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Engagement at the theater: science in the cinema

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TEACHING AND LEARNING

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The deficiencies in the scientific knowledge of American students have been well documented both in educational journals and the popular media. The scores students have received on standardized tests—such as the Trends in International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA)—over the last several decades have shown that U.S. students fall short of leading the world in the STEM disciplines (Wu, 2008). These scores have increased a bit over the last decade, but the achievement of students in the United States on these tests still fall below that of other countries such as Slovenia and Hungary (Martin et al. 2008). The results on this and many other tests drive much of educational policy making and funding in this country and lead to a public that is misinformed about science (NSF, 2010).

What is less often discussed is the public's lack of knowledge about scientists and how science is done. Other than possibly in a college or high school classroom, most people never have the opportunity either to do science or to interact with a real scientist. This leads to many inaccurate views by the public about who scientists are and what they do, as shown by surveys over the past fifty years. Since 1957 when Margaret Mead first surveyed schoolchildren about their attitudes toward scientists (Mead and Metraux, 1957), there has been a very clear stereotype that has predominated: a male wearing glasses and a white lab coat with a pocket protector, holding either a test tube or a flask.

The reason for this stereotype is quite simple: in the absence of any direct interaction with scientists, perceptions of scientists and the work that they do is filled in by the most popular public medium—visual entertainment such as movies and television shows. The time-compressed nature of these media means that they rely heavily on stereotypes in their character portrayal in order to grab the audience's attention. This time compression also means they do not have time to show the full way that a particular profession carries out its tasks, which leads to major misconceptions about the processes and procedures of that profession. In the case of scientists, the subset of stereotypes is fairly limited, measuring with six distinct ones being evident (Frayling, 2005). These popular character types are the alchemist, the absent-minded professor, the inhuman rationalist, the helpless scientist, the social idealist, and the heroic adventurer. The alchemist, otherwise known as the evil mastermind, seeks power and fame at all costs and uses science to control others and situations (e.g., Frankenstein, Dr. No). The

absent-minded professor is so engaged in science that he or she neglects social responsibilities and often lose track of time (e.g., Doc Brown from *Back to the Future*). The inhuman rationalist believes that logic and protocol must outweigh any other consideration, such as the welfare of an individual (e.g., Lieutenant Commander Spock from *Star Trek*). The helpless scientists either have their discoveries taken from them and abused by the government/corporation, or their scientific experiments get out of hand and start doing harm (e.g. Dr. Bruce Banner from *The Incredible Hulk*). The social idealist, or altruist, believes that science should be offered freely for the good of society (e.g., Dr. Emma Russell from *The Saint*). Lastly, the heroic adventurer often does science for the pure sake of discovery and takes science where no one has gone before (e.g., Dr. Arroway from *Contact*).

While the use of these stereotypes in movies does lead to misperceptions about scientists and the science that they do, there are some positive aspects to their use. As Daniel Sarewitz points out (Sarewitz, 2010), these stereotypes are needed to allow the cinema to explore the mythic dilemmas of our time. Science and technology have the potential to change the world and our lives in incredible way, from curing horrible diseases to the extinction of all life. More accurate portrayals of science and scientists would be helpful in attracting more students to the field and in educating the public regarding the realities of science, but it is also important to allow authors and artists to fully explore the implications of our actions and our works. Authors often need to use stereotypes as shortcuts to follow issues to their logical conclusions and portray the philosophical issues involved in our actions.

Course

As scientists, our job is not to prevent these uses of stereotypes, but to educate people about them, and to discuss how their use effects the public's perception of science. In response to this situation, we have developed a novel hybrid course that is part traditional college course, part online course, and part informal science film series. This course, Science in the Cinema, started as a public science film series that was developed to show the portrayal of science and scientists. This series was somewhat different from normal science film series in that it was not centered on science fact or fiction, but on how scientists and the science that they do are portrayed in the movies (the audience was given a handout of scientific errors in the film in order to improve critical thinking skills, but it was not the focus of the discussions). This series involved a different film shown every month with a panel of scientists who had expertise in the area in question and who would discuss the portrayal at the end of the film. Movies were chosen to represent a diversity of disciplines and movie eras and had to include at least one scientist who was doing science. Below are samples of movies shown to the public.

- *Alien: Resurrection* (1997)
- *The Andromeda Strain* (1971)
- *The Boys From Brazil* (1978)
- *Buckaroo Banzai* (1984)
- *Contact* (1997)
- *The Day the Earth Stood Still* (1951)
- *The Day the Earth Stood Still* (2008)
- *Dr. Strangelove* (1964)
- *Fatman and Little Boy* (1989)
- *Honey, I Shrunk the Kids* (1989)
- *I Am Legend* (2007)
- *The Incredible Hulk* (2008)
- *I.Q.* (1995)
- *Jurassic Park* (1993)
- *Mary Shelley's Frankenstein* (1994)
- *Meteor* (1979)
- *Real Genius* (1985)
- *This Island Earth* (1955)
- *Tron* (1982)
- *20,000 Leagues under the Sea* (1954)
- *Twister* (1996)
- *Volcano* (1997)
- *Wargames* (1983)
- *War of the Worlds* (1953)

The popularity of this series led to giving students an opportunity to study the material in more depth and receive credit for their work. Rather than creating a separate course while maintaining the film series, we decided to marry the two projects into a single package. This action was not simply taken because of the obvious savings in time and effort by combining the two projects. One of the purposes of the course is to discuss the interaction between the portrayal of science by Hollywood and the public perception of science. By bringing the public into the room with the students, we are able to make that perspective more broad-based and readily available to the students.

