

STAR WORDS: A SELECT ETYMOLOGY OF TERMS COINED IN SCIENCE FICTION

An Honors Thesis

Presented by

Christopher Pitt

Completion Date:

May 2016

Approved By:

Professor David Toomey, English

Professor TreaAndrea Russworm, English

ABSTRACT

Title: Star Words: A Select Etymology of Terms Coined in Science Fiction

Author: Christopher Pitt

Thesis/Project Type: Independent Honors Thesis

Approved By: Professor David Toomey, English

Approved By: Professor TreaAndrea Russworm, English

This thesis explores a selection of terms found commonly outside of science fiction literature or media that originally were coined within science fiction. These terms each follow a set of requirements for their inclusion: They must be no longer confined to science fiction, whether that means a widespread adoption in works not considered science fiction or in certain cases, their adoption as real-life inventions. Additionally, while the concept for the term does not have to come from science fiction, the first recorded usage of the term itself must come from science fiction. Each term has a section on it, which follows a standard format: The first part briefly describes the term. The second part follows the history of the concept and then the first usage of the word. The final part follows the term's adoption outside of science fiction. Altogether this provides a detailed etymology of the term as well as the history of its underlying concept and an exploration of its wider usage.

ABSTRACT

Title: Star Words: A Select Etymology of Terms Coined in Science Fiction

Author: Christopher Pitt

Thesis/Project Type: Independent Honors Thesis

Approved By: Professor David Toomey, English

Approved By: Professor TreaAndrea Russworm, English

This thesis explores a selection of terms found commonly outside of science fiction literature or media that originally were coined within science fiction. These terms each follow a set of requirements for their inclusion: They must be no longer confined to science fiction, whether that means a widespread adoption in works not considered science fiction or in certain cases, their adoption as real-life inventions. Additionally, while the concept for the term does not have to come from science fiction, the first recorded usage of the term itself must come from science fiction. Each term has a section on it, which follows a standard format: The first part briefly describes the term. The second part follows the history of the concept and then the first usage of the word. The final part follows the term's adoption outside of science fiction. Altogether this provides a detailed etymology of the term as well as the history of its underlying concept and an exploration of its wider usage.

Table of Contents

Introduction.....	1
Robots.....	2
Cryogenics.....	9
Hoverboard.....	11
Cyberspace.....	14
Cyberpunk.....	18
Steampunk.....	20
Genetic Engineering.....	21
Death Ray.....	25
Hive-Mind.....	29
Spaceship, Spacesuit, & Space Shuttle.....	32
Mothership.....	38
Parallel Universe.....	40
Teleportation.....	44
Conclusion.....	48
Selected Bibliography.....	51

Introduction

What happens when society can look back on a genre that has always based itself on looking forward? What insights, predictions, and possibilities are gleaned from a vision of a future that is now present? When we look at science fiction, we see what was impossible at conception becoming possible now. Space travel, the Internet, virtual reality, robotics, the list goes on of things that were one step short of fantasy, but now are seen as clearly reality.

Technology has progressed to the point where we do not always recognize even the origins of the words we use to describe technologies that are now commonplace but were once confined to the pages of a book. Whether they be words like “hoverboard” that were conceived of in the 1980s or “robot” which was coined in the 1920s but describes a concept that has existed since ancient times, I will trace the origins of words are common now but were once quite rare, and pulled from the wildest dreams of writers.

Of course, some of the technologies may not exist as they were envisioned by those who first imagined them, but almost all of the words studied in this thesis will have some sort of modern application, or at least research being done into their viability. The point is not necessarily to document technologies envisioned in science fiction and then made real, but to examine the words that have entered the modern zeitgeist that came from science fiction. To that end, many of the ideas that excite the general public also excite scientists, and for almost every instance there is effort being made, to make it real. This thesis will trace the etymology of words that are in more current and colloquial parlance, but came from science fiction. It will also examine the words’ conceptions, and the real world creations that have been designed in the vision of the science fictional technology.

Robots

The history of robotics goes long before it was even called “robotics”. The concept of man-machines, or humanoid automatons has a long history, having been seen in ancient Greece and China, before rising as a science in the Middle-East and Europe. For a time, rather than being what we consider “robots”, automatons were simply mechanical creations capable of some sort of preset movement of what seemed to be of its own accord, and they rarely looked humanoid at all.

The first word that was used to describe any sort of moving machine is “automaton”. It was first used in The Iliad in reference to the doors of Olympus opening by themselves. Being that “automaton” in Greek means something close to “acting of itself” in the context the doors were called automata because they were moved by magic. But the idea of inanimate objects acting of their own will entered the consciousness of inventors and soon enough, the magic become science.

Additionally, the idea of machines taking humanoid forms also began to gain traction. The Argonautica, describes Talus, a massive automaton made of bronze and built by the Greek God of the forge, Hephaestus. Despite being artificially created, Talus has the form of a human: “Now in all the rest of his body and limbs was he fashioned of bronze and invulnerable; but beneath the sinew by his ankle was a blood red vein; and this, with its issues of life and death, was covered by a thin skin”.¹ This claims that Talus was an artificial man with muscles covered in bronze, and one vein of some sort of blood or ichor, stopped up with a nail. When that nail was pulled, the blood flowed out, and Talus died by exsanguination. He was an example of a humanoid automaton, and an early example of a stereotypical robot. He obeyed orders without ques-

1 Apollonius, and Richard L. Hunter. *Argonautica*. Cambridge U.a.: Cambridge U Pr., 1989. Print.

tion, and had a fuel source (the ichor in his ankle) that, when depleted, caused him to die. Soon enough automata had jumped from stories to reality. While there are few to no reputable accounts of humanoid automata, there are many accounts of mechanical creations that performed interesting or useful functions. One such creation was invented by Ctesibius, considered one of the first heads of the Library of Alexandria: “Soon Ctesibius’s clocks were smothered in stopcocks and valves, controlling a host of devices from bells to puppets to mechanical doves that sang to mark the passing of each hour -the very first cuckoo clock!”² This is an example of a specific automaton created to perform an actual task, and not just move in a preset way; this would pave the way for the first robots.

In China, artificers were at the forefront of mechanical engineering, but even the most incredible artificers had not created anything close to a humanoid automaton by the 11th century. The only report of a humanoid automaton is in an anecdotal story of a hermit artificer, Yen Shih, who arrived at the king’s court with a “man-machine” in tow. The man-machine was presented to the king and did a number of impressive things.

“The king stared at the figure in astonishment. It walked with rapid strides, moving its head up and down, so that anyone would have taken it for a live human being. The artificer touched its chin, and it began singing, perfectly in tune. He touched its hand, and it began posturing, keeping perfect time... As the performance was drawing to an end, the robot winked its eye and made advances to the ladies in attendance, whereupon the king became incensed and would have had Yen Shi executed on the spot had not the latter, in mortal fear, instantly taken the robot to pieces to let him see what it really was. And, indeed, it turned out to be

2 Reid, Howard and Pollard, Justin. *The Rise and Fall of Alexandria: Birthplace of the Modern World*: Print. Penguin, 2007

only a construction of leather, wood, glue and lacquer, variously colored white, black, red and blue. Examining it closely, the king found all the internal organs complete—liver, gall, heart, lungs, spleen, kidneys, stomach and intestines; and over these again, muscles, bones and limbs with their joints, skin, teeth and hair, all of them artificial.”³

Anecdotal though that story is, if there is any truth to it then it proves that humanoid automatons were within the reach of artificers in China. The artificer chose to return to his hermitage with the automaton, and reports of a man-machine seemed to vanish for many more years.

It took many centuries before mechanical engineering outside of China reached a point where automatons were capable of more than just moving around. Much of the early robotic work being done during the Middle-Ages was by inventors in the Middle-East. There are accounts of lions that stomped their feet, birds that sang songs, and other mechanical wonders in the palace of the Byzantine Emperor Theophilus.⁴ In Turkey, the inventor Ismail al-Jazari made a host of automata capable of functions ranging from simple movement in the form of mechanical peacocks, to serving drinks to guests, to even being able to play instruments in a band.⁵

The leap from automata to robots began to surface as early as the late 1400s. The difference lay mostly in the functional aspects. Up until this point, automatons were only able to move, or perform simple actions like making a noise or moving an object from one place to the next.

There was no “brain”, simply clever usage of space, acoustics, or engineering. Robots would

3 Needham, Joseph, Christoph Harbsmeier, and Kenneth Robinson. *Science and Civilisation in China*. Cambridge: Cambridge UP, 1998. Print.

4 Safran, Linda. *Heaven on Earth: Art and the Church in Byzantium*. University Park, Penn.: Pennsylvania State UP, 1998. Print.

5 Rosheim, Mark E. *Robot Evolution: The Development of Anthrobotics*. New York, NY: Wiley, 1994. Print.

soon be found to be capable of much more, being able to move more fluidly or react to external stimuli. Schematics, created by Leonardo da Vinci, were found that were supposedly meant for the building of a “robot”. The design of such a robot is described here:

“The robot had two independent operating systems. The first had three degree-of-freedom legs, ankles, knees, and hips. The second had four degrees of freedom in the arms with articulated shoulders, elbows, wrists, and hands. A mechanical analog-programmable controller within the chest provided the power and control for the arms. The legs were powered by an external crank arrangement driving the cable, which connected to key locations near each lower extremity’s joints.”⁶

For a period after this, very few new strides in robotics appeared. There are accounts of slightly automatized puppets in Japan during the Edo period (1600-1800), called Karakuri Ningyo, but they do not approach the complexity of the automatons before them or the robots after them. They perform only a singular purpose, like “serving” tea. To do this, they have a system of gears and weights that, once wound up, will allow the puppet to move forward on wheels for a set period of time, then turn, and move a little more forward. This gives the illusion of them being able to serve tea, as they are placed at the head of the table with a cup of tea in their hands and wound, at which point they move forward and turn, if placed correctly, to face a guest. This gives the illusion that the machine has taken the tea to you as a result of its own thoughts, when in fact it was just very accurate winding that ensured it would stop unwinding in front of the correct guest. Once the guest has finished their tea, they give the cup back to the doll, and the doll

6 “The da Vinci Robot” Michael E. Moran. Journal of Endourology. January 2007, 2012

turns again and wheels its way back to the head of the table.⁷

In the 1700s, the word “android” was first coined, in reference to an automaton. Android came from Greek roots, *άνδρ*, meaning man, and *-oid*, meaning like. It was originally used to refer to a humanoid automaton, but over time it has come to reference any sort of robot that outwardly resembles a human.⁸

By the 19th century, focus had shifted from creating self-powered humanoid automatons to exploring the new field of remote control. At the time, remote control was being explored primarily for military matters. Torpedoes were a particularly popular choice for inventors, and remote-guided torpedoes began to spring up in rapid succession by the late 1800s. These torpedoes were guided by long strings of high-tensile steel wire, which were connected to the operator station where the torpedoes could be steered. This idea of remote control through wires would be instrumental in the engineering of early robotics.

In 1921, the idea of humanoid machines fabricated on a large scale found its new name in a play written by Czechoslovakian author Karel Čapek. The play was *R.U.R.*, which stands for *Rossumovi Univerzální Roboti*, which translates to Rossum’s Universal Robots. The play is centered around the roboti, artificial humanoids created in a factory to be used as workers. While they are called robots, due to the fact that they are made from organic matter and have organs, muscle, and skin, a more correct nomenclature may be androids or clones (Figure 1⁹).

