circulate most strongly in contemporary society: Cyberpunk and New Wave. From these technotypes, specific categorizations were extracted and used to further categorize the case studies in search of patterns that could be extrapolated beyond this work.

In the third section, the categories that were made apparent by the case studies are further validated through an analysis based on the CLA - Causal Layered Analysis method (*Inayatullah, 1998*), where each category is deepened through a single materialization that can have its origin pinpointed in science fiction narratives.

The fourth part is where the conclusions are presented. Through this work, the final goal is to understand how popular culture science fiction works are not only extrapolated visions of future, but are the origins of technotypes that are agreed upon by society and further chased as ideals of technological production, and how a designer can leverage them to understand future technological opportunities and anticipate possible challenges posed by technological advancements.

ABSTRACT

Sin dai suoi esordi la fantascienza è stata considerata un vettore per estrapolare le attuali tendenze tecnologiche. Questa tesi di Laurea mira a esplorare questa relazione tra fantascienza e tecnologia, in particolare attraverso la lente della cultura popolare (*Jenkins, 2006*), e a comprendere come questa fusione catalizza le ideologie tecnoscientifiche e, al fine, guida quali tecnologie sono sviluppate, diffuse e accettate dal pubblico in generale.

Questa tesi è divisa in quattro parti. La prima, denominata ricerca teorica, è dedicata alla spiegazione dei concetti fondamentali attraverso i quali si costruisce l'intero percorso: cultura materiale, cultura popolare e fantascienza. Il processo produttivo della cultura popolare messo a nudo e legato alle origini e alle funzioni della fantascienza. Esplorando ulteriormente queste funzioni, emerge come culminano in microideologie tecnoscientifiche che possono essere successivamente adottate, supportate e replicate dai decisori nella società.

La seconda parte dell'elaborato è un'indagine fenomenologica sulla fantascienza e sulla materialità. Il suo obiettivo è comprendere, attraverso una prospettiva contemporanea e storica, la manifestazione dei tecnotipi più noti e riconoscibili nella società contemporanea: Cyberpunk e New Wave. Da questi tecnotipi sono state estratte categorizzazioni specifiche e utilizzate per categorizzare ulteriormente i casi di studio alla ricerca di modelli che potrebbero essere estrapolati al di là di questo lavoro.

Nella terza sezione, le categorie che sono state rese evidenti dai casi di studio sono ulteriormente convalidate attraverso il modello della CLA - Causal Layer Analysis (*Inayatullah, 1998*), in cui ogni categoria viene approfondita attraverso un'unica materializzazione che può avere la sua origine individuata nelle narrazioni di fantascienza.

Nella quarta parte vengono presentate le conclusioni. Attraverso questo lavoro, l'obiettivo finale è comprendere come le opere di fantascienza della cultura popolare non siano solo visioni estrapolate del futuro, ma rappresentino le origini di tecnotipi condivisi dalla società e ulteriormente inseguiti come ideali di produzione tecnologica, dall'altro come un designer possa sfruttarli per comprendere le future opportunità e anticipare le possibili sfide poste dai progressi tecnologici.

ACKNOWLEDGEMENTS

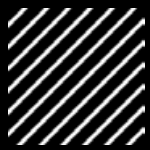
I thank my supervisor, Manuela Celi, for guiding me through this entire work. While I only arrived with a simple idea, she was instrumental in shaping the methodologies used and bringing clarity during this research.

I thank my colleagues from Politecnico di Milano, who are all deep sources of inspiration for me, both through their works and the conversations we had during our time together.

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Lastly, I thank all the dreamers, writers, technologists and scientists. The ones that build the worlds that we inhabit, both in present and future.



PART null

INTRODUCTION

INTRODUCTION

1.1 PERSONAL DRIVERS

The natural relationship between humans and futures has always been a theme of intense discussion. The first social paradigm shift that happened in human behavior stems from exactly this relationship: the invention of agriculture (Carneiro, 1970). A simple, yet fundamental technology that happened organically, and kickstarted a variety of sociological and technological revolutions such as writing, architecture, emergence of complex societies and several others. One of the most peculiar ones, perhaps, was the emergence of the concept of future. For the first time in history, with a surplus of food, its consequential surplus of people and the birth of complex societies, the need of maintaining the constant food source that the cultivated fields provided drove the invention of a timekeeping method, a way to plan for seeding and harvesting, to keep track of seasons and its weather patterns, to accumulate knowledge and to pass it on to next generations.

This complex web that happens when you mix technological advancements, societal changes and assimilation of knowledge through collective intelligence is where this research project positions itself. However, even though the elements of technological revolution and its consequences are similar, the aim of this thesis is to understand several minor revolutions that are happening in the recent past, the present and the close future, and as such, we need to understand the new clothes that these elements wear.

Due to the recent breakthroughs that the human race went through in regards to space exploration and how this field is popularly considered one of the most technologically advanced, it presents itself as a natural starting point for a technologically centered research project. Furthermore, in the next chapters I hope to analyze by what most technological revolutions are driven, and highlight that the human perception of different futures, one that has been historically linked to possibilities, choices, imagination and wonder, has always played a key role in determining which technology is researched, developed, and ultimately, made commonplace in most human societies.

1.2 RESEARCH METHODOLOGY

This work is organized through the juncture of theoretical research, phenomenological research, pattern recognition and historical validation

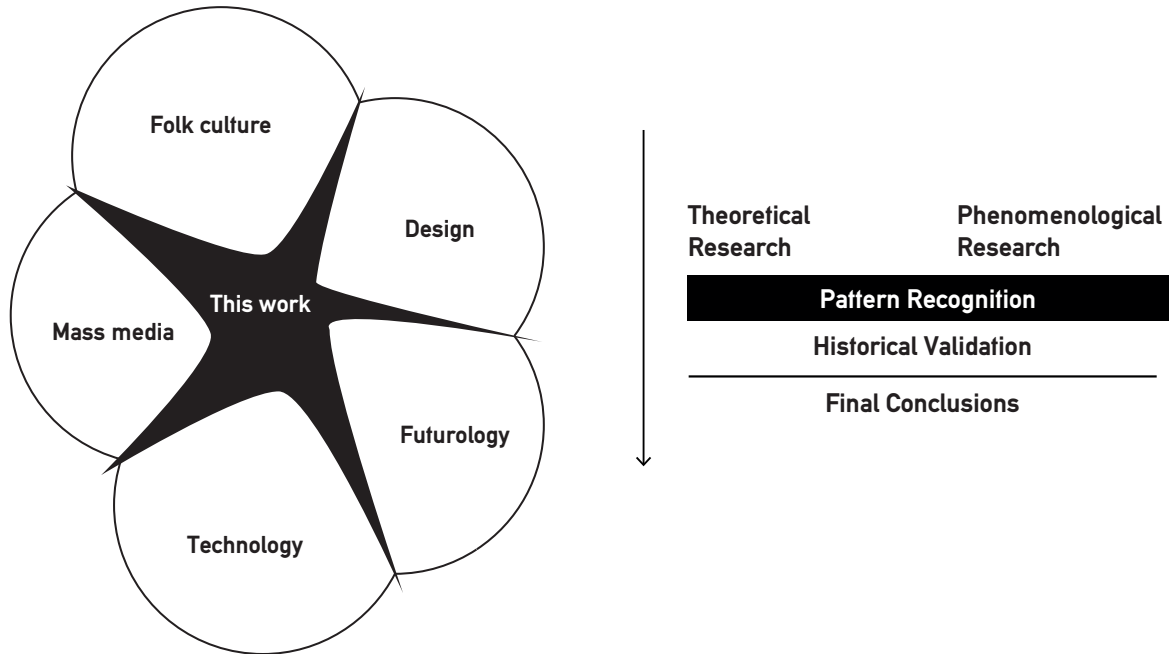


Figure 1. Map detailing the relationships between the fields that will be approached during the dissertation, accompanied by the main methodology adopted.

of the previous findings. Most of the academic concepts that will be discussed were gathered through secondary research, however, since the thesis uses works of fiction as a critical source of patterns, insights and imaginaries, the vast majority of them were experienced first hand (be they of literary, visual or interactive nature). This proved to be crucial to development of the pattern recognition exercise, where the case studies selected during the phenomenological research are analyzed in depth through a hollistic perspective.

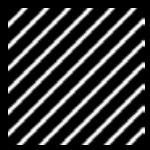
Regarding the organization of the chapters themselves, the first step in this journey will be to understand how a common vision of future is built in our contemporary society. This leads to an analysis of contemporary narratives and media consumption, emerging technologies of media distribution, how commercial culture became the pervasive entity that it is today, where folk culture comes into play and how all these elements are combined to produce a common, popular culture.

Secondly, we will look at popular culture narratives that deal specifically with technology, commonly known as the Science Fiction genre. By definition, the relationship with possible, plausible and preferable futures (Voros, 2003) is embedded in science fiction pieces, and as such it will be discussed through our perception of time, the historicity of science fiction as a medium for moral questioning and how scifi, in the contemporary society, is actively working as an attractor of current technological development through the consolidation of

technoscientific microideologies.

With the key concepts explained through the theoretical research, the project finds further support through a phenomenology research. The case studies will be analyzed in search of general categories, common characteristics and threads that indicate possible developments and relationships between science fiction and technology. This includes a deepdive into several different mediums, from art to video games, in an effort to highlight how pervasive the genre is. Hallmarks of science fiction will also be analyzed, seeking to understand how what was written decades ago approached technological developments and moral questions in such an atemporal manner that it could still be considered a contemporary work of fiction.

In our last section, with the categorization finalized, we will walkthrough a deepdive seeking historical confirmation of each of the categories. This means that, using technological crystallizations that today are commonplace in society, such as the pacemaker and debit cards, we will search for their origins in science fiction, the relevance of the fictional works during their first implementations, and how societal drivers could be interpreted from this materialization.



PART A

THEORETICAL RESEARCH

1. CULTURE

1.1 MATERIAL CULTURE

The manifestation of culture as material artifacts is a subject that has raised quite a few analyses from philosophers, ethnologists and anthropologists. Considering the industrial revolution and its the new peak of production capacity, the capitalist society had to restructure itself to transition from a production society to a consumption society (Baudrillard, 1968). This rationale and its consequences is what makes the work of Jean Baudrillard relevant to this research project.

Of particular interest is the recognition of the role of technological systems in the consumption of objects, even though it is an indirect relationship with the consumer, explained in the introduction of his work *System of Objects* (1968). As an intrinsic characteristic, such system is not stable, continually going through revolutions and evolutions, but most importantly, as Baudrillard puts it:

(...) the fact that technology depends strictly on the social conditions under which technological research is carried out, and hence on the global order of production and consumption (...). It is thus not consistent technical structures but, rather, the ways in which practices affect techniques - or, more exactly, the ways in which techniques are checked by practices - that account for reality here. (Baudrillard, 1968, p18)

In an effort to build a vocabulary to analyze role, anatomy and values of everyday objects, Baudrillard also brings to attention another point. According to him, such a description cannot be separated from a critique of the practical ideology of the system itself, and therefore, the relationship between an ever changing technological system (which holds only intention) and the object itself produced by this system (which holds intention and added meaning) should be analyzed thoroughly. In the following chapter of his work, Baudrillard uses interior design to explain how objects are more than their function and form. As an example, the victorian home is a clear exhibition of excess, of belonging to a social status that is not vulnerable to scarcity. However, with the advent of industrial revolution and modernist homes - which, in his opinion, carry the message of the new technical system proposed by the industrial revolution: of Man's complete mastery over the surrounding environment - victorian homes also gain an additional layer of opposition to the looming technical revolution that they preceded.

The materiality, however, is not the most interesting aspect of an object. According to Baudrillard, investigating further the interior design of a traditional home, it's possible to assert a clear ideological tonality to it (1968). One such example is the established patriarchal structure present in traditional homes at the time, with dining rooms that at the time were more often than not somber in aesthetics, with furniture set up as immovable and immutable. This system of objects legitimizes the ideology which spawned it, and as such, further incentivizes social identification with this ideology.

These concepts make it clear that objects play an active role in shaping perceived meaning and molding social interactions, while also being influenced by the unstable technological system and the dominating ideology in which they are inserted.

1.2 THE NEW REAL

In a later work produced by Jean Baudrillard in 1981 called *Simulacra and Simulation*, the theoretical analysis of a consumption society and its consequences are refined and exposed more in depth. Its main conceptual theory is how, in a capitalist society permeated by signs and symbols, they replaced the human perception of reality with a simulacrum - something that presents itself as real, even though it has no ties to reality whatsoever.

Given that one of the discussed aspects of this work will be mass media, popular culture and diffusion of ideas, it's extremely valuable to analyze what the author of such an influential work in the form of *System of Objects* (1968) later devised in a more abstract field.

As Baudrillard delineates, there are 4 main stages through which images follow:

*"it is the reflection of a profound reality;
it masks and denatures a profound reality;
it masks the absence of a profound reality;
it has no relation to any reality whatsoever: it is its own pure
simulacrum."* (Baudrillard, 1981)

Once the simulacrum has been manufactured, the meaning of reality changes: reality, as it is known today, now can be replaced by the simulacrum, a fabricated perception through which humanity will assimilate the meanings and experiences they are exposed to.

Baudrillard, however, did not limit his analysis to the image, but also

extended it to the aspects of the narrative, and more specifically, to the science fiction genre. According to him, there are 3 orders to which simulacra can belong to. The first one is of natural order, optimistic and founded on the image. This type of simulacra is the furthest from the present, and can be directly represented by utopian narratives.

The second order is the order of the productive, and brings with it the vision of future much closer to the present, being “most often nothing other than an unbounded projection of the real world of production, but it is not qualitatively different from it.” (Baudrillard, 1981). This was embodied by, at the time, most of the science fiction narratives, where the productive capabilities of society are exacerbated: we have more energy, more materials, more destinations.

The third order is of a simulative nature. This narrative is completely absorbed by the present, and clashes with it, while trying to extrapolate present problems in the nearest possible future. It involves the cybernetic and the complete control over surveillance. What is most telling is that, at the time of writing, Baudrillard couldn't find a literary work that was fitting of this order of simulacrum. Moreover, he explains in depth how, once society enters the third order of simulacrum, narrative works of science fiction would not expand outwardly, reaching for new goals that can be achieved with more productive capabilities, such as it happens in the Star Trek (1966) universe. It would, instead, focus inwardly, chasing the fragmentation of perceptions and realities inherent of simulacra, in an attempt to reinvent the real as fiction and normalize the fragments of simulacrum as the reality. As Baudrillard puts it,

“Without a doubt, the most difficult thing today, in the complex universe of science fiction, is to unravel what still complies (and a large part still does) with the imaginary of the second order, of the productive/projective order, and what already comes from this vagueness of the imaginary, of this uncertainty proper to the third order of simulation. Thus one can clearly mark the difference between the mechanical robot machines, characteristic of the second order, and the cybernetic machines, computers, etc . , that, in their governing principle, depend on the third order.” (Baudrillard, 1981)

This analysis, made 40 years before the development of this research project, is astoundingly close to what came to pass. In the following chapter the analysis will focus on science fiction proper, and it will be made apparent that the second order of simulacrum is directly linked to what today is called the New Age movement in science fiction - the

exploration of productive capabilities, of expanding horizons. The third order of simulacrum also has materialized in contemporary society - the works that follow inward exploration, of cybernetic spaces, of superposition of present and near future. These works, today, are known as pertaining to the subgenre of Cyberpunk, founded on 1984, 3 years after the publication of *Simulacra and Simulation* (1981), and, in accordance to what Baudrillard thought would happen, is the movement that the complex and interesting works of today belong to.

1.3 POPULAR CULTURE

Because of the goal of this thesis, several concepts from media theory had to be investigated. One key concept among them is the so called Pop Culture. The first step into comprehending contemporary Pop Culture is understanding the basis of what constitutes this ever changing realm that mixes communication technologies, cultural signifiers and pervasive narratives that have become universal to people.

According to Henry Jenkins (2006), we live in a media context that can be categorized as a Convergence Culture. Against what was commonly speculated at the time, he postulates that the future of media consumption will never reach the "Black Box Fallacy" - where there will be one single, aesthetically impersonal, device that will encompass all the functions desired by the consumers. This, he claims, is an oversimplification of how media is consumed, reducing several cultural and sociological layers in favor of newly developed (and usually not yet universally adopted) technology. Instead, what will be diffused and accessible through several different devices will be the content itself, creating an environment that leverages the interconnectedness of the Internet to subvert the mostly passive relationship consumers have had with media content so far and replace it with communities that consume, produce and interact with content they identify with and are passionate about.

This paradigm shift in both producing and consuming content, potentialized by the web, gives way to knowledge communities to grow and expand like it simply wasn't possible before. These communities work within the basic principle of collective intelligence. A collective intelligence can be defined when the knowledge of a community simply cannot be held in its entirety by a single individual (Lévy, 1999). This implies that members of a collective intelligence are both consumers and creators, organically aggregating, organizing and deciding which information is pertinent to the community as a whole.

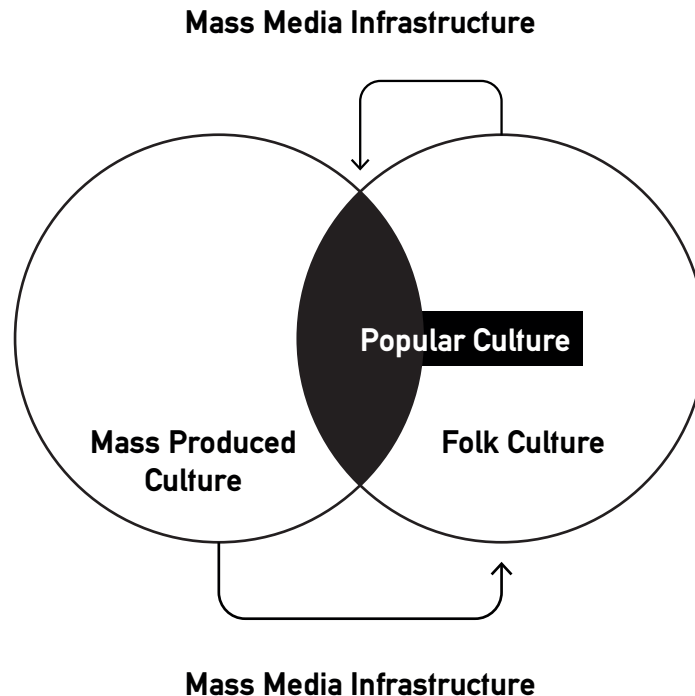


Figure 2. Definition of popular culture as a process. Adapted from *Convergence Culture*, Jenkins, 2006.

