

THE PRIVATE LIVES OF SCIENTISTS: REVEALING THE
HUMAN-SIDE OF SCIENCE FILM

by

Stefanie Snioszek Misztal

A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Fine Arts

in

Science and Natural History Filmmaking

MONTANA STATE UNIVERSITY
Bozeman, Montana

July 2008

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Stefanie Snioszek Misztal

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Dr. Walter C. Metz

Approved for the Department Media and Theatre Arts

Dr. Walter C. Metz

Approved for the Division of Graduate Education

Dr. Carl A. Fox

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Stefanie Snioszek Misztal

July 2008

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ABSTRACT

As a genre, science films have routinely dehumanized the scientists who appear in them, portraying these characters as simple, one-dimensional encyclopedias of knowledge, whose sole purpose is to relay facts and provide expert testimony in support of the filmmaker's agenda. These films fall short of their true potential when they neglect to present their subjects as complex, multidimensional human beings with fascinating stories, opinions, tragedies and comedies to share about their lives. As science filmmakers we should attempt to *re-humanize* the way science is portrayed on film by looking to examples like standpoint feminist theory, which advocates owning our particular, incomplete subjective-viewpoints, or 'standpoints' as a form of empowerment. Championed by scientist and feminist scholar Donna Haraway, these partial perspectives allow filmmakers to create a place where the public and private lives of scientists can not only co-exist, but also strengthen one another. By exploring the complex world in the private lives of scientists, we can give greater respect to scientists themselves as well as to the intelligence and emotional needs of the greater public. To treat science and the people involved in its construction with more ethical responsibility, to build a more empowered and enlightened public, we as filmmakers need to introduce the personal values of willing scientists into the public sphere. If we can reinvent the science film as an endeavor steeped in humanity, it may become a more ethical and effective communication tool to fill these growing needs.

CHAPTER ONE

INTRODUCTION

As a genre, science films have routinely dehumanized the scientists who appear in them, portraying these characters as simple, one-dimensional encyclopedias of knowledge, whose sole purpose is to relay facts and provide expert testimony in support of the filmmaker's agenda. These films fall short of their true potential when they neglect to present their subjects as complex, multidimensional human beings with fascinating stories, opinions, tragedies and comedies to share about their lives. Inspiring and exceptional films paint a subtle and nuanced picture of vivid yet flawed characters we empathize with because we relate to their vulnerabilities. They win over both our hearts and our minds by reflecting the universal human qualities inherent in us all. Yet, science film has long neglected to pursue these types of character-driven stories, mostly because filmmakers find it easier to build tried and true simplistic plots about science as either a mystery with a set solution, or as an 'us versus them' conflict, usually involving man versus nature or science versus antiscience.

However, these simplification tactics can be irresponsible and disrespectful to both the scientists and the audience, because they reduce complexities and nuances into what often becomes a single-minded propaganda in films like *The 11th Hour* (2006). While the rest of the documentary film genre has developed more responsible practices to respect its viewers and on-camera subjects via reflexive films such as *Surname Viet Given Name Nam* and *Sherman's March*, science film has persistently lagged behind in

adopting these innovations (1989; 1986). Its striking lack of variation outside of the established formula begs an intriguing question. With all of the potential roads available to treat a subject like science—which itself inherently promotes evolution and innovation—why has science film failed to evolve?

The science documentary lies in a tricky place, caught between art and science, but it has tended to favor the values of science over all else. Much like science itself has tried to claim direct access to the ‘Truth’, science film has exploited the idea of the camera as an instrument of science, used for documenting this all-encompassing Truth. By mirroring some of the chief tenets of modern science—objectivity, certainty, and positivism—science film has persistently hidden the real processes of both science and filmmaking in all of their biased and flawed glory. Science films’ practice of relegating emotions to the sidelines in order to legitimize itself is only alienating both the scientists from the public and the public from the scientists. Yet, isn’t the purpose of film for the audience to *feel* something? To connect with the viewers on both an emotional and an intellectual level? Just as great teachers inspire their students to think critically and develop a passion for a subject, filmmakers cannot neglect the power of this ‘spark’ as an invaluable educational incitement. But, they also should not think this means they can stray too far from intellectual arguments into the dangerous realm of sensationalism and reductionism. It is irresponsible to provoke emotional controversy for the sole purpose of constructing thrilling stories when the issues are more complex than a simple conflict thesis supposes. In this respect, healthy science films should seek a balance between

intellect and emotion, but one should not be ignored in favor of the other. We snub emotion at our own risk.

For too long, science has championed positivist notions that it can provide solutions to all our problems, but this only leads to disillusionment within the public if and when science does fail. How can you trust something that does not fulfill its promises? If instead, we as science filmmakers look to standpoint feminist theory, which advocates owning our particular, incomplete subjective-viewpoints, or ‘standpoints’ as a form of empowerment, we can find an intriguing foundation for character-driven science films that embraces the complexity inherent in human beings. By adopting this idea of partial perspectives championed by scientist and standpoint feminist scholar Donna Haraway, filmmakers can re-humanize science film by creating a place where the public and private lives of scientists can not only co-exist, but also strengthen one another.

As responsible filmmakers and citizens, we can use these tools to rebuild failing public trust of science by giving audiences an informed critical eye with which to assess the merits of scientists and scientific issues that surround them on a daily basis. By exploring the complex world in the private lives of scientists, filmmakers can give greater respect to scientists themselves as well as to the intelligence and emotional needs of the greater public. To treat science and the people involved in its construction with more ethical responsibility, to build a more empowered and enlightened public, we as filmmakers need to introduce the personal values of willing scientists into the public sphere. If we can reinvent the science film as an endeavor steeped in humanity, it may become a more ethical and effective communication tool to fill these growing needs.

CHAPTER TWO

AN ALIEN WORLD

The Quest for Objectivity

Science's efforts to remove subjectivity from its research began with the Enlightenment Era and its paradigm shift in the way scientists thought about their surroundings. At the time, these thinkers saw objectivity as a way of legitimizing science in the eyes of the world. However, their revolutionary philosophy has also unintentionally created an alienated world of scientists, secluding scientists from the rest of society with its secularizing influences. As one of the major instigators of this segregation, the French philosopher Descartes laid the foundation for secular science when he declared the mind separate from the body. His Cartesian followers strove to take the idea even further, advocating that science should remove all subjectivity—and signs of humanity—from the equation (Numbers, 2007). This Enlightenment technique of separating thinking from feeling was deemed good at the time to legitimize science, but over the course of several centuries, it has also revealed many inherent flaws in the system when put into practice. Its chief creeds of objectivity and positivism prevent self-conscious thought amongst the science community, its patriarchal values create bias against alternative, emotional ways of solving problems—implicitly associated with women—and its values encourage moral detachment that can allow dangerous science, such as nuclear weapon development, to occur without moral checks (Levins and Lewontin, 1985). While all of these philosophical influences have alienated this very

powerful group of scientists from the rest of the global society, clear evidence from science studies contradicts the idea that these scientists have risen above the fray. In fact, these studies actually point to a very strong societal influence on science as well as an equally powerful relationship between scientific thought and society (Levins and Lewontin 1985). Still, science persists in ignoring these critiques of its methods, because it continues to build walls around its constructed alien world. And, in spite of science's repeated efforts to promote its own positivistic quest for progress, its inability to consider itself as a value-laden part of society has also created a growing public alienation from science, particularly in the realm of human faith and spirituality.