Domin: (drily) For mixing the dough. Each one of them can mix the material for a thousand robots at a time. Then there are the vats of liver and brain and so on. The bone factory. Then I’ll show you the spinning-mill.

Helena: What spinning-mill?

7 “Karakuri.info.” Karakuri.info. Web. 02 Mar. 2016.

8 Chambers, Ephraim. *Cyclopaedia: Or, An Universal Dictionary of Arts and Sciences ... The Whole Intended as a Course of Antient and Modern Learning, Extracted from the Best Authors, Dictionaries, Journals, Memoirs, Transactions, Ephemerides, &c. in Several Languages*. London: D. Midwinter, 1741. Print. <http://www.umich.edu/~engb415/literature/pontee/RUR/RURplay1.jpg>

9 <http://www.umich.edu/~engb415/literature/pontee/RUR/RURplay1.jpg>

Domin: Where we make the nerve fibres and the veins. And the intestine mill, where kilometers of tubing run through at a time. Then there's the assembly room where all these things are put together, it's just like making a car really. Each worker contributes just his own part of the production which automatically goes on to the next worker, then to the third and on and on. It's all fascinating to watch. After that they go to the drying room and into storage where the newly made robots work.¹⁰

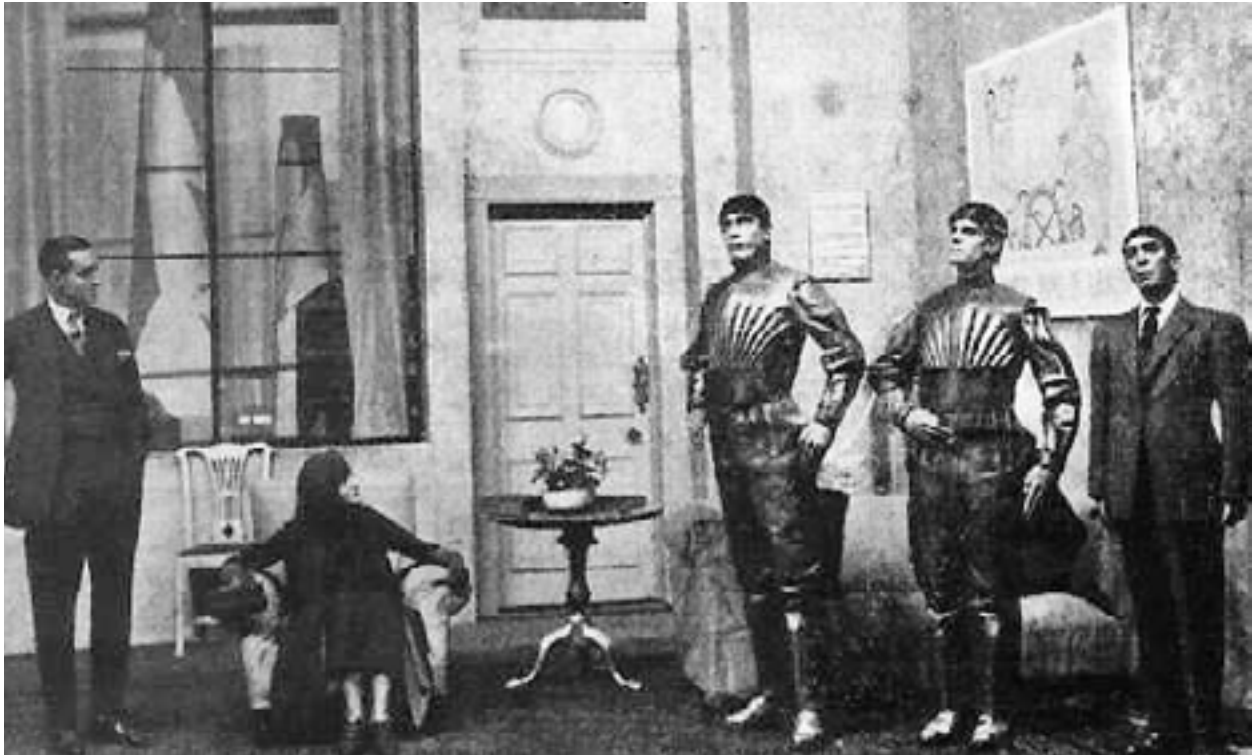


Figure 1. Robots as depicted in *Rossum's Universal Robots*

The play goes into many different themes that would later define a vast majority of literature regarding robots. The word roboti is similar to the word robota, which is Czech for “work”, so the obvious connection is that the robots are an artificial proletariat. As the play goes on, the robots revolt and the humans are systematically killed until only one is left. The human character Alquist is left alive because he is a bricklayer who works with his hands, which is an occupa-

10 Čapek, Karel, Paul Selver, and Nigel Playfair. *R.U.R. (Rossum's Universal Robots): A Fantastic Melodrama in Three Acts and an Epilogue*. New York: Samuel French, 1923. Print. Prologue

tion the robots find solidarity with. The robots leave him alive and he is forced into dissecting one to learn how they work and are made, as the secrets died with the creator of the robots. As Alquist begins the dissection he quickly becomes horrified by the prospect of cutting into what he believes to be a living thing. After seeing the range of pain and emotion that the robots can feel he realizes that aside from the improvements that have been made, they are no different than humans.¹¹ He proclaims that two robots who are in love are Adam and Eve and that even with humans dead, life “will not perish”.¹²

Through a 1923 translation by Paul Selver, the word *roboti* became *robot* and was put on for English speaking audiences soon after. The play was a hit, and soon the word *robot* entered the common lexicon. The first usage of the word after its translation was in 1925, in the novel *City of No Escape* by T.C. Bridges. From there *robot* became the catchall word, and would be seen in later publications such as Isaac Asimov’s *I, Robot*, television shows such as *The Twilight Zone*, and films such as *Metropolitan*. Of note is that for a time, the pronunciation for many people of “robot” was “robit”, as can be heard, for example, in the episode “The Lonely” of *The Twilight Zone*¹³ or in interviews with Isaac Asimov.¹⁴

Since the coining of the word “robot”, robots have become more and more common in society. Robots are now found building cars, acting as toys, and even cooking food. When a person is working hard, they are described as “robotic”. Just as it was envisioned by Capek, “robot” has continued to be closely intertwined with “work” even almost a century later.

11 This becomes a common theme in relation to robots, as seen in *Blade Runner* and *Do Androids Dream of Electric Sheep?*.

12 Čapek, *R.U.R. (Rossum’s Universal Robots): A Fantastic Melodrama in Three Acts and an Epilogue*, Act 3

13 “The Lonely”, *Twilight Zone*, Rod Sterling, November 13, 1959

14 “Interview with Isaac Asimov” <https://www.youtube.com/watch?v=4gn3MyTE80A>

Cryogenics

When Rip Van Winkle fell asleep in the Catskills mountain range, he did something that has fascinated people for centuries: he “fast-forwarded”. He skipped ahead in time until he was firmly in the future. But while Rip van Winkle was enchanted asleep by ghostly sailors, in science fiction, the usual source of this long sleep is freezing. Cryogenics as a way of time travel has been featured in all kinds of science fiction, from its earliest appearances in Edmund About’s *The Man with the Broken Ear* to Robert Heinlein’s *The Door into Summer* all the way to the popular TV show *Futurama*. And as much as cryogenics has graced the pages and television screens of science fiction, it has also begun to show signs of becoming a reality, weak as those signs may be.

The first idea of “cold sleep”, being frozen for a period of time to preserve the body and mind, essentially falling asleep at one time and waking up many years in the future, was presented in *The Man with the Broken Ear* (1862) by Edmund About. The eponymous man with a broken ear is one Colonel Fougas, who was captured by Germans during the Napoleonic War, but during his captivity he falls into “that profound and lethargic sleep which is superinduced by intense cold”¹⁵ on a freezing November night. Due to this sort of coma, a professor sees an opportunity to study preservation of a body and purchases the Colonel’s body, the Germans seeing it as a corpse for all intents and purposes. The professor takes the Colonel to his laboratory where, over a period of time, he desiccates him. Time passes and the professor dies and leaves the body to his nephew, who takes up the mantle of resuscitating the Colonel. To counteract the mixture of freezing and desiccation, the Colonel is placed in a bathroom, where heat and humidity slowly brings functionality back to his organs. He is placed in a warm bath multiple times, his head is

15 About, Edmond. *The Man with the Broken Ear*. New York: Arno, 1975. Print. 32

massaged, and upon compressions of his chest, the Colonel awakes crying “Vive l’Empereur”.¹⁶ The Colonel had been frozen and desiccated in 1813 and is unfrozen and awoken in 1859, still at the physical age of 24.

The first time the word “cold sleep” was used was by Robert Heinlein in *The Door into Summer* (1957). In it, the main character opts to do the cold sleep, falling asleep in the 70’s and waking up in the year 2000. The process is treated much more like a business, where the company that performs the process is an insurance company. The main character essentially lets them invest his money for him so that when he wakes up he has, ideally, more money than he fell asleep with. Due to the success rate of being frozen and then being woken up being around 70%, he also opts into a survivor pool, where if he wakes up and survives, he gets a chunk of the pool. Unfortunately, when he is woken up, his insurance company has gone bankrupt, and as a result, so has he.

While the fiscal ramifications of a process like cryogenics is addressed in *The Door into Summer*, it also hinges on being operated by a corporation. In the world today, the loudest voice in cryogenics is the American Cryonics Society (ACS), a nonprofit organization that is “dedicated to furthering research and education into cryobiology”.¹⁷ Inspired by Robert Ettinger’s 1964 book *The Prospect of Immortality*, organizations like the ACS have started up as a way to cryogenically preserve clients. Due to the fledgling nature of the field, these organizations do not perform thawings, as the knowledge for such a procedure does not exist. It is possible to suspend animation on a person’s body, but there is no way to resume it as of yet.

16 About. *The Man with the Broken Ear*. 76

17 “American Cryonics Society - Human Cryopreservation Services for the 21st Century.” American Cryonics Society - Human Cryopreservation Services for the 21st Century. Web. 02 Mar. 2016.

Hoverboard

Captivating the imagination of generations since Marty McFly escaped a group of bullies on a hovering skateboard, the hoverboard has been a staple of science fiction, a tool and plaything for the futuristic, edgy skateboarder. But what was originally envisioned as a skateboard without wheels or a snowboard without snow, has come to be associated with something a little bit different. The end result is that there are hoverboards in the world today, but they probably would not have been able to help Marty McFly beat the bullies.

The first usage of a hoverboard, both as a word and as a concept, is in the film *Back to the Future Part 2* (1989). In it, protagonist Marty McFly travels 30 years in the future to the year 2015. After a heated exchange with the descendant of a notorious bully, McFly has to escape from the bully and his posse. McFly was a proficient skateboarder in his time, so after a bit of adjusting, he uses a hovering skateboard without wheels to get away. Since the bullies chasing him on hoverboards of their own, it seems that this technology is commonplace.