However, what is most interesting for this research is what happens when a member of such a community asks for new, specific information from his peers and none of them is capable of supplying the requested information. This type of situation, according to Pierre Lévy (1999), a scholar of collective intelligence, is vital to the growth of the knowledge community, since its tension sparks discussion, arguments and acknowledgement of inventions and new directions for the community. This type of relationship with content, explains Jenkins, is by no means new to society. In fact, for most of the time that civilization existed, the main way in which media content was consumed was through interaction, be it music, folklore, stories or imagery. As an example, the differences in media production during the nineteenth century and twentieth century in North America are rather easily compared. During the nineteenth century most of the cultural production was characterized by what could be called grassroots initiatives, with songs and stories being organically diffused with no single person claiming the authorship of it. With the emergence of what Jenkins calls “industrialized arts” and the heavy investment behind their production, cultural production during the twentieth century was increasingly dominated by professionals and spread through an infrastructure that was set up in such a way that it reached virtually every and anyone. The natural consequence of this is that commercially produced culture

increasingly was what dictated what type of narrative resounded most with the public, be it songs, images and stories.

Folk produced culture, however, never stopped happening. At local levels, amateur cultural production was still ongoing, and, as stated by Jenkins, once it had a reliable means of distribution in the Internet and a supporting community in the format of collective intelligences, it started to flourish once again.

Having explained that, the definition of popular culture that will be used in this thesis is the following:

"...popular culture is what happens as mass culture gets pulled back into folk culture." (Jenkins, H., 2006 p187).

"...it should be no surprise that much of what the public creates models itself after, exists in dialog with, reacts to or against, and/or otherwise repurposes materials drawn from commercial culture." (Jenkins, H., 2006 p189).

This implies in a central point of this project - to understand, discuss and conceptualize possibilities for the future, first the frame of knowledge needs to be introduced, and today, the main way in which references are absorbed, questioned and consolidated is through a clear cycle that involves mass culture, folk culture and pop culture.

2. SCIENCE FICTION

2.1 THE HUMAN RELATIONSHIP WITH FUTURES

As it will be discussed in this chapter, science fiction works have always had a complex relationship between technology and futures, with their narratives usually acting as the exploration of these concepts, either by themselves or connected to other, more specific ideas. Because of this, the first step into understanding the drivers behind science fiction and its several visions of future will be to analyze the contemporary understanding of the concept of time itself.

Carlo Rovelli, a gravitational quantum physicist, has a rather unique way of explaining such concepts (2018). His book, *Order of Time*, is divided into two main parts. The first one is dedicated to dissolving the common notion of time. Here, he explains that the time (and as such, also the present) is local, and therefore there is no basis for the widespread concept of a single timeflow that is universal and is measured equally anywhere - in fact, with today's precision, it's possible to measure time flowing differences in a lab, with clocks spaced as little as 40 centimeters apart. Among several other arguments he makes, one reveals itself as strikingly important for the subject of this thesis:

"At the most fundamental level that we currently know of, therefore, there is little that resembles time as we experience it. There is no special variable "time", there is no difference between past and future, there is no spacetime". (Rovelli, 2018)

With this stated, it begs the question - if there is no difference between past and future, what is this experience that is perceived by every single human? The second part of the book is dedicated to define time through what is factually known. The most fundamental characteristic of time is that it is perspectival - the way it flows from past to future is real, but partial to us, humans, as beings. This leads to the fact that while physically there is no difference between past and future, our experience of time (and more importantly, our differentiation between time segments) is an interpretation of the local present, memories of the past and anticipations of the future. Time is, with the exclusion of entropy, experiential and a partial agent to our beings. Therefore, it is impossible to not have a emotional connection with it, and as Rovelli explains, while Physics can help to clear the fog between the perception and the reality of the inner workings of time, the mere search of its understanding has been a key driver behind innovation,

philosophy, astronomy, psychology, neuroscience and several other areas of knowledge. As Rovelli says, “perhaps the emotion of time is precisely what time is for us”.

With that brief overview of how the emotional attachment humans have with the mere concept of future, this project will start to focus on how we collectively imagine visions of future through narrative devices.

2.2 ORIGINS OF SCIENCE FICTION

Science fiction, as any literary genre, has an intensely contested origin. The way that scifi narratives are told today is, in fact, incredibly recent, when looked through a timeline that extrapolates the genre as only a style of narrative, and also includes story elements and questions that have always been contemporary to humanity. Starting from moral questioning, the oldest examples that could be included in the genre are, unsurprisingly, also one of the oldest registers of written narrative - the Epic of Gilgamesh, of which the earlier texts date as far as 750 BC (Sandars, 1972). The story depicted in this poem - which is also one of the best preserved references of the ancient mesopotamian cuneiform written language - brings, as a central point, the quest for immortality and the morality of one's actions and their consequences, both of which have been recurring themes in science fiction. However, this



Figure 3. Stone tablet of the Epic of Gilgamesh. Extracted from https://www.ancient-literature.com/other_gilgamesh.html

MODERN SCIENCE FICTION TIMELINE

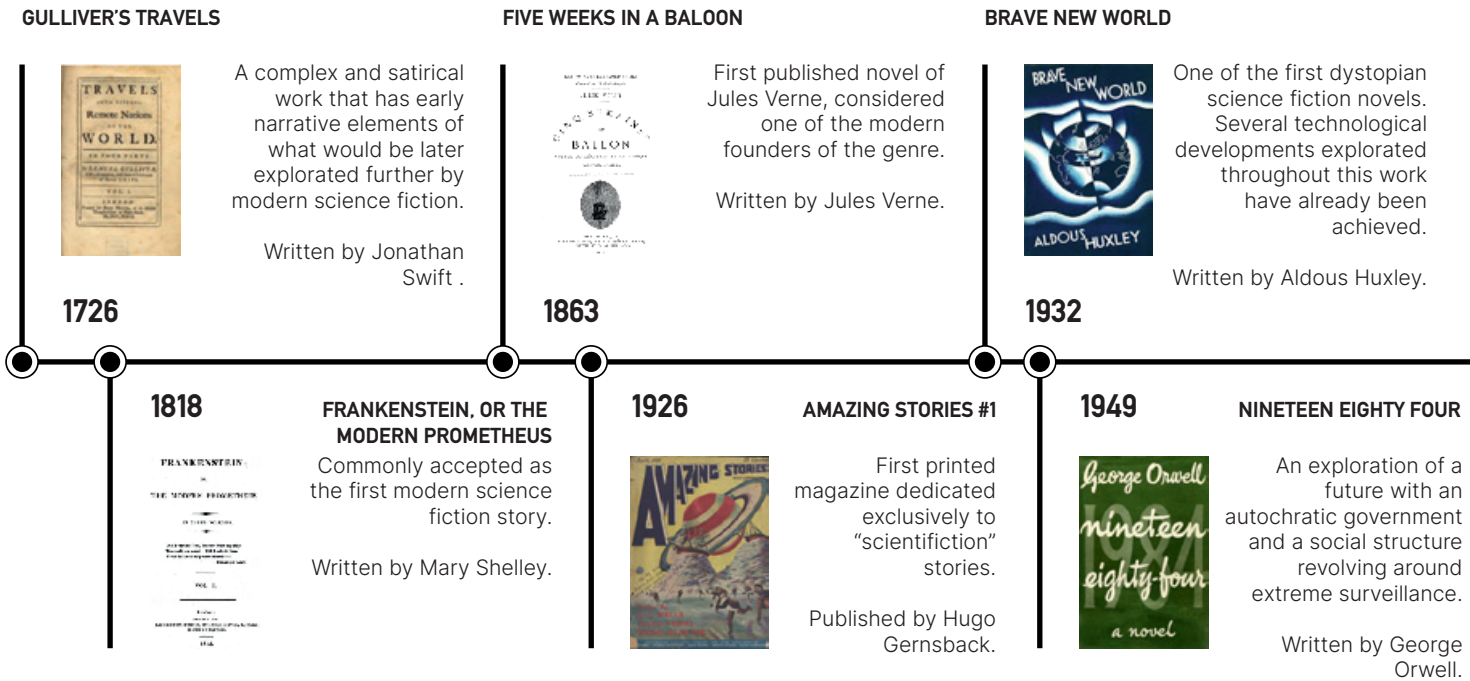


Figure 4. A small selection of works representing the Modern Science Fiction timeline.

theme alone will not be enough to classify it as scifi. The key element of technology is not clearly approached, and as such, we will relegate this tale, of which the physical record is already a remarkable factor in understanding the history of human communication, to the genre of fantastical tales.

Going forward in time, other works where technology is explicitly addressed start to appear. Of particular interest are stories from Eastern cultures, such as the epic tale of King Kakudmi, included in the collection of Mahabharata (900 - 800 BC), where it's possible to find the first concept of time dilation, which would be proved millennia later by Einstein's Theory of General Relativity, in 1915. During this specific tale, King Kakudmi is in search of a worthy husband for his daughter, and his quest leads him to an interstellar travel to the Hindu creator Brahma, only to find out, after a short wait after arriving at his destination, that time there passes differently than on Earth:

"O King, all those whom you may have decided within the core of your heart to accept as your son-in-law has died in the course of time. Twenty-seven chatur-yugas have already passed. Those upon whom you may have already decided are now gone, and so are their sons, grandsons and other descendants. You cannot even hear about their names." (Vishnu Purana, Chapter I, Book IV. Date unknown. Translation by H. H. Wilson, 1840).

I. ROBOT

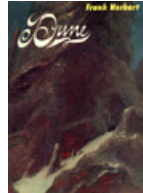


Collection of short stories about robots, humans and morality. Republishes the story where the famous *Three Laws of Robotics* first debuted.

Written by Isaac Asimov.

1950

DUNE



Commonly regarded as the work that created the space opera archetype.

Written by Frank Herbert.

1965

THE LEFT HAND OF DARKNESS

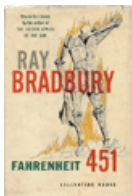


A story that posits possibilities of other social structures that revolve around sexes and genders. One of most influential New Age works.

Written by Ursula K. Le Guin.

1969

1953



An exploration of a society plagued by the natural disinterest in literature cause by mass media.

Written by Ray Bradbury.

FAHRENHEIT 451

1968

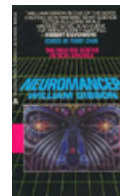


DO ANDROIDS DREAM OF ELECTRIC SHEEP?

The story where some of the first embryonic ideas of the Cyberpunk genre can be found.

Written by Phillip K. Dick.

1984



The foundational work of the Cyberpunk genre.

Written by William Gibson.

NEUROMANCER

Upon coming back, Kakudmi finds another surprise - during the time he has been travelling, human society has regressed in terms of technology, knowledge and physical capabilities. In this work of fiction, it is possible to identify all the moving elements that would become the defining characteristics of contemporary science fiction - extrapolation of scientific, man made technology; exploration of possible (and most of the times unintended) consequences of the use or spread of such technology; and finally, possible, individual reactions (usually used as a narrative or plot device) to the new situation created by the technology.

However, as mentioned before, the way that science fiction is told in contemporary times is incredibly recent when compared to the longer timespan in which it is possible to identify small seeds that would be extrapolated only much later.

To consolidate the characteristics and the evolution of the literary genre, a small sample of hallmark works was selected to construct a timeline of publication (see figure 4). It is important to highlight that this sample is by no means exhaustive, and was organized in accordance to the influence of each literary work in the genre and its relevance to this particular research project.

Having said that, Gulliver's Travels (1726) works as the starting point

of the timeline, providing embryonic elements that are not yet full-fledged and aligned to the modern vision of science fiction stories. It's commonly seen as a satirical masterpiece, investigating themes such as whether the human race is inherently corrupted, hypocrisy and misanthropy - all of that in an accessible language, easing its incorporation into the popular culture imaginary of its time. Of particular interest for this research is its Part III: A Voyage to Laputa, Balnibarbi, Luggnagg, Glubbudrib and Japan. Here, the protagonist arrives on a floating island called Laputa, where its population is mainly devoted to the blind pursuit of science for science itself. This means that the scientists there have no practical means of applying its discoveries, and instead focus on impractical projects such as means of softening marble to use it in pillows and properly mixing paints using only its smells. In a further analysis, it's visible that the extrapolation of science and technology into society is already being approached, even though it's mostly from a satirical point of view.

Further down the timeline, the first proper modern science fiction literary work appears in 1818, with *Frankenstein, Or Modern Prometheus*, by Mary Shelly. Throughout the entire work the fascination with recent technology is palpable, where the protagonist is devoted completely to the development of the fields of biology, physics and chemistry in search of a breakthrough in regards to the nature of life. It's also interesting to note that contemporary to this work, there was an intense advancement and dissemination of electricity in the field of physics, with experiments ongoing to understand electricity and its relationship with muscle movement, and more than likely this was where Mary Shelly sought inspiration to write. *Frankenstein* is also a complex work that questions the morality of science development and reflects a society that, at that time, was still trying to understand the role of scientific development in its context.

Five Weeks In a Balloon (1863) is a peculiar piece. This was the first published novel by Jules Verne, which would later follow the same narrative structure in other memorable works such as *Voyage to the Center of the Earth* (1864) and *Twenty Thousand Leagues Under the Seas* (published in full in 1870). While *Five Weeks In a Balloon* could be seen as a work about the exploration of Africa - which at the time was not entirely charted by the Europeans - it can also be seen as a thought exercise about the confined spaces of exploratory endeavors at the time. This specific subject, supported by a dangerous transportation technology for its time, meld into a compelling story about uncharting the unknown and the perils that come with this activity.

With growing market interest in science fiction stories, Hugo Gernsback leveraged his existing career in the publishing field to start the

publishing of the first magazine dedicated exclusively to science fiction - Amazing Stories, in 1926. Several influential authors were first published in this magazine, including Isaac Asimov and Ursula K. Le Guin. Another incredible consequence of its publication was caused mainly by the section where they would publish the letters from the readers. This can be directly analyzed through the view of Henry Jenkins (2006), stimulating the organic growth of a supportive community of the genre.

In 1932, six years later, one of the most contemporary dystopian novels was published - Brave New World, written by Aldous Huxley. Here, the reader is introduced to a world where genetic human manipulation is commonplace, sadness and mood swings are solved by the famous "soma" substance and society is constantly driven by pleasure as a reward. The main plot includes an outsider, John, which is from what is called a Savage Reservation - a place where people are naturally born, have diseases and live through a mostly religious lifestyle, all aspects that are pollarily opposite of what Bernard, someone that lived only inside the World State, has experienced during his life. This dichotomy of both characters trying to challenge the current society is what drives the plot forward, where the reader is induced to question the real benefits of the technological achievements of society.

In 1949 was published the novel Nineteen Eighty Four, by George Orwell, which is usually compared to Brave New World and considered as its counterpart of possible societal extremes. The contemporary relevance of this work is uncanny, with mass media manipulation, heavy surveillance, religious exacerbation and historical records manipulation being only some of the aspects that could very well be analyzed through the history of the most modern autocratic regimes.

The following year, 1950, was highlighted by the release of I, Robot, a collection of short stories by Isaac Asimov that had already been previously published separately. The work of Asimov as a whole is worth mentioning because of his deep dive into the meaning of humanity and morality in a possible future where the fabrication of androids is commonplace. One of the supporting pillars of the world where most of his work is inserted into is the creation of the "Three Laws of Robotics":

"First Law

A robot may not injure a human being or, through inaction, allow a human being to come to harm.

Second Law

A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.

Third Law

A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.'

(I. Asimov, Runaround short story, 1942)

These Laws, even though they were fictional, sparked an incredibly productive discussion about the ethics of artificial intelligence decades later, and are still referenced in fictional works.

Ray Bradbury, according to himself in an interview to the Weekly Wire, (1999) has only produced one single work of science fiction: Fahrenheit 451 (1953). A story where its main inception can be construed as critique to the way that mass media hampers the interest of the masses into literary works, it extrapolates into a world where books are outlawed, and the sole purpose of firefighters has been remodeled into burning them. The worldbuilding of the book itself is also interesting, as it ideates fireproof houses, advanced entertainment systems and which would be the consequences of academia if books are forbidden.

Dune (1965), The Left Hand of Darkness (1969) and Neuromancer (1984) will be approached more in depth later in this chapter, but a short analysis of Do Androids Dream of Electric Sheep shows itself as crucial to the train of thought of this research. In it, the author manufactures an Earth that is so polluted that causes major ecological collapse. Subsequently, governmental bodies encourage humans to move to offplanet colonies, and as an incentive, it provides a free android to those willing to do so. Some of these androids rebel against humans, and due to the toxic nature of Earth, decide to flee there. The reader accompanies the journey of Rick Deckard, a bounty hunter who accepts the job in hopes to be able to replace his robot electric sheep with a live animal. The story sets the first elements and environments that would be later known as hallmarks of the scientific cyberpunk, such as industrialized and broken ecospheres, the social contrasts exacerbated by technology and the search of mechanical entities as an alternative to natural ones.