Turning the Microscope Back on Science

In order to better appreciate the extraordinary value of science, we need to be able to interpret it from a moral standpoint of embodied knowledges, both as a field strongly influenced by the subjective values of scientists, and in terms of the products it produces for society. Once we as filmmakers recognize science as a very human activity, we can begin to develop a much greater self-interest in its applications and ability to judge how to harness these applications into the future. By embracing a hermeneutical approach to critiques of scientific values, we can move beyond a false dichotomy that pits objectivity against its mortal enemy, relativism. Looking to dialectics, historical materialism, and standpoint feminism we can find a place for both objectivity and subjectivity in the dialogue. Just as no science experiment has meaning until interpreted by theory, science has no meaning until interpreted by human beings (Stahl, et al., 2002). The goal of this

contextual communication should not be to continue touting the historic idea of scientific omnipotence, but instead to promote the creation of enforceable, reliable accounts in the public communication of science. This idea of partial perspectives within standpoint feminist thought, advocated by Donna Haraway, encourages the summing of parts to create meaning by finding interconnections between science, morals, religion and other subjective aspects of a scientist's identity as a person (Haraway, 1993). Haraway's philosophies represent a more embodied type of objectivity that embraces the subjective side of science while maintaining its credibility as an invaluable tool in our study of the world around us. In fact, as feminist author Chris Weedon states, Haraway's idea of situated knowledge rejects the traditional subjective/objective dichotomy that denies any partial perspectives or ownership in science (1999). By breaking down this border, originally erected by the Enlightenment thinkers, Haraway believes that we can find a different, possibly more productive way of framing science that reduces alienation by allowing its human qualities to shine through. These ideas are not about esteeming science less, but about esteeming it in the right way. As social scientist Mary Migdley states:

We are not saying that science has not been successful in providing technological and conceptual means for coming to terms with many of the problems that we face, or that scientists are all living in a fanciful world, blinded by a myth of truth seeking and knowledge making. Nor are we suggesting that science is another form of religion. (qtd. Stahl, et al., 2002).

According to Migdley, critiquing science does not mean we are rejecting science, but that we are striving to make it more transparent and understandable for a public growing ever more distrustful of the power of science. In order to make important decisions about

issues like stem-cell research, thinning ice caps, and food shortages we need to recognize the basic human values of science, as well as the people who represent the faces of these values.

CHAPTER THREE

THE PRIVATE LIVES OF SCIENTISTS

Revealing Scientists as Human

Because science has hidden its human-side so well under the ubiquitous passive voice of objectivity, its human qualities have become a largely unrecognized influence within scientific circles and remain an underused, yet vital tool for interpreting scientific findings. According to standpoint feminism, we should be embracing these impetuses as part of scientists' situated knowledge, which can bring the private human dimension into the public sphere and add a more relatable dimension to their work. Yet, science today seems nearly devoid of any sign of humanism, and scientists themselves often wonder how much of their personal beliefs and values they can display in public communication without being discredited professionally. When the Enlightenment era strove to drive subjectivity out of the equation of scientific research, it also left behind a "crisis of spirit", with scientists seeking a balanced and morally fulfilled life away from their work (Fish, 2008). However, this side of their personalities has been strictly relegated to the privacy of their non-work lives, despite the fact that it often consciously or unconsciously carries over into the decisions they make at work, and could act as a critical, untapped aid in the role of science communication. Many scientists frequently express an incredibly heartfelt sense of awe and wonder about the scope of the natural world they study, but hesitate to fully display this sentimentality on the record, in spite of the fact that such emotional openness could serve to demystify and humanize the endeavor (Sagan, 1996).

Additionally, Carl Sagan argues that this social turmoil is particularly good for science, and that the human-side of things—the debates, the serendipity, and the failures—is what drives science forward (Sagan, 1996). For example, historical figures Charles Darwin and Issac Newton both sought to find God in the natural processes they studied, but many science textbooks neglect to mention this fact. Yet, does the impetus for their great discoveries discredit their work, or should we simply consider it a means to particularly spectacular ends?

Under the ideas of Haraway's partial perspectives, the motivations for a scientist's work become even more important than their results when exploring the strengths and weaknesses of current scientific thought and the history science. If embracing Sagan's ideas about showing the emotions of scientists as one partial perspective means humanizing science, perhaps we should strive to move in this direction rather than shy away from it. For, science filmmakers have to wonder what other damage they are causing in the public opinion of science by neglecting to acknowledge these societal influences.

Paradoxically, by reacting against the very dehumanizing techniques that were supposed to validate Enlightenment science, New Ageism, pseudoscience, and organized religion have come to fill the moral void that objective science has left behind for many. This trend has created a worrying, comprehensive knowledge gap about science that shuts many of these groups' followers out of current, important scientific discourse. But, instead of berating them as scientifically illiterate by dictating knowledge to them from on high, the scientific community needs to find common human ground with these groups

in order to further the discussion on important issues. As Simon Locke argues, science communicators should not treat the public as “faulty scientists” or think of science communication as type of “one-way colonization”, which will only further marginalize these minority groups (Locke 2002). The public is not so much illiterate as busy and studies show that the public literacy of science becomes high when the issues presented touch their lives in “significant and sustained ways” (Hess, 1997). Therefore, blame for science illiteracy should not be placed on a public but on the communicators. In addition, many of these science literacy surveys only “reinforce the syndrome” of blaming the public for disinterest and callousness when in fact, the public can make excellent analyses of science and even reconstruct it to their own benefit when they feel it directly affects them (Hess, 1997). Clearly, non-scientists can understand science when it is presented in a very personal, subjective way, so perhaps it is time for science and science popularizers to rethink their standard methods of communication. Instead of typical one-way colonization thinking, we need to promote a type of counter-colonization between the public and science by recognizing where partial perspectives overlap and where we can find common ground (Locke, 2002). And, by looking closely at the various camps in science and faith, human commonalities such as needs for ethics, hope, and faith can emerge from the seeming discord.

In addition to these considerations about the private lives of scientists, scientists seem to *want* the ability to provide this type of contextualization, rather than dismissing these cries for more self-aware subjectivity as we might expect. To find a real life example of a scientist clamoring to provide this type of commentary in his work, we only

need to look at the controversy surrounding the government censoring of James Hansen's climate change research. Hansen argues that if policymakers refuse to take adequate steps to institute policy recommendations based on the findings of science, then scientists should have every right to suggest their own recommendations both to the public and the policymakers, providing the type of analysis needed by those who do not necessarily understand the ramifications of sometimes dense scientific publications ("James Hansen and Mark Bowen on Censored Science", 2008). What science popularizers can take away from this, is that scientists are ready and willing to work with them to rebuild failing public trust. Yet, in order to do this, we cannot use the condescending approach of "uplifting the illiterates", which may only lead to further polarization (Hess, 1997). Instead, we need to innovate the way we discuss science topics in the media, to engage them on a level playing field with mutual human experiences.

The Private Spiritual Lives of Scientists: A Case Study

When we look at social beliefs about science and religion, we can find some interesting parallels in their embodied rationalizations and thought processes. In fact, social scientist William A. Stahl makes a direct connection between the subjective, embodied natures of these two supposed polar opposites, calling science "no more or less of a human practice" than religion when it comes to the morals and values inherently entwined in both scientific and religious systems (Stahl, et al., 2002). And while scientific circles consider objectivity a virtue, commitments to scientific belief structures such as the paradigms outlined by Thomas Kuhn and the faith of scientism do not face

the same critical eye as religious beliefs (Stahl, et al., 2002). In stark contrast to this notion, science studies has shown that the subjectivity of these scientists actually plays an enormous role in the type of research they choose to pursue. Researchers tend to study subjects they value, implying that in terms of morals, religion and science can overlap in subtle, but very important ways (Stahl, et al., 2002). In fact, many science studies scholars are now examining science ethics as a realm that could be either historically connected to religious morals or a fully separate domain from religious thought deserving of more attention. The idea of moral checks on science has been in serious play ever since the threat of nuclear war first raised concerns about scientific ethics, and such moral questions persist today in the form of impending global issues such as population growth, resource scarcity, and global warming (Kurtz, 2003). Clearly, with such heavy concerns on their minds, people need morals to make sense of the world. However for many, science can answer only answer ‘how’, not ‘why’ questions, which is why these same people tend to turn to religion and spiritual beliefs to provide guidance and meaning in their lives.