The history of machines capable of hovering above the ground goes back to the 1960s. The original hovering machine was the ionocraft, which uses a concept known as EHD, or ElectroHydroDynamic thrust. The ionocraft uses EHD to generate a small ionic, or electric, wind, which levitates the lightweight craft. This levitation is possible because the ionocraft is small, generally no longer than 3-4 feet on any given side, and light. The ionic wind is not very strong, and cannot lift much more than a few grams,.

On the other end of the size spectrum are hovercraft, the large amphibious vehicles with an inflatable skirt. These operate much like a fan-boat mixed with a large scale ionocraft. They hover by blowing air under the hull, which increases air pressure to a higher level than outside. This disparity causes the craft to hover above the surface beneath it. Then a large fan on the

back of the craft allows for forward velocity, allowing the craft to operate much like a boat while still being able to seamlessly transition from water to land travel. Hovercraft are large by necessity though, as they require high power fans to create lift and velocity. Even the smallest hovercrafts are about as big as a Boston Whaler or a large dinghy. At this point the major limitation in regards to skateboard-sized hovering vehicles is that the vehicles are either too small and incapable of supporting a human, or are too large to ever be small enough to be considered a “board”. But hoverboards do exist, they just have not quite reached the same level as was seen in Back to the Future.

Scooter-boards (Figure 2¹⁸) have begun to take on the moniker of hoverboard despite not actually hovering. Rather, they move along the ground on wheels, with the operator pushing forward, backward, or to the side to steer. They are self-propelled and very maneuverable, and can reach maximum speeds of around 6 miles



Figure 2. A scooter-board, colloquially called a hoverboard

per hour¹⁹, compared to the average human walking speed of about 3 miles per hour.²⁰ “Hoverboard” is just a colloquial name for the vehicles, with “self-balancing electric scooter” or “self-balancing two-wheeled board” being more technical, and correct, names.

But not all hope is lost, as hoverboards in the traditional sense are still being researched. In 2015, inventor Catalin Alexandru Duru entered his personal hoverboard invention to the

18 “RioRand Two Wheels Smart Self Balancing Scooters Drifting Board Electric Personal Transporter-outdoor Sports Kids Adult Transporter with LED Light-White-Black.” - Self Balancing Scooter. Web. 02 Mar. 2016.

19 RioRand - Self Balancing Scooter

20 http://www.westernite.org/datacollectionfund/2005/psu_ped_summary.pdf

Guinness Book of World Records for the world record in farthest flight by a hoverboard. The challenge they presented him was to fly a full 50 meters in the air without crashing.²¹

Duru rose to the challenge and, at a height of 5 meters above the surface of Canada's Lake Ouareau, he managed to fly a distance of 275.9 meters before setting down in the water.²² The hoverboard design is essentially four downward-facing fans mounted on a frame shaped like an "H". According to the inventor:

“The Omni Hoverboard features eight propellers and a frame made from carbon fibre. The motors controlling the propellers are powered by 12 lithium polymer batteries, which generate around 40 horsepower, but sadly, this currently generates a combined flying time of only 1.5 minutes.”

As has been noted with the ionocraft, energy is currently the biggest obstacle for hoverboards. The amount of energy required to lift a human is too much for any battery small enough to be unobtrusive on the device, and even those that can handle it cannot last for very long. Until batteries have progressed to a level of energy storage large enough for sustained flight, hoverboards as a method of transportation for longer than 275 meters will have to stay grounded.

21 “Omni Hoverboard: Canadian Inventor Still Refining His Guinness Record-breaking Flying Propeller Device.” International Business Times RSS. 16 Oct. 2015. Web. 02 Mar. 2016.

22 <http://www.guinnessworldrecords.com/news/2015/5/video-watch-incredible-footage-of-farthest-flight-by-a-hoverboard-record-set-by-379420>

Cyberspace

With each passing year, the rise of virtual reality machines, and new ways to interface with the Internet, people exist partially the World Wide Web. As the Internet became an integral part of everyday life, the concept of a much more literal existence did too. The first usage of “cyberspace” was not in relation to the internet though, with William Gibson being the first to connect the idea of a more concrete space with the capabilities of the internet.

The first usage of the word “cyberspace” was by Atelier Cyberspace in 1968, an art group consisting of Susanne Ussing and Carsten Hoff in a painting by Ussing appropriately titled *Cyberspace* (Figure 3²³). The two had been inspired by the science of cybernetics, a growing science in the post-WWII period. Their art did not utilize the internet-based, abstract simulation cyberspace as it has come to be known as, instead, their cyberspace is a much more concrete, architectural space.

The art does not use computers, as at the time computers were not capable of much more than dry computations, much less communication or the building of a personal space. Instead their art uses “a number of words that serve to describe the project: system, randomness, repetition, consciousness, nature...”²⁴ These terms, while technological, are not at all similar to the techno-jargon filled cyberspace that would come about in *Neuromancer*.

For a while the term “cyberspace” had no associations with a truly “cyber” space as



Figure 3. Cyberspace by Susanne Ussing (1968)

23 Susanne Ussing, *Cyberspace*, 1968–70, collages, dry transfers and photolithography.

24 “The (Re)invention of Cyberspace.” *Kunstkrikk The Reinvention of Cyberspace Comments*. Web. 02 Mar. 2016.

it were, until William Gibson began publishing short stories set in a virtual world accessible through computers. The original story that introduced the word “cyberspace” was *Burning Chrome* (1982), set in the same universe as *Neuromancer* and the rest of the Sprawl series. “[I]t looked like your workaday Ono-Sendai VII, the ‘Cyberspace Seven,’ but I’d rebuilt it so many times that you’d have had a hard time finding a square millimeter of factory circuitry in all that silicon.”²⁵

The original cyberspace in this story was much more abstract and informed by computer graphics at the time. “The matrix is an abstract representation of the relationships between data systems.”²⁶ As such, the visuals of such a space are more vague than they have become recently. There are no reconstructions of the real world. Instead there are many references to walls of “shadow” and “ice”. These walls are designed to keep programmers from seeing the rest of the cyberspace, almost as if they are inside cubicles of code. In more recent years, depictions of cyberspace, such as in *The Matrix* or *Ready Player One* are closer to full-on simulations, capable of simulating entire planets, cities, and people.

In regards to a simulated cyberspace that better reflects the depicted world, we can look at video games. Massively Multiplayer Online (MMO) games are microcosmic cyberspaces all their own. Simulated game worlds offer a lot of the basic aspects of a smaller, contained society. A number of these worlds, such as *Ultima Online*, *Star Wars Galaxies*, or *World of Warcraft*, have player-based economies, where resources and goods come from other people, and not from Non-player characters (NPCs), and this means that players have to interact to engage in trades or sales. Supply exists, as does demand, and some games also offer player housing or even governing bodies that consist of players. It is quite possible to engage in the simulated cyberspace made within these games without ever having to fight monsters, storm dungeons, or fulfill quests.

25 Gibson, William. *Burning Chrome*. New York: HarperCollins, 2003. Print. 11

26 Gibson, *Burning Chrome*. 24

For a pseudo-realistic cyberspace, we can look at Second Life. Developed by Linden Lab, Second Life is more of a simulated world than an actual video game. Users create virtual avatars within the game and then interact with the world therein. The world is entirely user-created and over the course of more than a decade the world of Second Life has become populated with a massive array of locations covering a wide range of themes from cyberpunk noir cityscapes to arcadian groves to massive gladiatorial arenas. In addition, the Maldives, Sweden, Estonia, Albania, Serbia, Colombia, Macedonia, and the Philippines have all opened embassy buildings inside the virtual world. These embassies acted as a mixture of online offices where people could get information regarding visas and other documents related to the country, and a promotional tool for travel to the country.

The main difference between the more game-like MMOs and Second Life is that the entire point of Second Life is to create a simulated world, and not to make a game, per se. Since so much of SL is player-generated, it truly feels like a lived-in world, because there is nothing that was added with the intention of furthering a simulation, everything has been created by players for a reason. These reasons can be anything, really, since the game offers the freedom to engage in the mundane or the spectacular. An avatar can fly, or they can go to the mall. As strange as that dichotomy sounds, it all suggests that this is a world of almost pure freedom, where anything can happen.

Perhaps video games were the catalyst behind this way of thinking that changed from abstract spaces to simulated ones. The whole point of a cyberspace has been to enhance space by making it something smaller and customizable by its residents. Rather than just being a place that people go to that creates a representation of an abstract concept like computer systems, cyberspace has evolved to be a representation of the human imagination and its limitless potential. In this way, the graphics and the politics of cyberspace have changed almost as dramatically as the

graphics of computers over the years, and the space inside the pages of *Burning Chrome* seems much closer to the space that once adorned art gallery walls than the one that we see now.

Cyberpunk

In the late 1980s a new subgenre of science fiction referred to as “cyberpunk” began to take shape. Historically described as “high tech, low life”, the cyberpunk genre was based on the idea of rapid technological advancement in many different fields. Rather than some older science fiction that goes into great detail about one specific advancement or technology or societal shift, cyberpunk is based around many. As described by on cyberpunk fan, “The future isn’t ‘just one damn thing after another,’ it’s every damn thing all at the same time. Cyberpunk not only realized this truth, but embraced it. To paraphrase Chairman Bruce, cyberpunk carried technological extrapolation into the fabric of everyday life.”²⁷

Into that everyday life, cyberpunk found itself gaining relevancy throughout the 90s and early 00s as computers and the Internet connected the world and became omnipresent. “...[I]f postmodernism is the cultural logic of late capitalism, then this places cyberpunk as central to the understanding of the period”.²⁸ The future depicted by cyberpunk is not necessarily dystopian or utopian²⁹, it simply exists to provide a more accurate and realistic mirror to present society. Thus, any dystopian or utopian elements of a cyberpunk society would be natural extensions or exaggerations of those same elements as could be found in our society.

The origin of cyberpunk can be traced back to the 80s, with the general consensus that William Gibson was the architect of it. Having already made forays into this networked world where technology allowed for both a rise in governmental powers and a movement against

27 “What Is Cyberpunk? | Neon Dystopia.” Neon Dystopia. Web. 02 Mar. 2016.

28 James, Edward, and Farah Mendlesohn. *The Cambridge Companion to Science Fiction*. Cambridge: Cambridge UP, 2003. Print.

29 “Dystopian” and “Utopian” refer to two societal theories where either society has become frightening and generally unlivable (dystopia, translating to literally mean “not-good place”, originally coined by John Stuart Mill as an antonym of utopia) or society has become very desirable, or even near-perfect (utopia, as introduced by Sir Thomas More in the eponymous book *Utopia*)

them, Gibson released what most consider his seminal work, *Neuromancer*, in 1984. Two years earlier, the film *Blade Runner* was released, an adaptation of Philip K. Dick's novel *Do Androids Dream of Electric Sheep?*. *Blade Runner* puts on film a large amount of the visual palette that Gibson attempted to create in his book, to the point that while writing, Gibson saw the film and felt that he would seem derivative. "When I saw (the first twenty minutes of) *Blade Runner*, I figured my unfinished first novel was sunk, done for. Everyone would assume I'd copped my visual texture from this astonishingly fine-looking film."³⁰

While *Blade Runner* did utilize many elements that would later become synonymous with the overall look and feel of cyberpunk, it was still hampered by a lack of prescience regarding the power and culture that would come from an interconnected world, which perhaps kept it from being as relevant when the Internet entered the cultural zeitgeist in the succeeding years. Cyberpunk would make the Internet and all the possible interactions and danger therein a vital part of its general milieu. Later books in the genre such as *Snow Crash* or *Islands in the Net* would make greater use of this. Since those early books, cyberpunk has become something more analogous to a philosophical movement, while still retaining its literary heritage.