With the historical relevance of science fiction established and its main elements detailed, to understand how they are applied today more recent examples are needed. Due to the scope of this project, the next analysis will focus on the mediatic movements called New Wave

and Cyberpunk, both of which heavily influenced aesthetics, narrative styles and the collective vision of future, with different foci between them. In chronological order, the New Wave movement, as described by the Encyclopedia of Science Fiction (2020), represented a rupture with what had been done during the past decades. Science Fiction as a genre was becoming predictable and stale, even though the publishers were more than willing to print scifi stories. The approach that New Wave writers take to refresh their narratives was, surprisingly, to focus less in the science itself and more in the human, moral and societal consequences of new technologies - such as Frank Herbert's *Dune*, published in 1965, which it's still considered the originator of the modern space opera, bringing with itself a plot that involves open use of intellect-boosting drugs, biological engineering for harsher climates in other planets and the interplay of political and economic entities. Another author that distinguished herself approaching more experimental themes for science fiction was Ursula K. Le Guin, with her novel *The Left Hand of Darkness*, published in 1969. Here, the context she built was specifically related to the process of sexual structuring a society - Genly Ai is tasked with the mission of negotiating an alliance with a biologically different race of humans in another planet - one that is ambisexual, that can change their sexes freely and structures their own society around this fact.

Not surprisingly, during the New Age is also when the Space Race, which happened between 1955 and 1991 (Royal Museums Greenwich, 2021) was at full speed. The influence of the rapid development and the wonder that came with possibilities of space exploration is incredibly clear when reading or watching works of science fiction from this era. One fundamental piece of work that summarizes the New Age movement's philosophy and aesthetical elements is *2001: Space Odyssey* (1968). From the idea of a rogue A.I. to the aseptic environment that is presented to the audience, *2001* has had such a lasting impact in our visual culture that it's extremely difficult to decouple space exploration from its aesthetical elements and feeling. Comparing the scenarios that were presented more than 50 years ago to what is being produced in the space sector today, it's almost disappointing to see that the stylistic evolution was next to none.

While the New Wave movement is linked to new technological possibilities and dilemmas heavily influenced by the ongoing Space Race, such as space exploration, human android relationships and artificial intelligence, Cyberpunk, the movement that directly followed the New Age, is instead linked to technological disruption. The mark zero of the Cyberpunk movement can be traced directly to William Gibson's novel *Neuromancer*, published in 1984. Crafted with care, the reader accompanies a data thief called Case through its last heist.

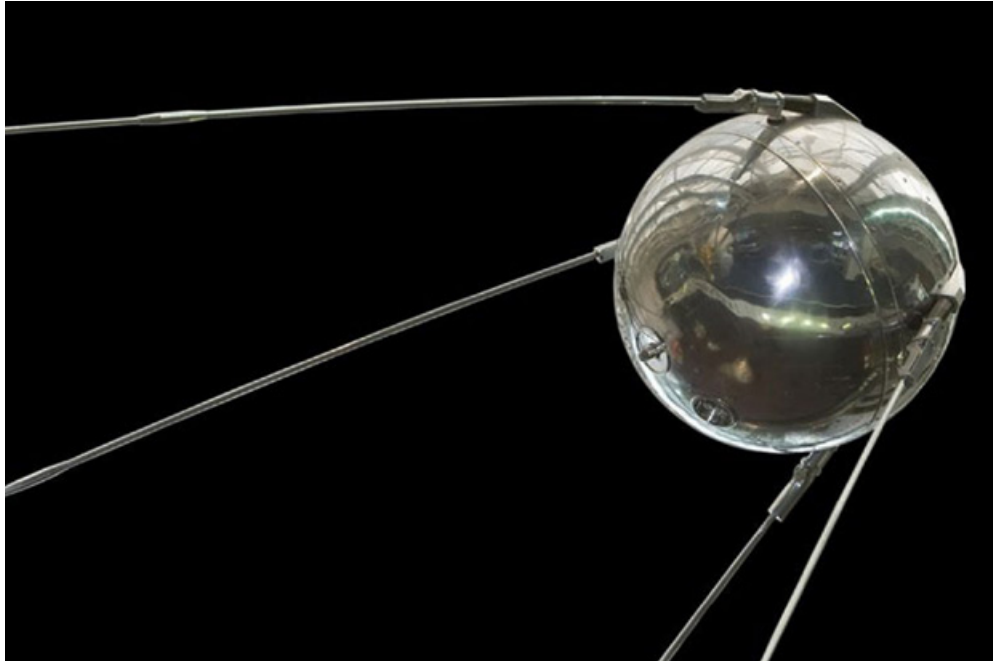


Figure 5. Replica of Sputnik 1, the first artificial satellite to send signals back to Earth, one of the defining moments of the Space Race. Launched in 1957.

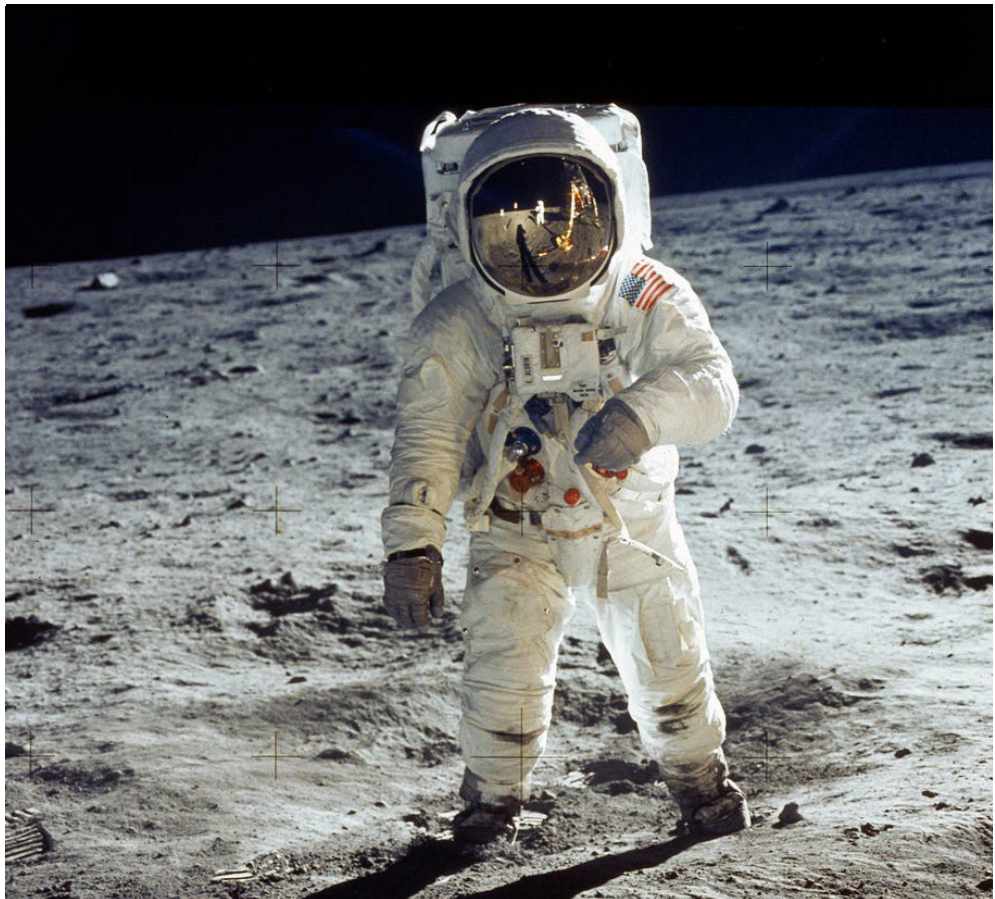


Figure 6. Buzz Aldrin on the Moon, photographed by Neil Armstrong. The results of the Apollo 11 mission, in 1969.

The worldbuilding of the novel takes into consideration geopolitical, technological, social and economical elements and synthesizes a world where social structures didn't keep up with technological development. With glaringly contrasts among neon lit streets and virtual cyberspaces (about which the novel was so revolutionary that it presents the first written record of the word "cyberspace"), Gibson's novel takes heavy inspiration from the personal computer revolution that was happening at the time and extrapolates its consequences into contemporary social chasms. As 2001 is to New Wave, Blade Runner is to Cyberpunk, responsible for materializing visually what had been only described in a literary manner before.

The impact that both of these movements have had in the contemporary vision of future is still being felt and mapped, and as of now, is mixing into something else. Contemporary works can be seen crossing and meshing these visions, with series such as *Altered Carbon* (2018) and *The Expanse* (2015) being the end result. *The Expanse* positions itself as a series that approaches the idea of interstellar travel and the space mining context as a classic New Age work, but borrows heavily from the aesthetic and social questioning characteristic from Cyberpunk through its multilayered politics, renegade internal factions and the struggle of the less favored in its society. *Altered Carbon*, on the other hand, is a traditional Cyberpunk narrative with New Age elements of space colonization and the biological differentiation between humans after expanding society throughout the galaxy.

2.3 PROVING GROUNDS

Throughout the entirety of science fiction history, from millennia ago to contemporary works, its relationship with technology is intrinsic. As demonstrated, the construction of successful science fiction is done through the appropriation of current technology and its application in a carefully crafted narrative environment, where, according to the creative constraints of the author, its consequences can be extrapolated, whether they be social, biological, philosophical, economic or ethical.

One important consequence of this is that cutting edge technology of today can be actually tested through science fiction narratives as Thomas Michaud (2020) puts so eloquently in the fourth chapter of his book *Science Fiction and Innovation*. Through his work, he compiled around 300 modern science fiction works in the database for comparison purposes. One important highlight about the curatorial process of these works is that it is composed mostly of mediums that have objective visual qualities, such as movies, animations and videogames. According to Michaud, this approach enabled interviewing



Figure 7. Major in battle with a futuristic tank. Extracted from the animation.

subjects that had never seen any of the fiction works to have a quick understanding of the vision of future that would be discussed through visual elements. Using as a starting point the character of a soldier, one of the most commonly depicted characters in modern science fiction across several different media, it's possible to see an incredible overlap between technological challenges that he faces during the narrative of these works and what is actually been in development by the interested parties in warfare.

The manga of Ghost in the Shell (1989) and the anime that was produced later (1995) are great examples of projective science fiction that sought to test new futures for technology.

Throughout the story, the battles that are fought always have a cybernetic element to them, be it before, during or after combat. This falls in line with current warfare tactics, where "any battle should now be preceded by a struggle for superiority in electromagnetic and cyber space" (Michaud, 2020). Ghost in the Shell also approaches the consequences of connectivity and network vulnerability in an interconnected world - questions that are specially relevant today with the Internet of Things, data privacy and psychological cyberwarfare.

Videogames tend to be a specially rich medium as testing grounds because, firstly, of the interaction intrinsic to them, which adds another layer of complexity in creating and understanding the feel of the

technological artifact, and secondly, because scifi videogames strive to be realistic even in a radical vision of future, and therefore can be considered pseudo-justified scientifically, as Michaud puts it. This can be seen in the more recent Call of Duty installments, where cloaking (becoming invisible) is available as an action to the player, and the aesthetic and functional feel of the artifact and its technology is close to what has been currently developed by the company BAE.

2.4 LITERARY PROTOTYPING

Even though visual media plays a powerful role as future testing of in-development technologies, written media should not be considered as surpassed by its newer siblings. The book *Visions, Ventures, Escape Velocities: A Collection of Space Futures* (2017) that resulted from the partnership between NASA's funding and the Center for Science and the Imagination from Arizona State University is proof of literature as validation of new tech. The methodological approach was already unorthodoxical from the start.

Dividing the project into 4 main categories - Low Earth Orbit, Mars, Asteroids and Exoplanets, they invited science fiction writers and academic researchers to form a partnership with the goal of consulting with the researchers to learn about the technology that is being developed today for space endeavors and extrapolate it through narratives placed in the future. This effectively means a collaborative effort into understanding the vision of future of scientists and technologists today, materializing this vision through science fiction and analyzing these stories in search of questions, doubts, challenges and consequences of new technological applications.

As Finn and Eschrich (2017) put it, they aim for two objectives: firstly, to crystalize classic dilemmas of space exploration, which can be surmised as the relationship of risk, cost and long-term benefits. Reading a concrete vision of future, backed by social and technical scientists, shows that this relationship has the potential to inspire buy-in of decision makers actors to act today in guiding the tomorrow of space exploration. Secondly, through their work, its evident that that many of these dilemmas that are contemporarily attached to space exploration are not new at all,

"but instead questions that explorers have faced many times before, from the fourth-century voyage of Pytheas of Massalia and the incredible journeys of Polynesian peoples across the Pacific Ocean to the nineteenth-century Arctic expeditions sponsored by British food manufacturer like Huntley & Palmer and Beach's" (Finn, Eschrich, 2017).

The final results of this work are, at the very least, intriguing. Stories produced through this methodology presented results such as “The Baker of Mars” (Schroeder, 2017), where interested parties look for martian resources remotely, through human controlled robots. The author tests in his story the blockchain technology applied to robotics and extrapolates on future economic models that would embrace extraterrestrial resources, while also questioning the problematic of latency in controlling any electronic device on Mars from Earth, where the time between sending a command, the robot executing the command, and receiving feedback or confirmation about said command is around 20 minutes (NASA, 2020). Another story, “Death on Mars”, already tackles a specific solution to latency between Earth and Mars. Instead of controlling the devices from Earth, Madeline Ashby’s future proposes an approach that is already gathering attention throughout the scientific community - the use of an inhabited orbital base in one of Mars’ moons, significantly decreasing the complexity of human travel to Mars itself and also reducing any latency difficulties in controlling devices that would be faced sending signals from Earth. These stories are not merely testing current technology and finding its challenges and difficulties, but also showing alternatives to what we might face during space exploration endeavors. They are researching, understanding and evaluating the technical possibilities of today, prototyping the current vision of future and actively proposing solutions. They are guiding the technological development today through designing possible futures. As Schroeder puts it, “...it is easy - not only for the general public but also for rank and file space scientists and engineers - to believe that such adventures are indeed possible in the 2030s - and so, let’s work to try to make them actually happen” (2017).

2.5 AN INCLUSIVE DISCUSSION

It is clear that there are academic initiatives using science fiction as collaborative exercise into charting futures and research into using pop culture works as testing grounds for technology. Andrew Maynard, however, argues that science fiction works also actively play a central role with the general audience (2016). In line with what has been stated so far, he explains that these stories have as their main attractor our relationship with the future, and that their creative freedom is what enables them to stimulate “thinking about the social benefits and consequences of new technologies and how we can steer technology innovation toward more beneficial and equitable outcomes” (2016).

One of scifi’s key role is building the bridge between what is being developed now and the critical consideration of preferable (or not) futures, regardless if that person “flunked high school” or is “a Nobel Prize winner”. This is further explained as a facet of social responsible

innovation, which can be characterized as ensuring that anyone who can be potentially impacted by a technological innovation should have a say in “how it’s developed and used”, while also being sure that that innovation leads to a better future for as many people as possible, without causing undue harm (Maynard, 2016).

Through this lens, popular culture, which has already been appropriated by the general audience and is being used as a frame of reference to produce new work (Jenkins, 2006), gains another significance - the role of leveling the playfield of discussion in regards to technological innovation that will affect all of us in complicated and unpredictable ways, possibly altering the human relationship with the environment, labor culture, social structures and several other complex, human made structures that are simply accepted as they are today.

2.6 FROM WORLDBUILDING TO MARKET SHARES

Previously it was lightly touched upon the use of science fiction to shape the present. While this is true, this generalization is too simplistic to reflect the true influence that the pervasive science fiction works that have been produced by popular culture have in the current technological development of society.

Thomas Michau eloquently classifies this process of incorporation as the transformation of a science fiction imaginary world into a technoscientific microideology (Malrieu, 2000 apud Michau, 2020). At first, embryonic elements of the fictional world start to appear across authors, with variable degrees of detail and specificity. These patterns appear isolated, but due to a both specific and global community, soon an organic selective process which can be closely compared to the collective intelligence described by Lévy (1999) happens, where some of the narratives are elevated, such as Gibson’s *Neuromancer* and Asimov’s *Foundation*, while others are left to be forgotten. What happens next is an amalgamation of the elements present in these visions of future, and the transformation of these elements into possible marketable technologies that correspond to specific material technotypes. As explained by Michau,

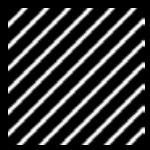
“This phenomenon partly explains the belief that science fiction is endowed with precognitive power. In fact, these fictions contribute to innovation as they are inserted into ideological discourses coming from actors increasingly close to political and economic decision-making processes”. (Michau, 2020)

A virtuous cycle is then started, with decision-makers that have been influenced and now ascribe to the new technoscientific microideology

actively working to perpetuate its technotypes, from which new science fiction will be further produced to test and validate in-development technology. Through the mass media infrastructure, this cycle has also gained a powerful visual and aesthetic quality to it, with decision makers leveraging and perpetuating the technotype's visual properties to link their products to their vision of future, their technoscientific ideology.

With this process in mind, it is now possible to understand the permanence that the aesthetic and ideological elements of the New Age and the Cyberpunk movements have had thus far. Both were galvanized into existence through (at their own time) contemporary technological revolutions, one through the Space Race and the other through the diffusion of personal computer devices. These movements have brought reflection and criticism in regards to our collective vision of future at the time, and since then have been accepted as possible futures that could be achieved. With this, their aesthetics and characteristics have been incorporated into social imaginaries and replicated through the process of production of commercial culture.

