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Depictions of Genetic Research in Film Across Film Genres

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Depictions of Genetic Research in Film Across Film Genres

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Abstract

When people do not have personal experience to draw on, the experiences of characters in film can serve in the mind as a substitute. This research sought to determine what kind of impression films depicting genetics research leave on the audience. These genres were romance (*Code 46*, 2004), horror (*Splice*, 2009), thriller (*Children of Men*, 2006), and drama (*Gattaca*, 1997). Scenes from the films were analyzed to determine their likely effect on the audience perception of genetics. The researcher hypothesized that the drama and romance films would portray genetics research as neutral, but the science would be less accurate, and that the horror and thriller films would portray genetics research negatively but contain more accurate science. The overall effect of the two factors on audience perception of genetics research was discussed, and a conclusion about overall depiction across the four films was then drawn.

Influence of Nonscientific Media

The medium of film has been rooted in the American psyche almost since its inception. Since the early days, audiences could be frightened by the realism of footage of a train speeding towards them, making the line between film and reality difficult for the human mind to grasp. In the current age, where film is a mainstay of life and we have a conscious knowledge of films small deceptions, the brain has negotiated ways of suspending disbelief for the purpose of understanding the story being told as long as internal consistency is maintained (Grody 2010). Despite the conscious knowledge that film is not always truth, the question of how much the unconscious can be affected by what is being seen remains. Film techniques such as lighting, set design and camera angle exist primarily to effect the unconscious. Without specifically watching for these elements, most audiences do not notice these elements, yet they play an integral role in the overall effect of the film.

With no reference to draw on for real knowledge, audiences sometimes believe themselves to be more knowledgeable than they are based on what they have seen on the screen. This is most notable in the form of the *CSI effect*, which is characterized by how the audience of crime dramas sometimes believe that since they have seen how an investigation is done on TV, they have knowledge of how real investigations are conducted. This becomes a problem when people are selected for juries and think they know what constitutes strong evidence and what does not. Ewanation, Yamamoto, Monnink, Maeder, and Mccartan (2017) found that audiences who frequently viewed crime dramas on TV were more likely to convict in mock cases than those who did not. The effect of film on the audience is sometimes profound and can be damaging to the field it portrays.

Similarly, in a 1999 study by Henderson and Kitzinger found that pop articles and TV dramas were the most influential sources of information on breast cancer. The study asked focus groups of women about their knowledge of breast cancer. Ideas tended to focus around the genetic basis and family inheritance of breast cancer, but the scientific accuracy of these ideas was generally unsound, and when asked where their ideas came from, dramas and pop articles were most frequently cited by the subjects. In fact, scientific articles were almost never cited as a source of information. This attests to the influence of dramatized, inaccurate media portrayals of science on the public knowledge.

This research sought to determine if a similar phenomenon occurs with portrayals of genetics research. Genetics is a rapidly expanding and complex field requiring a background in biology and chemistry to understand. The average movie-goer does not have this background when they walk into a theater to watch a film involving genetics research. With this in mind, the potential for false information and biases caused by misrepresentation is high. With genetic testing becoming more widespread and genetic research opening the door to new advances in medical science, a damaging effect from film depictions could have unintended but harmful consequences. Those for whom genetic testing could be beneficial may not receive it and people may fear genetic research.

Psychology of Film Techniques

The methods employed by film creators to evoke feeling in the audience are often highly effective on the unconscious bias of the viewer. Winter examined the techniques used in horror movies to determine what the implicit meaning behind shot-types (2014). They found that certain angles and lighting techniques typically conveyed a set of ideas to the viewer; for instance, *dark*

is bad and *down is threatening*, noting these assumptions likely stemmed from the historical implications these images held in the cultural imagination.

Implicitly held beliefs also affect the way films are perceived by viewers; specifically, if there is cultural precedent for a belief, its reflection on the screen tends to make the films ideas easier to convey and more impactful. Payne and Dal examined from viewers implicit beliefs and their impact on film perception (2015).

This researcher hypothesizes that the drama and romance films will portray genetics research as neutral, but would portray science less accurately, and that the horror and thriller films would portray genetics research more negatively but contain more accurate science.