With the creation of the class, there were several changes made to what we had been doing in the film series. The number of movies involved in the course has been greatly increased from that of the film series, as have the number of public viewings. These movies are organized around particular themes. Originally, we organized them around such themes as "alien scientists" or "scientists versus machines," but more recently

we have adopted the six stereotypes listed above as the themes. Additional movies from each theme that are not shown in public are assigned to students to watch during the two-week period between public viewings. Students discuss these movies on the class discussion board, which is moderated by the faculty.

Based upon their viewings, discussions, and independent research, the students are required to write a paper analyzing each theme every couple of weeks. In their papers, the students are expected to dissect the various portrayals they have watched to delineate the basic features of the stereotypes and to discuss how these features help or hinder the film. By the end of the course, the students are expected to produce a major research paper on a topic of their choosing about some particular aspect of science in the cinema. These topics have ranged from gender roles of scientists to the use of nuclear energy in movies to the growth of scientists as consultants in movie over time. The goal of these exercises is to make the students more discerning consumers of media images of scientists and science.

Findings

The course has been now been offered four times, twice as a special topics course and twice as an upper-division elective course. Enrollment has increased from an initial group of four science majors to a class size of twenty-one, with most of the students still drawn from the sciences. Before class begins on the first day, students are asked to draw a picture of a scientist (we also ask them to draw a lawyer and a plumber, two other professions that are stereotypically male). While the vast majority of the students are upper-division science majors and have had a lot of interaction with science and scientists, they still fall back on the basic stereotypes that the general public does on such an assignment. They drew the scientist as male 70 percent of the time and female only 12 percent of the time (18 percent of the drawings had undetermined gender), even though females made up 52 percent of the classes. For comparison's sake, plumbers were drawn as males 64 percent and females 3 percent of the time, while lawyers were drawn as males 61 percent and 15 percent of the time. As one might expect from other surveys of this type (Griffith, 1983), no male student drew a female scientist and only a quarter of the female students drew a female scientist.

Beyond the question of gender, the drawings put scientists in stereotypical style and settings. The scientist was holding a beaker or test tube in 76 percent of the drawings, had a lab coat on in 67 percent, and had "weird" hair and glasses in 42 percent of the drawings. These results closely match results from the same survey given to entering science majors on our campus.

In the classroom, the greatest challenge faced so far is getting students to think critically about what takes place in the movies and television shows. Watching movies or television is a passive experience for most people, and our students mirror this experience in their early papers by merely stating the plots of what they have seen rather than dissecting it for the stereotypes that are portrayed. It is often not until the latter half of the course that the students are able to fully appreciate how to engage the material. As an example, here is an excerpt from one student's initial paper:

> In this movie (*The Core*), the scientists Dr. Josh Keyes, played by Aaron Eckhart, and Conrad Zimsky, played by Stanley Tucci, discover that the Earth's core has stopped rotating. This being the source of the electromagnetic field that protects the Earth from Solar Radiation without it we will all die [*sic*]. Therefore a team is put together to restart the core. Going to the core are the two discovers [*sic*] Keyes and Zimsky, along with the ships [*sic*] designer Dr. Edward Brazzelton, played by Delroy Lindo, the weapons specialist Dr. Serge Leveque, played by Tcheky Karyo, and two astronaut pilots Major Rebecca Childs, played by Hilary Swank, and Commander Robert Iverson, played by Bruce Greenwood.

The following is an excerpt from the final paper from the same student:

> The character in *Evolution* played by Julianne Moore is the naïve expert, though she has qualities of the assistant. She contributed little to the advancement of science and when she tried, a superior male character turned her ideas away. She was mocked sexually by her male colleagues and at the end of the movie, began a relationship with one of the men who participated in making fun of her.

Some students have gone beyond the bounds of the course, either continuing to come to the public viewings after having taken the course or by using the concepts discussed in the class for further research.

Future

To date, the course has focused almost exclusively on film, which for decades was the primary medium for scientist portrayals. However, the growth in the number of television channels and content delivery via the internet over the last decade means that there has been an explosion in the number of television shows and cartoons in which scientists play a lead role. These shows seem to have a greater diversity in their portrayals of scientists, at least in terms of gender, as there are more female scientists being portrayed. Also, there have been initiatives, such as the UCSB STAGE Script Competition (http://www.stage.ucsb.edu/) and the Imagine Film Festival (http://www.imaginesciencefilms.com), to connect plays and movies to science and scientists in a more realistic manner. In the future, we will spend more time looking at these portrayals and how they might be changing the stereotypical view of scientists.

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References

Chambers, D.W. 1983. "Stereotypic Images of the Scientist: The Draw-A-Scientist Test." *Science Education*, 67 (2): 255–265.

Frayling, C. 2005. *Mad, Bad, and Dangerous? The Scientist and the Cinema*. London: Reaktion Books.

Martin, M.O., I.V.S. Mullis, and P. Foy, J.F. Olson, E. Erberber, C. Preuschoff, and J. Galia. 2008. *TIMSS 2007 International Science Report: Findings from IEA's Trends in International Mathematics and Science Study at the Fourth and Eighth Grades*. Chestnut Hill, MA: TIMSS and PIRLS International Study Center, Boston College.

Mead, M., and R. Metraux. 1957. "Image of the Scientist Among High-School Students." *Science*, 126 (Aug. 30, 1957): 384–390.

National Science Board. 2010 *Science and Engineering Indicators 2010* (NSB 10-01). Arlington, VA: National Science Board.

Sarewitz, David. 2010. "Entertaining Science." *Nature* 466 (July 2010): 27.

Wu, M.L. 2008. *A Comparison of PISA and TIMSS 2003 Achievement Results in Mathematics*. Paper presented at the annual conference of American Educational Research Association, New York, NY. http://www.iea.nl/fileadmin/user_upload/IRC2008/Papers/TIMSS_Mathematics/Wu.pdf (accessed April 16, 2010).