As a philosophical movement, cyberpunk is based on the idea of a world where the social, financial, and technological divide has become so egregious that clear delimiters of class and status appear. The casteless in this "cyber" society become the "punks". This sets up the cyberpunk philosophy of engaging with technology at almost all times, and using it to be subversive, however that means to the individual. The argument that society now allows for cyberpunk can then be easily shown, as anyone with knowledge of hacking or computer science can live a subversive life with authorities that are more and more discovering the benefits of technology.

Whether one thinks that technology is beneficial or harmful to society is all up to the individual.

30 "http://www.williamgibsonbooks.com/archive/2003_01_17_archive.asp" William Gibson. Web. 02 Mar. 2016.

Steampunk

Steampunk became a viable alternative form of science fiction or fantasy with a matching social conscience but without the high tech of Cyberpunk. If Cyberpunk is a step forward into a technologically advanced future, then Steampunk is a step backwards into a technologically advanced past. Steampunk is generally exemplified by its Victorian style, as exemplified by elaborate outfits, corsets, and steam power, transposed onto fashion, technology, and architecture (Figure 4). The technology tends to be intricate clockwork creations, frequently using steam or pneumatics. The themes of Steampunk are also those found in Cyberpunk, with a large amount of anti-authoritarian and subversive elements. Authority figures are often antagonists, and protagonists tend to be lower class workers with a gift for invention. Steampunk books had been written far before the term Steampunk was coined.



Figure 4. An example of Steampunk fashion and technology

The earliest writers were Jules Verne and H.G. Wells, who often wrote about marvelous inventions, but since what we consider computers had not been invented at the time, the inventions detailed within their stories tended to be influenced by mechanical engineering, biology, or chemistry. The term Steampunk was not used until author K.W. Jeter wrote in to Locus magazine in 1987 about his book *Morlock Night* (1979), a sort of sequel to H.G. Wells' *The Time Machine*. "Personally, I think Victorian fantasies are going to be the next big thing, as long as we can come up with a fitting collective term for Powers, Blaylock and myself. Something based on the appropriate technology of the era; like 'steam-punks', perhaps."³¹ From there the genre took off and "steam-punks" became "Steampunk".

31 "What Is Steampunk." Gdfalksen.com. March 19, 2016. <http://www.gdfalksen.com/Steampunk>.

Genetic Engineering

Of all the terms studied in this thesis, “genetic engineering” may be the most surprising one to have come out of science fiction. Genetic engineering is the practice of artificially modifying genetics, thereby creating some sort of new genetic variant of something. This can be as innocuous as breeding plants and animals over generations, as is incredibly common in present society, all the way to creating new combinations and mutations of creatures, plants, or people, as is often seen in science fiction. The end result is always a new version of an existing organism, just changed in big or small ways.

Strange combinations of creatures have long existed in legends and myths. The chimera of Greek mythology, often described as a lion with a goat head and a snake head for a tail, has even become a term used in genetics for a creature composed of two genetically different types of cells, an example being if a creature has more than one blood type or has male and female organs.

Fast-forwarding to the 19th century, we begin to see this sort of genetic manipulation through science becoming a theme in literature. Since genetics was a young science at the time, with the major breakthroughs being performed by Gregor Mendel and his pea plants. In literature, since genetics was essentially unheard of, the closest approximation could be found in more vague terms. In *The Island of Dr. Moreau* (1896), the creation of hybrid creatures is the result of vivisection and judicious stitching. The hybrids are the result of what amounts to taking a bit of one animal, a bit of another, and then physically attaching them. As such, while the Beast-folk that Dr. Moreau creates attempt to act human, this involves repeated and conscious shunning of their animalistic instincts. While not being genetic engineering in the scientific sense, *The Island*

of *Dr. Moreau*, through these themes, explores what would become common themes in science fiction about hybridization and artificial creations.

With genetic engineering still considered a non-scientific type of engineering, another thematically similar book is Mary Shelley's *Frankenstein* (1818). While the Monster created by Dr. Frankenstein was not genetically engineered, he is a composite being, having been stitched together from different humans. While *Dr. Moreau* explores the desire to not give into animalistic instincts, to reject the heritage before being changed, *Frankenstein* is much more morally ambiguous. The Monster at first attempts to embrace its human heritage, attempting to learn as much as it can about the culture before finally attempting to bond with a person. The failure of that act causes the Monster to then reject those human customs and, as it could be argued, transcend to follow rules that are more applicable to an artificial creation such as itself.

Of course, these two novels were written before genetics had become an established and well-known field of study. The first mention of true genetic engineering and not just physical alteration and hybridization can be found in Aldous Huxley's *Brave New World* (1932). The engineering there is similar to eugenics, and is tied closely to a caste system. It is not as much focused on DNA being manipulated by science, but by idealized reproduction. Eugenics is a philosophy with some similarities to genetic engineering, but it works on a slower, generational scale, with an emphasis not on artificially changing DNA but instead artificially "breeding" for ideal qualities.

The themes originally explored in *The Island of Dr. Moreau* soon began to fuse with the burgeoning science of genetics. In Stanley Weinbaum's *Proteus Island* (1936), features another island filled with creatures modified in strange and alien ways. But this time, the animals are more of mutants than vivisected hybrids. The story follows Alan Carver, a zoologist on an expedition into the Polynesian islands. His Maori guides take him to a deserted island, Austin Island,

but quickly the strangeness of the island and its flora and fauna spook his guides, leaving Carver stranded with strange creatures. Bats with abnormally long tails and wolves with features likened to gorillas or humans are just some examples, and the key aspect of all of this is that no flora or fauna are alike. Each wolf has a different way of moving, or has a different set of hind or fore legs, which is deemed naturally impossible due to the small size of the island and the essential need for inbreeding, which should not allow for such a genetic variance. After meeting a human woman on the island, Carver explores and finds the remnants of another scientist's work. The scientist had been working on what is referred to in the novel as "synthetic evolution", designed to change the genetics enough to allow for genetic variance to occur in every generation. This creates an large variance of species, and the only genetic engineering that occurs involves starting the original synthetic evolution.

The actual coinage of the term "genetic engineering" and its first usage can be found in Jack Williamson's *Dragon's Island* (1951). The novel follows Dane Belfast, a geneticist who is in the midst of studying genetic mutations and the secrets therein. He has failed in every opportunity to actually perform genetic engineering, and he is almost bankrupt when he finds a series of letters from a great scientist and old friend of his father. Those letters contain the secrets to the beginnings of genetic mutations --or so he believes. As written in the novel, "He had been ready to give up, himself, before he found the old letters in his father's desk. Letters from Charles Kendrick — written in the 1930s by that pioneer geneticist, about his daring plans for the great new science he called genetic engineering."³² Belfast is soon contacted by two diametrically opposed agents who claim that there is a war going on between genetically modified superhumans and unmodified humans. This is all a product of genetic engineering run rampant. Of course, the genetic engineering present in books like *Proteus Island* and *Dragon's Island* is a little further along than the engineering we see in the present day, but genetic engineering is quite real. Essentially there is low-level and high-level genetic engineering. Low-level engineering has existed for centuries and is closer to sort of adjusting natural selection and evolution. This is found in practices such as breeding and domestication. Breeding animals and plants throughout generations to embody

32 Williamson, Jack. *Dragon's Island*. New York: Simon and Schuster, 1951. Print. 11

advantageous traits is natural selection, but through a bit of interference and correction it can become artificial selection.

High-level engineering is closer to science fiction. That involves going down to the genetic level and affecting changes that will occur much much faster, essentially speeding up evolution. This type of engineering is most often found in plants. GMOs are examples of genetically altered plants, changed at the DNA level to give them advantages that would have taken generations of evolution. An example is in corn that is modified to be resistant to a certain disease or parasite. Resistant DNA is inserted into the corn and it is allowed to reproduce until the majority of corn in a field is resistant. It may take a couple generations but it is much, much faster than natural methods that would take many generations to begin to show signs of change. This engineering is not limited to plants though, and small breakthroughs have been made in genetically modified animals. These can range from functional changes, like featherless chickens, to purely aesthetic changes, like glow-in-the-dark cats, among others (Figure 5^{33 34}). These advances will perhaps someday lead to incredible mutations as seen in media such as the apes in the new *Planet of the Apes* movies, or even the dinosaurs from *Jurassic Park*.



Figure 5. A featherless chicken and a glow-in-the-dark cat

33 Cahaner, A., J. A. Ajuh, M. Siegmund-Schultze, Y. Azoulay, S. Druyan, and A. Valle Zárate. 2008. Effects of the genetically reduced feather coverage in naked neck and featherless broilers on their performance under hot conditions. *Poult. Sci.* 87:2517-2527.

34 https://www.researchgate.net/publication/5842961_Generation_of_Cloned_Transgenic_Cats_Expressing_Red_Fluorescence_Protein

Death Ray

A classic of the science fiction format, the death ray is very popular as a way to provide an easy to understand threat without having to go too heavily into the actual mechanics of the device. It offers a dangerous tool that needs little explanation. It kills things, and that is all that is needed to know.

Death rays are difficult to classify when not being referred to as death rays. Realistically, anything that uses beams of light or particle beams to kill something can be a death ray. Perhaps one of the earliest examples of a death ray can be found in H.G. Wells' *The War of the Worlds* (1897). The Martian machines fire what Wells calls a "heat-ray". This is a death ray with a slightly different name and explanation. The ray sweeps over people and causes them to combust, and then soon die.

Not long after *The War of the Worlds*, the first naming of a death ray appeared in literature, in George Griffith's *The World Masters* (1903). Following an inventor who holds a grudge against Germany for annexing Alsace-Lorraine in the late 1800s, he builds the ray as a way to get the territory back for France, but after France refuses to see his invention, he leaves the instructions in a locked box and commits suicide. The invention falls into the hands of a scientist who moves it to an island on the northern coast of Canada, where its efficacy and power makes the scientist and his ray the singular world superpower. The death ray included in the book is an evolution of the heat ray, in that it disintegrates those people that it touches. "For an instant, two of the most beautiful countenances in Europe were transformed into living skulls, which grinned out in unspeakable hideousness. Then their clothing shrivelled up into tinder, and all three dropped together in an indistinguishable heap of crumbling bones."³⁵ The ray notably was not even designed to be a death ray. In the prologue, the inventor meant for it to be able to make

35 Griffith, George. *The World Masters*. <http://www.gutenberg.org/files/38028/38028-h/38028-h.htm>. Web 15 Mar, 2016

metal incredibly fragile and break easily. The effect it has on living things is just a side effect that is used with great success in the climactic battle scene of the book.

From there, “death ray” becomes widely used to describe any sort of ray weapon that kills instantly. Indeed, in later analyses of *The War of the Worlds* scholars and readers often call the heat-ray a death ray. Death rays are soon found in a range of sizes from small laser guns to rifles to artillery sized beam weapons all the way up to the death ray employed by the Death Star in *Star Wars*, the Death Star being so large as to be confused for a moon. No matter what the size the effect is always the same, and the simplicity and non-ambiguity of the death ray is likely what has lead to its continued and sustained use in science fiction, and to its interest by writers of all genres and by real life inventors.