Method

This study compares the depiction of genetics research across four genres of film as labeled by the website IMDB. *Gattaca* (1997) was characterized as drama; *Code 46* (2003) as romance; *Children of Men* (2006) as a thriller; and *Splice* (2009) as horror. All four films received a theatrical release with a major US entertainment company (MGM, Warner Brothers, Sony Pictures, and Universal Studios), and each film was available to be purchased on iTunes for viewing. For each film, scenes were chosen that specifically mentioned genetics research; those scenes were then evaluated for scientific accuracy. Then, the filming techniques used during the scenes were recorded, and the psychological effect of those techniques were analyzed to determine the filmmaker's intended reaction of the audience.

Gattaca (1997)

Background and Synopsis

The human genome project was completed in April of 2003 with a rough draft of the results available in 2000. *Gattaca* was released in 1997 when speculation as to the effect of

having the human genome fully sequenced was still very high. Gattaca explores the possible ramifications of a prospective “not too distant” future in which specific genes for health and physical appearance can be selected to form a genetically “superior” privileged class. Gattaca tells the story of Vincent, a natural-born child, and his struggle to succeed in a world that has already decided that he will fail. The story uses genetics to explore themes of discrimination as well as nature-versus-nurture. Vincent is discriminated against for his lack of genetic perfection (deemed “genelism” in the film) and is therefore unable to get a job at Gattaca and go to space, as was his lifelong dream. Deciding that he wants to try anyway, Vincent becomes a “borrowed ladder” using the genetic footprint of Jerome Morrow, a perfect genetic specimen and former swimmer who is now quadriplegic. Vincent applies to Gattaca as Jerome, is accepted, and works there long enough to be scheduled for a mission to Titan. However, a week before he is set to leave, a murder is committed at the company by an unknown party. During the ensuing investigation, one of Vincent’s real eyelashes is discovered and he becomes a suspect despite no one knowing that he works there. Even in the face of the discrimination faced by Vincent throughout his life, he proves himself to be smart and healthy enough to face every test thrown at him. His success suggests flaws in this society’s insistence on genetic superiority as a measure of intelligence, success and health. His society thinks it is his nature to be inferior and he was, as such, raised to believe that he was. However, his belief in himself was altered when, earlier in the film, he defeated his brother, Anton, during a swimming competition. After this event, Vincent became committed to proving that he was as capable, if not more so, than those whose genes supposedly predisposed them to greatness. Had his belief in the way he was raised not been tested, he may have never tried to beat the system. Instead, he challenged the societal belief that the genetically superior of this world are truly better, and questioned whether genetic

altering was just a means of yet another institution of society created to keep a certain class of people oppressed.

The Science

While genetics serves partly as a backdrop for the drama to play out, and appears briefly in many instances, there are also several specific mentions to the science involved. For instance, about 10 minutes into the movie, the film presents the story behind the circumstances of Vincent's birth and later, the birth of his brother Anton. Vincent was conceived the old-fashioned way and was born in a hospital with the doctor immediately testing his blood and reading aloud to his parents a list of diseases he was at risk for, and when he was likely to die. This list included a random assortment of issues along with their probabilities, such as, "neurological condition 60% probability, manic depression 42% probability, attention deficit disorder 89% probability, and heart disorder 99% probability". This sampling of probabilities has some issues, specifically, neurological condition is vague and could include includes one or many conditions from a very long list of disorders of the nervous system, including Attention Deficit Disorder, which also falls into this category. Additionally, most neurological disorders are not inherited, so testing of Vincent's genetic code would do little to tell his parents of his risk. Psychological conditions such as manic depression, may include genes that are risk factors (making the probability segment more realistic), but there are often many other factors at play. The list ended with an estimate of his life span being approximately 30.2 years, a specific estimate that and would likely be affected by environmental factors that could not be accounted for by a genetic testing. When Vincent's parents considered the birth of Anton, their sperm and eggs were donated and the doctor cultured four possible children (2 male and 2 female) for the parents to choose from. This process is real and is known as preimplantation genetic diagnosis (PGD).