The combination of roles described in this chapter and exercised by science fiction works in contemporary society places them as an object that should be analyzed with great interest and attention. They appropriate from current technological ideas, extrapolating them into narratives that effectively act as proving grounds for the technology, detecting possible problems of viability, unintended applications and usability. They also make an effort to worldbuild the context of their work around the technology that is being appropriated, offering valuable insights into how human structures, such as economics and social systems, could interact with, adapt to or collapse under disruptive technological applications. Furthermore, when applied to popular culture works, science fiction leverages its extrapolation of the present into future consequences to democratize the discussion among all participants (whether they be active or passive) and give everyone that would be affected by the implementation of new tech a voice, striving, in this way, to achieve social responsible innovation. Finally, science fiction works act as lighthouses for technological development - through their transformation into technoscientific ideologies, they effectively crystallize a common vision of future that has been presented, discussed, agreed upon, and now can be worked on towards realization.



PART B

PHENOMENOLOGICAL RESEARCH

3. CASE STUDIES

The intent of the phenomenological research is to leverage another layer of information that would not necessarily be explicit simply through a theoretical research. This means that throughout this chapter there will be an investigation and exploration of case studies that have an intimate relationship with technology. Instead of restricting this research only to works of fiction from traditional media (for example, movies and literature) and design projects, it was decided to expand its scope to tangential areas such as art pieces and scientific knowledge frameworks, as long as they also were intimately related to technology. The process of selection was based on two main criteria: either if that case study could be considered a hallmark, causing the birth of a new archetype in its area, or if that case study could be considered a current outlier in its field, intrinsically pushing the boundaries of innovation.

With this explained, the practical goal of this exercise is to understand how fictions and technotypes interact with the daily life of people and how this crystallises the concepts of technological developments that haven't happened yet through the design field. This is further materialized into the search of keywords and the organization of the case studies in a map - both of these exercises relying on an analysis of pattern recognition to bring insights through the layering of, at first glance, non-related information.

During the analysis of each case study, the main categories that provided information were its relative technotype and its relationship with technology. Due to the restricted timeframe in which this research project happened, the main technotypes considered were only the ones already explained through the theoretical research: New Age and Cyberpunk. It's glaringly obvious that the science fiction environment has produced much more technotypes than only these two, with examples ranging from retrofutures such as Steampunk and Dieselpunk to more recent extrapolations such as the Y2K movement. The decision in restricting to the aforementioned technotypes stems from the recent relevance of space endeavors and computers entrenching even more their central role in everyday life.

The relationship with technology will be analyzed as follows:

DISRUPTION

Technological works that imagine or effectively cause rupture from past behaviors and standards, creating new material archetypes and technological imaginaries.

INSPIRATION

Technological works that heavily draw from previous references, concept and ideas, effectively reinforcing existing archetypes.

UNINTENDED CONSEQUENCES

Technological works that extropolate current technology, trends or behaviors into previously unforeseen situations.

RELIANCE

Technological works that analyze or critique the pervasive aspect of current technological trends.



Figure 8. Humanity Star by the side of the Rocket Labs Founder, Peter Beck.

name:: HUMANITY STAR

company:: ROCKET LAB
type of medium:: OBJECT
main technotype:: NEW AGE
technology relationship:: UNINTENDED CONSEQUENCES
date:: JANUARY 20 / 2018

DESCRIPTION

The Humanity Star was created by Peter Beck, CEO and founder of Rocket Lab as something that would inspire humans looking forward to conquering space. “No matter where you are in the world, rich or in poverty, in conflict or at peace, everyone will be able to see the bright, blinking Humanity Star orbiting Earth in the night sky;”. To avoid unnecessary space waste, the artificial star made from carbon fiber and reflective panels was scheduled to burn up in reentry after 9 months of its launch, and during this period, anyone that wanted to keep track of the artificial body could do so through NASA’s website and the video feed from the International Space Station.

SPARK OF DISCUSSION

This publicity stunt was largely viewed under negative lenses from astronomers and critics alike. First, it’s important to understand that Rocket Lab is one of the few private companies that has the resources needed to launch mini satellites into low orbit reliably, and in doing so carved a market niche that currently dominates. Secondly, the company itself has no obligation to obey legislation regarding putting objects into low orbit, since space law has severely lagged after space rocket technological diffusion. With this in mind, the discussion that is put forth is not if it’s possible to launch a generic object disguised as a source of inspiration to humanity, but how unilaterally this decision was taken, once that one individual has all the technological capabilities of achieving such a feat.

SOURCES

<https://www.nytimes.com/2018/01/28/science/rocket-lab-humanity-star.html>

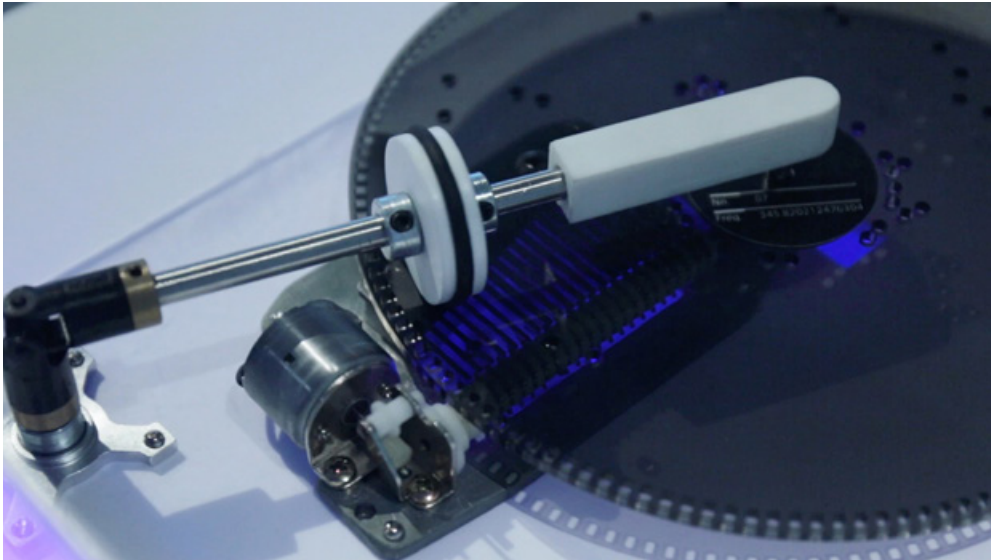


Figure 9. Close up of the disc that produces music in the Melody of a Dying Star.

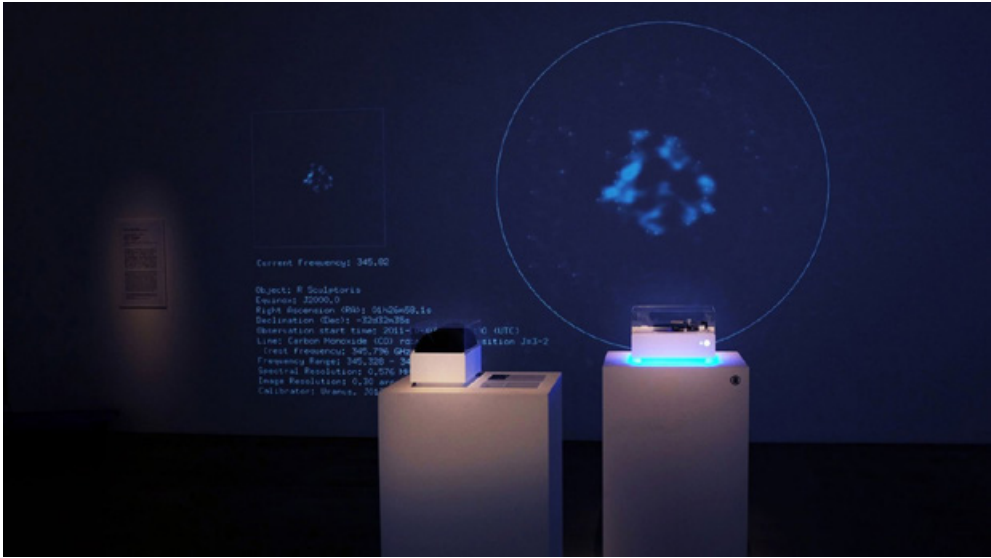


Figure 10. Exhibition of Melody of a Dying Star.

name:: ALMA MUSIC BOX - MELODY OF A DYING STAR**author:: ALMA OBSERVATORY + WHATEVER STUDIO****type of medium:: ARTPIECE****main technotype:: NEW AGE****technology relationship:: INSPIRATION****date:: YEAR OF 2015****DESCRIPTION**

The ALMA Music Box is a collection of 70 custom made discs, that match the 70 radio frequencies emitted by the dying star R Sculptoris, located 950 light-years away - all of them captured by the Atacama Large Millimeter Array (ALMA) telescopes in Chile. Each of the discs have holes in them signaling points of interest in the emission of gases by R Sculptoris, and were attributed musical notes to them.

SPARK OF DISCUSSION

The result of this project is a thought provoking melody, where it emotionally connects the viewer to something that he will never see and, in further analysis, due to the time that these radio frequencies take to reach Earth, is probably already gone. It's also interesting to note the clear influence of New Wave aesthetics throughout the project - clean lines, high contrast volumes and decades old typography, all as deliberate choices.

SOURCES

<https://whatever.co/work/alma-music-box-melody-of-a-dying-star/>

<https://www.almaobservatory.org/en/announcements/english-alma-music-box-listen-to-the-music-of-a-dying-star/>



Figure 11. Final product of the Toaster Project.



Figure 12. Exhibition of the tools using during the manufacturing process of the Toaster Project.

name:: THE TOASTER PROJECT

author:: THOMAS THWAITES
type of medium:: OBJECT
main technotype:: NOT IDENTIFIED
technology relationship:: RELIANCE
date:: YEAR OF 2009

DESCRIPTION

The Toaster Project, developed by designer Thomas Thwaites while he studied at the Royal College of Art, was born from a deceptively simple question - "how can I, as an individual, build a mass produced object using only products of my own work?". What he thought that would be rather simplistic, soon revealed itself to be an investigation into centuries-old technology and knowledge. He simplified the original over 100 materials into five: iron, copper, nickel, plastic and mica, and proceeded to mine, refine and cast all the raw materials into actual pieces to assemble his toaster. Currently this work is part of the archive of Victoria and Albert Museum, in London, UK.

SPARK OF DISCUSSION

Thwaites prods into a critical aspect of the globalised world that is usually left to be forgotten - how economy, consumerism, technology and logistics are intrinsically connected, and this connection is the only reason that mass production in any shape or form is made viable for society as a whole. It also questions the degree of dependency that the average consumer relies upon, where he considers this herculean modern feat as a given, sparing no thought to the huge complexity of the systems that produces pretty much any and everything in the contemporary world. Finally, while not explicitly so, this project paves the way to inquiring more deeply how today's society relates to shared knowledge - why should knowledge of mass production systems, which provenly cannot be replicated in an individual scale, be registered and kept, while knowledge from older (and sometimes considered primitive) technologies, which could work as DIY jumpstart in individual production, not held in the same standard?

SOURCES

<http://www.thetoasterproject.org/page2.htm>

<https://collections.vam.ac.uk/item/O1269559/the-toaster-project-the-toaster-project-thwaites-thomas/the-toaster-project-the-toaster-project-thomas-thwaites/>

https://www.ted.com/talks/thomas_thwaites_how_i_built_a_toaster_from_scratch?language=en



Figure 13. Subnautica's environment, with the player holding a scanner in his hand.



Figure 14. Screenshot of Subnautica showing one of the vehicles in the game.

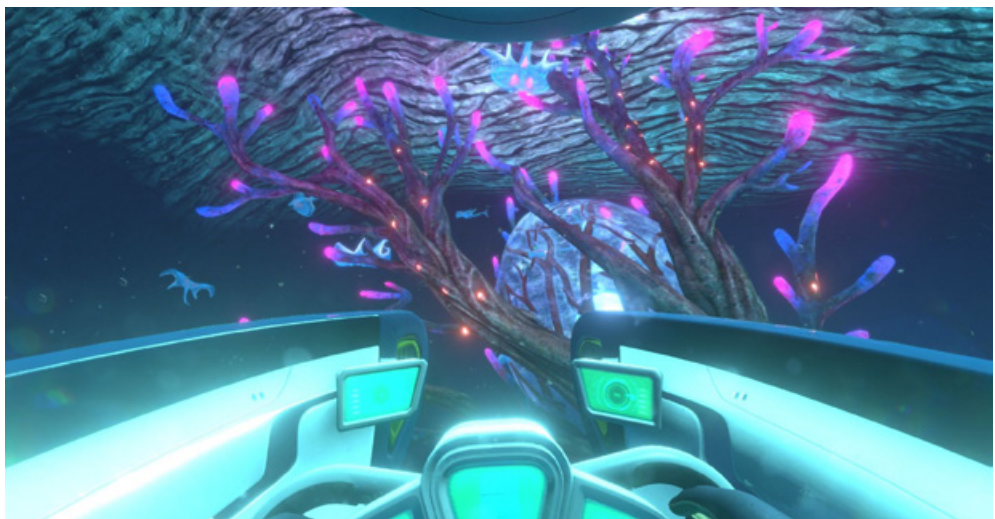


Figure 15. Inside one of the vehicles available in Subnautica.

name:: SUBNAUTICA

developer:: PANIC BUTTON GAMES
type of medium:: INTERACTIVE MEDIA
main technotype:: NEW AGE
technology relationship:: INSPIRATION
date:: DECEMBER 16 / 2014

DESCRIPTION

The concept behind Subnautica is incredibly simple - what would be needed to survive on a planet where the entire surface is water? Being in the survival genre, the game rewards exploration and investigation. The player is given small bits of story from the companion pad he carries, and is able to infer the context of the future he is now inserted - where corporations are exploring new worlds in search of valuable scientific data, where no human has eaten meat voluntarily in the last decades and where relationships are treated as commercial contracts, with documentation and everything else that that it entails. However, the centerpiece of this work of fiction is, without a doubt, the environment. With the exception of 3 small, hidden islands, the entire playable world is just water, with the verticality of going deep or shallow, and the physical mechanics that would entail such a feat - floating devices, oxygen management, harmful pressure and low ambient light.

SPARK OF DISCUSSION

Subnautica is a game where it quite literally takes the entire frame of reference away from the player. The world is set up in such a way that you are actively encouraged to explore new biomes, with alien creatures and resources that you only understand their behaviors and uses after interacting with them. The sound design is superb, and in an alien world where everything is new, it easily immerses the player in the gameplay loop. With deft hands, the game also introduces pertinent questions regarding sustainability - how can we consciously explore resources, the unintended consequences of biological interactions and glimpses of a future run by corporate values that permeate even relationships.

SOURCES

https://subnautica.fandom.com/wiki/Subnautica_Wiki



Figure 16. Concept art for the game Beautiful Desolation.



Figure 17. Concept art for one of the factions present in the game.

name:: BEAUTIFUL DESOLATION

developer:: THE BROTHERHOOD
type of medium:: INTERACTIVE MEDIA
main technotype:: NOT IDENTIFIED
technology relationship:: RELIANCE (COULD IT BE DISRUPTION?)
date:: FEBURARY 26 / 2020

DESCRIPTION

Beautiful Desolation is a 2D Isometric point-and-click game, where the narrative is the main focus. Funded by a Kickstarter campaign launched in 2017 and produced by the south african studio THE BROTHERHOOD, it focuses on a story that launches the player forward into a future where alien technology has spread even to biological entities. With its main focus being the narrative, the player is encouraged to explore and interact with all the elements inside the scenarios, giving the characters inside the fictional world the opportunity to be properly characterized.

SPARK OF DISCUSSION

The key aspect of this interactive piece of media is its worldbuilding. Melding alien technology and the ruins of human civilization as we know it, the developers were able to create a unique vision of the future, leveraging the full scope of their african backgrounds and incorporating it seemingly into the game. Aesthetic elements that are built through the mixture of technological bits and organic elements, create, at the same time, something disturbing and familiar to players.

SOURCES

https://beautifuldesolation.fandom.com/wiki/Beautiful_Desolation_Wiki



Figure 18. Main concept image for the Cyberpunk 2077 marketing campaign.



Figure 19. Some of the several factions that Cyberpunk 2077 has.

name:: CYBERPUNK 2077

developer:: CD PROJEKT RED
type of medium:: INTERACTIVE MEDIA
main technotype:: CYBERPUNK
technology relationship:: DISRUPTION
date:: SEPTEMBER 17 / 2020

DESCRIPTION

Cyberpunk 2077 is a first person, action role playing game where you play as V, the protagonist of the story. Its setting is a metropolis called Night City, in a future where a vaguely described economic collapse happened, and subsequently extrapolation of corporate unchecked power is exacerbated. Launched at the end of 2020, the game had initially been announced in 2012, and had driven expectations high during these 8 years of development. The game is placed as a direct sequel from the pen and paper RPG Cyberpunk 2020, launched in 1990.

SPARK OF DISCUSSION

The references of Willian Gibson's Neuromancer and Phillip K. Dick's Do Androids Dream of Electric Sheep are incredibly clear in this work of fiction. Through the exacerbation of technology-driven social problems, heavily characteristic in the genre of cyberpunk, the player is able to explore the contrast of a world where technology only worked as fuel for fulfilling a plutocracy, while at the same time biotech augmentations, artificial limbs and neuro enhancers are common place.

SOURCES

https://cyberpunk.fandom.com/wiki/Cyberpunk_2077



Figure 20. Markus facing a decision amidst a mob of androids.



Figure 21. Kara leaving the house she is supposed to work as a housekeeper.

name:: DETROIT:BECOME HUMAN

developer:: QUANTIC DREAM
type of medium:: INTERACTIVE MEDIA
main technotype:: NEW AGE
technology relationship:: DISRUPTION
date:: APRIL 24 / 2018

DESCRIPTION

Set in a Detroit in the year of 2038, the world is facing a revolution, since androids, which in this future are a fundamental piece of society, are now behaving as if they were truly alive. Detroit: Become Human is an interactive visual work where the player accompanies 3 main characters, all of them androids: Connor, Kara and Markus, each with their own perspectives and unique traits. Connor is a police investigator tasked with hunting down deviant androids, the ones that are behaving in ways that they shouldn't be able to. Kara is a housekeeper that developed artificial consciousness after protecting a young girl from parental abuse. Finally, Markus, a former caretaker that, after also developing consciousness, is attempting to "free" all other androids.