A subcategory of death rays are phasers. “Set phasers to stun”, the oft-said quote that is usually attributed to *Star Trek*, refers to the guns that the Galactic Federation uses that are capable of being switched between lethal and nonlethal settings. Phaser are described as particle weapons, essentially laser guns, and in *Star Trek* they come in a wide variety of designs ranging from handheld sidearms, to rifles, to ship-mounted cannons. Because it is a particle-based weapon, it can be adjusted to range anywhere from a light pinprick to a full on lethal beam (Figure 6³⁶).

Unique to *Star Trek*, the etymology of the phaser has been claimed to be a portmanteau of the words “photon” and “maser”,³⁷ with the capabilities of lasers not being widely known at the time of the series premiering in 1966. Masers had been explored and experimented with since the early 50s, and their capabilities were well-known. The technology behind phasers was described in the book *The Making of Star Trek* as involving a pulsating beam that uses that pulse to increase its strength as needed; the more pulsing, the more power.

The phaser is the first real example of a semi-explained laser weapon, and since it showed up on the small screen on *Star Trek* it has captured the imagination of more than just Trekkies.

36 “Atalskes Phaser IV.” Memory Beta, Non-canon Star Trek Wiki. March 16, 2016. http://memory-beta.wikia.com/wiki/Atalskes_phaser_IV.

37 Cushman, Marc, and Susan Osborn. *These Are the Voyages*. Print. 40



Figure 6. A diagram of a phaser

The U.S. military has been working on phaser weapons for years now. In an interview for National Defense Magazine in 2002, Marine Col. George P. Fenton spoke about possible pulsating energy weapons currently being worked on.

“Another interesting weapon, Fenton said, is called a pulsed-energy projectile. ‘It’s the closest thing we have right now to the phasers on the television series ‘Star Trek,’” he said. ‘Remember how Capt. Kirk was always saying ‘set your phasers on stun?’ The projectile works like that.’ The projectile’s charge—like that of a phaser—can be adjusted to produce a light shock, to stun or to kill,’ Fenton explained. ‘The good news is that it works,’ he said. ‘The bad news is that, right now, it weighs 500 pounds.’”³⁸

Since that interview there have been breakthroughs in that weaponry, though not quite

38 “U.S. Troops Find New Uses For Non-Lethal Weaponry.” U.S. Troops Find New Uses For Non-Lethal Weaponry. Web. 02 Mar. 2016.

enough to build rifles or sidearms. The phaser being constructed by the military is operable though, despite the program being canceled for a time. Their phaser has found new life as an efficient and automated way to shoot down unmanned drones, though it is still in production.³⁹ Phasers may be a real world creation, maybe even within the next few years, but for now it sounds like the only thing it will be set to is “drone”.

39 http://www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/03_RDT_and_E/Vol_5_Other_Defense_Agencies/SOCOM%20PB09%20RDTE.pdf

Hive-Mind

In a world filled with people who seemingly do not think for themselves, it can be easy for pundits or social critiques to use the term “hive-mind”. It carries a weight with it that immediately brings to mind drones serving a singular purpose or mobs of people held in thrall to one effervescent personality. A hive-mind was once used to refer to a sort of gestalt community, one where all needs were communicated by a queen, a leader, or the collective desires of the entire community and then disseminated to workers who would then carry out the job. Hive-minds could be anything from bee hives to brainwashed humans, but they shared one thing: they all were beholden to the greater good of their own community.

Hive-mind creatures, perhaps due in part to how utterly alien the idea of a gestalt consciousness can be to humanity, are often the antagonists. In the first appearance of the term “hive-mind”, James Schmitz’s *The Second Night of Summer* (1950), the hive-mind creatures are the Halpa, described as being about six feet long and having the appearance of “a big, dark rag of leather”⁴⁰. This simplicity of form is described as helping to enable the collective consciousness that they share. “Their physical structure is believed to be quite simple... many very efficient life-forms aren’t physically complicated, you know... parasitical types, particularly. It’s pretty certain, too, that the Halpa have the hive-mind class of intelligence...”⁴¹ They go on to say that the nerve systems are just secondary reflex transmitters, which implies that the creatures not only are capable of sharing intelligence, but also sharing physical feelings. This theme is not always common in depictions of hive-minds, and some depictions are only “one way”, that is, they only allow for the leader of the hive to communicate with the subjects, and not vice versa.

Soon enough, the idea of a hive-mind became a common trope in the depictions of insectoid alien races. These depictions tend to set the hive-minds as above humanity in technological

40 Schmitz, James. *The Second Night of Summer*. http://www.baen.com/Chapters/0671318470/0671318470__3.htm. Web. 13 Mar, 2016

41 Schmitz, James. *The Second Night of Summer*. Web. 13 Mar, 2016

scale, as they are capable of working more efficiently and effectively due to the lack of miscommunication and the speed of information transfer. Examples include the Bugs from Robert Heinlein's *Starship Troopers*, the Borg from *Star Trek*, and the Formics from Orson Scott Card's *Ender's Game*. Generally antagonistic, these caste societies tend to be defeated when the leaders of queens are killed, as the drones no longer have anything to take orders from. If the collective is similar to the Halpa, where feelings can be transmitted, then many drones may just immediately die from the shock.

Hive-mind capabilities are also becoming a common trope in depictions of robots. This is, at the moment, the closest society has gotten to an actual hive-mind. The Internet, being a form of collected intelligence that is accessible to anyone with the, now almost basic, tools to access it, has made the concept of robots taking orders all at once, or humans being able to be controlled through the internet, appealing to science fiction authors. Again, the Borg from *Star Trek* are an example, and the concept of "assimilation" is a common fear in hive-mind related fiction. Assimilation is the absorption, rarely consensual, into a hive mind, where the method of entry is often contingent on the collective. In *Star Trek*, the Borg inject "nanoprobes" into their victims, which then allows the collective to take over the victim's mind. The Pod People from *Invasion of the Body Snatchers* (1956) is another example of hive mind assimilation. A pod is created that grows an exact alien replica of a human. Once the replica emerges, the original human disappears and the Pod Person takes their place.

Hive-minds in reality are not quite as extensively capable of communicating so many things, and the mechanics in which they work are far simpler. Bees are the most common example of a hive-mind, with the worker bees carrying out orders from the queen bee. Pheromones (smells) allow bee colonies to communicate effectively with each other. There are different smells that indicate things such as which hive a bee belongs to, warning signals, or signalling

where a nectar source is. Dancing and trophallaxis (food-sharing) also allow for more direct communication between bees. Combined, this creates a system of constant background information (pheromones) combined with a system of direct communication (dancing and trophallaxis). It may not be a full hive-mind, but it is an effective system for bees that often precludes the need for any sort of communication, and it rests on the idea of the greater good for all members of the community.

Spaceship, Spacesuit, & Space Shuttle

This section will be covering the coinage of the terms “spaceship”, “space shuttle”, and “spacesuit”, all of which were words coined before the actual vessels and garments were produced. More broadly, this section will also look at the evolution of spaceflight in science-fiction, as it has seen a tremendous amount of change since the humble origins of shooting people out of cannons as a way of sending them to the moon.

Space has always fascinated humans, and literature regarding space travel goes back as far as ancient China. Legends tell of Wan Hu, an ancient Chinese scientist who attached a large number of rockets to a chair, sat in it, lit the rockets, and supposedly went to space. The legend states that after the liftoff, Wan Hu disappeared, but since he never returned, or was found, it is left to the apocryphal nature of legend to discern if Wan Hu actually went to space (unlikely) or met a terrible fate (likely).

For a time, when space flight began to gain traction in science fiction, rockets were not the preferred method of travel. In Jules Verne’s novel *From the Earth to the Moon* (1865), the intrepid astronauts (members of a local gun club) build a spaceship that is nothing more than a large bullet that is then shot out of a cannon at the moon. “Cannon” may be a bit of an understatement, as the barrel of is 900 feet long, 60 feet wide, and 6 feet thick. While this idea may sound far-fetched and unrealistic, the calculations regarding the potential size of such a cannon were fairly close to the figures that would be needed to perform an actual space launch. They were much smaller than reality, and the entire concept was dismissed in 1903 by Konstantin Tsiolkovsky, a Russian scientist who was one of, if not the, first scientists to study space travel and rocketry.

The first actual mention of a spaceship by name is in the book *A Journey in Other*

Worlds (1894) by John Jacob Astor IV, once known as among the richest men in the world, who perished in the sinking of the RMS Titanic. The book pivots around the fictional concept of “apergy”, that is, anti-gravity. Set a century in the future, in the year 2000, the book follows a group of explorers venturing through the worlds of Jupiter and Saturn. Rather than be massive gas-giants with no surface, Jupiter and Saturn are depicted as a dangerous jungle and a cold world of spirits, respectively. The space-ship itself is similar to Verne’s in shape only, described as a “short-stroke cylinder of large diameter, with a flat base and dome roof, composed of aluminum, or, still better, of glucinum or beryllium as it is sometimes called...” This quote is in answer to the previous question, “What sort of spaceship do you propose to have?”⁴² which is the first usage of the word “spaceship”.

There is a difference between a spaceship and a space shuttle, and 50 years after the first mention of the word “spaceship” but still almost 20 years before NASA would begin designing a reusable shuttle between Earth and space, the term “space shuttle” was first used in Wyman Guin’s short story, *Trigger Tide* (1950). The difference between a spaceship and a space shuttle is a bit like the difference between a car and a bus. A bus is a type of car, but its purpose is to deliver someone or something from one location to another, often just going between those two locations over and over again. While a spaceship could be a space shuttle, it could also be a warship, a racer, or fulfill any other role necessary.

The appearance of the “space shuttle” in *Trigger Tide* is very utilitarian, only appearing for a moment. This ties well into the nature of the story, where utility technologies such as a space shuttle are commonplace. The main character is an assassin who is meeting with his contact to learn more about his target. His contact has “gone native” on the planet where he resides and the main character takes a shuttle down to the planet’s surface to meet with him. “In fact [his

42 Astor, John Jacob. *A Journey in Other Worlds. A Romance of the Future*. New York: D. Appleton and, 1894. 34

having gone native] had not been visible a month ago when the pilot of my tiny space shuttle dropped me off in the dark at his cottage.”⁴³

Transportation was a large part of the story, and space shuttles joined the ranks of air cars and pneumatic elevators as a futuristic method of moving from place to place. The space shuttle since this has become very much a reality, though even the real space shuttle has ties to science fiction beyond the origin of the word. The first real space shuttle, the Space Shuttle Enterprise, was not originally called the Enterprise. The original naming plan was for the shuttle to be called the Constitution, and to be revealed on September 17, 1976, Constitution day, and the Bicentennial of the signing of the United States Constitution. However, due to the popularity of *Star Trek*, and the nature of the space shuttle, fans of the TV show (Trekkies) organized a letter-writing campaign to rename the shuttle to be the Enterprise. The White House saw the dedication of the Trekkies (calling them “one of the most dedicated constituencies in the country”⁴⁴) and chose to rename the shuttle to the Enterprise.