During this process, eggs are fertilized and left to divide several times outside of the womb. One or two cells are then removed and DNA from these cells is analyzed. Embryos that are healthy can then be implanted (Watson 2003). Later in the film Irene, Vincent's love interest, tests a sample of his hair and has his genome sequenced within seconds. The test reveals his entire genome and gives an overview of results about his health, assigning it at 9.3, which is noted in the film to be a desirable score and a determiner of greater health. A similar test can now be conducted via services such as 23andMe and Ancestry DNA. With these tests, a saliva sample is sent to the company's lab and is used to sequence the DNA of the individual. The report is returned, relaying health and ancestry information. Currently, the minimum time to sequence the human genome is about 24 hours, as opposed to the several seconds it took in the film; however, this technology continues to improve and the process for sequencing is getting faster. The science depicted in *Gattaca* remains within the realm of possibility as the technology of the film is simply an extension or amplification of existing technologies. Therefore, the film's depiction of genetics is as accurate as a science fiction film can be.

Film Techniques

The audience experiences the conception of both Vincent and Anton in this film and the boys' differences begin with these scenes. Vincent is conceived in a green car on a beach at sunset overlooking a beach in Detroit. In the hospital where Vincent is born, the set design features sash windows, soft lighting and vivid red walls, and the nurses and the medical staff wear modern green scrubs. This amplifies the message that Vincent's birth is natural, the scenes shown would more easily relate to the experiences of the audience. The office where Vincent's parents meet to conceive Anton is bright and cold with glass walls revealing a background with lots of movement from other couples there to do the same thing as Vincent's parents. The rooms

have red ceilings, as red as the walls of the room where Vincent is born. The cold office setting evokes a feeling of unnatural distance, especially for an action that would normally be so personal and intimate.

The building Irene visits to have Vincent's DNA sequenced shares this sterile and cold feeling in the office where Anton is discussed. The client and the tester are separated by a deep blue wall with a hole located at head height and the framing is such that the focus is on Irene's face. The contrast between the personal nature of the information being discovered by Irene and the sterile office impresses on the audience the way that this society commodifies personal information and health. The framing on Irene's face separates her from the other patrons submitting DNA for sequencing and allows us to see her reaction as her ideas about Anton's health are confirmed.

Effects

Gattaca displays a vision of a future that is heavily influenced by the effects of genetic testing and selection. It does a good job of illustrating the potential ethical issues that could arise from new genetic advancements by building on technologies already in use. Gattaca shows a world where most people are healthier and stronger than ever before, but shows that while these traits may be beneficial, humans can succeed the way they are now.

Vincent is the primary protagonist of this film; the film tracks his success and he is clearly our sympathetic character. Vincent and the protagonist of the film, Irene, are both targeted by society for being defective. Even with genetic engineering, Irene is considered imperfect due to a heart condition. Because of this, we are meant to choose a side against the society of the film and, be against the rigidity of genetic engineering.

I would not say the film is opposed to genetics research, more that it is warning about a world where genetics is used as a new form of discrimination and is taken as the ultimate signal of someone's worth.

Code 46 (2003)

Background and Synopsis

Centering on the romance between two strangers, William and Maria, Code 46 is set in a future where viruses enhance a person's perception and abilities. Clones are commonplace and the government decides why and if you have permission to do anything, including travel. In this world, you need "cover" (a kind of insurance cover document) to travel anywhere and cover is authorized through the granting of "papelles". William is an insurance fraud investigator from Seattle who is in Shanghai to investigate papel forgery and quickly falls for Maria, the forger. They have a brief but passionate affair, then William returns home to his wife and child in Seattle and things return to normal; until William is called back to Shanghai after 14 days because he did not turn in Maria and the last person she sold a forged papel to, died. The papel was not given out in the first place because the man requesting it had a blood condition that caused him to die. William sets out find Maria and discovers she is in the hospital for a Code 46 violation. He knows that going to get her will take longer than the 14 days that his cover allows, but he goes anyway. Maria was in the hospital because she was pregnant, but her pregnancy was terminated because the parental genes were too similar, and her memory of the affair that resulted in her pregnancy was erased. William picks her up from the hospital but she does not remember him so he asks her to get him a papel so he can go home. She gets him the papel but they fall in love again and they end up taking a flight to Jebel Ali and hide there together. As part of the protocol for Code 46 violation, repetition of the inciting incident results in automatic self-

reporting, so Maria contacts the authorities who come to arrest both of them. While running from the authorities, William crashes their car and they both lose consciousness. William wakes up in a hospital in Seattle, his memory of Maria erased. As punishment, Maria is left in Jebel Ali with her memories with William intentionally left intact, forcing her to remember him with no way of being with him again. She is left without cover and any way to fend for herself.