SPARK OF DISCUSSION

Detroit: Become Human is a clear response to contemporary ever more powerful A.I. systems combined with the decades-long dream of creating artificial, robotic humans. Even though its theme could be considered overused already, the emotional relationship that the player develops through direct interaction and agency in the story leads to a much deeper level of reflection and empathy with the subject presented.

SOURCES

<https://www.quanticroad.com/en/detroit-become-human>

https://detroit-become-human.fandom.com/wiki/Main_Page

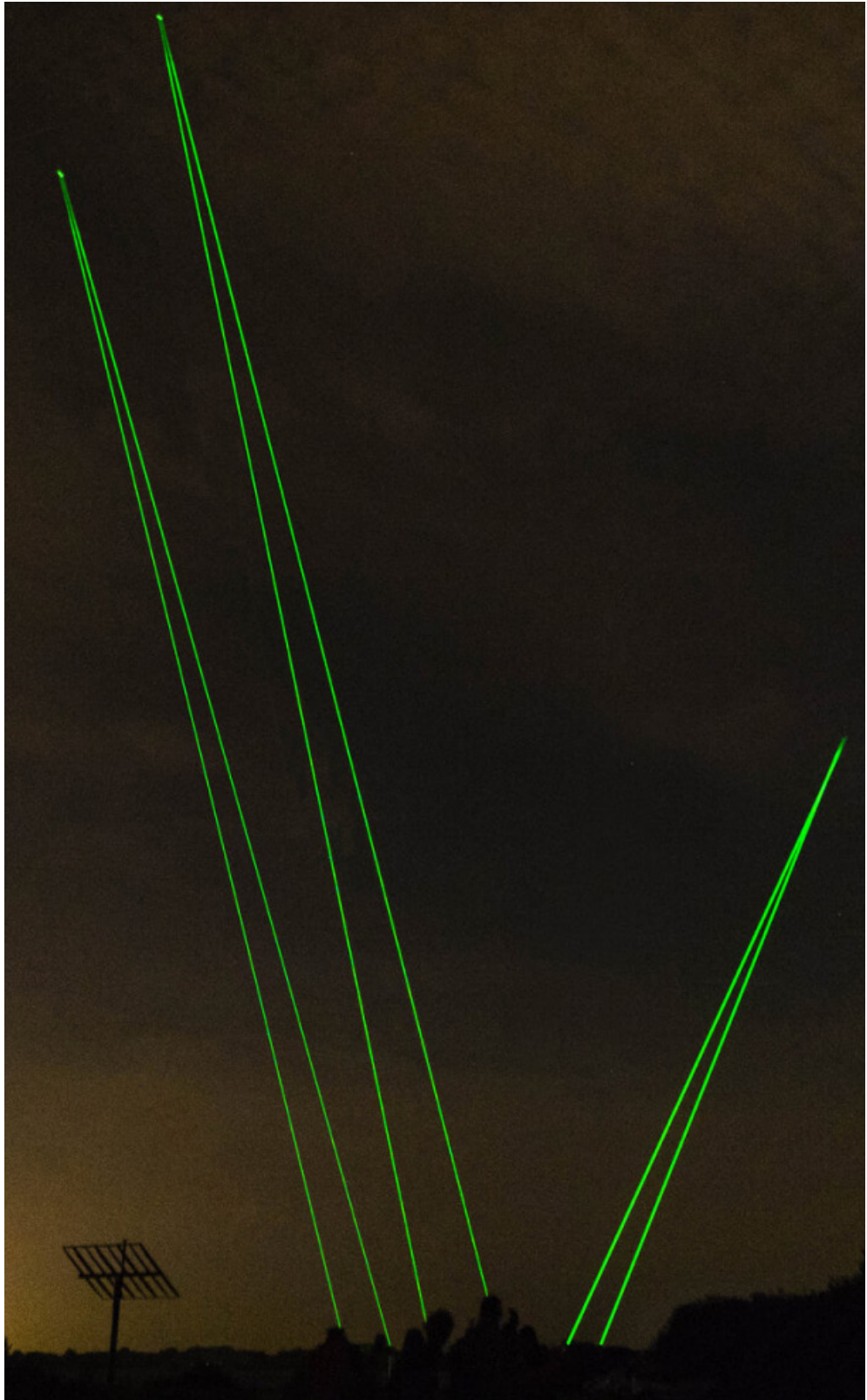


Figure 22. Space Waste Lab in operation. Extracted from <https://www.studioroosegaard.net/project/space-waste-lab>

name:: SPACE WASTE LAB

author:: DAAN ROOSEGAARD + ESA
type of medium:: ARTPIECE
main technotype:: NEW AGE
technology relationship:: UNINTENDED CONSEQUENCES
date:: YEAR OF 2019

DESCRIPTION

The Space Waste Lab is an initiative kickstarted by ESA to analyse and explore solutions and new sustainable uses to the current space waste that clouds our Low Earth Orbit. There are more than 29.000 objects orbiting Earth that are bigger than 10 centimeters, and with the projected amount of private space initiatives, this number will only increase from now on, with no practical solution yet in sight. The Space Waste Lab Performance, executed by studio Daan Roosegaarde, consists of green LEDs that track in real time space waste above the area the installation was put up, in this case Milan and Almere. The pieces that were tracked were between 200 km and 20.000 km of altitude, and as said before, were bigger than 10cm.

SPARK OF DISCUSSION

This initiative takes the clear approach of transforming a wicked, contemporary problem, into a data visualization exercise, in the hopes that awareness will inspire action. If left unchecked, space waste will be debilitating to the current way of living, with the potential to cascade into a problem so critical that would make even Low Earth Orbit flights and observations simply not viable. (write more about this one)

SOURCES

<https://www.studioroosegaarde.net/project/space-waste-lab>



Figure 23. Cockpit of the Dragon Crew Module.



Figure 24. The plushie affectionately called Zero G Sensor.

name:: DRAGON CREW MODULE - ZERO G SENSOR

company:: SPACEX
type of medium:: OBJECT
main technotype:: NEW AGE
technology relationship:: INSPIRATION
date:: YEAR OF 2019

SpaceX itself, with its groundbreaking business model and technological research, revolutionized the private market for space missions. Instead of simply discarding all rocket stages used during a mission, it salvages the most precious parts to be reused later, significantly cutting down the mission costs. This mission in particular also signaled to the world that the probable future of space missions is a hybrid between private companies and public organizations, in this case, SpaceX and NASA.

Having said that, two particular details regarding the first manned flight of the Crew Module are worth highlighting. Firstly, the control panels are entirely touch based. It's possible to draw parallels to several fictional scenarios where the touch screen and finger movement technology is used as an implicit signifier of high technological sophistication. The astronauts themselves mentioned, when asked, that they missed the tactile feel that physical buttons provided, even though all the screens were incredibly responsive during the voyages,

Secondly, what the SpaceX press team called the Zero G Sensor. As shown by the liftoff footage, there is a dinosaur plushie that floats around the module when it escapes the gravitational pull of the Earth. When thought through, this plushie by itself adds nothing to the mission - in fact, in extreme situations, it could actively hinder emergency actions that the astronauts could possibly have to do. When analyzed through a different lens, however, it's possible to see a spark of humanization in what has been, since the beginning of the New Wave movement and later seen in real manned space flights, an aseptic environment.

SPARK OF DISCUSSION

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Figure 25. Docking of the Dragon Crew Module in the ISS, in 2020. Extracted from NASA.

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SOURCES

<https://www.dezeen.com/2020/05/29/spacex-nasa-falcon-9-rocket-crew-dragon-spacesuit-worm-logo/>

<https://blogs.nasa.gov/commercialcrew/2020/05/30/liftoff-nasas-spacex-demo-2-launches-the-commercial-crew-era/>

<https://www.electronicdesign.com/atembedded/article/21133361/dragon-launch-the-bob-and-doug-show>



Figure 26. Perspective of SAM during gameplay.

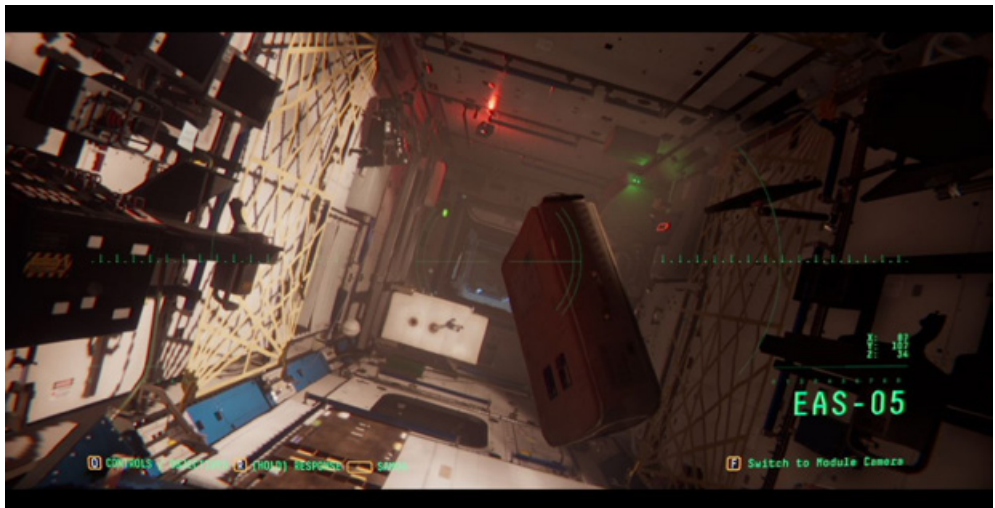


Figure 27. SAM Navigating through an ISS Storage room.



Figure 28. SAM checking through the cameras what is happening in the Station

name:: OBSERVATION

developer:: NO CODE
type of medium:: INTERACTIVE MEDIA
main technotype:: NEW AGE
technology relationship:: UNINTENDED CONSEQUENCES?
date:: MAY 21 / 2019

DESCRIPTION

Observation is a game developed by No Code Studios, and published by Devolver Digital in 2019. Set in 2026, the player follows the story of Dr. Emma Fisher, an astronaut aboard the International Space Station. Right from the beginning, it's clear that something terrible has happened, since Dr. Fisher is isolated and the ISS is not in Earth's orbit anymore. The real innovation of this game reveals itself as the manner the player is given agency - he plays as the entity called System Administration and Maintenance, or SAM, for short. This entity is the embodiment of the ship's A.I., which means that the player has no physical way (at least for the most part of the narrative) to interact with the world, and instead interacts with the support systems of the ship, helping Dr. Fisher achieve her goal of understanding what has happened with her colleagues. It has won a series of awards, including the Best Game category of British Academy Scotland Awards in 2019.

SPARK OF DISCUSSION

This game is an incredible example of deconstructing narrative archetypes present in most science fiction stories. As one reviewer of the videogame outlet GameSpot puts it, "Observation absolutely nails its distinct lo-fi, sci-fi aesthetic. The cameras crackle and jump as you shift between them, and the stylistic film grain and distortion over every visual emphasizes your slight removal from the reality of the situation Emma is facing.". This is a piece of work that puts the spectator in an unexpected role, restricted by its very nature, and leverages this to build a compelling and thought provoking story.

SOURCES

<https://www.bafta.org/scotland/awards/ceremony/nominees-winners/british-academy-scotland-awards-nominees-in-2019#GAME>

<https://www.gamespot.com/reviews/observation-review-space-madness/1900-6417146/>

<https://gamingbolt.com/observation-interview-a-unique-sci-fi-thriller-that-flips-the-switch>

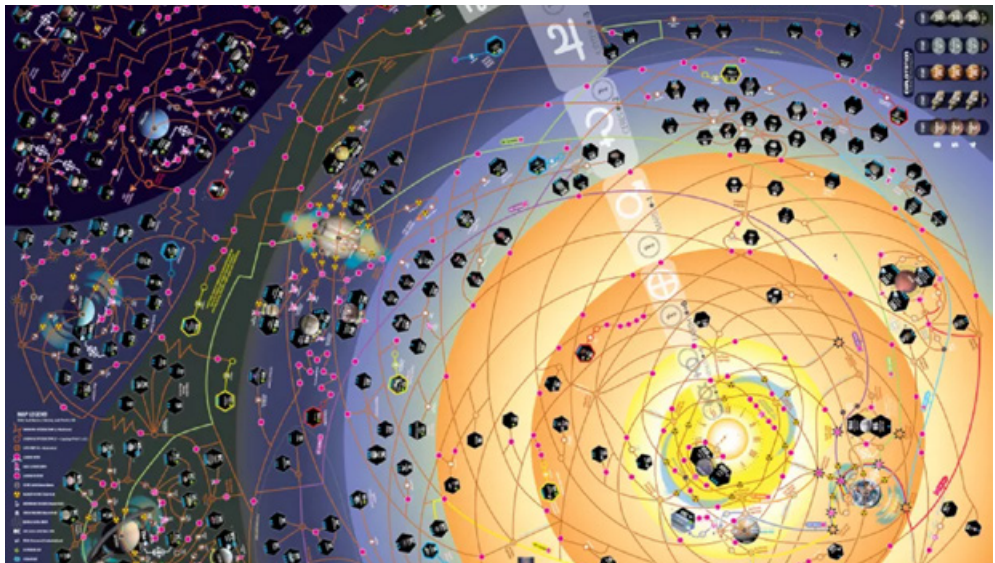


Figure 29. The map of High Frontier.



Figure 30. Close up of the components from High Frontier.

name:: HIGH FRONTIER 4TH EDITION

company:: SIERRA MADRE GAMES
type of medium:: INTERACTIVE MEDIA
main technotype:: NEW AGE
technology relationship:: INSPIRATION
date:: FIRST EDITION_2018/LAST EDITION_2020

DESCRIPTION

High Frontier, designed by former NASA engineer Phil Eklund, is a boardgame pushed to its limits, presented more as a simulation than an entertainment activity. The main objective is rather simple: operate as a spacefaring company and turn in a profit, be it through publicity stunts, asteroid mining or technological research. All the core gameplay components are made to be as accurate as possible, starting from the interstellar map, which shows to the player the possible paths of orbit to the several interstellar bodies that can be mined, to the bits that represent fuel in the tank of the spaceship that was assembled by the player with technology heavily grounded in the real world.

SPARK OF DISCUSSION

Through a boardgame, Phil Eklund demonstrates how punishing a space journey can be without the needed forethought. It also teaches to the players, through experience, basic space physics, such as liftoff against gravity fields, the importance of unmanned missions as first contact with astral bodies and commonly used space maneuvers like ditching mass before entering a gravitational pull and the critical importance of La Grange points in chartering a course. All these elements, together, illustrate how daunting planning and executing space missions are, even with today's technology.

SOURCES

<https://boardgamegeek.com/boardgame/281655/high-frontier-4-all>

<https://ionsmg.com/collections/game/products/high-frontier-4-all>



Figure 31. Jim using an asleep Aurora to keep him company.



Figure 32. Aurora as she wakes up from cryogenic sleep.

name:: PASSENGERS

director:: MORTEN TYLDUM
type of medium:: ANIMATED MEDIA
main technotype:: NEW AGE
technology relationship:: UNINTENDED CONSEQUENCES
date:: YEAR OF 2016

DESCRIPTION

Passengers is a romance that is set in a space travelling context. The viewer is taken aboard the vessel of Awaion, where 5,000 colonists and 258 crew members await in suspension until they get closer to the planet Homestead II. All things considered, this voyage should take around 120 years. The problems start when James Preston, a mechanical engineer aboard the vessel, is woken up 90 years earlier because of a malfunction in the system. He then spends one year in isolation, and after that he devises a plan to wake up another passenger, Aurora, as a way to end his loneliness.

SPARK OF DISCUSSION

Without getting into the merits of the movie's quality, two facts are worth highlighting about this case. The first is that the production design of the entire movie is coherent and believable, giving the technology presented, even though it's only fictional, a credible feel of how it works and how it could be repaired if under malfunction (or exploited, in Jim's case). The second fact is the engagement that was generated throughout the community that enjoyed the premise of the movie, but was not satisfied with the romance take on it. This produced a fan made cut that reorganized the order of which scenes are shown first - in this cut, the focus is on Aurora, instead of Jim. This shifts the dynamics from a romance to a psychological thriller, where the loneliness is only revealed as a climax and instigates a critical thinking about possible psychological problems and challenges that an interstellar voyage might entail.

SOURCES

<https://www.metacritic.com/movie/passengers-2016>

<https://ifdb.fanedit.org/passengers-aurora/>

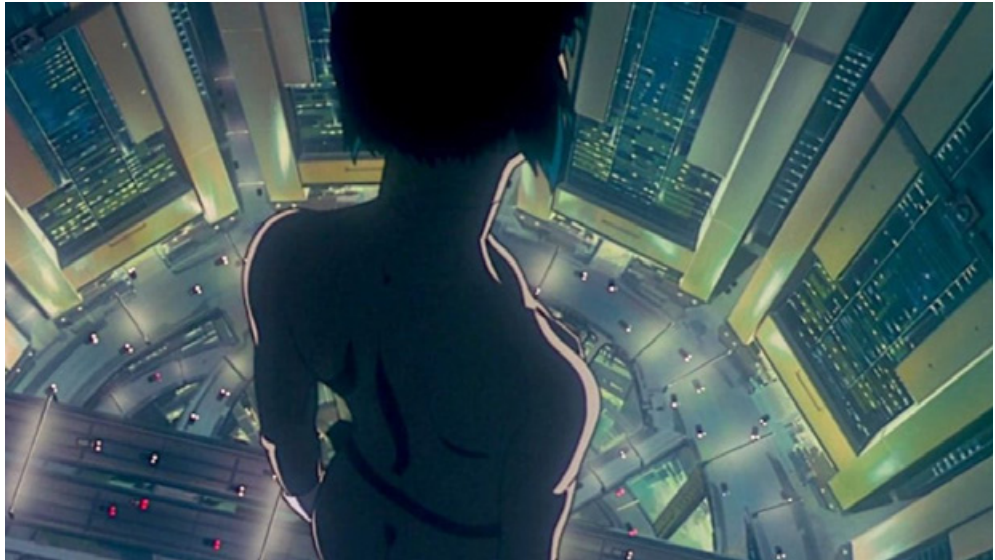


Figure 33. Major about to jump from a skyscraper. Extracted from the animation.