Once one has arrived in space, more protection than a spaceship is required. Once space had become a location in which one could set their science fiction story, spacesuits were necessary. At the time, while it was well-known that there was no breathable oxygen in space, the effects of a vacuum on the human body were unknown, since at the time nobody had ever actually gone into space. The idea of a spacesuit was primarily built around a mixture of providing necessary oxygen and as a result of the marriage of nautical terms to interstellar ships. This created a need for uniforms that provided a certain functionality, which made early depictions of spacesuits often look like diving suits.

The first depiction of a spacesuit can be found in *Edison's Conquest of Mars* (1898) by Garrett P. Serviss. A strange sort of sequel to H.G. Wells' *War of the Worlds*, *Edison's Conquest of Mars* follows a literary representation of Serviss, the author, and Thomas Edison as Edison invents spaceships and disintegration rays to lead the counterattack against Mars. Edison reverse

43 Conklin, Groff. *Omnibus of Science Fiction*. New York: Crown Publishers, 1952. 137

44 William F. Gorog to President Gerald Ford, September 3, 1976, Department of State, United States of America, “Naming the Space Shuttle”.

engineers the Martian's spacecrafts and weapons to create new versions of them, usable by humans, and soon leads an army to Mars itself. Due to the nature of the story, and the combative element, there are a number of mentions of a spacesuit being necessary to survive any emergencies while in space. "Mr. Edison had provided for this emergency by inventing an air-tight dress somewhat after the manner of a diver's suit, but of much larger material... by which wearing one could venture outside the ship even when it was beyond the atmosphere of the earth."⁴⁵ These are the prototypical spacesuits, and they show the knowledge of the time that there is no oxygen in space. There is an illustration in the original book of what the spacesuits looked like (Figure 7⁴⁶).



Figure 7. Spacesuits as depicted in Edison's Conquest of Mars

Spacesuits as seen in *Edison's Conquest of Mars* began to appear in other publications, but it wasn't until *Skylark of Space*, widely considered the first space opera, that the term "spacesuit" was coined. *Skylark of Space*, much like many of the other

works presented in this section, concerns a group of scientists and engineers who fly into space and visit strange and exotic planets. But what separates *Skylark* from its predecessors is the romance and intrigue in the plot.

Government scientist Richard Seaton accidentally discovers an element that can cause material to move faster than the speed of light. Seaton and his best friend, wealthy engineer Martin Crane immediately realize the power of this material and use it to build a spaceship.

⁴⁵ Serviss, Garrett Putman. *Edison's Conquest of Mars*. Los Angeles: Carcosa House, 1947. 36.

⁴⁶ Illus. GY Kaufmann, *Edison's Conquest of Mars*. 71.

But Seaton's colleague, Marc DuQuesne, with the assistance of the evil World Steel Corporation, steal the plans and some of the material along with Seaton's fiancée, Dorothy, and blast into space. Seaton and Crane take pursuit in their own spaceship, the Skylark, and eventually find DuQuesne, Dorothy, and another female captive stuck in orbit around a dead star. DuQuesne's spaceship has no fuel left so the three inside have to put on spacesuits to transfer from one ship to the other. "[DuQuesne] took a long drag at his cigarette, deposited the butt carefully in an ashtray, and put on his space-suit; leaving the faceplates open."⁴⁷



Figure 8. Spacesuits as depicted in *Skylark of Space*

These spacesuits only show up at this moment, and at no point when the crew makes excursions onto planets later in the book do they wear the spacesuits. Based on a cover for one of the issues of *Amazing Stories*, where *Skylark of Space* was originally serialized, the spacesuits looked like suits of armor with a spherical helmet with a clear faceplate (Figure 8⁴⁸). The spacesuit has since become a staple of science fiction, just as it is a staple of true sci-

47 Smith, E. E. *The Skylark of Space*. New York: Garland Pub., 1975. 67.

48 "Amazing Stories." Pulp Covers. April 3, 2016. <http://pulpcovers.com/tag/amazingstories/page/8/>.

ence in space. Incidentally, some of the original spacesuit designs that NASA considered for the Apollo program were similar in design and presumably material to the ones shown in Figure 8. It wasn't until Playtex submitted a bid for bulkier, cloth-based spacesuits that NASA chose suits with a focus on comfort and stability over the futuristic sheen of the original bid.

Mothership

Every good invading alien force needs a mothership, that is, some sort of command ship that tells the army what to do and, once blown up, cripples the entire force. The mothership is a staple of military science fiction, being an easy immediately recognizable target. Once the mothership goes down, the war is all over but for the crying. While not called motherships, the tradition of these massive mobile command units comes from a mixture of real life command stations, which have been a commonality among militaries for centuries, and the idea of a massive invading force of aliens from space. Some motherships are nothing more than a spaceship version of an aircraft carrier, and others, as briefly touched upon in the section on hive-minds, are where all of the most important leaders are.

Whether referred to as mobile command units, aircraft carriers, or a hub ship, the mothership has its conceptual origins dating back centuries. The original motherships were hubs for naval vessels, either military or commercial. Military capital ships and other flagships were often commanded by high-ranking officers, with the value of their presence being proportional to the firepower of the ship. Suffice to say that a capital ship of high value was also going to be capable of overpowering almost any other ship in the water, and often multiple ships at a time. Commercially, “factory ships” were common during whaling times as a mobile hub for smaller whaling ships to bring their product back to for processing rather than having to drag a whale all the way back to port. This could easily bring to mind the image one gets when hearing the word “mothership”: smaller ships being deployed from a much larger one, reporting back once they have fulfilled their personal mission.

The first occurrence of the word “mothership” can be found in John Campbell’s novella *The Black Star Passes* (1930). In the story, an alien race called the Nigrans invade the Solar

System, at this point with Venus comfortably colonized by Earth, to take its planets for their own. Earth and Venus, having an interplanetary alliance, fight back. A trio of scientists, Arcot, Morey, and Wade are called upon to lead the scientific front of the new interstellar war. As they plan the war fleet, they come up with the idea of having a carrier ship that holds smaller fighter ships. “They would need a fleet of mother ships—ships that would hold both the speedsters and their pilots—say thirty to a cruiser.”⁴⁹ This system of smaller ships deployed from a larger carrier ship helps the Solarians win the war and repulses the Nigran invaders.

The mothership as a carrier vessel is commonplace in the real world, as aircraft carriers are not only a reality, but are a common symbol of strength. Just as the carrier ships were a huge advantage for the Solarians in *The Black Star Passes*, so too are aircraft carriers a massive strategic resource. But as seen popularly in books like *Ender’s Game* and movies like *Independence Day*, motherships can be much much more than just a mobile troop deployment center. These kinds of motherships hold the leaders of the invading army and act as a command module. As is often the case, once this mothership is blown up, the army loses its ability to function, effectively ending the battle or war.

49 Campbell, John. *The Black Star Passes*. <http://www.gutenberg.org/files/20707/20707-h/20707-h.htm>

Parallel Universe

In fantasy, the question of “what if” is often answered through divination or fortune telling. In science fiction, that question of “what if” is often answered through parallel universes. Parallel universes exist in tandem with each other, often being similar with only a few key differences. This allows for a feeling of understanding how that world works even as the reader finds those key differences in how the world fundamentally operates. These differences can be as small as each coin flip ending on the opposite side it did in the original universe, or as large as evolutionary differences leading to non-human inhabitants. No matter what the differences, these universes remain parallel with ours.

The idea of multiple, similar universes dates back to ancient times. Plato, the Greek philosopher, expounded on his concept of heaven, and how it acts as a more pure parallel to Earth. Heaven is where souls go in between lives, to attempt to see pure truth. When those souls come back to Earth, in physical forms, they can only recollect a shadow of what they see. Plato supposes that those more creatively or philosophically minded (like artists or philosophers) are able to recall more than those who are more physically minded (like tyrants or soldiers). These two places, the physical Earth and the abstract heaven, are forms of parallel universes where there is little communication between the two aside from the shadows of pure truth that some souls carry with them on Earth.

This version of a parallel universe is very abstract. Parallel universes as they appear in science fiction today were perhaps first introduced in the satirical story *Flatland*. Written in 1884 as a satire on social hierarchies, *Flatland* involves parallel dimensions in a very literal sense. Beginning in the titular Flatland, A Square lives in two dimensions. After experiencing a vision of a one-dimensional world (Lineland), he is visited by A Sphere, from the three-dimensional Spaceland. Each of these dimensions are parallel to each other, and each refuses to believe in a dimension above theirs. The extreme of these is the inhabitant of the one-dimensional Pointland, who due to his singular presence (he is the point, and the only point in his universe), believes that

every thought and communication is his own, since he has never known anything more. These parallel universes refuse to acknowledge each other's existence, but they do not seem to have any similarities to a human universe. It was not until a few decades later, in 1923, that parallel universes in the more traditional sense appeared in H.G. Wells' *Men Like Gods*.

Following the exploits of a Mr. Barnstaple, *Men Like Gods* takes place initially in London before sending Barnstaple and a number of other people to another world referred to as Utopia. This Utopia is much like a very advanced version of our civilization, with only small changes, such as Jesus Christ dying on the wheel rather than the cross. The major differences in the worlds come from Utopia's advancements as a civilization. This parallel universe is different from our own in some fundamental ways, but it still has enough similarities to be recognizable as a variant of Earth. A member of Barnstaple's party, Mr. Burleigh, in an attempt to make sense of the Utopians initially explaining the concept of parallel universes says, "...we conceive ourselves to be living in a parallel universe to yours, on a planet the very brother of your own, indeed quite amazingly like yours, having regard to all the possible contrasts we might have found here."⁵⁰ This is the first instance of the term "parallel universe" in literature.

The idea of multiple similar yet different universes propagated through science fiction, but found a large conceptual home in comic books. Due in part to comic books dealing with a large cast of superheroes with easily recognizable and iconic powers and backstories, the idea of different universes with small similarities found an easy niche. The first instance of a parallel universe in comic books was in issue 123 of *The Flash* in 1961. In it, The Flash (Barry Allen) vibrates his molecules to such a speed that he is transported to a universe where the original Flash (Jay Garrick) is real, whereas in his universe, Jay Garrick's Flash is a fictional character. This introduced the concept of the Multiverse, which would become a key part of the DC comic book world. In each universe of the Multiverse there is a different version of each DC superhero.

The scientific theory of parallel universes has mainly been a part of one field of quantum physics. A theory on parallel universes is that if space is infinite, it is infinitely capable of physically containing parallel universes. In 2003, M.I.T. physicist Max Tegmark published an

50 Wells, H. G. *Men like Gods: A Novel*. New York: Macmillan Company, 1923. 23.

article in Scientific American where he posited that there are four levels of universes that create a multiverse. (Figure 9⁵¹). The first level is the previously mentioned idea that these universes, not necessarily “parallel” at this level, exist in infinite space. The second level is based on the idea that each universe is within a “bubble”, and these bubbles are propagating and moving away from each other at enormous speeds. Tegmark claims that a person could not travel to these universes even if they were to move at the speed of light, because “the space between our bubble and its neighbors is expanding faster than you could travel through it.”⁵²

At the third level, parallel universes are the result of quantum uncertainty; in the same way that Schrodinger’s cat can be considered, due to uncertainty, to be alive or dead until the box is opened, so too can multiple possible universes exist as a result of every choice made by a person being uncertain until the choice is made. Therefore, a new parallel universe is created every time a person makes a choice, with that universe containing the consequences of the opposing choice. The fourth level in some ways harkens back to Flatland in that the parallel universes are not constrained by laws of physics, or even the commonly considered laws of reason. The variance of these universes is much larger, and can encompass anything from a simple change of one choice, to being governed by an entirely different set of universal constants. These universes are perhaps the most abstract, as they can truly be anything. If time as a constant is different in one universe, it changes how everything in that universe operates. The same applies for gravitation, heat, or even entropy. These levels of parallel universes illustrate just how little is known on the subject at the moment, but also show that there is a possibility, slim as it might be, that somewhere out there is a world just like ours, save for one or two small differences.