Prior to the Enlightenment’s firm adherence to its ideals of positivism and objectivity, science and religion actually maintained a very close and mutually beneficial alliance. It was the Enlightenment’s historic paradigm shift in scientific thought that not only led science to forcefully sever the bond with the supernatural, but also fostered an arrogance of thought that has widened the gap between scientists and the lay public. Prior to this shift towards modern scientific paradigms, naturalists frequently referenced divine influence in their study of natural philosophy. However, at some point between the mid-

eighteenth and mid-nineteenth centuries, these Romantic naturalists decided that regardless of personal belief, supernatural explanations no longer had a place in scientific studies. This revelation went hand in hand with the dehumanization of science, as scientists worked to delete references to religion in their publications at the same time as they religiously strove to avoid first person sentence construction and to adopt the passive voice in their writings (Numbers, 2007). Some science historians have taken this disappearance to mean that science defeated religion in the minds of these individuals and that secularization trumped faith. But, others counter that with the cultural pressures to validate science as objective in the eyes of the Enlightenment world, religion simply faded from public view and moved into the private lives of scientists (Numbers, 2007). However, many scientists remained devoutly religious, but rarely said so publicly. In fact, when scientists addressed the public rather than their peers, they “usually choose to speak as complete persons, and therefore not only report the technical results of natural science but also to place those scientific results in the framework of their worldview” (Numbers, 2007). Despite the pressures of their professional lives to remain stoically objective, scientists were quite candid in their personal lives about their religious beliefs, because they used their faith to contextualize their work for public consumption. Yet, how common are these scientists who lead dual lives?

Historic surveys uphold the assertion that many scientists describe themselves as religious, despite the image of the science institution as very atheistic. When James H. Leuba asked working scientists in 1914 and 1933 whether they believed in a God, nearly half, 42 percent, answered that they did, and when Edward Larson and Larry Witham

repeated the survey in 1997 they found remarkably similar results. Again, 39 percent of scientists claimed to believe in a personal God, and an even larger group believed in a more mystical form of a deity. These numbers are substantially less than those within the general American public, but considerably more than expected—90 percent of Americans say they believe in a personal God, the highest number in the Western world (Kurtz, 2003; Larson and Witham 1997; Stahl, et al., 2002). Interestingly, mathematicians appear as the most religious group of scientists, with 65 percent declaring themselves religious, with physicists and astronomers coming in as the least religious group at 22 percent (Kurtz, 2003). However, at the opposite end of the spectrum, elite scientists, those in power at the National Academy of Sciences in particular, appear overwhelmingly non-religious. In fact, Larson and Witham's survey also discovered that 95 percent of this group describe themselves as atheists or agnostics (1997). This has led other social scientists to ask whether there is an anti-religious corporate culture amongst science institutions that may not be representative of scientists as a whole (Stahl, et al., 2002). Only when we look at individuals versus those in power can we realize that perhaps only a privileged few control the science-side of the often-hostile science and religion dialogue. They do not speak for many in their group, nor should they be the only voice that is heard. However, this trend may continue unless we can bring the large number of religious and spiritual scientists out of the shadows and into a dialogue in the public sphere, supported by the multifaceted identities of standpoint feminism. By eliminating the either/or Enlightenment thinking of science and religion as wholly separate, we can embrace the thought that many scientists may have both of these partial

perspectives in their lives, and the two may coexist quite peacefully together. Only then can we create a paradigm shift in the way we think about the authority, objective claims, and positivist message of institutional science.

Many science studies scholars realize that perpetuating the status quo dictated by those in power does no one any good, as science continues to lose the support of the public when it fails to uphold its promises of inevitable positivistic success. As Charles Hodge argues, this attitude about the inevitable success of scientific endeavors has created an alienation between scientific and religious groups, partially as a result of these scientists' newfound "assumption of superiority" and their labeling of critics "as narrow-minded bigots, old women, Bible worshippers, etc". Hodge also found it hypocritical when scientists instructed religious leaders to stop interfering in science, yet continued to belittle religion on its own turf (qtd Numbers, 2007). Many scientists today may argue that they are clearly in the right, based on proven evidence, when it comes to classic scientific and religious issues such as evolution and cosmogony, but it is the tone of this declaration that matters more to the general public than the statement. Even today, many scientists seem to believe in the omnipotence of thought and that "only very clever people become scientists, and only very clever people interpret science, and the rest of us do not have the information to agree or disagree with their interpretation" (Tilby, 1993). A perpetuation of this attitude into current scientific thought continues to split science from humanity in the eyes of the world, despite growing critiques from the world of science studies that this separation is not a natural or desirable one.

On a more positive note though, when the public understands the *process* of science, and the human standpoints of individual scientists in particular, they are less likely to be taken in by politically motivated claims based on ill-informed science. For example, we only need to look at some of the questionably funded research used to prolong uncertainty in the ongoing global warming debate, to find a place where a more critical public eye may have helped illuminate some of the dubious motivations of these science results (Levins and Lewontin, 1985; DeWitt, 2006). In addition, scientists seem to want to speak out about the subject of their personal spiritual beliefs, but often hesitate to do so because of the politically charged nature of the topic. In fact, when surveyors changed their question from a belief in God to a broader question of spirituality, 66 percent of scientists, and 22 percent of atheistic scientists, described themselves as spiritual. According to the study's author, Elaine Howard Ecklund, many scientists have replaced religion with spirituality because they see it as "more flexible and personal" whereas they consider organized religion "judgmental". They also expressed a desire for more access to resources that could aid discussions with students about their personal beliefs (Bartlett, 2006). Clearly individual scientists want to move away from the unspoken mandates of scientific objectivity, but are unsure how to break through this political taboo. If science popularizers can help them with this endeavor, perhaps everyone has something to gain from the experience. As Brian Greene states in a heartfelt appeal to *New York Times* readers, we need to bring the humanity back into science to make it relevant in the lives of non-scientists. He argues that we need to look

deeper into why science really matters to our society because:

Science is a way of life. Science is a perspective. Science is the process that takes us from confusion to understanding in a manner that's precise, predictive and reliable — a transformation, for those lucky enough to experience it, that is empowering and emotional. To be able to think through and grasp explanations — for everything from why the sky is blue to how life formed on earth — not because they are declared dogma but rather because they reveal patterns confirmed by experiment and observation, is one of the most precious of human experiences (Greene, 2008).

According to Greene we need to reexamine the way we think about science and science education, by bringing these personalized and emotional accounts into the public sphere as new perspectives on the traditionally dehumanizing, and damaging dialogue.

If we follow Greene's recommendations and look to dialectics for inspiration within this discussion of the partial perspectives in scientists' lives, we can no longer classify science, religion, and the private and public lives of scientists as mutually exclusive. Richard Levins and Richard Lewontin use the example of Taoism and the Yin and Yang to highlight a dialectal, spiritual belief system with a balance between partial perspectives that the science and religion dialogue should examine, because under dialectics and Taoism, everything interpenetrates everything else (1985). In their example, parts of the Yin and Yang can exist within each other as separate but compatible pieces of the puzzle, without ever melting together to create undesirable, relativistic shades of grey. Those who fear that if we allow any sort of crossover, science will completely succumb to the demands of religion and vice versa, can look to dialectics and Taoism for reassurance that crosspollination does not mean a mutual muddying of the two. However, this crosspollination is already happening and we need to find healthy ways of coping these changing roles. We now look to science for a comfortable life

secure from the elements, diseases, and hunger, whereas historically people have looked to religion for these needs (Stahl, et al., 2002; Greene, 2008). But religion still holds a strong place in many people's moral lives because "the happy Enlightenment prediction that democracy plus science would produce freedom and happiness has been, at best, only minimally fulfilled" and many have come to believe that "without a sense of the sacred we will be left with nothing but uncontrolled economic growth and cultural despair" (Gottlieb, 2003). Religion still overwhelmingly provides hope for many struggling to comprehend the increasingly impersonal world portrayed by science as devoid of any ultimate meaning (Kurtz, 2003). Still, science can tread into the hopeful realm of religion, if we can incorporate some of these traditionally spiritual, moral thoughts into the dialogue.

So just what would a standpoint feminist portrait of a scientist look like and what can we gain from this new outlook? When we use the idea of partial perspectives to view science as a human enterprise, we can gain a useful viewpoint on the place of science in modern culture, namely in terms of the science and religion dialogue. First, by putting scientists back in the picture of the scientific process, science becomes less of an intimidating abstraction and instead transforms into the practice of real people, creating a "much more solid basis for partnership and dialogue" (Stahl, et al., 2002). Secondly, the history of the relationship between science and religion is a complicated one to say the least, and it deserves another look in terms of science studies in particular. Bringing something private like this emotional, human experience into the public discussion can often bring us to new insights that private reflection on its own simply cannot. By

utilizing these innovative and more intimate ideas, we can find a lot of substance for a new and productive dialogue between the scientific and religious communities (Barnhill and Gottlieb, 2001). But, a scientist's spiritual identity is only one partial perspective we can explore. Perhaps, a childhood spent in the outdoors created love of ecology and conservation in one scientist, or a history of global traveling lead to a multicultural, even non-Western, strategy for problem-solving in another. Or maybe a newborn baby inspired one scientist to look for greener ways to farm, or stopped her from treading down an ethically questionable path into the creation of dangerous, biological weapons. All of these facets of our personalities as humans play into every important decision we make in our lives, and despite public appearances, this is just as true for any scientist. A standpoint feminist perspective on this process can both aid the public in their evaluation of the trustworthiness of scientific endeavors and can create recognition amongst scientists themselves that they are part of a very human society that has a diverse, reciprocal knowledge to contribute to scientific discussions. Science filmmakers could have a lot to contribute to this discussion as well, but first we need to start innovating a tired genre, if we are going to succeed in this endeavor.