Science

The film deals with genetic issues of government control by knowing every citizen's genetic code, and by cloning. The government in the film, referred to as the "Sphinx", knows everyone's genetic code and uses this information to control people. The Sphinx is in charge of who has the ability to travel and to where. It is demonstrated in the film with the death of one of the characters named Damien, that sometimes this control is justified. Damien had a rare heart disorder called Ward's disease that made him likely to die if he traveled. The film leaves it unclear whether Damien also had this information, but Maria and William clearly did not. Potential government use of genetic information is a genuine fear in today's society as well. One issue that some people voice concerns about is the possibility that insurance companies may be able to use the statistics of genetic susceptibility gleaned from genomic testing to raise rates and/or deny coverage. This issue relates to the character Damien because it is possible that the reason they did not allow him to travel was not just to protect him, but to stop a valuable member of society from dying.

The other genetic research related factor in the film was the revelation that Maria is one of several clones, and is in fact a clone of William's mother. This is the only time cloning is mentioned throughout the film so it is unclear exactly how widespread cloning is. It would be an extreme coincidence that this woman, half a world away, would be a clone of his mother if

cloning were not prevalent. The film is suggesting that cloning is widespread enough for William to easily find and fall in love with a genetic clone of his mother. This sort of incident is prevalent enough that they have to have rules about screening parents before they conceive.

The reason that Maria and William cannot have children together is because their genes are too similar. In a world where they can clone humans and presumably have access to the citizens genomes (given what they knew about Damien), they could simply check to see if Maria and William are both carriers of anything physically or mentally damaging. The fact they are related does not necessarily mean that their offspring will be unhealthy; it just makes it more likely because there is less genetic diversity between them and more chances for unhealthy genes being passed on in a way that would affect their children.

Cloning humans is not currently possible scientifically, though it has been done on mice and sheep with variable success. That said, there are moral and ethical issues involved with cloning humans, which is why many countries have passed legislation banning human reproductive cloning.

Film Techniques

The two scenes reviewed are very different. The atmosphere of the crowded and lively bar where Damien receives his travel papers is full of happy people. The main characters are all close together and celebrating that Damien finally gets to achieve his dream to study bats. The bar is full of warm colors, red decor, and colored lights. This communicates to the audience that despite the illegal nature of the gathering, this is a place of friends and life. It suggests that allowing Damien the ability to travel brings him a lot of joy, a notion that becomes important later after his death.

The clinic where William discovers that Maria has been taken in for a Code 46 violation is full of bright white lights. Whites, grays, and blacks make up the colors of the set, and all is quiet as William thinks about what has happened and how. He knows elements of the law so in this silent moment, he must have realized that Maria's memory would be wiped and the fetus aborted, and that he has no one to talk to about it. In contrast with the earlier scene set among friends in a crowded lively bar, this scene quietly mirrors the emptiness that William feels when he realizes that not only has the possibility of a child between himself and the woman he loves ended, but that said woman does not even remember that he exists. The setting help to illustrate the feeling of the main characters to the audience.

Effects

Code 46 depicts a world where the Sphinx knows everyone's genetic code and uses it, and where cloning is widespread enough to have strict rules about it. The government holds all the cards and is the one using genetic information. Our main characters both work for the government at the beginning of the film, but by the end have decided to rebel (even if for one party that decision is later revoked through a memory wipe). William is clearly saddened by the fact that he and Maria's pregnancy was terminated despite knowledge of why the rule was in place. I believe this film to be less anti-genetics research than it is anti-governmental control of genetics information. Maria and William know the risks, but they personally want to be free to love each other however they want.

