THE POWER OF SCIENCE FICTION:

exploring sci-fi's relationship to real-world innovation

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KING: Do you like science fiction, Professor? Can it be harmful, or helpful, or neither?

HAWKING: I think science fiction is useful, both for stimulating the imagination and for defusing fear of the future. But science fact can be even more amazing. Science fiction never suggested anything as strange as black holes.

Taken from a *Larry King Live* interview in 1999 the response by theoretical physicist Professor Stephen Hawking highlights the impetus of my study proposal: a project to explore the *useful* nature of science fiction.

THE INFLUENCE OF SCIENCE FICTION

Science fiction has been referred to as "the designer's role on steroids" (de la Mare, 2009) because of its forward-thinking nature. As designers, we are called upon to anticipate future trends and to create visions of futures that have not been realized. In much the same way science fiction mirrors the design activity of future casting through its presentation of (seemingly far-flung) possible futures. Though they may seem on the verge of fantasy, often the futures presented actually come true.

In 1914 H. G. Wells published a novel titled *The World Set Free*. While not well known, the novel is an example of the future casting power of sci-fi. In the novel Wells imagines a new kind of bomb based on nuclear chain reactions. Ho notes how atomic energy would be discovered in 1933 (20 years in his future), and how the first bomb would explode in 1956. In this excerpt from *The World Set Free*, Wells writes of the success of his main character named Holsten, in creating what Wells called an "atomic bomb":

> The problem which was already being mooted by such scientific men as Ramsay, Rutherford, and Soddy, in the very beginning of the twentieth century, the problem of inducing radio-activity in the heavier elements and so tapping the internal energy of atoms, was solved by a wonderful combination of induction, intuition, and luck by Holsten so soon as the year 1933.

This is just one case where science fiction has clearly foretold what later became science-fact. This isn't to say that scientists who worked on the first atom bomb read or were influenced by *The World Set Free*, but it does highlight the fact that science fiction is about the concepts, technologies and possibilities of he future. With this in mind, determining how much influence sci-fi has had on individuals is a worthy study to determine both its influence on the historical development of science and its usefulness in shaping future developments.

In July of 2010, Sigma Xi, The Scientific Research Society conducted a study of its members titled *Did Science Fiction Influence You?*. In reviewing the study findings, the overwhelming majority of the answers held that science fiction did have an impact on respondents in various ways, including inspiring a sense of wonder, promoting an attitude of imagination and creativity, awareness of other scientific disciplines, and a general interest in science that shaped some respondent's decisions to go into science as a profession. While the study is a collection of personal narratives that represents a diverse number of views and perspectives, it is limited to members of the Society. As an extension of the Sigma Xi study, I am most interested in surveying future thinkers in areas outside of science, influencing areas such as economics, government, medicine to determine the usefulness of the genre outside of its native territory.

EXAMINING SCIENCE FICTION AS A SHAPER OF REALITY

An examination of the genre of science fiction reveals that, while the hard sciences such as chemistry, physics and biology are often topics of interest, the genre also branches out into areas of sociology, anthropology, government, natural science, and even metaphysics, ethics, and values. With this in mind, and with through constructivist lens, I wish to address the following question to learn if and how science fiction has shaped those who interact with it:

Has science fiction played an integral part in shaping visionaries' world views, goals, and in turn personal and/or career work?

APPLYING SCIENCE FICTION: A HYPOTHESIS

If science fiction has indeed proved to play an integral part in shaping visionaries' world views, then, like nursery rhymes, fables, morality plays and other cautionary tales, science fiction may have extended applications for challenging and inspiring others. With this in mind, I present the following hypothesis on which to build my research:

It may be the case that the future worlds and infinite possibilities projected in science fiction can be used to inspire viewers to pursue work that will make those possibilities or ones like them, real.

EXAMINING SCIENCE FICTION

Across a breadth of both written and visual media, the term *science fiction* spans a wide array of sub-genres. These genres are popularly recognized and have unique nuances that delineate them from one another. The generally recognized sub-genres of sci-fi are hard sci-fi, soft and social sci-fi, cyberpunk, time travel, alternate history, military sci-fi, apocalyptic, space opera, space western and superhuman. For the sake of this study, the definition of science fiction holds that concrete scientific principles are related the story and that the works do not rest in the realm of *fantasy* (Pohl, 1997).