CHAPTER FOUR

THE TROUBLE WITH SCIENCE FILM

Building an 'Expert'

If we are going to engage a television audience with portraits of scientists as very real and emotional human beings, we should treat them on-screen as humans with subjective values that shape the work they feel is important to pursue, rather than as uninspiring vessels of knowledge devoid of any personality. So where does science film currently fall short in this respect and why? Traditional science films have long championed the Enlightenment ideals of positivism and objectivity by suggesting access to the ultimate Truth of reality. Without much deviation, they usually provide an expository, didactic discussion of a topic, carried by an omnipotent, Voice-of-God narrator, and validated by the presence of “talking heads”, which are almost always in concurrence on the message of the film (Gardner and Young, 1981). Often the stories told are simplistic, uninspiring detective stories or man versus nature battles, always moving in the direction of ultimate progress towards the ‘Truth’ (Curtis, 1994). These simplistic story structures fly in the face of what science studies reveals about the real nature of ongoing science: the heated debates between competing interest groups, serendipitous findings, and many, many failed experiments (Gardner and Young, 1981). Yet, with the magic of television and the power of the edit room, filmmakers can neatly sweep this messiness aside in favor of tidy triumph stories that ignore the complexities of

science-in-the-making. Science on television is a “certainty rendering machine” where the future will be just as definite and inevitable as the abridged past presented to the audience, without any implications of social choice in the crusade towards answers (Collins, 1987; Gardner and Young, 1981). And, despite the positive connotation of concepts like “progress” and “certainty”, we should wonder if these love letters to positivism are truly the best way to depict the real nature of science to the general public.

To elaborate on this matter, Gardner and Young discuss a television show about the historic validity of the infamous Shroud of Turin as this type of ‘certainty rendering’ in science documentary, which can produce misguided assumptions about the scientific process amongst the audience. In this particular show, the talking head experts, who insist that they will find the answers eventually, erase any uncertainty in the process of carbon dating; no matter how many obstacles they face in the process. While this specific dilemma seemingly resolves itself within the condensed and edited television episode, many scientists in reality never find that inevitable end we seem to always hear about on television. Those who sought to prove the existence of the mysterious ether and turn lead into gold, never found their happy endings, which is perhaps why we rarely see these subjects on television. Yet the failures and serendipity of science can often lead to new discoveries, like the use of penicillin as an antibiotic, which can be more important to the history of science than the traditional stories of diligent workers trudging along slowly towards an inevitable end result. Ignoring this facet of the scientific method in science film not only paints an inaccurate picture of the scientific process, it also creates a

distrust amongst the public when the science they see in their real lives does not reflect the process of constructed television science.

Perhaps even more insidious are the science documentaries that use the status and allure of talking head experts to validate their messages and squelch any audience questioning—the opposite effect we would expect from a standpoint feminist film. Films like *A War on Science*, which present scientific experts like Sir David Attenborough and Richard Dawkins somewhat ironically as ‘voices of God’, abuse their celebrity status to support the films’ agenda (2006). This film in particular uses the relative recognition power and authority of its figures to validate its argument for questioning religion, even though it paradoxically treats its subject of science and religion in a very authoritarian way. It is clear where the biases of the filmmakers lie in this film, but what is not so clear is where figures like Dawkins or Attenborough are coming from or why they express their particular stated opinions. The film never explains either’s background, but simply places them on-screen as ‘experts’ for the topic at hand based on their familiarity with the audience and a short title for each consisting of a few words that appears briefly on-screen. Under these debatable standards for qualifying experts in science filmmaking, any celebrity or talking head with an impressive title could be considered an ‘expert’. To make problems worse, at the opposite end of the ‘talking head’ spectrum, we find the film, *What the Bleep Do We Know!?*, which presents all of its non-celebrity talking heads as equals by never presenting their name or titles until the very end of the film, when we find out that some of the ‘experts’ were scientists and some were psychics (2004). Needless to say, this misleads the audience and abuses their assumptions about the

validity of the film's arguments. Clearly, standpoint feminism could have a role to play here by encouraging the complication of these simplified experts into characters with differing levels of expertise in different areas of life—and not necessarily just in scientific knowledge. This potential for mutual intellectual respect and skepticism between the filmmaker and audience becomes lost in films like *A War on Science* and *What the Bleep Do We Know!?*, because these insist on removing any sort of context that could help the audience question the opinions of the expert talking heads. Ironically, these supposedly educational films shut down skeptical thought by embracing the increasingly outdated methods of positivistic science, while ignoring any of the benefits standpoint feminism could bring to the discussion.

With this evidence in hand, it seems as though producers of science documentaries want to convey as simple a message as possible to the public, namely that 'science is good'. However, if their audience already brings their own values and prejudices into these shows, science film should address these issues of moral context. A 1984 survey of students showed that after they watched a standard science documentary, they interpreted the film based on personal experiences, fears, and prejudices, creating personal meanings to gain a fuller understanding of the film (Silverstone, 1984). However, science filmmakers almost never attempt to shape this type of contextual meaning, because they usually strive to keep science stories simple in order to avoid any confusion. Under current circumstances, these reductionist films seem to have the unexpected effect of discouraging an increased sophistication of scientific and technological knowledge amongst their viewers. But, they could instead encourage

audience engagement by letting the complexity of their subjects speak for themselves. Films made to show this type of science-in-action, with all of the inherent human drama, debates, and failures can be very successful, and as responsible filmmakers we should be willing to invite viewers to look at controversial issues critically within a social context (Gardner and Young, 1981). In addition, by portraying the uncertainty inherent in the scientific process these films can promote more realistic expectations for science amongst non-scientists and improve trust between the two groups (Collins, 1987). This depiction of science as a generator of uncertainty can prevent the public disillusionment that tends to result when popularizers depict the scientific process as “heroic, apolitical, and inherently rational” (Gregory and Miller, 1998). For when science eventually fails to solve one problem or another, it in turn can fail its naively optimistic followers as well. And while the science community may have thought it was “doing the public a favor by not troubling them with the complexities of scientific research” the unabashed positivistic message that ‘science will solve all problems’ is not solving any problems when it comes to public trust of this two-faced behavior (Gregory and Miller, 1998). If we want to encourage an involved and proactive citizenry who can look out for their own well-being and the health of their society, we need to acknowledge the controversies and the human-side of these issues.

Assumptions of Objectivity in Science and Documentary

If we took science papers and textbooks at face value, we might think that all science findings were the result of a well-reasoned march to inevitability, despite the fact

that science is really a very personal effort steeped in failure as well as success. Because these science publications, and consequently science films, almost universally use objective language and passive voice to explain results, they erase all traces of the people behind the work, including science's failed attempts in the process and inherent subjectivity. Yet, as Donna Haraway argues, positivistic science stories tend to disappear the deeper people delve into the scientific knowledge, and these positivist science fairy tales only linger in the dialogue of introductory science courses—often the only science courses taken by most non-scientists (1991). This tendency to oversimplify science for non-scientists creates a dangerous situation because it kills that spark of imagination, which is so important in inspiring students to think critically and explore beyond the face value of science. Brian Greene, author of the popular science book *The Elegant Universe* argues that our current education system is failing to teach its students how to integrate science into their lives, and based on passionate letters from readers inspired by his writings, he feels that science education can and should provide this context and meaning (Greene, 2008). Meanwhile, those who pursue advanced scientific studies would never “be caught dead *acting on* the textbook versions”, thus creating an even more worrying gap between how the public believes scientific knowledge is made and how scientists actually work on a day-to-day basis (Haraway, 1991). Professional scientists within the community understand that these subjective influences exist behind the objective front, but the unprivileged lay community does not. Because of this misconception, science filmmakers face the daunting task of not only effectively handling this gap in the public's knowledge about how science *really* works, but they also must cope with the public's

naïveté concerning the subjective processes of documentary filmmaking and their sometimes dangerous beliefs about these films' inherent truth.

