The Science And Entertainment Exchange: A Literature Review

LIBR 200: Information Communities

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Fall, 2014
Introduction

It seems like every time you turn around there’s another superhero movie about to hit the local theatres. There’s Superman, The Amazing Spider-Man, The Watchmen, The Avengers, Iron Man, X-Men and the list goes on. As you sit in the dark enjoying the entertaining stories told by bigger-than-life characters and incredible special effects, don’t you sometimes wonder about Captain America’s indestructible shield? I mean, is that really possible?

Enter ‘The Science and Entertainment Exchange,’ a program of the National Academy of Sciences, a sort of consulting not-for-profit that provides resources for accurate scientific information to the entertainment industry. Established in 2008 and equipped with a team of volunteers, the Exchange fields requests from writers, producers, and directors looking for insights on how science can accurately and appropriately inform their creations. In other words, how can scientists help an audience transcend disbelief and actually believe that an indestructible shield is quite possible and even plausible?

This review will explore the literature related to the information community of scientists who consult with the entertainment industry. Of particular interest are scholarly, peer-reviewed studies including books and articles and online journals relating to the communities information needs and behaviors. I have specifically focused on works by scientists or science writers relating to superheroes. I have additionally looked at the work of NASA and the astronauts of the Apollo program who are real life heroes, as well as the fictional character of James Bond 007 and other articles and books on the portrayal of science in the movies.
These movies and these superheroes have been in the forefront of pop culture for decades including the “Silver Age” of comics from 1956 to 1973 and the many movie incarnations of Superman and Spider-Man. It’s a way to engage the younger generation and get them interested in science as a vocation.

Review of Writings

Science and entertainment is essentially a niche market with regard to published works especially in the superhero category. Most authors are university professors in the sciences or practicing physicians or award-winning journalists whose background is in science.

For the purposes of this literature review, I have focused primarily on articles and books written by scientists with an interest in superheroes and the plausibility of their superhero powers. Many of the articles used are published in science journals for example *Journal of Minerals, Metals and Materials Society*. Even though these articles are scholarly in nature, they are told in layman’s terms so non-scientists can understand how it’s possible for Captain America’s shield to actually be manufactured in today’s world. The intended reader appears to be both peers within their own field and other science disciplines but also anyone who is interested in superheroes especially fans of the movie franchises and comic books.

Most articles used for the purpose of this review have scientists who have conducted research but also an employee, Eric M. Jones, of the Los Alamos National Laboratory who interviewed astronauts from the Apollo program and created an online journal to keep all of this historical information in one place.
The Apollo Lunar Surface Journal is an online journal on the NASA website whose subject matter is the Apollo Project which sent nine manned flights to the Moon and landed six on the lunar surface including twelve men. It contains reports, manuals, transcripts, photographs, audiotapes and videotapes.

Under the information on the Apollo 11 mission is a transcript of an interview with Neil A. Armstrong conducted at the NASA Johnson Space Center for their Oral History Project from September 19th 2001. Dr. Stephen E. Ambrose and Dr. Douglas Brinkley interviewed Armstrong in Houston, Texas about his now infamous moonwalk and Brinkley asked the question if there was anything that surprised him. Armstrong replied, “I was surprised by the trajectory of dust that you kicked up with your boot…there was no dust…that’s a product of having an atmosphere” (p 84).

This first-hand account from the first human to ever step foot on the moon including Armstrong’s famous line, “that’s one small step for man, one giant leap for mankind,” could be used by screenwriters to lend authenticity to their scripts as it’s always advisable to go directly to the source. The interview itself is a minefield of data including something as mundane as how Armstrong answers questions and how he formulates sentences. This could be used as a basis for movie dialogue.

For the purpose of this literature review, although Armstrong and the other astronauts who subsequently walked on the moon are not technically superheroes they are in fact real life heroes and have most probably lent themselves to promoting the work of NASA. I bet there’s many a modern day scientist who was inspired by him.

In Lynne Robinson’s article The Super Materials of the Super Heroes, it begins by introducing us to Suveen N. Mathaudhu, program manager in Synthesis and Process of
Materials for the U.S. Army Research Office. Mathaudhu is a self-confessed superhero who himself was inspired by, “the real hero of the Captain America legend is Dr. Myron MacLain, an American metallurgist” (p14). Mathaudhu, “recently issued a request for white papers based on the theme of the making of Captain America’s shield” (p 13).