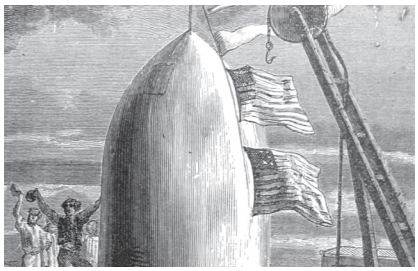
THE VALUE OF SCIENCE FICTION

While sci-fi often provides commentary on existing states of society including government, conflict, and progress, it also produces images and descriptions of innovations in technology, sociopolitical configurations and metaphysical theory. As a whole, science fiction promotes the consideration of possibilities and often inspires consumers to *wonder* (Sigma Chi, *Did Science Fiction Influence You?* 2010)

SCIENCE-FICTION GENRES AND THEMES

A selection of major science-fiction publications and franchises and the themes they explore. These themes are areas to examine when determining visionaries' influences.

MAJOR SCI-FI FRANCHISES AND DOMINANT THEMES



FROM THE EARTH TO THE MOON

NOVEL (1865)

space travel via "space cannon"

vessel and launching technologies

moon exploration

METROPOLIS

FILM (1927)

ramifications of capitalism

societal systems of government

industrialization and mechanization

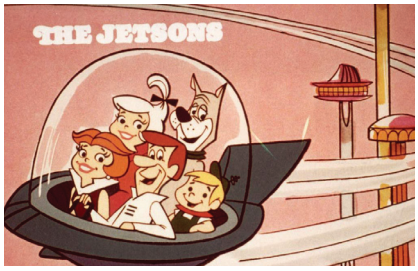
THE TIME MACHINE

NOVEL (1895)

time travel

alternate realities

advances in manufacturing



THE JETSONS

TV SERIES (1962–1988)

daily future living

technological advancements in domestic environments

evolution of societal norms

DOCTOR WHO

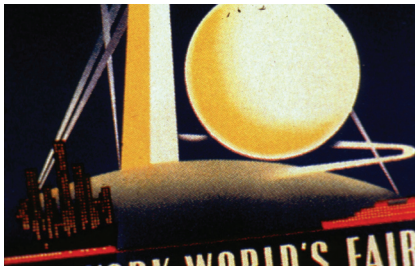
TV SERIES (1963–CURRENT)

time travel

alternate dimensions

wormholes and space-time continuum

totalitarian governments



NEW YORK WORLD'S FAIR

ATTRACTION (1964)

transportation

computing and artificial intelligence

city and community planning

LOST IN SPACE

TV SERIES (1965–1968)

familial relationships

artificial intelligence

space travel

robots

STAR TREK // TV SERIES & FILMS (1966–CURRENT)

manipulation and transportation of matter

faster than light speed travel

cultural relativism

non-invasive medical procedures

advanced scanning and imaging

biomedical engineering

interstellar commerce and diplomacy

governmental models

racial and gender equality

post-currency economy

BLADE RUNNER

FILM (1982)

genetic engineering and cloning

challenging the definition of "living things"

multi-planet economies

EPCOT CENTER HORIZONS PAVILION

THEME PARK ATTRACTION (1982–1999)

desert reclamation

space colonization

undersea colonization

alternative energy

BACK TO THE FUTURE

FILM (1985)

time travel

invention and non-intended design

consumer product innovation (esp. hoverboards)

QUANTUM LEAP

TV SERIES (1989–1993)

time travel

quantum mechanics and quantum physics

paradoxes

CONTACT

FILM (1997)

search for extraterrestrial life

metaphics

interstellar communication

THE MATRIX

FILM (1999)

alternate realities

computing and networking technologies

computing code and languages

FIREFLY

TV SERIES (2002–2003)

post-apocalyptic society

multi-planet economies

easternization of Earth culture

future colloquialisms and evolution of language

EUREKA

TV SERIES (2006–2012)

artificial intelligence in residential developments

extensions of military technologies to benefit civilians

light speed travel

alternate realities

INTERSECTING THEMES WITH THE REAL WORLD

When grouping the dominant themes found in science-fiction franchises, six major areas of interest arise. Noted below, these areas can serve as starting points in determining:

- what professional fields may yield "visionaries"
- what types of language to look for in transcripts
- the formation of questions for interviews with participants to allow useful responses
- codes for use in data analysis

TECHNOLOGY

vessel and launching technologies
technological advancements in domestic environments
advances in manufacturing
invention and non-intended design
transportation
manipulation and transportation of matter
modern spaceflight technologies
faster than light speed travel
computing code and languages
space colonization
undersea colonization
computing and networking technologies
extensions of military technologies to benefit civilians
computing code and languages
artificial intelligence and computing
interstellar communication
computing and artificial intelligence
robots