If we look at the notions of scientism and the history of the photographic camera, we can find some clues into the public's assumptions about the nature of truth in documentary, science, and science film in particular. Film scholar Brian Winston believes that people have long perceived the camera as inherently objective, because of its status as a scientific instrument used for its ability to accurately reproduce a copy of the original specimen (Renov, 1993). This strong historical connection between science and the camera has led to a mythology about the truth-value of documentary, and of science film in particular. In fact, audience assumptions about the nature of documentary films can be very similar to their assumptions about the objective, truthful nature of the scientific process (Nichols, 2001). Interestingly, science films that claim to represent *the* objective 'Truth' also disregard the fact that the public tends not to understand much of the process of constructing a film, and coincidentally these films end-up hiding the human-made decisions of the filmmakers that influence the final product. Similar to the Enlightenment philosophy of creating objectivity in science, this idea of Truth with a capital "T" put forth by film scholar Bill Nichols, articulates the unspoken idea a documentary audience often holds that a documentary presents the one existing reality of its subject, where no other realities exist (Nichols, 2001). This idea can be dangerous when it remains unaddressed by a film, because the audience never sees the inherent biases of the filmmakers or their on-screen subjects.

In the case of a science documentary, these two assumptions about the objective nature of science and documentary combine to double the public's idea that they are watching a purely objective account of the one 'Truth', and science filmmakers need to take extra care to tread carefully with the claims they make to this particular idea of truth. In fact, the experiment of 1960's Direct Cinema caused many documentary filmmakers to reject this notion of an unfailing objectivity that provides access to the one Truth of reality—an idea still deeply engrained and upheld in scientific thought (Renov, 1993). Direct Cinema did not eliminate filmmaker subjectivity as promised; it only hid it from public view. However, once the methods of the objective mode of documentary—and their inherent subjectivity—came to light, the film community made a rapid outcry for these types of films to give recognition to their subjective influences (Renov, 1993). And while Direct Cinema has since evolved into a more self-aware, subjective mode of documentary with films like Fredrick Wiseman's *Zoo*, science film has failed to evolve away from this desire to disguise its subjectivity (1993). It instead shirks its responsibilities to respect rather than exploit audience assumptions. However, in light of the advancements found in other documentary modes, is it time to reevaluate the partnership between documentary and science in terms of its usefulness to the purpose of science filmmaking?

Despite this history of documentary evolution, science film still persists in hiding its own methods and has yet to inspire en masse protests within the science filmmaking community similar to the Direct Cinema reaction. While Wiseman's films make his viewers uncomfortable with the camera's objective gaze by forcing them to share the

sterile, unfeeling view of the scientists they portray, most science films still tend to glorify the objective view of scientists by continuing to use voice-of-God narration and other expository techniques, which have not evolved for decades. Wiseman films, on the other hand, managed to turn objectivity on its head, embracing the ideas of sociologists like Bruno Latour, who has long argued that science institutions need a close analysis to encourage more subjective and responsible practices within themselves. Like standpoint feminism, Wiseman and Latour both reject the idea of traditional scientific objectivity by advocating a newer form of objectivity that allows for partial perspectives in scientists, filmmakers, and audiences alike. While watching Wiseman's films, we suddenly become uncomfortable with the authority of the robotic automatons he criticizes, once they cross a moral line due to their lack of multifaceted moral thinking. However, despite this history of social documentarians innovating the treatment of scientists on-screen, traditional science films have overwhelmingly failed to reinvent themselves, choosing instead to mirror the dangerous ideals of positivism so inherent in modern science. By using the same techniques Enlightenment science used to justify itself, these films, like *A War on Science* seek to give credence to their topics and agendas by tightening the historically close partnership between science and the camera as a tool for recording "objective" reality (2006). Based on the small number of science film critiques published, perhaps science film has failed to evolve because it is just now starting to receive the same critical treatment as these other documentary genres. After all, unless we tell science filmmakers they may be doing something wrong, they will continue to think they are doing everything right.

So why has science film been overlooked by critics until now? Perhaps again because filmmakers and the public alike inherently assume its subject, science, is always objective and representative of this Truth, which should not require any questioning on their part according to the way science is presented. There is a mystery about science that can be difficult to penetrate for non-scientists, but if they are ever going to truly understand science, we need to cut through this layer of positivistic propaganda and follow the path of other documentary modes, embracing both the subjectivity and humanity of all players in the game. As film scholar Michael Renov states, the science documentary needs to negotiate an escape from science (Renov, 1993). The rest of the non-fiction filmmaking world has long accepted Bill Nichols' eloquent statement that documentary can only offer access to *a* world, not *the* world, and does not present *the* truth but *a* truth. As Nichols argues, the history of the documentary genre has suggested completion, knowledge and fact, but, following in the footsteps of standpoint feminism, it has only recently come to represent the embodied knowledge of incompleteness, personal worlds and their subjective construction (Nichols, 2001). Yet, does science film need to escape from the paradigms of scientific thought completely if we can persuade its makers to turn a more critical eye to the process? Standpoint feminists, like Donna Haraway, would probably argue quite the opposite. Haraway has contended that feminist science studies instead needs to embrace the historically masculine metaphor of vision and the gaze, because we need these tools in order to see through the "tricks and power" of science (Haraway, 1993). I think she would agree that the camera is a tool we need to

reassess in order to embrace this new land of individual realities, rather than perpetuating the idea of one, reductionist Truth.

CHAPTER FIVE

LOOKING OUTSIDE THE BLACK BOX FOR SOLUTIONS

Science studies and standpoint feminism in particular can help revolutionize the ideas of science film, if we as filmmakers embrace some of these philosophies' critical tactics and insights into the complex, often misunderstood world of science. Post-constructivist science studies advocates laying all the cards on the table—rather than hiding behind the traditional scientific ideal of objectivity—as a way to strengthen our understanding of the *real* process of science (Hess, 1997). This understanding is what science films should strive to accomplish in order to bring science into the public sphere. At the moment, the practices within science laboratories and behind science filmmaking remain mostly hidden from public view in their respective “black boxes” (Latour and Woolgar, 1986). To make matters worse, traditional science films and textbooks depict the scientific process as supposedly practiced by lone scientists without any mention of social context or other members in the workgroup. These staples of the science literature diet show science “as a product rather than as a process, that is, as a corpus of truths rather than as a practice” and “as individualistic, asocial, and authoritative” (Stahl, et al., 2002). Notwithstanding these repeated claims of science as the hard work of the unaffected lone wolf, science studies has shown quite the opposite to be true, and that science can be greatly influenced by personal values and societal pressures. We are now faced with treating science and science documentary not as a series of undebated revelations, but as active processes of discovery with constantly acting agents that shape

the inner-workings of both (Stahl, et al., 2002; Renov, 1993). Only once we embrace this idea of rethinking science in a critically constructive way, can we actually reinvent science film as a more effective and responsible endeavor. This goes beyond simply trying to show personal biases in supposedly objective work, because critics of science have failed to confirm that personal biases adversely affect the outcome of research (Gregory and Miller, 1998). What we really want to do is unmask the doctrine of science and give power and culture a more prominent role in our consideration of science as a socially determined medium (Haraway, 1993; Hess, 1997; Latour and Woolgar, 1986). This is not to say that these influences are detrimental to and corrupting science, but rather they are productive resources for driving the motivation of scientists acting within the institution. Our question should not be how to eliminate them, but to assess whether or not we could achieve better science by replacing certain values with others (Hess, 1997). If we use this historicized legacy to reveal science as a human-driven process, we are likely to find many unique possibilities we have never before considered, and by looking at the day-to-day lives of the people behind the textbooks we can gain a new respect for their very human nature.