51 “The Universes of Max Tegmark.” The Universes of Max Tegmark. April 19, 2016. <http://space.mit.edu/home/tegmark/crazy.html>.

52 Tegmark, Max “The Universes of Max Tegmark.”

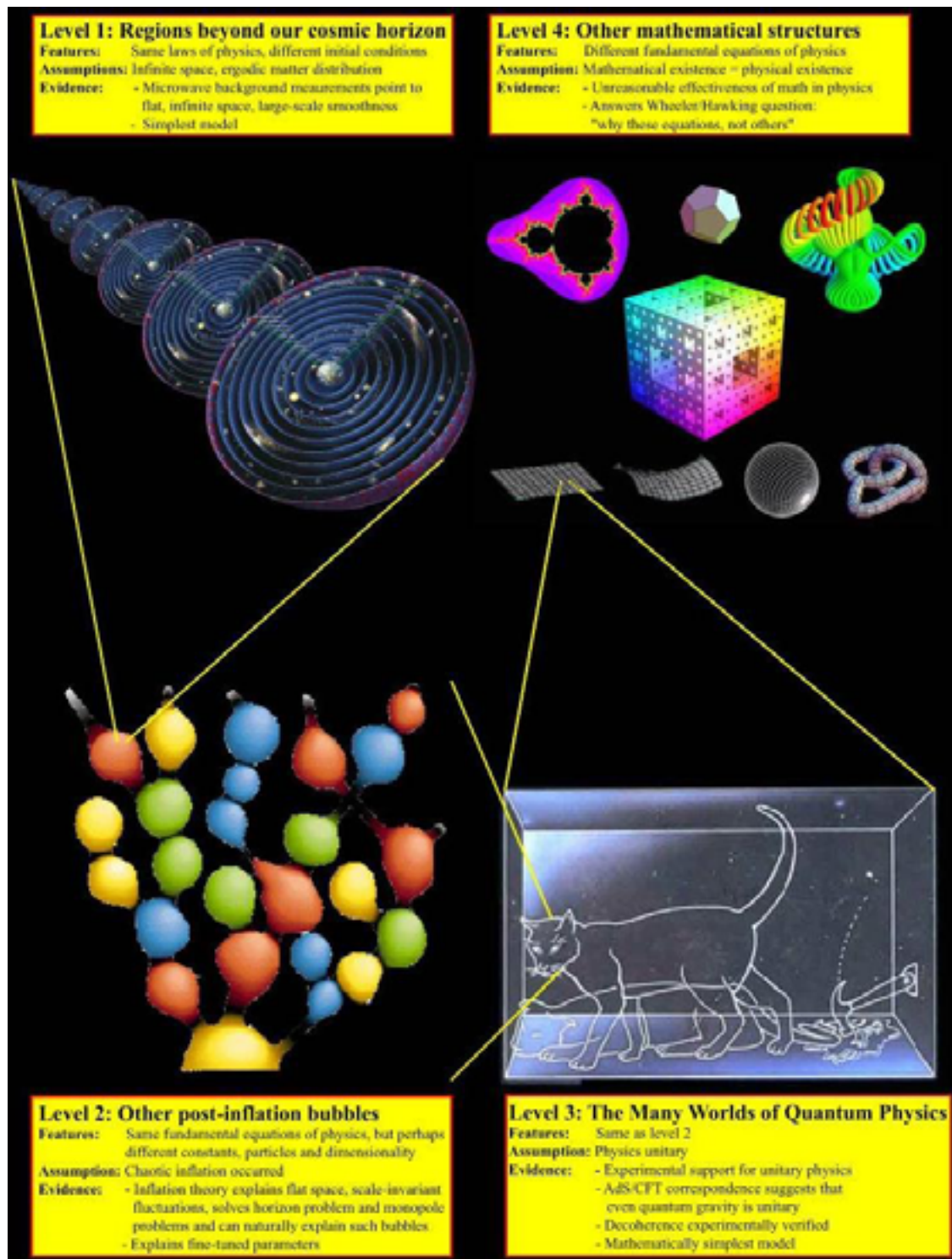


Figure 9. A diagram of the four levels of parallel universes

Teleportation

A more general version of beaming, teleportation is a classic trope of science fiction, fantasy, and depending on superstitions and anecdotes, real life. Instantaneous transportation from one place to another can be attributed to magic, science, or alien powers. As such, teleportation often fits into Clarke's Third Law: Any sufficiently advanced technology is indistinguishable from magic.

Much of teleportation in earlier times was a phenomenon associated with the supernatural, wherein one entity would be capable of disappearing in one place and reappearing in another. The supernatural and the scientific have spiraled around each other, as some references to teleportation involve it being an unexplained phenomena and others involve it being a scientific discovery. Many of the accounts of teleportation as a supernatural phenomenon can be found in the same place as the original coinage of the word: *Lo!* by Charles Fort. While this thesis focuses on words with science fictional origins, due to the somewhat unbelievable nature of Fort's claims, it straddles the line between reality and fantasy, and teleportation has gained a widespread connotation with science fiction rather than with strange happenings in small towns.

Charles Fort was a scholar of the supernatural, who wrote extensively of accounts of unexplained phenomena throughout history. *Lo!* is his most famous work, and it is where he presents an argument and explanation for how teleportation works. Much of his work is investigative, and it ties together a large breadth of reports and conjecture regarding supernatural occurrences. When he notices trends, he makes suppositions and possible explanations. For example, there is an account of a line of clothes in Liverpool "shooting upwards" and then

disappearing. A few weeks later, there is another account in Cuper of the same thing. Fort supposes two possibilities: “A sensible suggestion” that a person read the Liverpool story and faked their version of it in Cuper, or a “not so sensible” suggestion that “in this year 1842, somebody had learned the secrets of teleportation, and to avoid attracting much attention in any one place was experimenting in places far apart.”⁵³ Fort, while studying the supernatural, remains a partial skeptic by putting forth a sensible theory to offset the more sensation and insensible suggestion of supernatural actions.

Due to teleportation playing a major role in his work, Fort coins the term as a shorthand. “Mostly in this book I shall specialize upon indications that there exists a transportory force that I shall call Teleportation”⁵⁴ Fort proceeds to describe occurrences all over the world of household items, clothes, and even people disappearing into thin air. Teleportation being a shorthand for transportory force means that strange things appear too. One account is of a group of stones in the middle of a town in Spain suddenly shooting up from the group, accompanied by the sound of loud detonations. There were claims that a dormant volcano under the town had erupted, but not crater was ever found and there was no record of volcanic activity in that area of Spain at that time or any other.

While Fort documents the supernatural occurrences of teleportation, the concept of instantaneous transportation has been used in countless works of science fiction. Teleportation is a concept so immediately understood yet so far in the future that a person could almost immediately recognize what is happening and the technological complexity that would be required to perform it. Teleportation plays major roles in science fiction of all kinds, from the horrible effects of mismanaged teleportation in *The Fly*, to it being an almost mundane method of transportation in *Star Trek*. Teleportation in science fiction tends towards the *Star Trek* method, wherein if it is present then it is common enough to be considered a form of transportation on par with flight,

53 Fort, Charles. *Lo!* New York: Garland Pub., 1975. 46.

54 Fort, Charles. *Lo!* 19

driving, or any other comparable fast-paced way to travel. Teleportation in science fiction is also almost always machine-assisted, that is, there is almost always a teleporter for a person to use. There is often a teleportation terminal that takes the user from one location and deposits them in another, which also has a teleportation terminal. Occasionally there are unintended side effects, but if a teleporter is present then it is often assumed that the technology is advanced enough to allow such a machine.

A subcategory of teleportation is beaming. In the world of *Star Trek*, the crew of the *Enterprise* do not use landing shuttles or any sort of vehicle to transport themselves between space and their planet. Instead, they are “beamed” from place to place (Figure 10⁵⁵). When the crew needs to go between places, a complex series of events occur that “beam” them to the destina-

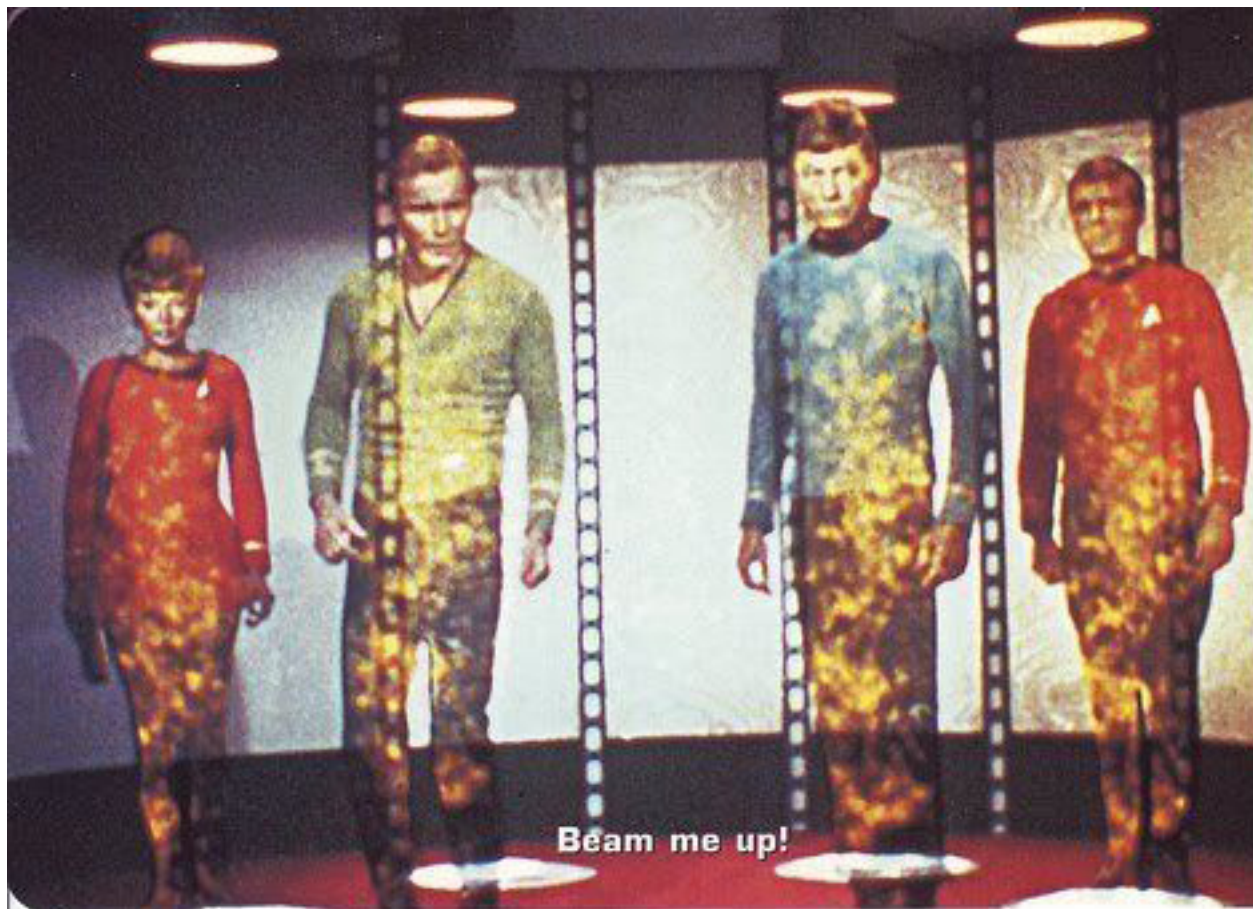


Figure 10. The crew of the *Enterprise* in the process of being “beamed”