Children of Men (2006)

Background and Synopsis

What would become of society if no new children were born in the world? Director Alfonso Cuarón shows us what such a world may look like in the first three minutes of the film.

A news report informs viewers that the world's youngest person, Diego Ricardo, died at the age of 18. The news story informs the audience of both the problem and how long it has been an issue. In the following scene, our protagonist, Theo, narrowly avoids an explosion in the coffee shop where the news report was shown, setting up all we need to know.

The film uses the world's infertility crisis to explore themes of faith. Theo is a former activist who lost faith in the cause and the world at large after the death of his son. He is reunited with Julian, his former partner, is the leader of a rebel group called FISHERS in an attempt to make money by assisting them Julian introduces Theo to Kee, the woman he is supposed to travel with for the FISHERS. Near the border, the travel companions are attacked and Julian is killed. The group flees to a nearby safehouse and Kee reignites Theo's faith by revealing to him that she is pregnant. He begins to believe again if not in the world, at least in Kee and her child. It turns out that Julian sought out the disillusioned Theo in particular because she trusts him, despite his tendency toward nihilistic views. After learning that the attack was planned by a force within the FISHERS Kee and Theo flee the farmhouse and head for the house of Julian's friend and former activist Jasper. It is at this point that trust becomes an integral theme. Theo trusts Jasper to help them, Jasper trusts a guard named Syd to help them after soldiers catch up with Kee and Theo. Syd smuggles the two into a refugee camp that is connect to a bay where Kee is supposed to meet more rebels.

Over the course of about seven days, Theo goes from a character that believes the world is ending and resistance is futile, to a character with hope for the future. Of course, seeing a newborn for the first time in 18 years inspires hope in everyone in the film. What differs from the beginning of the film is anticipation of what the newborn will bring.

The film has no real villains; it had antagonists of course, but everyone and every group in the film had understandable motivations. The film leaves us on a hopeful note with Kee finding the long sought after human project on the sea.

Science

Children of Men gives no solid explanation for the cause of infertility in the world. We have only the bits and pieces of an explanation. Genetic experimentation is a stated potential cause, as are gamma rays and pollution, so here we evaluate the likelihood of such a claim.

Children of Men takes place in an alternate world in the year 2027. As stated in the opening, the youngest human's lifespan was 2009-2027; 18 years. According to Kee's caretaker, Mariam, the infertility crisis peak happened rather suddenly. She was a nurse and recounts losing three babies in a week to miscarriage, and noticed that there were no appointments booked up to seven months forward. So, we know the peak of the crisis happened 18 years ago and we know it happened quickly, suggesting that the cause was not genetic.

Film Techniques

The scene in which genetics is mentioned as a cause of the fertility crisis is rather short. It takes place at the house of one of Theo's friends, Jasper. Jasper is justifiably a bit crazy; he is a former newspaper cartoonist whose wife is catatonic from government torture. He also claims to have once seen a UFO, and he grows marijuana that he sometimes sells to soldiers. Jasper's house is full of remnants of days gone by. He listens to old music and has newspapers clippings on the walls, additionally part of his house is taken over by his marijuana operation. But unlike most places we see in the film, the set design in Jasper's house feels like it could be a home in our world. It feels cozy and lived in, is physically separated and hidden from the chaos of the rest of the world, and while everything else is gray and dirty looking, Jasper's house is warm. These

design choices communicate to the audience that in a world of chaos, this place retains some vestige of a world familiar to us. This makes sense as well because it later proves to be the one, albeit short-lived, safe haven for Kee, Miriam and Theo on their way to meet the Human Project.

Effects

A grim apocalyptic thriller, *Children of Men* shows the highs and lows of humanity by putting its main characters through terrible ordeals. In a hopeless world, science is both a beacon of hope and a possible cause of destruction. It is brought up that pollution could be why people are infertile, but the boat that Kee heads for will almost certainly use genetic science to determine why her pregnancy succeeds where all others failed. In this film genetic science is not playing for either side and the characters have no reason to embrace or rebel against it, it is depicted as a tool.