Emotional Truth in Filmmaking

If we want to follow these recommendations and make science more personal and accessible, we should consider portraying the emotional, human truths of science, which fiction and some modes of documentary have embraced as a valid method for presenting aspects of reality to their audiences. This alliance between science and subjective morals

could act as a mitigating factor in the public's perception of science as a cold indifferent drive towards progress at all costs. As Brian Greene states, "we rob science education of life when we focus solely on results and seek to train students to solve problems and recite facts without a commensurate emphasis on transporting them out beyond the stars" (Greene, 2008). We clearly need a more emotional touch if we are going to help carry them there. And, if we want to rethink science film in this respect, we should look to fiction film and documentaries that tread the line between fiction and non-fiction, if such a line even exists. For while some science filmmakers may disagree, Bill Nichols has argued that this line between fiction and non-fiction is a blurry one, if it can even be called a line, for there are universal human "truths" found in both fiction and documentary film (Nichols 1994). Filmmaker Errol Morris supports this blending of boundaries and says, "There's no reason why documentaries can't be as personal as fiction filmmaking and bear the imprint of those who made them. Truth isn't guaranteed by style or expression. It isn't guaranteed by anything" (Renov, 1993). In order to make science documentaries more personal we need to take Morris's idea about the futility of standard documentary 'truth guarantees' into account, and become a bit more creative in our search for the more elusive human truths so apparent in his films and in fiction.

Fiction films represent the pinnacle of this type of subjective truthfulness, because they can create an empathy for characters and stories currently ignored by most science films. Fiction films effectively erase the emotional distance between the actors and the audience, because the actors are experts at pretending the camera is not there, while those in documentary are constantly conscious of its presence. The boundary between the

actors' feelings and those of the audience vanishes when these players become drug addicts, struggling single mothers, or even conflicted scientists. In documentary on the other hand, the people on camera are constantly aware that the camera represents hundreds, even millions of viewers who are scrutinizing their every word, because they are playing themselves, not a fictional character. Naturally, they will be more guarded in the openness of their emotions than actors playing a role. They will not naturally reveal their weaknesses, mistakes, and vulnerabilities to their full extent—nor should we ask them to—because it is in our human nature to only show these sides of ourselves to those we truly trust, not a room full of strangers. Fiction films, on the other hand, can enable us as the audience to beautifully suspend our disbelief and enter a world that can be truer in some ways than documentary may ever be. Their fictional devices are incredibly effective, because in the entirely contrived nature of the endeavor, we can still clearly see the private side of our everyday lives—the hopes and tragedies of ourselves, our friends, children, and lovers.

Science film should not only take note of the truths inherent in fiction filmmaking, but should also consider documentaries like Errol Morris' *Fast, Cheap, and Out of Control*, *The Fog of War*, and *The Thin Blue Line*, which strive to reach this goal of human truth by showing the vulnerabilities of *real* people in order to build empathy for their causes (1997; 2004; 1988). In order to cope with the natural guardedness of their subjects, many documentary filmmakers select central characters who can convey an internal complexity without suggesting their on-screen persona differs from their normal personalities away from the camera (Nichols, 2001). And, while some science

filmmakers attempt to create excitement for a topic by subjectively selecting scientists who are exciting on camera, they almost never attempt to engage scientists as people, perhaps out of fear of making their revered subjects uncomfortable, or maybe because they think this type of information is unnecessary. Whatever the reason for this choice, it is still so unfortunately rare to actually see the private lives of scientists in science documentaries. This particular genre too often paints them as dehumanized, institutionalized textbooks—albeit very intelligent textbooks—but ultimately as caricatures who maintain a simplistic, puppy-like love and devotion to the objective demands of their work. Based on my personal experience, I do not think this is the case at all, and disagree fully with such assumptions. Having grown-up in a family of scientists and science aficionados, I would argue the exact opposite based on the heated arguments, passion, and disappointments I have witnessed amongst those closest to me. But, I also recognize that I am in a privileged position most people may never get to truly experience. Just as I may never know what it is like to be the daughter of a politician, a bakery owner, an accountant, or a revolutionary, many will go through life never seeing this side of science, and I think that is one of the greatest oversights and missed opportunities of science filmmaking.

So, if we as scientists and filmmakers have to give trust to earn trust, then maybe these alternative viewpoints offer potential next steps in the evolution of science filmmaking. Maybe it is time for scientists to respect the humanity of their audience and hopefully trust that the public will accept them as they are—flawed humans just like the rest of us. Yes, it is a difficult step to take—to willingly decide to strip bare our less than

perfect sides to the world, but perhaps only then can the audience return the gesture and start to think of the human-side of science as sometimes flawed but worthy of a larger piece of their trust. However, if we are going to ask these scientists to open their hearts and souls to us, to trust us as filmmakers, then we need to treat their vulnerabilities with respect rather than using them for sensational purposes.

Drawing Inspiration from Fiction, Television, and Bill Bryson

Despite the huge number of simplified, expository science films, the few character-driven science stories presented in popular science publications and films tend to draw large crowds excited to see something unique and relatable on a human level. For example, Bill Bryson's bestselling book *A Short History of Nearly Everything* beats textbook science hands down in terms of portraying the true process of science, the characters involved, and the personal values that motivated their work, whether religious, ego-centric, or just plain dumb luck (New York Times Bestseller List, 2005; Bryson, 2005). Bryson paints vivid portraits of his characters that truly involve his readers with the story not just of the history of science, but with other fellow human beings such as the mystic Isaac Newton and the narcissistic Edwin Hubble. He delves into the personal histories and reputations of his characters to historicize some of their major scientific findings, which usually only receive a couple lines of recognition in standard science textbooks. By revealing the human-side of characters like Hubble, who would do push-ups in front of co-workers to impress and intimidate them, Bryson creates an emotionally engaging world for his audience. By creating engrossing, character-driven stories,

Bryson causes his readers to become much more invested in the results of his character's struggles, like those of Hubble to determine the rate of the expansion of the universe. This would be dry material at the least in a standard textbook, but Bryson can almost magically turn these facts into page-turning fables by not only reveling in the plots and personality quirks of his characters, but by also inserting his own perspectives on their science into his text, often in very humorous and insightful ways. I personally found the previously indecipherable field of astrophysics both comprehensible and intriguing after Bryson's treatment. His captivating style of characterization acts as an incredibly valuable teaching tool, and science film would benefit from considering this strategy as a vital asset for sparking the imagination, while presenting a responsible, historicized treatment of science. And, while translating these qualities into science filmmaking may seem like an insurmountable task at first, some filmmakers are already implementing his humanizing qualities into very popular and successful pieces of entertainment.

If we look to the few untraditional science documentaries that exist and to fiction film, we can find a wide variety of exemplary models and innovative ideas to emulate. For example, the Oscar-winning film *An Inconvenient Truth* represents a revolution both in its reinvention of science film as a character-driven foray, but also in its ability to inspire and rejuvenate the long stagnant environmental movement (2006). A similar film, *The 11th Hour* released a year later in 2007 and headed by Leonardo DiCaprio, flopped at the box office, despite the support of a celebrity presence and its depiction of similar valid and important environmental issues (Variety.com, 2007). Because it maintains the status quo of science film as a war of 'us versus the bad guys' we cannot control, *The 11th*

Hour leaves the audience feeling depressed rather than inspired. Obviously in this case, eloquent intellectual arguments by scores of ‘talking head’ experts were not enough to move people’s hearts in an environmental resurgence or to buy tickets at the theater. We can find the chief difference between the two films in their depictions of their lead characters. *An Inconvenient Truth* portrayed Al Gore as a complex and passionate human being, clearly championing his subjective interests in a move akin to Donna Haraway’s partial perspectives, whereas *The 11th Hour* seemed only interested in using its chief celebrity as a name to push a standard agenda-based environmental film—albeit a much needed agenda in public discourse. Evidently, attempts to tell a character-driven story that use this type of standpoint characterization and complexity to full advantage can be very successful both from an educational and a profitable perspective.