55 “Star Trek Fans to Be ‘beamed Up’ by Augmented Reality App - No Need for Scotty.” - Pocket-lint. April 2, 2016. <http://www.pocket-lint.com/news/117563-star-trek-fans-beamed-up-by-augmented-reality-app>

tion. The process is described in the official book on the science of *Star Trek*: “Next, the lifeform or object to be beamed was scanned on the quantum level, using a molecular imaging scanner... Simultaneously, the object was broken down into a stream of subatomic particles, also called the matter stream... The matter stream was then transmitted to its destination across a subspace domain... Finally, the initial process was reversed and the object or individual was reassembled at the destination.”⁵⁶

This instance of the word “beam” is certainly not the first, but it is the first in regards to this usage. The idea of beaming being in reference to a method of semi-instantaneous transportation was unique to *Star Trek* and a major part of how the word “beam” became connotated with that concept. The popularity of the word can also be attributed to its place in perhaps one of the most notorious quotes from *Star Trek* and indeed, all of science fiction: “Beam me up, Scotty”. That simple quote encapsulates much of what science fiction represents. In one phrase the speaker is requesting the ability to be transported instantaneously from a planet to a spaceship. This simplicity, mixed with the incredible implications the technology, makes this quote seem realistically futuristic, as though it is a common command, similar to if one was to ask a question to Siri on their iPhone. But science fiction needs grounding, and by having a human be the one being commanded, especially one with a name like Scotty, which brings to mind Scotland and contemporary Earth, the fantastical phrase is grounded in some small way.

56 “Transporter.” *Memory Alpha*. Web. 02 Mar. 2016. <http://memory-alpha.wikia.com/wiki/Transporter>.

Conclusion

Science fiction has had a far-reaching impact on human culture. Much of science is focused on learning as much as possible about the world in an effort to understand it more. Much of science fiction puts a magnifying glass to what is unknown in the world and calls attention to it. This attention becomes interest and perhaps someday becomes innovation. While not all of the concepts discussed in this thesis have become real creations, almost all of them have inspired real scientific studies due to the immense popularity afforded to them by being discussed in science fiction. With wide-eyed wonder, people read science fiction and then attempt to make it science fact. Whether it is homegrown engineers building hoverboards in their garages or massive military organizations making real life phasers, science fiction undoubtedly inspires people to turn what they read into reality.

What is not made yet still exists in the cultural consciousness too. When people imagine the future, no matter how old or young they are, what gender they are, no matter where they are, they think of similar futures: Ones with telepoertation, robots, cryogenics, cyberspaces, etc. The list goes on and it is not restricted to science fiction readers. The popularity of the ideas extends past the source, and become embedded in the collective consciousness of entire cultures. The future becomes a common ground for all people, and science fiction is the vision of the future that all people use.

Understanding where these words and concepts come from is important, if only for historical perspective, and to know that people have been considering these futuristic ideas for a much longer time than ever expected. When science supplants magic, it does not supplant its sense of wonder and incomprehensibility. If every sufficiently advanced technology is indistinguishable from magic, then every good science fiction can be considered an optimistic fantasy

of the future: one in which things that were once thought impossible become possible, and that which is magic is really science.

Selected Bibliography

- “Amazing Stories.” Pulp Covers. April 3, 2016. <http://pulpcovers.com/tag/amazingstories/page/8/>.
- “American Cryonics Society - Human Cryopreservation Services for the 21st Century.” American Cryonics Society - Human Cryopreservation Services for the 21st Century. Web. 02 Mar. 2016.
- “Atalskes Phaser IV.” Memory Beta, Non-canon Star Trek Wiki. March 16, 2016. http://memory-beta.wikia.com/wiki/Atalskes_phaser_IV.
- “Karakuri.info.” Karakuri.info. Web. 02 Mar. 2016.
- “RioRand Two Wheels Smart Self Balancing Scooters Drifting Board Electric Personal Transporter-outdoor Sports Kids Adult Transporter with LED Light-White-Black.” - Self Balancing Scooter. Web. 02 Mar. 2016.
- “Star Trek Fans to Be ‘beamed Up’ by Augmented Reality App - No Need for Scotty.” - Pocket-lint. April 2, 2016. <http://www.pocket-lint.com/news/117563-star-trek-fans-beamed-up-by-augmented-reality-app>
- “The (Re)invention of Cyberspace.” Kunstkritikk The Reinvention of Cyberspace Comments. Web. 02 Mar. 2016.
- “The Universes of Max Tegmark.” The Universes of Max Tegmark. April 19, 2016. <http://space.mit.edu/home/tegmark/crazy.html>.
- “Transporter.” Memory Alpha. Web. 02 Mar. 2016. <http://memory-alpha.wikia.com/wiki/Transporter>.
- “U.S. Troops Find New Uses For Non-Lethal Weaponry .” U.S. Troops Find New Uses For Non-Lethal Weaponry. Web. 02 Mar. 2016.
- “What Is Cyberpunk? | Neon Dystopia.” Neon Dystopia. Web. 02 Mar. 2016.
- “What Is Steampunk.” Gdfalksen.com. March 19, 2016. <http://www.gdfalksen.com/Steampunk>.
- “http://www.williamgibsonbooks.com/archive/2003_01_17_archive.asp” William Gibson. Web. 02 Mar. 2016.
- “Interview with Isaac Asimov” <https://www.youtube.com/watch?v=4gn3MyTE80A>
- “The da Vinci Robot“ Michael E. Moran. Journal of Endourology. January 2007, 2012
- “The Lonely”, Twilight Zone, Rod Sterling, November 13, 1959
- Abbott, Edwin Abbott. Flatland: A Romance of Many Dimensions. New York: Barnes & Noble, 1963.
- About, Edmond. The Man with the Broken Ear. New York: Arno, 1975. Print.
- Astor, John Jacob. A Journey in Other Worlds. A Romance of the Future. New York: D. Appleton and, 1894.
- Broome, John. The Flash Archives. New York, NY: DC Comics, 1996.

- Cahaner, A., J. A. Ajuh, M. Siegmund-Schultze, Y. Azoulay, S. Druyan, and A. Valle Zárate. 2008. Effects of the genetically reduced feather coverage in naked neck and featherless broilers on their performance under hot conditions. *Poult. Sci.* 87:2517-2527.
- Čapek, Karel, Paul Selver, and Nigel Playfair. *R.U.R. (Rossum's Universal Robots): A Fantastic Melodrama in Three Acts and an Epilogue*. New York: Samuel French, 1923. Print.
- Chambers, Ephraim. *Cyclopaedia: Or, An Universal Dictionary of Arts and Sciences ... The Whole Intended as a Course of Antient and Modern Learning, Extracted from the Best Authors, Dictionaries, Journals, Memoirs, Transactions, Ephemerides, &c. in Several Languages*. London: D. Midwinter, 1741. Print.
- Conklin, Groff. *Omnibus of Science Fiction*. New York: Crown Publishers, 1952.
- Cushman, Marc, and Susan Osborn. *These Are the Voyages*. Print.
- Fort, Charles. *Lo!* New York: Garland Pub., 1975.
- Gibson, William. *Burning Chrome*. New York: HarperCollins, 2003. Print.
- Heinlein, Robert A. *The Door into Summer*. Garden City, NY: Doubleday, 1957. Print.
- http://www.westernite.org/datacollectionfund/2005/psu_ped_summary.pdf
- https://www.researchgate.net/publication/5842961_Generation_of_Cloned_Transgenic_Cats_Expressing_Red_Fluorescence_Protein
- Huxley, Aldous. *Brave New World*. New York: Harper & Bros., 1946. Print.
- Illus. GY Kaufmann, *Edison's Conquest of Mars*
- James, Edward, and Farah Mendlesohn. *The Cambridge Companion to Science Fiction*. Cambridge: Cambridge UP, 2003. Print.
- Jeter, K.W., *Locus*, #315 April 1987
- Monchaux, Nicholas De. *Spacesuit: Fashioning Apollo*. Cambridge, MA: MIT Press, 2011.
- Needham, Joseph, Christoph Harbsmeier, and Kenneth Robinson. *Science and Civilisation in China*. Cambridge: Cambridge UP, 1998. Print.
- Prucher, Jeff. *Brave New Words: The Oxford Dictionary of Science Fiction*. Oxford: Oxford University Press, 2007.
- Reid, Howard and Pollard, Justin. *The Rise and Fall of Alexandria: Birthplace of the Modern World*. Print. Penguin, 2007
- Rosheim, Mark E. *Robot Evolution: The Development of Anthrobotics*. New York, NY: Wiley, 1994. Print.
- Safran, Linda. *Heaven on Earth: Art and the Church in Byzantium*. University Park, Penn.: Pennsylvania State UP, 1998. Print.
- Serviss, Garrett Putman. *Edison's Conquest of Mars*. Los Angeles: Carcosa House, 1947.
- Shelley, Mary Wollstonecraft, and Diana Gibson. *Frankenstein*. Madrid, España: Edimat Libros, 2000. Print.
- Smith, E. E. *The Skylark of Space*. New York: Garland Pub., 1975.

Susanne Ussing, Cyberspace, 1968–70, collages, dry transfers and photolithography.

Wells, H. G. *Men like Gods: A Novel*. New York: Macmillan Company, 1923.

Wells, H. G. *The Island of Dr. Moreau*. New York: Modern Library, 1996. Print.

“Omni Hoverboard: Canadian Inventor Still Refining His Guinness Record-breaking Flying Propeller Device.” *International Business Times RSS*. 16 Oct. 2015. Web. 02 Mar. 2016.

Apollonius, and Richard L. Hunter. *Argonautica*. Cambridge U.a.: Cambridge U Pr., 1989. Print.

http://www.defenselink.mil/comptroller/defbudget/fy2009/budget_justification/pdfs/03_RDT_and_E/Vol_5_Other_Defense_Agencies/SOCOM%20PB09%20RDTE.pdf

<http://www.guinnessworldrecords.com/news/2015/5/video-watch-incredible-footage-of-farthest-flight-by-a-hoverboard-record-set-by-379420>