Splice (2009)

Background and Synopsis

Splice is a horror film with shock encouraged primarily through body horror and light gore. It begins with a point of view shot from what is revealed to be a creature created by two young scientists. The creature is a male who immediately imprints on the already created female version of the creature, and all seems well. The scientists are funded by a pharmaceutical company and with the success of their creatures, dubbed Ginger and Fred, they want to try the same gene recombination techniques with human DNA. In the interest increasing profits made from the isolation of Fred and Ginger's the genes which produce a protein that keeps livestock healthy. However, the company denies the request. The two scientists, Elsa and Clive, proceed with the recombination anyway as Elsa insists that they will "just see if it's viable, then terminate it", and then "see how close they came". Unable to stop this sequence of events, the pair

eventually end up raising an increasingly intelligent humanoid hybrid creature. Clive's brother finds out, and they are forced to move the creature they named Dren (nerd spelled backwards) to a remote farm where Elsa grew up. In the professional world, Clive and Elsa show their creations, Ginger and Fred, to a group of company investors, but in their preoccupation with Dren, they failed to notice that Ginger became male. The two creatures then fight and kill each other in front of the investors. At the farm, the relationship between Elsa and Dren declines rapidly, culminating in Elsa cutting off part of Dren's tail. Dren begins to show some violence, killing a cat and a rabbit. Oddly, after all of that, Clive and Dren have sex. Elsa finds out and she and Clive are faced with determining what to do with Dren's, now that he is becoming violent. They decide to kill their creation, but by the time they return to the farm, Dren is already dead. They bury her, but their manager finds them and demands to know what is going on, prompting Dren, who was not really dead, to kill the manager. Dren was not dead; she was turning into a male just as Ginger did. In all, Dren kills Clive's brother, their manager, and severely wounds Clive before forcing himself on Elsa. Clive's last act before dying is to kill Dren, but in the final scene of the movie we see that Elsa is pregnant with the result of the altercation between she and Dren. She plans to carry the fetus to term to sell to the pharmaceutical company.

Splice begins with a lot of technical genetic jargon and plausible science; however, it soon becomes more of story of two scientists arguing with each other and making decisions without first considering the possible negative effects of those decisions. There is some evidence of themes involving parenting and putting your own ambitions above reason. There is also some indication that Elsa's childhood was not very good, which makes her rather unpredictable with regard to her parenting of Dren, eventually physically maiming her. Our two young scientists put

their own interests above those of the rest of their team and ignore logical ethical standards to pursue something that was unapproved and became quite dangerous.

Science

Despite the fact that half of the film takes place within the confines of a biology lab, there are only two scenes in particular that discuss genetics in detail. The first discussion involves the two scientists giving an update and pitching their idea for a human hybrid to the pharmaceutical company. In this scene the scientists imply that Ginger and Fred contain genes from various creatures, including but not limited to: a horse, a bird, a fish, a kangaroo, a gecko and some kind of plant, and that the pair produce certain enteric proteins that are medicinal to livestock. Enteric means “relating to the intestines” so an enteric protein would conceivably relate to the functioning of the intestines in some way; this is left vague. When it comes to the combination of genes within Ginger and Fred, conceivably it could be possible to combine the DNA of different animals, though the appearance of the two creatures as wormlike blobs seems to be a stylistic choice.

The scene following, in which Clive and Elsa try to create their human chimera, also includes a lot of technical jargon. For instance, the protein they are researching for the Ginger and Fred produce is named CD 356, CD meaning cluster of differentiation. CD 356 does not exist in humans, however CD 355 and CD 357 do, and since this is science fiction the basis in reality makes sense.

Film Techniques

The scene where the conference is held is dark and sparsely decorated, the scientists discuss business over a round table. This lends a sense of foreboding to the scene, reminding the audience that this meeting is a shady illegal affair. The scene where the chimera is made takes

place in the lab. The lab is lit with dim blue light, not what one would expect of a real lab, which is typically brightly lit so lab employees can see what they are doing. The montage scenes of them attempting gene recombination also include a lot of screen images of double helices and percentage matches and chromosome pairs. These random scenes of things that bring to mind science but are not quite real science seem meant to scare and draw to mind other films that use science to scare the audience.