If we also look at some select science television shows and the surplus of fictional science films in terms of partial perspectives, we can find some intriguing examples that successfully incorporate some of Bryson’s classic character-driven ideas into science education. Interestingly, some of these examples have a tendency to demonize science as a critique of science’s inherent authority and obsession with constantly appearing flawlessly objective. These sometimes-harsh assessments could present a worrying trend, unless we can look at these examples and incorporate their appealing facets into more responsible science filmmaking. For instance, popular television shows like *A Haunting* and *Ghost Hunters* that glorify the pseudoscience of the supernatural while disregarding science as rigid and unbelieving seem to only be growing in number and diversity on cable television (2002; 2004). Based on their popularity, we can surmise that their

audience enjoys the shows' appeal to their gut instincts about fear, faith, and the unknown. The question becomes whether we as science filmmakers can engage these desires of the audience to *feel* something and translate these techniques into the traditionally unfeeling genre of classic science documentary. On a more positive note, the BBC has taken the lead on this question with its current show *The People Watchers* (2006). This cleverly produced series debunks pseudoscience claims by illustrating how our social instincts lead us to exhibit certain human behaviors such as superstition, faith, and trust, which can be easily manipulated when this power falls into the wrong hands. By providing the public with a type of litmus test to determine what may be questionable science and what is more accurate, the show empowers its audience to take the reins in determining what science to support and what to reject. Carl Sagan himself wanted to produce a similar science show in America that would test myths and highlight the flawed nature of pseudoscientific claims, but unfortunately never saw his ideas gain steam with science television producers (Sagan, 1996). However, if we want to find an engaging American show that uses the gut beliefs of pseudoscience as well as the human investment inherent in the science and standpoint feminism, we need look no further than *Mythbusters* (2003). This show uses a host of relatable and charismatic human characters who showcase the experimental process of science—albeit sometimes a bit dubiously—as something that can be incredibly exciting or very disappointing depending on the always surprising results. While the show does have its flaws in terms of scientific methods and accuracy, it is one of the few examples of an American popular science show that incorporates some aspects of science studies in order to reveal the trial and

error methods of science in the making. Throughout the show we meet quirky and entertaining characters who seem genuinely excited about attempting to bust the pseudoscientific myth of the day using the scientific method. While the Mythbusters' method of releasing a herd of bulls into a pen filled with china-covered bookshelves may not be the best way to test the 'bull in a china shop' phrase, it certainly produces some genuinely astonishing results when the bulls agilely avoid the china with the aversion of a cat to water. By showing many failures with some successes, and creating an emotional audience investment in characters who dare to strap-on homemade rocket packs to faithfully test theories, this is science-in-the-making in all of its flawed and inspiring glory. And, while the show may not have the complex character development of *An Inconvenient Truth*, it certainly revels in the fun and personal rewards that the human-side of science can bring to science filmmaking (2006).

Turning back to the BBC, we can even find a science documentary that takes the idea of responsible science filmmaking one step further by putting the filmmaker in front of the camera as a moral, contextual, and physical guide for the audience's journey. Pulling reflexive techniques from non-science documentaries like *Sherman's March* and the staples of feminist standpoint theory, the BBC documentary *God Is Green* presents a wonderful example of a reinvention in science filmmaking. It incorporates many facets of other documentary genres, while creating an uplifting and highly personal message about the growing relationship between environmentalism and religion (1986; 2007). The filmmaker, Mark Dowd, becomes the main character embarking on the film's quest to find religious leaders who are 'going green', and incorporates reflexivity, humor,

multicultural perspectives, and his personal interactions with interviewees into his highly entertaining film. He is completely open about his Catholic background, distaste for the SUV they are required to rent while in America, and his skepticism of the Vatican's minimal efforts to curb global warming. While he jokes about carbon emissions as the newest deadly sin by comparing them to lustful desires, he also inserts his own personal, highly critical contextualizations of his dialogue with others, while still remaining a likeable and complex character. This is not an easy feat to say the least, and those looking to create more responsible and positive environmental films should take note. I personally would advocate that we need more science documentaries that reflect the engaging qualities of films like *God is Green* in order to widely inform the public about the positive actions of progressive religious leaders throughout the world (2007). We want to inspire people to care and to have hope, not lecture them about an inevitable apocalypse, which can only inspire feelings of powerlessness against an inevitable fate.

If we move onto the cinema screen, examples of socially determined scientists suddenly become the norm rather than the exception. Perhaps this stark difference lies in the fact that fictional characters' problems almost certainly combine with their scientific dilemmas, and one cannot be resolved without the solution of the other. Crossover filmmaker Werner Herzog's *Grizzly Man*, is the one documentary film on this list of socially determined films, because it links a real person to a greater message about the connection between humanity and nature, which traditional science films usually would reduce to a simple conflict thesis (2005). By delving deep into the character of a man whose obsession with grizzlies and the Alaskan wilderness led to his tragic death, we find

someone not obsessed with beating nature, but with embracing it in every aspect of his life. Yet, an indifferent nature in the eyes of Werner Herzog not only turns its back on Timothy Treadwell, it also literally destroys him and his quest to save the very animals that would eventually kill him. Just as Timothy Treadwell never finds a resolution to his obsession with wild animals, Werner Herzog's eerie voice never finds true resolution with any rationalizations he discovers for these sad events, and both the character's personal problems and greater quest remain unresolved. Providing a similar perspective in the fictional world, Darren Aronofsky's fiction film *Pi* rejects science's positivistic faith through its protagonist's quest to find the meaning of life via mathematics (1998). Striving to find meaning in everything, to find the ultimate answer, to know the name of God can drive a human to the brink of insanity. Aronofsky's film rejects the teleology of scientism by questioning whether science can truly solve the world's problems, or if the ultimate answers sought by scientists and mathematicians would simply cause madness. In this case, knowing God is knowing the end of all things, but the mathematician rejects this knowledge after a brief moment of arrogance. He chooses instead to remain human, and rejects scientific omnipotence in favor of the partial perspectives of Haraway's science. Finally in Francis Lawrence's film *I Am Legend*, we find another strong rejection of science's attempts to play God when a genetically modified retrovirus hailed as a great scientific advancement, suddenly mutates into a virulent strain that wipes out humanity (2007). However, this film's protagonist must overcome his belief that science can cure everything and stop playing God himself in order to solve the problem. In the end, it is the faithful, religious believer who comes to his rescue at his darkest hour and

who has the strength to deliver his vaccine to the remaining survivors, only after he sacrifices himself for the good of humanity as a scientific savior. His salvation is tied to his acceptance that he can no longer play an invincible God, and only through his humility and sacrifice can he save the world.

All of these television shows and films present prime examples of tools we can use to both reinvent and improve science film, if we just take the care to look for them. So why haven't more science documentaries used these characterization strategies to create stories just as engaging and emotionally truthful as fiction films? Perhaps this is because both the scientists and filmmakers fear showing any vulnerabilities in their status as experts lest critics attack them. However, painting complex portraits of scientists with partial perspectives in their public and private lives creates empathy, even though it may crack the door for criticism. But, if we admit our flaws and work to correct them, it is far better than the damaging effects denial and reductionism can create in the images of scientists and filmmakers alike.

If science popularizers choose to harness these appeals to human emotions, they can also create a meaningful way of contextualizing science and provide critical-thinking skeptical thought exercises that could bring science studies into the popular science arena. Portraying scientific uncertainty and humanity in debated science could be an effective alternative method for teaching the scientific process, but science popularizers have yet to embrace this concept. It is this idea of choosing complexity over simple conflict that should color discussions in scientific films. What really matters at this point in time, is that social scientists and science studies scholars need to make an effort to

popularize their critiques of science, just as scientists have a responsibility to popularize their research. And it is up to the science popularizers to help tell their stories along the way.

CHAPTER SIX

BUILDING A CYBORG HOME

By rethinking the relationship between the public and private lives of scientists, we find an ideal avenue for creating a more enlightened dialogue on the implications of science for the general public. We are not looking to meld these identities into one unified entity in the style of ecofeminist writings (Merchant, 2003). Instead we want to acknowledge that science, religion, morality, and ethics can coexist peacefully in people's lives as separate but complimentary perspectives. Once we can do this, we have a more responsible form of science filmmaking that can handle blurred boundaries and partial perspectives. As Donna Haraway argues in her "Cyborg Manifesto" we need a paradigm shift in how we think about science and religion, objectivity and subjectivity, science and art if we are going to create a comfortable place for these shared mentalities (1993). Using the metaphor of a cyborg that is both machine and animal, but with clear delineations between these two selves, she advocates finding "*pleasure* in the confusion of boundaries and for *responsibility* in their construction" (Haraway, 1993). By applying her philosophy, we can find cyborgs everywhere, from the scientists themselves who feel strongly spiritual in their private lives, to religious leaders who feel a duty to protect the planet from environmental ills, these people all represent unlikely marriages between two very different but complimentary identities.