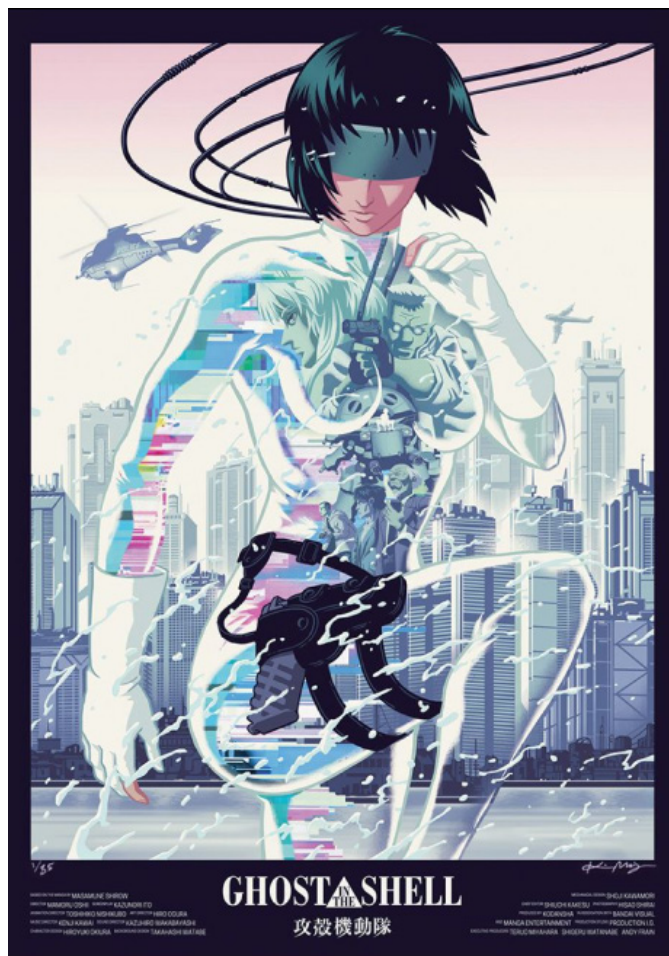


Figure 34. Japanese movie poster of Ghost in the Shell.

name:: GHOST IN THE SHELL

author:: MASAMUNE SHIROW
type of medium:: ANIMATED MEDIA
main technotype:: CYBERPUNK
technology relationship:: DISRUPTION
date:: YEAR OF 1995

DESCRIPTION

While the original manga of Ghost in the Shell was published in 1989, the anime adaptation was released in 1995, in which it is much more interesting to analyze the visual, fully animated elements that portray a Hong Kong that has advanced so far in technology that it is commonplace to enhance a biological brain, enabling the enhanced person to interface directly with computers and other electronic interfaces. Major Motoko Kusanagi, the main protagonist of this work, takes it one step further - because of a tragic childhood accident, she uses a fully artificial body to house her brain, effectively turning her into a full cyborg.

SPARK OF DISCUSSION

Ghost in the Shell is an astounding thought investigation into what makes humans, human. Major, the lead character, is faced with this question several times while pursuing a terrifying criminal called the Puppet Master, which can hack into augmented people's brain and force them to act against their will. The technological elements presented can be seen clearly in the setting, with interfaces designed specifically for augmented persons. The deepest commentary, however, comes forward when an entirely robotic android is fabricated with no warning, but it still presents a "ghost", or a sentient entity inhabiting it. And this begs the question- once such technological progress is achieved, is there any use in defining humanity?

SOURCES

https://ghostintheshell.fandom.com/wiki/Ghost_in_the_Shell_Wiki

<https://www.anime-planet.com/anime/ghost-in-the-shell>



Figure 35. Representation of Case and Molly, by Juan Giménez.

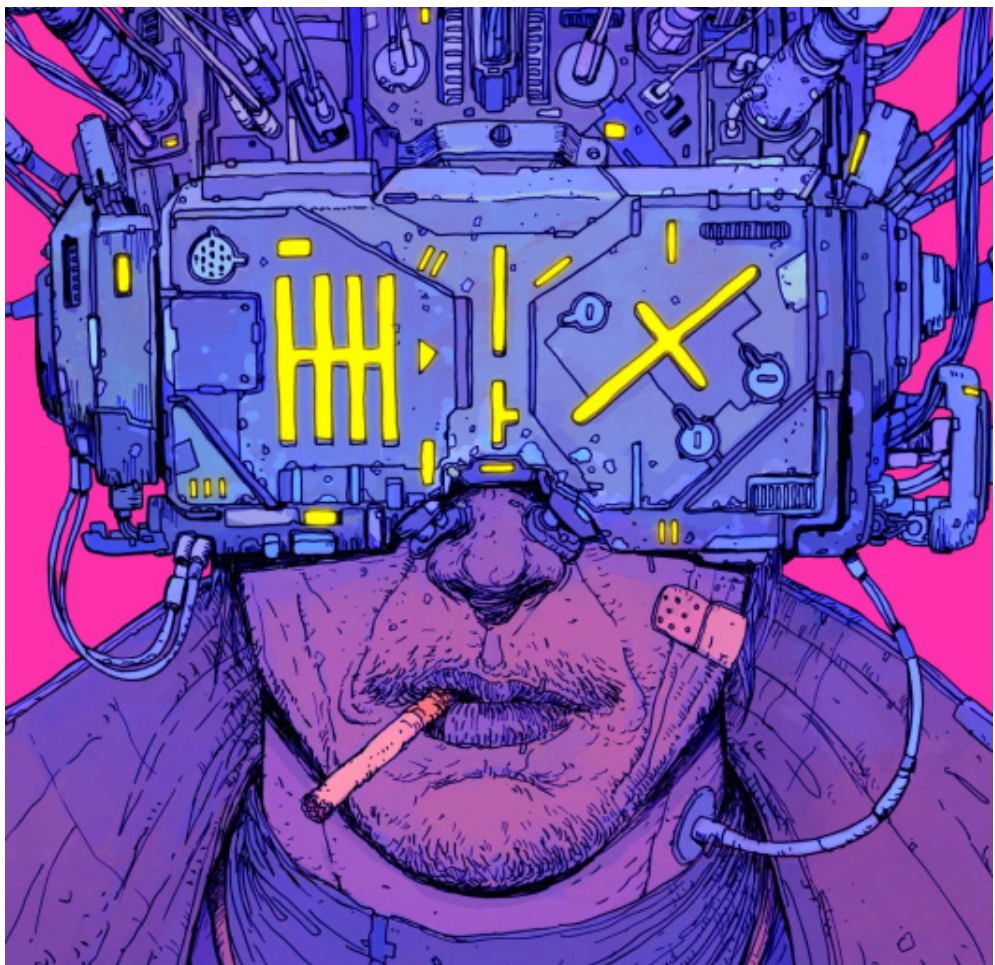


Figure 36. Book cover of *Neuromancer*.

name:: NEUROMANCER

author: WILLIAM GIBSON
type of medium:: LITERARY MEDIA
main technotype:: CYBERPUNK
technology relationship:: DISRUPTION
date:: YEAR OF 1984

DESCRIPTION

Neuromancer is a novel published in 1984, written by William Gibson. In a world where technology only exacerbated social problems, we accompany the story of Case, a data thief that has had his nervous system crippled, trying to pull off his last heist. The world presented includes personal computers, bio augmentations, artificial limbs and enhancements and a system in which it is possible to mentally enter the cyber space.

SPARK OF DISCUSSION

As mentioned during the research regarding science fiction history, the Neuromancer novel played a key role in cementing the technoscientific ideology that most people would consider as high tech today, Cyberpunk. It also served as inspiration for further science fiction works that became hallmarks of the genre by their own, such as The Matrix. In its story, the reader is presented several moral dilemmas regarding a future that is environmentally desecrated, with its society apathetic and alienated from the political and economic future structures.

SOURCES

<https://www.britannica.com/topic/Neuromancer>



Figure 37. The player using a laser cutter.



Figure 38. One of the available ships for dismantling in Hardspace: Shipbreaker

name:: HARDSPACE:SHIPBREAKER

developer:: BLACKBIRD INTERACTIVE

type of medium:: INTERACTIVE MEDIA

main technotype:: CYBERPUNK?

technology relationship:: UNINTENDED CONSEQUENCES?

date:: JUNE 16 / 2020

DESCRIPTION

Hardspace: Shipbreaker is currently an Early Access game, which means that it is being developed while it can be bought for a reduced price. The main incomplete feature of the game is the narrative aspect of it, but its case analysis will focus on mechanics and worldbuilding, and as such being an Early Access title will not interfere in it. The crude concept of the game is to work as a blue collar worker dismantling ships in hopes to pay off the debt that you have acquired. This is done through several different tools that the player has at his disposal, such as laser cutters and chemical expanding compounds. The pieces scrapped then need to be correctly separated, either for disposal or salvage, and the amount of money collected at the end is dependent on the precision of the separation as well as the time taken to execute the job.

SPARK OF DISCUSSION

This particular case can be seen as a speculation into technical tools and job activities needed in a context where space vessels get so common that an industry around them arises to function as a space scrapyards. As mentioned during research, video games can be particularly rich for future tech testing, and Shipbreaker is no exception. Here, there are operational risks like volatile compounds, everything that can be salvaged counts towards the game's score (such as chairs, computers and batteries), and the difficulty of navigating hazardous environments is made incredibly apparent. All of these elements lead the player into wondering the consequences of a future with a surplus of space vessels, and what this would entail for the workforce.

SOURCES

<https://hardspace-shipbreaker.com/>

https://hardspaceshipbreaker.fandom.com/wiki/Hardspace:_Shipbreaker_Wiki

4. PATTERN RECOGNITION

CATEGORIZATION OF CASE STUDIES

These projects were analyzed considering that they are all sources of inspiration and information. As mentioned previously, the main intent of a phenomenological research is to leverage layers of information that are not present when investigating the subject through abstract concepts only.

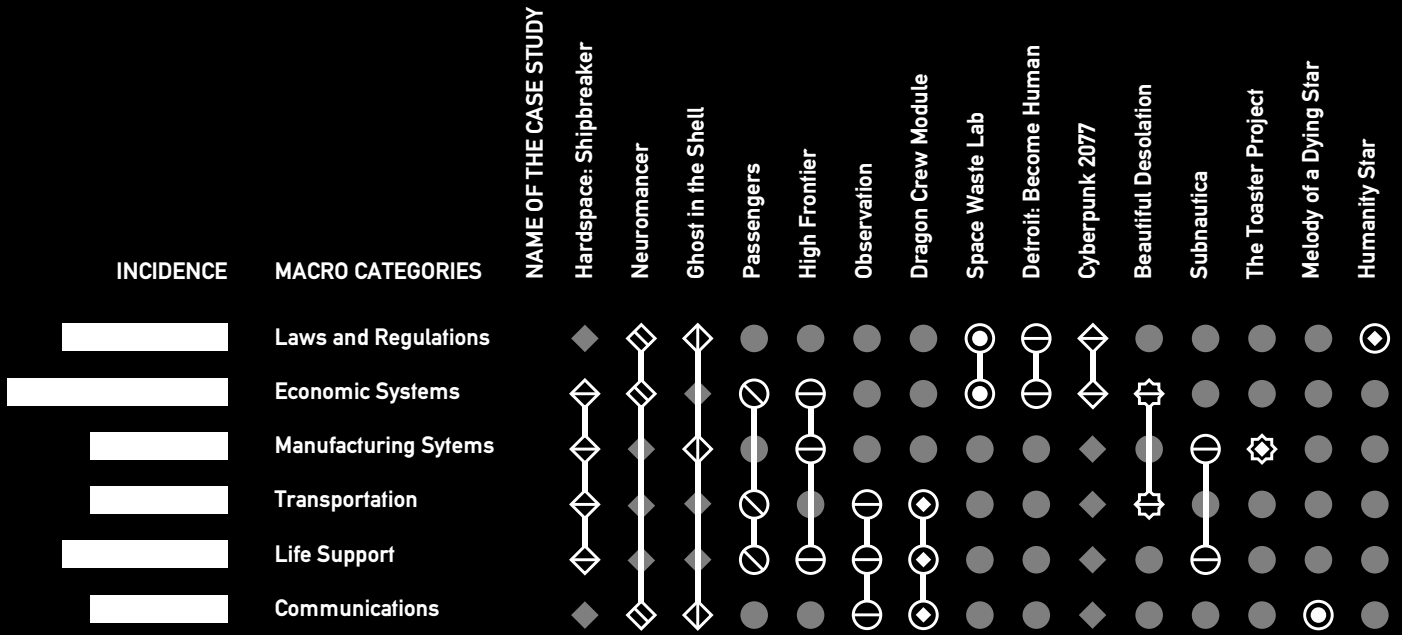
The resulting map is meant to help the researcher and the readers of this work to understand the context in which the case studies are inserted as a whole and in a visual manner. This facilitated a key aspect of this research - the detection of trends and patterns related to works of fiction or projects that can be considered derived from them.

The macro areas were delimited organically as they appeared repeatedly among several of the case studies investigated. A supporting argument of their validity is the incidence of each macro area, as the highest interval between most recurrent and least recurring is only 3, considering the highest incidence as 8, in the form of Economic Systems, and the least incidence tied between Manufacturing Systems, Transportation and Communications, each of them with 5.

Considering the patterns that emerged through the macro areas, it's interesting to note that Laws and Regulations is usually connected to Economic Systems, even though the opposite is not always true. Life Support, Transportation and Communications are also commonly approached through the same project, and could be considered the supporting macro areas that are mostly already embedded into the current technoscientific ideologies, and as such, don't engage much discussion without more complex ideas. This can further be seen through the participation of at least one of these supporting macro areas in higher complexity case studies.

Advancing to the comparison between the two technotypes that are the focus of this research, it is clear that even though they are less in quantity, projects which have the Cyberpunk technotype are usually more complex in nature than similar projects from New Age, usually including 3 or more macro areas in its works. This falls in line with Baudrillard's view of simulacra and science fiction, where, according to him, only works that deal with pervasive topics in the present society would interest enough the public to be relevant (Baudrillard, 1981).

The medium through which each project is presented also reveals something that has been foreshadowed during the theoretical research: the main medium is, by far, mediatic, be it interactive, animated



HOW TO READ IT

MAIN TECHNOLOGY

New Age



Cyberpunk



Not Identified



TYPE OF MEDIUM

Object



Artpiece



Interactive media



Animated media



Literary media



or literary. This could be so because they are not as restricted to consumer markets as objects of daily use, but still try to relate to mass audiences in the search of telling an engaging and relatable narrative, while this is not exactly true to art pieces.

Finally, as also mentioned during the theoretical research, the interactive media is of particular richness, since it combines objective mechanics that can be related to physicality and materiality and need to be thought as at least believable, and at best as intuitive, with engaging narrative.

These conclusions provide a clear next step for the project - the detailing each of the macro categories with visuals from its related works, when possible, and as a final act, the validation of the process of embedding concepts that have first appeared through science fiction, but currently are already diffused and widely used by the general populace.

4.1 LAWS AND REGULATIONS

DEFINITION OF MACROCATEGORIES

Laws, regulations and enforcement organizations are subjects that are deeply complex to extrapolate into the future but at the same time fascinating to build from ground up, applying current societal behaviors and experimenting the consequences of tomorrow from decisions that could be taken today.

The Cyberpunk technotype has a natural relationship with this subject. In its narrative structure, it's common to follow a rogue protagonist that attempts to change the power structure from the outside, as is incredibly clear through the Cyberpunk 2077 game and the Neuromancer novel. The Ghost in the Shell animation, however, has a more nuanced approach - Major is within the police organization, and because of that, it's possible to extrapolate how an official task force could operate in a technologically advanced future. They leverage the connection between the objects that exist in that world in a similar situation to the Internet of Things that is in place today - all the cameras, sensors and electronic devices are accessible and hackable, with little to no oversight from regulatory bodies. This is especially problematic when considering the human augmentations that are implemented into most persons' brains.

Detroit: Become Human is valuable from another perspective. In a context where fully functioning and independent androids operate autonomously, it investigates the consequences of using such entities in detective and police work, with ethically complex tasks like deescalating suicide threats, protecting citizens in risk and the use of force by autonomous, non-human entities.

Finally, through the artpiece Space Waste Lab and the object Humanity Star it's possible to critically analyze the lawlessness and absence of regulation in space. With no clear borders to be established and no global agreement in place clarifying on how to proceed with space related projects, there's an opportunity for independent agents to do whatever they please, possibly causing cascading consequences to international initiatives such as the International Space Station.

Laws and Regulations is the category through which regulatory bodies and societal structures maintain what has been agreed upon. This is where social pacts are formed, and the guidelines of what is permissible and what is not are discussed, drafted and consolidated.



Case studies, top to bottom: Humanity Star, Detroit: Become Human, Ghost in The Shell, Space Waste Lab and Cyberpunk 2077.

RELATED CASES

Neuromancer
Ghost in the Shell
Space Waste Lab
Detroit: Become Human
Cyberpunk 2077
Humanity Star

RELATED MEDIUM

Literary Media
Animated Media
Interactive Media
Artpiece
Object

4.2 ECONOMIC SYSTEMS

DEFINITION OF MACROCATEGORIES

Before discussing economic systems, it's important to identify the lenses through which most of recent cultural works have been produced. Today's capitalist society is based upon consumerism, leverage of debt and amassing wealth, and this is directly reflected in the case studies placed in this macrocategory.