Effects

Splice identifies a danger of genetics research that it may not have intended. The rules in place by corporations and governments in the film would have prevented a problem from occurring, it was instead the hubris of two individual scientists that creates a monster. While the science depicted as dangerous because it created a killer, a deeper look shows that the science was a tool that if regulated would have caused no harm, but instead was misused and as such problematic.

Discussion

All of the films, with the exception of *Splice*, are set in a near future time where science has progressed past what we currently know, also making all of them fall under the science fiction genre. Additionally, *Gattaca* and *Code 46* could be considered dystopia occurring in imagined societies where there is great injustice, and *Children of Men* occurs during an apocalypse where society is falling apart and the world is being destroyed. For plot reasons, science fiction has a tendency towards the unsettling. If the world is a perfect technologically advanced utopia, what kind of compelling stories can be told within it? For plot to be interesting there has to be conflict of some kind, so in science fiction typically something has gone wrong, someone is using the technology in a harmful way or the technology has turned on humankind.

Since genetics research, and manipulation would be impossible without technology and is in fact made easier and easier the more advanced technology becomes, it makes sense that its portrayal is tied to that of technology.

In our two dystopias, the world functions well, but genetics is used by the government on a personal level to restrict what people can and cannot do. In the apocalyptic world of the near future, the trajectory has genetics falling out of relevance and the world falls apart and technology declines. In our more modern science fiction the main characters test the boundaries of science only to have their plans blow up in their faces due to their own mistakes.

I hypothesized that the drama and romance films would portray genetics research as neutral, but the science would be less accurate, and that the horror and thriller films would portray genetics research negatively but contain more accurate science.

In the case of *Gattaca* which was characterized as drama, the film overall had a stance against genetic manipulation. While a little bit closer analysis may have shown that it was more of a warning that the use of genetic technologies could be used to damaging social effect, the overall stance setting the protagonists against the system that uses genetics to control people. Additionally, the science was the most accurate of all four films, which does not support my hypothesis.

Code 46 also took a stance against genetic control by having its two protagonists fight against a government that is set on driving them apart. The government in the film, known as “The Sphinx” has every citizens genetic code and uses it to impose restrictions on their behavior. This film like *Gattaca* also appears to warn against a world where the government uses genetics for control. The science of this film was mostly accurate with a couple issues in terms of cloning but overall it was within the realm of belief. This also does not support my hypothesis.

Children of Men contained little in terms of actual science, but what little it did contain was believable. Things like pollution and radiation can indeed effect fertility so the science was relatively accurate. The film also did not take a stance against genetic research, instead using a mostly unexplained phenomenon to explore humanity at its best and worst. This partly supports my hypothesis because the science was accurate but it was not anti-genetics research.

Finally, the film Splice, which was characterized as horror and out of the four films it contained the least realistic depiction of genetics with its human animal hybrids. The film was outwardly anti-genetic manipulation with the overarching theme seeming to be “look what kinds of horrible things can happen when humans meddle with nature”. This also does not support my hypothesis as I assumed that a horror film would be more effective if the science was more accurate.

Conclusion

Any discussion on the effect of film will be subjective, as every person comes into a film with the knowledge and experiences they have. The challenge of this paper was to try to draw conclusions about of how others would see a film, with the assumption that they had no experience with advanced genetics or film techniques. I made my conclusions based on this assumption, therefore it is possible that the conclusions drawn in this paper are erroneous when it comes to the way audiences see these films. I am also not an expert in either genetics or film techniques, I have taken classes in both and done research for this paper, but there is always the chance of being wrong, it is a scientific risk. However, each section was written to the best of my ability as a student.

Overall, my hypotheses were not supported, I assumed that a dramatic or romantic film would use science in the background while focusing on the main drama and as such the science

would be less important and more likely to be accurate. In truth, since these films used less science I assume they could afford to be more accurate with what little science they were using. In contrast, the film that featured the most science, *Splice*, seemed like it had to stretch the truth to an unlikely extent in order to advance the plot. Additionally, the films seemed to have multiple layers to the way they viewed genes research and manipulation. Overall, all the films provided a general warning against genetics research, but on a deeper level all were neutral. More quantitative research would have to be done in the future to see whether audiences without experience and knowledge of genetics would tend to see the deeper or more shallow level.

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