This ability to convey partial perspectives as parts of a whole person can only aid science filmmakers in this brave new world. With these complex portrayals of scientists

and the science they study, popular science audiences can become more enlightened citizens with the analytical tools needed to understand how science *really* works. If they lose some of their wariness and take a more active interest in controversial science that affects them directly, they could also become better able to differentiate between good quality science versus unsubstantiated science or pseudoscience, and therefore, to more accurately assess the ramifications of these issues on their own lives.

As science popularizers, we should consider presenting partial perspectives that do not have to be in conflict rather than strictly focusing on easy conflicts and sensationalism. Scientists want to be seen as human and the public wants to see emotionally engaging stories. If we can use the skeptical thinking tools of science and the cultural contextualization of science studies, we can present a more responsible and human-driven view of the scientific process that will encourage a different type of knowledgeable trust in the endeavor. With a foundation in standpoint feminism and the bricks of partial perspectives, we are building a new place in society for the unlikely cyborg marriage between the public and private lives of scientists with incredibly diverse spiritual and value-laden backgrounds. Like any other marriage, the road will be bumpy as fights play out between different perspectives and compromises are reached, but rewards should be great. We are not creating a utopia, but we are creating a place we can be proud to call home.

REFERENCES CITED

A Haunting. Discovery Channel, 2005.

A War on Science. Dir. James van der Pool. BBC Horizon, 2006.

An Inconvenient Truth. Dir. Davis Guggenheim. Lawrence Bender Productions/Participant Productions. 2006.

Barnhill, David Landis and Roger S. Gottlieb, eds. Deep Ecology and World Religions: New Essays on Sacred Grounds. Albany: State University of New York Press, 2001.

Bartlett, Thomas. "Many Academic Scientists Consider Themselves 'Spiritual,' Survey Finds". Chronicle of Higher Education 53:12 (2006), A13.

Bryson, Bill. A Short History of Nearly Everything. New York: Broadway Books, 2003.

Collins, H. M. "Certainty and the Public Understanding of Science: Science on Television". Social Studies of Science, Vol. 17, No. 4. (Nov., 1987), pp. 689-713.

Curtis, Ron. "Narrative Form and Normative Force: Baconian Story-Telling in Popular Science". Social Studies of Science, Vol. 24, No. 3. (Aug., 1994), pp. 419-461.

Dawkins, Richard. The God Delusion. London: Transworld Publishers, 2006.

DeWitt, Sarah Louise. "Creating Space For Science and Celebrity in the Public Discussion of Climate Change". Montana State University Library on the Web. Jul. 2006. 2 Jun 2008. <http://etd.lib.montana.edu/etd/view/item.php?id=343>.

Fast, Cheap, and Out of Control. Dir. Errol Morris. American Playhouse/Fourth Floor Pictures, 1997.

Fish, Stanley. "Will the Humanities Save Us?". New York Times on the Web. 13 Jan. 2008. 15 Feb. 2008. <http://fish.blogs.nytimes.com/2008/01/06/will-the-humanities-save-us/>.

Gardner, Carl and Robert Young. "Science on TV: A Critique". Popular Television and Film. London: BFI, 1981.

Ghost Hunters. Pilgrim Films & Television. The Sci-Fi Channel, 2004.

- God is Green. Dir. Mark Dowd and Bruno Sorrentino. 3BM Television/CTVC. BBC Channel 4, 2007.
- Gottlieb, Roger S., ed. Liberating Faith: Religious Voices for Justice, Peace, and Ecological Wisdom. Lanham, MD.: Rowman & Littlefield Publishers, 2003.
- Gregory, Jane and Steve Miller. Science in Public Communication, Culture, and Credibility. New York: Plenum Trade, 1998.
- Greene, Brian. "Put a Little Science in Your Life". New York Times on the Web. 1 Jun. 2008. 2 Jun 2008. <http://www.nytimes.com/2008/06/01/opinion/01greene.html>.
- Grizzly Man. Dir. Werner Herzog. Discovery Docs/Real Big Production, 2005.
- Haraway, Donna J. Simians, Cyborgs, and Women: The Reinvention of Nature. New York: Routledge, 1991.
- Hess, David J.. Science Studies: An Advanced Introduction. New York and London: New York UP, 1997.
- "James Hansen and Mark Bowen on Censored Science". Fresh Air. National Public Radio. WHYY, Philadelphia. 8 Jan. 2008. <http://www.npr.org/templates/story/story.php?storyId=17926941>.
- Kurtz, Paul. Ed. Science and Religion: Are They Compatible?. Amherst, N.Y.: Prometheus Books, 2003.
- I Am Legend. Dir. Francis Lawrence. Warner Bros. Pictures. 2007.
- Larson, Edward J. and Larry Witham. "Scientists Are Still Keeping the Faith". Nature. 386:6624 (1997), 435-436.
- Latour, Bruno and Steve Woolgar. Laboratory Life: The Construction of Scientific Facts. Princeton: Princeton UP, 1986.
- Levins, Richard and Richard Lewontin. The Dialectical Biologist. Cambridge: Harvard UP, 1985.
- Locke, Simon. "The Public Understanding of Science—A Rhetorical Invention". Science, Technology and Human Values. 27:1 (2002), 87-111.
- Merchant, Carolyn. Reinventing Eden: The Fate of Nature in Western Culture. New York: Routledge, 2003.

Mythbusters. Beyond Entertainment/Beyond Productions. Discovery Channel, 2003.

“New York Times Bestseller List”. New York Times on the Web. 9 Jan. 2005. 1 Jun. 2008.

<http://www.nytimes.com/2005/01/09/books/bestseller/0109bestpaperonfiction.html>.

Nichols, Bill. *Blurred Boundaries: Questions of Meaning in Contemporary Culture*. Bloomington: Indiana U P, 1994.

Nichols, Bill. Representing Reality. Bloomington: Indiana U P, 2001.

Numbers, Ronald L. Science and Christianity in Pulpit and Pew. Oxford; New York: Oxford University Press, 2007.

Pi. Dir. Darren Aronofsky. Harvest Filmworks/Truth and Soul Pictures/Plantain Films/Protozoa Pictures, 1998)

Renov, Michael, ed. Theorizing Documentary. New York: Routledge, 1993.

Sagan, Carl. The Demon-Haunted World: Science as a Candle in the Dark. New York: Ballantine, 1996.

Sherman's March. Dir. Ross McElwee. First Run Features, 1986.

Stahl, William A., Robert A. Campbell, Yvonne Petry, and Gary Diver. Webs of Reality: Social Perspectives on Science and Religion. New Jersey: Rutgers University Press, 2002.

Silverstone, Roger. “Narrative Strategies in Television Science: A Case Study.” Media, Culture, and Society. 6 (1984). 377-410.

Surname Viet Given Name Nam. Dir. Trinh T. Minh-ha. Women Make Movies, 1989.

The 11th Hour. Dir. Nadia Connors and Leila Connors Petersen. Appian Way/Greenhour/Tree Media Group, 2007.

The Daily Show. Mad Cow Productions/Comedy Central/Comedy Partners/Hello Doggie, 1996.

The Fog of War. Dir. Errol Morris. Sony Pictures Classics, 2004.

The People Watchers. BBC Channel 2, 2008.

The Thin Blue Line. Dir. Errol Morris. American Playhouse/Channel 4/Third Floor Productions, 1988.

Tilby, Angela. Soul: God, Self, and the New Cosmology. New York: Doubleday, 1993.

Variety.com. "Box Office Report". Oct. 2007. 2 Jun. 2008.
http://www.variety.com/index.asp?layout=b_o_weekend_all&dept=Film&sort=BOLASTWEEKEND&query=box+office+the+11th+hour

What the Bleep Do We Know!?. Dir. William Arntz, Betsy Chasse, Mark Vicente. Lord of the Wind, 2004.

Weedon, Chris. Feminism, Theory, and the Politics of Difference. Oxford: Blackwell Publishers, 1999.

Zoo. Dir. Fredrick Wiseman. Zipporah Films, 1993.