The first clear example of this is seen in *Passengers*, where an employee pass has restricted circulation in the space vessel and has its breakfast options restricted to a bare minimum, while a VIP pass has options of comfort and leisure because of the price that has been paid for the voyage. While this is common practice in the transportation means that are available today, it's worth considering the different set of variables that an interstellar voyage might entail and how they support (or not) the current system in place. This becomes especially important when considering the advancements regarding space tourism and the goals of interstellar colonizations.

Cyberpunk 2077, from the Cyberpunk technotype, and *Detroit: Become Human*, from the New Age technotype, are surprisingly similar in the way they represent inequalities. While Cyberpunk works have an intrinsic tendency of showing slums and social gaps in contrast to technological advancements, it's refreshing to imagine how poverty might look like in a society that has free access to androids and what this translates into.

Lastly, *Hardspace: Shipbreaker* takes a step further into extrapolating what highly specialized work might look like when space vessels are readily available. Here, the worker has to rent his tools from his company, and earn his salary through the salvaging of inoperant ships.

Economic Systems is a macro category of inequality, currency and contrasts. Opportunities and riches are made here, but so are social gaps, infrastructure inaccessibility and private ambition.



SALVAGE	AMT	VALUE
> Nacelle	4	\$ 380,000.00
> Thruster Class I Cap	3	\$ 139,500.00
> Thruster Class II	3	\$ 1,350,000.00
> Fuse	1	\$ 24,000.00
> Panel (Aluminum)	231 kg	\$ 2,777.27
> Door	1	\$ 12,000.00
> Panel (Kevlar)	7345 kg	\$ 320,750.00
> Kevlar	3794 kg	\$ 170,756.28
> Keel (Titanium)	1335 kg	\$ 60,893.24
> Silverfish	2523 kg	\$ 75,701.62

Credits Earned \$ +2,465,579.00

Current Debt

\$ 986,997,050.50

Complete Shift

Case studies, top to bottom: Passengers, Detroit: Become Human, Cyberpunk 2077 and Hardspace: Shipbreaker.

RELATED CASES

Hardspace: Shipbreaker
 Neuromancer
 Passengers
 High Frontier
 Space Waste Lab
 Detroit: Become Human
 Cyberpunk 2077
 Beautiful Desolation

RELATED MEDIUM

Literary Media
 Interactive Media
 Artpiece

4.3 MANUFACTURING SYSTEMS

DEFINITION OF MACROCATEGORIES

When talking about science fiction, one aspect that is, understandably, usually left out of the narrative is how the technology, devices, and infrastructure is actually built. However, this does not mean that there isn't an ideation there, even though it's in its embryonic stages.

One example is, again, *Ghost in the Shell*. The aesthetics of androids and cyborgs being built is already interesting enough to be analyzed. This specific work also centers its plot around this - how easily connected and automated factories could be hacked and locked down remotely, which reflects some recent incidents surrounding power stations in the United States.

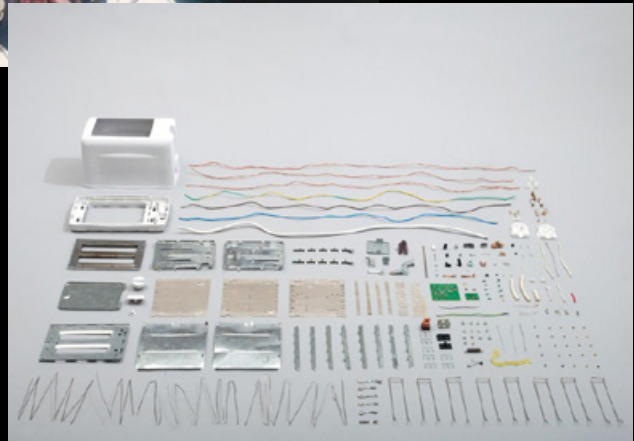
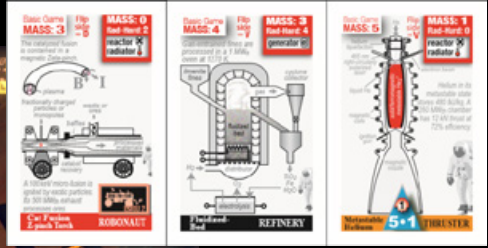
Subnautica also avoids explaining how the devices that the player uses work, but instead focuses on building energy harvesting systems and more efficient resource gathering devices.

Hardspace: Shipbreaker, however, goes into detail about the inner workings of its mechanics, probably because of their simpler nature. Here, there are several specialized tools that need to be used in specific situations, while the salvaged pieces of the ships also need to be sorted according to their nature.

High Frontier goes into yet another direction. Being based on the premise of researching, assembling and guiding a space vessel, the player is asked to plan carefully the literal assembly of his ship, having to consider if the cards that he is using are compatible with each other. Being designed by a former NASA engineer, he made these cards to actually represent existing technology that can be leveraged in today's space sector.

The case study that goes deeper into today's manufacturing systems is *The Toaster Project*. In search of producing a single unit of an electrodomestic, it becomes clear that the current system in place heavily favors scalability and production lot size in the detriment of single, individual production.

This is the macrocategory of know-how, of building and improving existing production methods. It is also the macrocategory of possible consequences for disassembling and leveraging out of date devices.



Case studies, top to bottom: High Frontier, Hardspace: Shipbreaker, Ghost in The Shell, The Toaster Project and Subnautica.

RELATED CASES

- Hardspace: Shipbreaker
- Ghost in the Shell
- High Frontier
- Subnautica
- The Toaster Project

RELATED MEDIUM

- Animated Media
- Interactive Media
- Object

4.4 TRANSPORTATION

DEFINITION OF MACROCATEGORIES

Transportation has always been at the forefront of societies' innovations. New ways of moving mean new capabilities of moving things, horizons that are broadened and distances that are shortened.

Not by chance, this is one of the macrocategories in which the New Age technotype, having its sight at the skies, presents the majority of the relevant information.

The movie *Passengers* and the games *Observation* and *Hardspace: Shipbreaker* have most of (if not all) their relevant context either inside a space vessel or in the vicinity of a space vessel, considering the facilities and tools that would be needed to maintain, repair or disassemble such vessels, respectively.

Of most relevance however is the SpaceX's Dragon Crew Module, launched in a tripulated mission for the first time in the year of 2020 as a test, with the goal of docking into the International Space Station. This is the first in a series of steps that SpaceX has laid out, with the ultimate goal being to reach and populate Mars.

This is probably the most straightforward macrocategory. It has the goal to understand how to reach destinations, leaving point A to arrive at point B.



Case studies, top to bottom: *Hardspace: Shipbreaker*, *Passengers*, *Beautiful Desolation*, *Dragon Crew Module* and *Observation*.

RELATED CASES

Hardspace: Shipbreaker
Passengers
Observation
Dragon Crew Module
Beautiful Desolation

RELATED MEDIUM

Animated Media
Interactive Media
Object

4.5 LIFE SUPPORT

DEFINITION OF MACROCATEGORIES

With extreme environments being so abundant in science fiction, the life support systems that need to be conceptualized to enable survival in harsher contexts also need to be thought out thoroughly.

Passengers provides a perfect example for this in its key plot point. During a multi century voyage, humanity devised an autonomously run space vessel and put its human tripulation in cryostasis. However, what they didn't account for is what happens when this malfunctions, and the protagonist finds himself awake and with still 90 years left until reaching his destination. The lifepod itself is also detailed - during the movie, since the process of awakening from an induced stasis by cryogenesis is not pleasant at all, the interface of the machine provides instructions to ease the unpleasantness, does a full medical scan to understand the health condition of the tripulant and gives further instructions to be followed. The ship, however, has scarcely any spare lifepods, and this soon becomes a key problem.

Being an interactive narrative media, Observation is able to innovate in this concept. Playing as the artificial intelligence of the vessel's system, it's possible to navigate and adjust all the vital regulations of the International Space Station modules, ensuring that the human character will be alive and well.

Lastly, Subnautica also invites the imagination to wonder how a human would be able to survive in a world that is almost entirely underwater, and which type of devices would be the most important ones in this endeavor.

If transportation envisions the goal, life support understands the how to reach it alive, and what will be needed to survive once the destination is reached. This naturally translates into basic biological necessities and medical devices, but could also be adapted if the biological needs of society itself change, be it through natural means such as evolution, or artificial means such as gene modifications.



Case studies, top to bottom: Passengers, Dragon Crew Module, Observation, High Frontier and Subnautica.

RELATED CASES

Hardspace: Shipbreaker
Passengers
High Frontier
Observation
Dragon Crew Module
Subnautica

RELATED MEDIUM

Animated Media
Interactive Media
Object

4.6 COMMUNICATIONS

DEFINITION OF MACROCATEGORIES

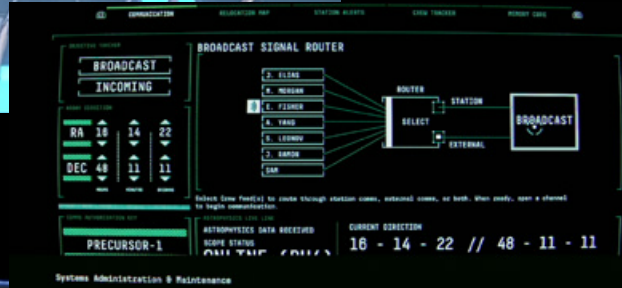
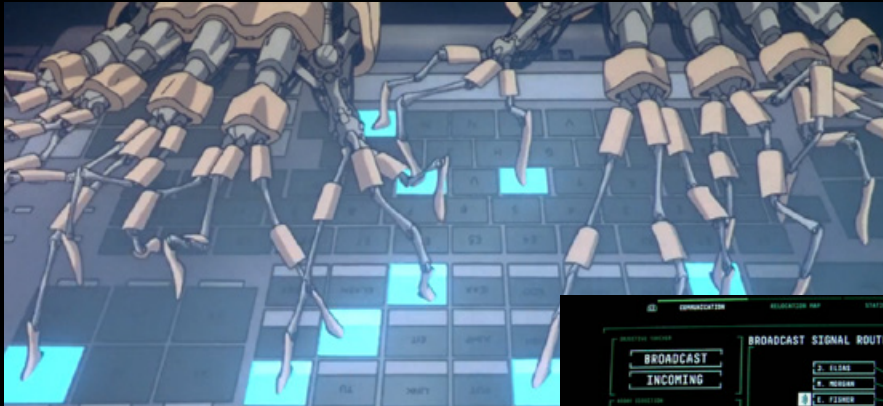
Communications is a naturally pervasive macrocategory, since almost any human endeavor relies on the ability to perceive and relay information to be successful.

Interfaces are the most palpable materialization of this. As seen in *Ghost in the Shell*, with a different set of human variables, in this case physical augmentations in cyborgs, new needs arise. In this specific case it materializes in interfaces that are designed with augmented humans in mind, such as a compound keyboard or a neurotransmitter capable of transmitting thoughts.

Closer to our current present, it's possible to analyze the interface of the Dragon Crew Module and its interactive media counterpart from the game *Observation*, which are strikingly similar. The crew of the Dragon Module mentioned feeling disturbed by the use of touchscreens and the absence of haptic feedback that they don't provide.

In a more abstract approach, *Melody of a Dying Star* instigate the listener to reflect upon the brevity of the universe, translating the energy bursts of the R. Sculptoris, a dying star located approximately 1.435 light-years from Earth, into notes that compose a harrowing and somber music.

Communications shows itself as an incredibly versatile macrocategory, which is in accordance with its role as a key factor in the advancement of the human species. It deals with interfaces, messages, types of commands and devices, but can also be related to emotion, thought patterns and visual symbolism.



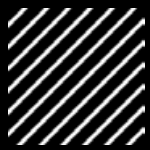
Case studies, top to bottom: Ghost in The Shell, Observation, Dragon Crew Module and Melody of a Dying Star.

RELATED CASES

Neuromancer
 Ghost in the Shell
 Observation
 Dragon Crew Module
 Melody of a Dying Star

RELATED MEDIUM

Literary Media
 Animated Media
 Interactive Media
 Object
 Artpiece



PART C

HISTORICAL CONFIRMATION

5. EMBEDDED TECHNOLOGICAL TRENDS

The organic analysis of the case studies brought forward the connections between technotypes, mediums of diffusion and, most importantly, the macrocategories through which most of science fiction relates to. With these categories at hand, the next natural step is to investigate deeper each one of them, seeking to understand if there is historical evidence of the origin process of technoscientific ideology consolidation through popular culture science fiction works in each of the categories.

Each category will be investigated independently, with a one to one relationship between science fiction and material innovation detailed deeply. Considering the current age we live in, most of the works are literary in nature, with some notable exceptions through movies and TV series. It's worth mentioning that, because of how popular culture works are produced, the next decades will incorporate even more multimedia references, and it won't be surprising to see a future research similar to this one where most innovations will be directly connected to interactive narratives instead of literary pieces.

Another important aspect of this analysis will be the prioritization of innovations that have materialistic qualities to it. This is relevant because it signals the crystallization of that specific technoscientific aspect, starting at the narrative and finishing at the material artifact. A second conscious effort will be made in selecting material artifacts that are already embedded into society and considered trivial by the general populace. This is the major historical validation at work - how a simple idea, born from the extrapolation of past technological trends, is incorporated by the very society that, at first, wondered if that technological revolution would ever be possible in the first place.

Having said that, the main method of analysis will take into consideration the Causal layered analysis, or CLA, proposed by Inayatullah in 1998. The CLA method has been widely used in strategic planning, but most importantly, in the field of futurology, as it means to understand at a deeper level how trends of the present can be extrapolated into futures, and what are the drivers between such futures.

CLA is divided into 4 main subjects:

THE LITANY

The way of things being that is commonly accepted, either regarding how they are or how they should be.

THE SYSTEMIC CAUSES

The social, economic and political causes at hand that can influence that subject.

THE WORLDVIEW

The cognitive lenses that are used to make sense of the world and inform us if what is seen is real or not.

THE MYTH AND METAPHOR

The unconscious narrative of issue.

The written analysis will take the form of a prose considering these four dimensions with the intent to make the relationships between materiality and narrative clearer and deeper, providing a framework upon which the research insights will be laid upon.

5.1 SMARTER DEVICES

MACROCATEGORY: LAWS AND REGULATIONS

The remote-access computer transponder called the "joymaker" is your most valuable single possession in your new life. If you can imagine a combination of telephone, credit card, alarm clock, pocket bar, reference library, and full-time secretary, you will have sketched some of the functions provided by your joymaker.

(...)

*"...Have you filled out an interests profile?"
"I don't think so."*

"Oh, do! Then it will tell you what programs are on, what parties you will be welcomed at, who you would wish to know. It's terrible to go on impulse, Charles," she said earnestly. "Let the joymaker help you."

**Frederik Pohl,
The Age of The Pussyfoot.**

1966

1966

The origin of a literary prototype similar to virtual home assistances today

Frederik Pohl describes an advanced virtual voice assistant with several other functions added to it. It's worth highlighting the personal interests profiles that the user is asked to fill out.

2014

Amazon launches the Amazon Echo, the first standalone virtual voice assistant

Lab126, the hardware division of Amazon, unveils the first standalone smart speaker with a virtual voice assistant embedded into it. In an effort of humanization of the device, the action word selected for turning it on is "Alexa".

2021

European Data Protection Board drafts the first version of guidelines to virtual voice assistants

Guidelines on how to design virtual voice assistants, extract data from them and share this data with business partners are drafted and published by the European Data Protection Board.

In 2011, Apple launched Siri, the first virtual voice assistant (VVA). Soon after, Amazon launched the first VVA standalone device - Amazon Echo. Ever since then, there has been a growing market interest in smarter, voice controlled appliances, connected devices that leverage IoT and that are able to be personalized precisely to what the user wants.

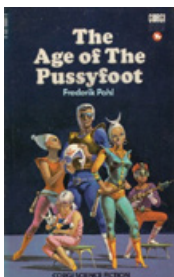
All of these features, however, need an outstanding amount of highly identifiable data, which is usually collected indiscriminately, without any regard to privacy concerns.

This raises several critical concerns, among them how this data is kept by the collecting entity, and further shared to interested third party companies that intend to leverage this information to produce and target ads, media pieces and other digital communication artifacts to specific users.

Legislation and regulation about disruptive technology usually takes a while to be drafted and implemented, and VVAs have been no exception. Only in March of 2021 that the European Data Protection Board has released the general guidelines of designing VVAs and extracting data through them - a concept that has been signaled and incorporated into technoscientific imaginaries since 1966 through the "Joymaker" device, in the novel "The Age of The Pussyfoot".

SOCIETAL DRIVERS

Virtual Voice Assistants have been popularized exponentially during the last decade, being present today in cellphones, entertainment systems, home appliances, vehicles and smart sound systems. The popularization, however, has apparently been too fast for legislation to keep up with, even though this concept has existed for more than half a century. This signals to a dissonance between the current legal system and the consumer market drives.



1966



2021

5.2 VIRTUAL TRANSACTIONS

MACROCATEGORY: ECONOMIC SYSTEMS

"A credit corresponding to his share of the annual product of the nation is given to every citizen on the public books at the beginning of each year, and a credit card issued him with which he procures at the public storehouses, found in every community, whatever he desires whenever he desires it. This arrangement, you will see, totally obviates the necessity for business transactions of any sort between individuals and consumers. Perhaps you would like to see what our credit cards are like.

"You observe," he pursued as I was curiously examining the piece of pasteboard he gave me, "that this card is issued for a certain number of dollars. We have kept the old word, but not the substance. The term, as we use it, answers to no real thing, but merely serves as an algebraical symbol for comparing the values of products with one another. For this purpose they are all priced in dollars and cents, just as in your day. The value of what I procure on this card is checked off by the clerk, who pricks out of these tiers of squares the price of what I order."