Mathaudhu surmises that it is not in the realms of fantasy to be able to manufacture Captain America’s shield. All you need is, “an array of advanced characterization, simulation, and computational design tools, enabling the ability to engineer the microstructure of materials to achieve almost equally amazing properties” (Robinson p 14). So, scientists are trying to discover if it is indeed possible to replicate some of the gadgets used by superheroes.

There is also a lot of literature published from university science professors. One book, *The Physics of Superheroes* by James Kakalios teaches Physics by relating it to the lives of comic book superheroes including X-Men, Spider-Man and Superman. It even includes an in-depth exploration of solid-state physics and transistors associated with Tony Stark’s powered armor Iron Man. Kakalios even has a chapter that examines Krypton by using Newton’s Law of Gravity. It’s no surprise, that he was the science consultant for the Warner Brothers movie ‘Watchmen.’ Again, the book is not a traditional textbook but is written for the non-specialist who is interested in a relatively pain-free way of learning about basic physics concepts. It mixes pop culture with actual science.

In general, the only school of thought that has developed within this small community of scientists who research the likelihood of superhero powers in the real world is the belief that during the “Silver Age” of comics from 1956 to 1973 when most
of the superheroes we are familiar with were born, the comic book writers actually knew their science. Suveen N. Mathaudhu of the U.S. Army Research Office believes that, “throughout history, the military has looked for ways to make better shields – stronger, lighter materials that absorb and reflect energy in defense of the soldier. So, it’s not surprising that the strength of many superheroes comes from their armor” (Robinson p14-15).

One controversial study published in the British Medical Journal entitled, *Were James Bond’s drinks shaken because of alcohol induced tremor?* conducted by three British physicians, Johnson, Guha and Davies. They looked at the weekly alcohol consumption of Commander James Bond 007 by reading all fourteen James Bond novels by Ian Fleming, and making copious notes detailing every alcoholic drink taken.

The results showed that according to today’s predefined alcohol unit levels for example a Vodka martini would be three alcohol units, James Bond, on average, consumed ninety-two units of alcohol a week, over four times the recommended amount.

To determine whether Bond is merely a connoisseur or an alcoholic they conducted the “CAGE” questionnaire.

- Have you ever felt you needed to **Cut down on your drinking?**
- Have people **Annoyed** you by criticizing your drinking?
- Have you ever felt **Guilty** about drinking?
- Have you ever felt you needed a drink first thing in the morning (**Eye opener**) to steady your nerves or to get rid of a hangover?

By reading the novels and applying these to Bond, the authors of the research would score him three out of four.
As with Neil Armstrong, Bond isn’t a superhero but he is a real hero albeit not a flesh and bone one, but he still performs feats of superhuman abilities. What’s the point of the study? It relates to the general public and how they view their own drinking and also the responsibility of authors to be aware of their fictional protagonists and their potential influence. Think about it, how many times have you heard Bond say that he like’s his martinis shaken not stirred?

The scientific method is the most common approach within the literature. It’s a way of asking and answering scientific questions by making observations and doing experiments. Kakalios writes in his Preface that he is a self-confessed comic book junkie who after receiving his Ph.D. in Physics wanted to do his own research to see if any of the science in comic books was based on reality which led him to the in-depth exploration of solid state physics related to Tony Stark’s Iron Man. The work of Suveen N. Mathaudhu is also part of the scientific method. As is the James Bond study.

In terms of gaps or biases in the literature, it appears to be solely centered on superheroes. In the Robinson article, Rick Loverd of the National Academy of Sciences’ (NAS) Science and Entertainment Exchange says that, “many in the entertainment industry feel an imperative to ‘get the science right’. They know that almost everyone in the audience now has a supercomputer in their pockets. Audiences are more savvy to science than they were in the past, and more questioning of some of the ideas. If what they see on the screen doesn’t mesh with information they have access to online, it takes them out of the story” (p19).
Of course, there is a plethora of science literature both scientific articles and books that can be used to draw from but most of these do not relate to the entertainment industry. In fact, it’s a very small niche market with only a few players involved.

Conclusion

In conclusion, one of the main objectives of *The Science and Entertainment Exchange* is to promote science as a vocation. Mathaudhu says, “the focus in most superhero comic stories is a problem or puzzle that requires science to resolve. The hero is always the person who can figure it out and create the technology that saves the day. And doesn’t everyone want to be a superhero, when you come down to it?” (Robinson p19).

Using superheroes and their depictions in the visual medium of film to engage young audiences and try to get them interested in science, is a way to help them understand that you can relate science to the real world. Science is fun not boring.
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