NATURAL SCIENCE

alternative energy
extra-terrestrial exploration
wormholes and space-time continuum
quantum mechanics and quantum physics
search for extraterrestrial life
desert reclamation

POSSIBILITIES

time travel
search for extraterrestrial life
alternate realities
alternate dimensions
paradoxes
long-distance space travel
extra-terrestrial expansion
spirit of exploration
democratization of work in space
challenging the definition of "living things"
metaphics
invention and non-intended design

MEDICINE

non-invasive procedures
advanced scanning and imaging
universal access to healthcare
elimination of disease
biomedical engineering
genetic engineering and cloning
cyborgs

ANTHROPOLOGY

future colloquialisms and evolution of language
daily future living
city and community planning
familial relationships
cultural relativism
racial and gender equality
living in space

SOCIOLOGY

imperialism and colonization
civilization beyond earth
evolution of societal norms
effects of totalitarian government
post-apocalyptic society
governmental models
easternization of Earth culture
multi-planet economies
ramifications of capitalism
interstellar commerce and diplomacy
erosion of civil-rights
effects of censorship
societal systems of government
capitalism
totalitarian governments
city and community planning

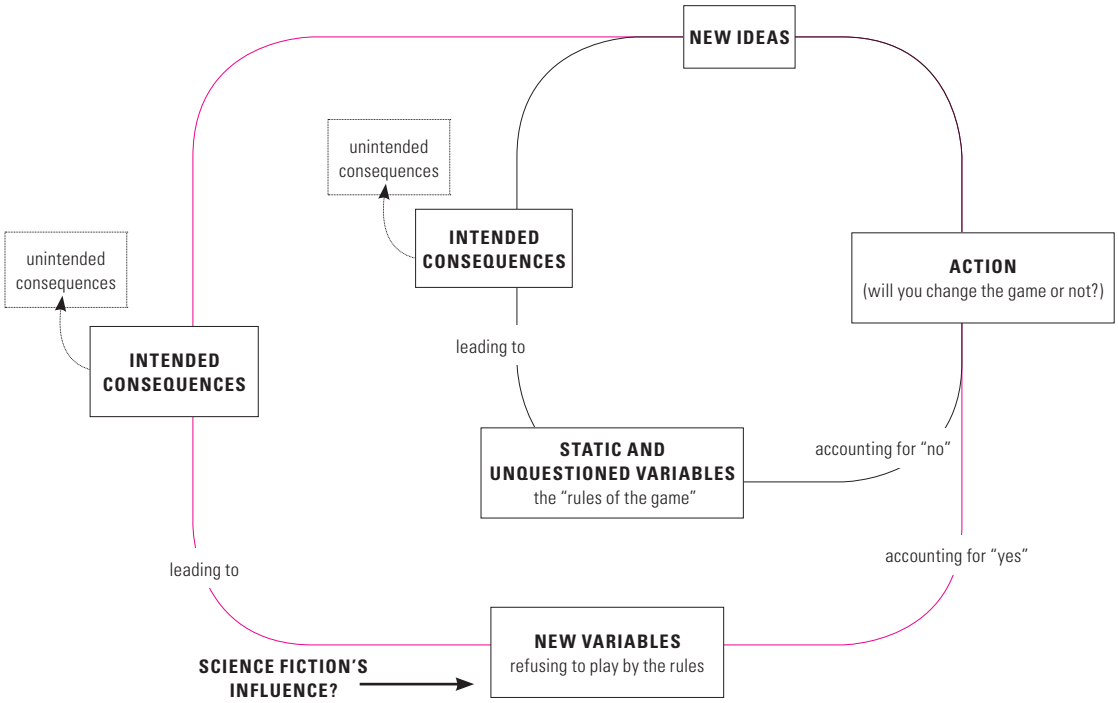
INTERSECTION WITH DESIGN

Science fiction has been referred to as "the designer's role on steroids" (de la Mare, 2009) because of its forward-thinking nature. As designers, we create visions of a future that has not been realized and are called on to anticipate future trends. By studying this same future-casting activity to the extent of science-fiction, I hope to explore its effectiveness in steering future outcomes on a scale of one's life work versus on a singular design project.

SCI-FI AND THE DOUBLE FEEDBACK LOOP

As shown in his article "Design Research and its Meaning to the Methodological Development of the Discipline" in *Design Research Now*, Wolfgang Jonas articulated a double feedback loop that showcases the design decision-making process. Below is a representation of this model rendered by Keith Owens with slight modifications for purposes of this study.