**Edward Bellamy,
Looking Backwards.**

1888

1888

First concept and literary prototype of a debit card

Mary Shelly writes about the possibility of galvanism reanimating human dead bodies, inspired by an experiment of a moving dead frog legs with an electrical current.

1946

First local credit based network for forwarding purchases a specific bank

John C. Biggins, in charge of the Flatbush National Bank of Brooklyn in New York, creates the Charg-It system, a purchasing model that let customers forward charges to his bank around a two blocks radius from the bank.

1950

Diner's Club, the first modern general purpose credit card with no physical limitations

The first independent credit card company was founded by Frank X. McNarama and Ralph Schneider, with the goal of providing credit to purchases made in any affiliated store, regardless of geographical location.

Virtual currency and transactions, when analyzed through the literal meaning of the word - of having no substance, have existed in a mostly ubiquitous manner whenever agrarian societies are involved. Farming usually involves a heavy upfront cost, and as such, it is a centuries old common practice to borrow seed money to keep expenses in check while waiting for the harvest.

This later translated to the ledger book in which store patrons would keep tabs on customers, trusting them to pay their dues whenever they could.

In a urban setting, trust is not enough to ensure business. In this vein, Bellamy describes a way with which each worker would be able to receive his due share of work at the beginning of each year. Even though this is mostly how a debit card would work today, it already signals the transition of trust based future transactions to official methods of distributing currency and executing transactions.

Although not directly referenced, it's logical do presume that such concept was adopted as an ideal to be achieved at the time as a technoscientific ideology after comparing it to the common practices in agrarian societies, since both achieve similar goals. The materialization of this discussion can be seen in the founding of the Diner's Club credit company, which gathered an outstanding 42.000 members by the end of 1951, one year after its first executed transaction.

SOCIETAL DRIVERS

While the concept of virtual and future transactions is not new by any means, it's extremely relevant to observe it's evolution and adaptation in an urban setting. Through an agreement between stores, credit company and client, the concept of currency started to be dematerialized. This willingness to adopt virtual transactions is further evidenced by the recent advancements in cryptomarkets and the commercialization of digital goods.



1950

2020

5.3 PERSONALIZED MANUFACTURING

MACRO CATEGORY MANUFACTURING SYSTEMS

"It makes drawings in the air following drawings it scans with photo-cells. But plastic comes out of the end of the drawing arm and hardens as it comes. This thing will start at one end of a ship or a house and build it complete to the other end, following drawings only. (...)

The arm made clumsy but precise gestures, following the drawings off to one side. It had begun by putting a blob of magnetronic plastic on a stout upright... Then, for a while, it made gradually enlarging circles about that spot."

**Murray Leinster,
Things Pass By.**

1945

1945

First visual concept of a long distance communication device in television

Murray Leinster describes in detail how an automated manufacturing tool would use pre determined, 2D drawings to produce whichever object was needed

1988

Foundation of the Stratasys company, the patent holder FDM-based manufacturing

S. Scott Crump, inspired by the manual construction of a frog made out of hot glue, starts to investigate a way to automate the process and make it scalable. Later the same year he founds Stratasys with his wife, Lisa Crump.

2021

The first time a 3D printed home is inhabited

Through a complex partnership managed by the Eindhoven University of Technology, the first of the five planned houses is 3D printed, assembled and delivered to the inhabited by its tenants.

The possibility of onsite manufacturing, tailoring the final product to the real needs of its usage context, has been a staple of modern science fiction for quite some time already. The surprising aspect, however, is that in 1945 Murray Leinster published a short story in the scifi magazine Thrilling Wonder Stories that detailed the manufacturing process of a house in an astonishingly similar way to the contemporary working principle of Fused Deposition Modeling (FDM) technology.

3D printing processes date back to 1981, with the use of syntherization of UV sensitive polymers through focused lasers. However, FDM technology revolutionized this production method since its invention, in 1988, and the introduction of the first 3D printer to reach the consumer market, in 1992, by Stratasys.

The technology itself is relatively simple when considered in a small scale - proof of this was the sudden popularization of desktop 3D printers after Stratasys' patent expired in 2009 - and even though large scale printing has been accepted into the popular imaginary as a matter of when, and not if, only recently it has been applied to large scale structures as more than a proof of concept.

The Project Milestone, managed by the Eindhoven University of Technology, is at the vanguard of this process: they plan to print five houses with varying degrees of complexity, and in partnering with Vesteda, a real state company, deliver all of them to interested tenants. The first house has already been delivered in April of 2021.

SOCIETAL DRIVERS

The diffusion of plastic as a material can be largely attributed as the starting point of a technological revolution that has started last century and is still ongoing. The push towards a greener, environmentally friendly construction industry is heading towards the search of alternative, minimal-waste solutions. Producing onsite, with maximized customization, not only is a more sustainable approach, but also hints at the possible automation of an industry that has been untouched thus far.



1992



2021

5.4 AT THE SPEED OF LIGHT

MACROCATEGORY: TRANSPORTATION

Fuller said: "Look, teacher, a man named Einstein said that the velocity of light was tops over two hundred years ago, and nobody's come up with any counter evidence yet. Has the Lord instituted a new speed law?"

"Oh, no," said Wade, waving his pipe in a grand gesture of importance. "Arcot just decided he didn't like that law and made a new one himself."

"Now wait a minute!" said Fuller. "The velocity of light is a property of space!"

Arcot's bantering smile was gone. "Now you've got it, Fuller. The velocity of light, just as Einstein said, is a property of space. What happens if we change space?"

Fuller blinked. "Change space? How?"

Arcot pointed toward a glass of water sitting nearby. "Why do things look distorted through the water? Because the light rays are bent. Why are they bent? Because as each wave front moves from air to water, it slows down. The electromagnetic and gravitational fields between those atoms are strong enough to increase the curvature of the space between them. Now, what happens if we reverse that effect?"

**John W. Campbell,
Islands of Space.**

1931

Investigation of superluminal travel through spacetime manipulation

Based on Einstein's Theory of Relativity, John W. Campbell writes the first story that uses the concept of bending spacetime as a way of transportation

1931

1966

Adoption of the warp drive concept by television mass media

Star Trek, today a cultural phenomenon, adopts the concept of a warp drive that has been diffused through literary science fiction and represents it for the first time in mass media television

1994

First identified theoretical solution to superluminal travel

Miguel Alcubierre, inspired by Star Trek, works with the General Theory of Relativity equation to find a possible solution to a gravitational field that would expand the space behind the object and contract the space in the front of the object.

Starting from the Theory of General Relativity published by Einstein in 1905, the human understanding of space time constraints went through a dramatic paradigm shift. While the possible speed limit was established as the speed of light, another physical phenomenon that was explained through it was the possibility of contracting and dilating the fabric of space as a consequence of special relativity in frames of reference similar to the speed of light. In less than two decades, John W. Campbell already expanded this concept to create the idea of a space warp, a device that would, instead of accelerating the object as normal engine, bend space around it to enable superluminal travel. This idea was further popularized by the TV series Star Trek, which started airing in 1966 and is still ongoing, where warp drives play a key role in navigating the galaxy.

In 1994, Miguel Alcubierre was inspired to search for superluminal travel solutions by this very series. The Alcubierre Drive is a theoretical solution to the equation of space deformation. The idea is rather simple - a warp engine would create a gravitational pull and a gravitation push simultaneously, one at the front and one at the back of the interstellar vessel, and as a consequence the space behind it would be expanded, while the space in front of it would be contracted, thus enabling the vessel to "ride" the bubble that was created effectively respecting the physical speed limit of light while traveling at superluminal speed. While his answer to this question is unfeasible for now since it would imply harnessing and using negative matter, Alcubierre's contribution to the scientific community is remarkable, spawning the Natario Warp Drive in 2004 and further pushing research into superluminal travel, a field which in 2020 has had a scientific breakthrough with a paper called "Breaking the Warp Barrier: Hyper-Fast Solutions in Einstein-Maxwell-Plasma Theory".

SOCIETAL DRIVERS

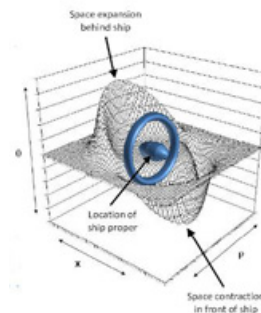
The history of the Alcubierre warp drive exemplifies exactly how science fiction can inspire science making. Until this solution was presented, scholars had been trying to solve the Einstein's equation from the beginning, extrapolating their valid answers into a gravitational field and analyzing the consequences of their findings. Alcubierre did the process backwards - he first formulated the gravitational field that would be needed to create a superluminal travel bubble, and from there applied Einstein's reasoning to understand the physical limitations of his geometry.



1931



1966



1994

5.5 THE SPARK OF MOVEMENT

MACRO CATEGORY: LIFE-SUPPORT



Figure 39. Doctor Frankenstein using electricity to raise the monster. Extracted from Frankenstein, 1931.

"Before this I was not unacquainted with the more obvious laws of electricity. On this occasion a man of great research in natural philosophy was with us, and excited by this catastrophe, he entered on the explanation of a theory which he had formed on the subject of electricity and galvanism, which was at once new and astonishing to me."

**Mary Shelley,
Frankenstein.**

1819

**Exploration of electricity being able to
reanimate human dead bodies**

Mary Shelley writes about the possibility of galvanism reanimating human dead bodies, inspired by an experiment of a moving dead frog legs with an electrical current.

1819

1965

**First mobile and non intrusive
defibrillator deployed in the field**

Frank Pantridge, the inventor of CPR protocol, deploys his first prototype of mobile defibrillator in an ambulance in Belfast. In 1968, his defibrillator was already reduced from 70kg to 3kg through the use of a microcapacitor produced by NASA

1958

**Application of the first portable and
battery powered pacemaker.**

A partnership between Walt Lillehei and Earl Bakken developed and deployed the first truly portable pacemaker, after Lillehei lost a patient to a cardiac arrest in the middle of an electric blackout. Lillehei was openly inspired by 1931's Frankenstein movie.

This work of fiction has a very specific origin: Galvani's experiments with frog muscles and electricity. In 1780, he and his wife started to explore what would happen with muscle tissue when struck with sparks, and to his surprise, he started to uncover the basic principles that govern bioelectricity, the field that investigates the signals that are emitted by nerves and muscles.

In 1818, at the time of Frankenstein's writing, electricity was still a recently discovered physical force, and as such, barely understood. However, the experiment involving an electrical current and the frog legs was already being exhibited to the public, and as Mary Shelley herself denotes in the preface of Frankenstein's 1831 edition, it was a major inspiration behind the story:

"Perhaps a corpse would be re-animated; galvanism had given token of such things: perhaps the component parts of a creature might be manufactured, brought together, and endued with vital warmth."

Her work of fiction was a success, and took hold of the common technoscientific imaginary at the time. Proof of this incorporation and the influence it exerted are incredibly clear today in the form of the defibrillator and the pacemaker, medical devices that are seen as common and readily available in time of need.

SOCIETAL DRIVERS

Frankenstein's narrative is built in a time and society where science was already making great strides of progress, but the general audience feared that these developments might be too quick. It also generates unease with the uncertainty that the future holds when compared to recent past.



1958



1947

5.6 MOBILE COMMUNICATIONS

MACRO CATEGORY COMMUNICATIONS



Figure 40. Captain Kirk communicating with the U.S.S. Enterprise.

Star Trek: The Original Series.

1966

First visual concept of a long distance communication device in television

Star Trek: The Original Series shows its concept of the future of long distance communications through the communicator used by Captain Kirk and Spock

1966

1973

Martin Cooper makes the first phone call from a mobile phone

Martin Cooper, the inventor of the DynaTAC, the first mobile phone, tests his prototype in Manhattan, New York. The call was routed to through a Motorola station previously installed for this specific purpose.

1995

Motorola launches the StarTAC, the first flip style cell phone

Motorola changes the concept of a mobile phone through the StarTAC, based directly on the communicator. It was the first flip style phone that positioned itself as a consumer friendly device.

While the invention of the technology is not linked directly to this work of fiction, it's worth highlighting the role it played into shaping the future development and application of mobile phones. Motorola's StarTAC was first launched in January 1996, and it helped shaping the mobile industry into what is known today. While technically it's not the first flip phone, since a few years prior a company called NEC had launched two other cellphone models that used a similar opening mechanism - the TZ-804 in 1991 and the TZ-1501 in 1994, the StarTAC was the first mobile phone that was sold as an object of status and desire. It was, simply put, the lightest and most compact phone ever made at the time, and until it's last iteration in 2007, sold an impressive 60 million units.

Since the DynaTAC first release and before the launch of the StarTAC, the logic that drove the use of mobile phones was one of functionality - they were big, heavy and not practical while in use. Motorola admittedly took inspiration from the communicator used by Captain Kirk (first exhibited in 1966) and steered the project into something that would transform the mobile phone archetype into a much more consumer oriented product, instead of a product only for the executive elites.

SOCIETAL DRIVERS

Star Trek leverages the trend of miniaturization to such an extreme that no one in the production crew thought the series would still be airing when the device was made possible. While not a direct invention of the applied technology, it's valuable to note that when searching for new ways to innovate, Motorola searched direct inspiration in the series to leverage what they perceived as desirable to the mass market, using aesthetic languages and symbolic gesture that were diffused 30 years before by the series.



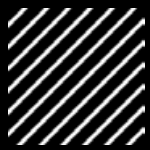
1966



1973



1995



PART D

DESIGN AND SCIENCE FICTION

5. CONCLUSIONS

5.1 RESULTS ACHIEVED

In conclusion, this consolidation thesis takes the aspect of an exploratory work intertwining science fiction, popular culture and technological developments, examining their relationships and aiming to understand in which manner a designer can leverage these topics.

Through the theoretical research, it was shown how popular culture is commonly produced, and in connection with the science fiction genre, the multitudes of roles they play in society. At its very core, science fiction narratives have provided, since their very beginning with Frankenstein, an inclusive framework for discussion of future consequences for the technological advancements of the present. They level the playing field, so to speak, between highly specialized individuals and the general audience, providing a platform in which every opinion is equally valid and welcomed.

Another role that stems directly from the discussion among individuals is the use of fiction as a literary prototype. Since its conception, science fiction writers have used their stories to extrapolate what they imagined as possible futures, combining technology on the front end of innovation with sweeping societal consequences that could be caused by technological disruption. As of late decades, the mass media propagation and, more recently, the diffusion of interactive media such as video games and virtual reality contexts have exacerbated this characteristic, acting as materializers of possible usability challenges and overall technological feeling of future artifacts that, in a common and shared imaginary, are already considered real, even though they haven't been produced yet.

This leads to the most important insight of the theoretical research. The combined functions of literary prototyping and inclusive discussion intrinsic to popular culture science fiction works naturally walks towards the acceptance (or rejection) of specific aspects that are considered desirable in these narratives. These are then incorporated into a technoscientific microideology, which provides a very specific view of future that has been refined and discussed through several iterations, and it becomes something that is considered only a matter of when it will become real, not if it will become real. Through general acceptance, technoscientific microideologies have enough reach to influence key decision makers in the consumer's market, which carefully look for

opportunities in developing new products and technology that will be accepted by the general public. Thus, it closes a virtuous cycle that will generate a new wave of science fiction and the amalgamation of new technoscientific microideologies with each new iteration of the cycle.

The phenomenological research leverages another layer of information through case studies - their impact in society and the materiality of two previously detected technoscientific ideologies: Cyberpunk and New Age. The case studies presented themselves as incredibly valuable once a pattern recognition exercise was conducted. The results of the pattern recognition exercise are clear through the detection of macrocategories of interest that the case studies signaled, and how each macrocategory is approached by the case studies themselves.

This leads into the final section of this consolidation thesis - a deep dive into each macrocategory through already embedded technologies in society. This acts as the historical confirmation of the main argument presented during the theoretical research - that science fiction does not predict the future at all. Instead, through a collective intelligence process of iteration, discussion and validation, it works as a lighthouse guiding technological developments that are present in the multitude of technoscientific microideologies that have already been consolidated into the popular imaginary.

5.2 A DESIGNER'S PERSPECTIVE

With this being said, these insights also need to be framed through a designer's perspective. There is an unspoken paradigm in most, if not all traditional industrial design methodologies that aim to produce marketable products. The usual process of design implies that the designer himself should approach each project as a blank slate, willing to learn all the information possible about the challenge that the briefing poses before ideating any solutions at all. When presented with something as pervasive as technoscientific imaginaries, this paradigm falls apart rather easily, since even if the designer is willing to use a blank slate approach, he carries with him all the ideals of popular culture narrative works that he identifies with.

Instead of trying to escape from any background that he carries, the designer can, instead, recognize that these technoscientific microideologies are pervasive and inescapable, and leverage the discussion that the popular culture science fiction works have already produced to extract possible challenges, validations and opportunities inherent to them. As demonstrated previously through the pattern recognition exercise, the use of science fiction works can be especially insightful when dealing with products that are either disruptive in their

nature or that escape already established archetypes, helping the designer to understand how these products that have not interacted with society yet could alter societal, economic and environmental relationships.

Science fiction narratives can also be leveraged to gauge public engagement with conceptual objects and to understand how powerful the trends exacerbated through the works really are. Directly tied to this is the materiality of any given technoscientific ideology - how refined it presents itself to the public signals how mature the movement is, and how rich the works derived from it will be under further analysis.

Finally, this work also has the intention of legitimizing science fiction as a valid research input in understanding probable next technological developments, societal drivers behind them and possible future consequences of their implementations. In recognizing that they are guided by popular culture works, the designer can position himself as an actor that will reinforce, oppose or subvert what has already been accepted as the next future steps of technology and their implementations.

//CONCLUSIONS

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