According to Hawking in the interview quote at the beginning of this paper, one of the benefits of science fiction is that it "defuses fear of the future." Perhaps this "diffusion" makes it more acceptable for people to challenge the "rules" inherent in the static and unquestioned variables of scripted problem solving and as a result, introduce new variables in their problem solving process. Combining these thoughts, it will be interesting to study if science fiction is a kind of catalyst in promoting this kind of thinking.



THE PROJECT

KNOWLEDGE NEEDED

Three main areas of knowledge are essential in beginning to frame the process for framing and conducting this study.

SCIENCE-FICTION ITSELF

- a clear, working definition of sci-fi will be needed to ensure that the methods used are focused properly to yield relevant data

- identify major themes in sci-fi so they can be recognized in analysis
- address sci-fi's origins and connections grounded science to establish justification for research into a potentially subjective topic

SCI-FI "FANS"

- complete a definition of people who engage with sci-fi as "fans" to begin developing a baseline user persona. This will also be useful in the work of determining whether a specific type of person is attracted to sci-fi, or if sci-fi is the cause of fan attitudes
- determine sub-genre interests to establish dominant concepts so they may be identified in analysis
- learn how pervasive sci-fi is in the world view of users to set a baseline for attitudes among fans of varying degrees. This will assist in clarifying personas for data analysis.
- learn the cultural makeup of users for data comparison in identifying patterns: *who are the people who like sci-fi?*
- determine the type of work these people are doing and would like to do to allow for connections during analysis to types of sci-fi they read/watched

MODERN-DAY "VISIONARIES"

- complete a definition of a "visionary" to allow identification of persons for study
- learn the cultural makeup of "visionaries" for data comparison in identifying patterns: *who are the people who are doing "visionary" work?*
- determine the amount of sci-fi use to render data for analysis based on intensity
- determine the type of work these people are doing and would like to do to allow for connections during analysis to types of sci-fi they liked

PARTNERS FOR RESEARCH

In order to gain the knowledge necessary and to determine the effectiveness of methods, partners in a variety of areas will be essential.

CULTURAL ANTHROPOLOGISTS IN POPULAR CULTURE

- for completing an ethnography of the fans of sci-fi and the visionaries whom it may have influenced to allow for analysis connecting the two

Who are the people who are attracted to sci-fi?

What attitudes did these persons posses before they interacted with sci-fi?

How pervasive was sci-fi in their "growing-up" years?

EXPERTS IN FUTURE STUDIES

- for studying the concept of possible, probable, and preferable futures and how these accepted norms connect with the genre of science fiction in determining patterns where they intersect.
- for comparing other influences on future-casting to science-fiction to determine sci-fi's influential power

What processes do people use to envision and define the future?

How, in the past have cultural influences shaped people's actions to enable future outcomes?

How effective have past efforts to shape futures been and what are they?

WRITERS/PRODUCERS OF SCIENCE-FICTION

- for defining how science fiction compares to other genres to allow clarity during analysis
- to learn if the creation of science fiction is in any way geared toward prompting future-thought and reality-based results
- define the structure of science fiction to solidify its definition for the purpose of the study

How much of science-fiction is based on science-fact?

What intentions go into the creation of sci-fi?

CONDUCTING THE STUDY

CHICKEN OR EGG? A SPECIFIC CHALLENGE

Identifying the effectiveness of science fiction in shaping world views brings its own unique challenges. Special care and attention to research design and information gathering must be taken to best identify if a person's pre-disposition is what drives them to future cast and in turn, make it more likely that they will interact with science fiction or if the interaction with science fiction was the cause for their future casting attitudes.

As this is a study of social issues, it should be conducted with a post-positivist view, recognizing that the results of the study may produce the most likely answer. Still, the quality of data gathered will hinge on the quality of the design of the research and for this reason, I propose two distinct methods should be used to prove (to what degree) interaction with science fiction correlates to individuals' visionary attitudes.

STRUCTURE

- define the number of persons to study and clearly demarcate what will be the "end" of the study (whether it's a number of participants in the study or an amount of time)
- identify fans of sci-fi as participants
- identify "visionaries" as participants: groups, speakers, inventors
- identify persons who work in "visionary" fields but who did not interact with sci-fi
- use methods to collect data on use of sci-fi in the past
- use methods to collect data on attitudes and work of participants

METHODS

- literature review to discover areas of interest, gaps in knowledge, and to define sci-fi as a genre for the study and to inform the types of questions to be asked
- surveys: to render quantitative data for demographic placement to help shape the pool of participants for study
- autoethnography for gathering information from participants
- unstructured interviews to render individual narratives for linguistic analysis

- linguistic analysis: vocabulary analysis from qualitative methods to identify science-fiction concepts as they appear in speech and in writing

ASSESSING CORRELATION OF SCI-FI WITH VISIONARY THINKING

This section of the study will be focused on determining individuals' pre and post science fiction states.

- autoethnography will be completed by participants with questions focusing on their "pre-sci-fi" states and their "post-sci-fi" states
- from autoethnographies, images and written narratives will be collected as data for comparison and analysis
- this analysis will compare states pre-and post states with content coded to reveal if and when participants noted concepts which appear in the sci-fi themes noted earlier in this paper

IMPLEMENTING A CONTROL GROUP FOR COMPARISON

This section of the study will be focused on participants who did not or chose not to interact with science fiction but who are still considered "visionaries."

- autoethnography will be completed by participants with questions focusing on their formative years and their decision processes that led them to become future-casters
- from autoethnographies, analysis will be conducted to map out the career path and decision processes of these individuals, with content coded per the sci-fi themes char earlier in this paper
- this group will be studied using the same methods as the sci-fi user group to render data for comparison

PATTERNS FOR ANALYSIS

- what are examples of sci-fi that were influential in driving individuals to choose a specific area of study or exploration?
- what age did the interaction with sci-fi take place?
- who are the personas? what are their attitudes and how were these shaped?
- what sorts of current activities and attitudes suggest sci-fi effects?
- is sci-fi consciously considered an agent in the person's development?
- what attitudes existed before and after sci-fi interaction? How different were they?
- how often did sci-fi themes appear in the linguistic analysis of both sci-fi users and non-sci-fi users?

EXTENSION

By studying and examining the possibility of sci-fi as a tool to prompt innovative attitudes, we may better understand the effects of culture on action. More importantly, if sci-fi and future casting may be a useful tool in educating and inspiring innovators and visionaries. As previously noted, considering Jonas's *Double Feedback Loop*, learning how sci-fi can and has led to divergent thinking can inform other design processes with regard to how cultural influences shape decision-making and attitudes.

LOVE'S META-THEORETICAL MODEL TAXONOMY

This taxonomy was the initial look at Star Trek and how it served as a vehicle for societal commentary. The study that has followed is a departure from Star Trek into science fiction in general, which I hope will render more generalized knowledge for application.

STAR TREK AS SOCIETAL COMMENTARY

DIRECT PERCEPTION OF REALITIES Watching the show or a movie. Listening to dialogue between various races and cultures. Hearing the sounds of space travel. Viewing various cultural practices.

DESCRIPTION OF OBJECTS An alien life form. Planetary governments. A council of planets. Spaceships. The crew. Sensor readings. Universal translators. Transporters.

BEHAVIOR OF ELEMENTS The Enterprise moves at warp speed to new planets. The prime directive drives the principle of cultural relativity and non-interference. Wars between alien peoples. Firing weapons.

MECHANISMS OF CHOICE Why did the creators of Star Trek position it as a ship visiting worlds instead of vice versa? How did the issues addressed some to the forefront? Why were the cultures created the way they are?

DESIGN METHODS What is the process for developing a sci-fi series that is able to address social issues? How has the franchise been delivered in syndication? The creative process of writing stories.

DESIGN PROCESS STRUCTURE What was the environment in which Star Trek was created? We must take into account the physical spaces as well as the social challenges of the 1960s in the United States and their impact on Star Trek creators. What were the demands of the studios at the time?

THEORIES ABOUT THE INTERNAL PROCESSES OF DESIGNERS AND COLLABORATION What was the process by which Star Trek was created and how has it evolved? How much effort did Gene Roddenberry and the following writers and producers put into taking on issues worthy of addressing in the public forum? What process produced the various interactions and conflicts?

GENERAL DESIGN THEORIES Star Trek was created primarily for entertainment, while any commentary on issues is ancillary to this supposition. Commentary issues were not necessary, but were applied nonetheless.

EPISTEMOLOGY Are there limits to the issues with which Star Trek can and should concern itself? What are the goals of a television show?

ONTOLOGY Why are television shows used as meaning-making devices? What is the reason for science fiction? Is the realm of sci-fi one that was ever intended to address real-world issues?

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