THE CINEMATIC TURN IN PUBLIC DISCUSSIONS OF SCIENCE

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Submitted to the Graduate Faculty of

Arts and Science in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

University of Pittsburgh

2005

UNIVERSITY OF PITTSBURGH

FACULTY OF ARTS AND SCIENCES

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31 October 2005

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University of Pittsburgh, 2005

The specialized vocabularies and complex methodologies of scientific practice complicate efforts both to communicate scientific information to lay publics and to enable those publics to sort out competing scientific claims when public policy decisions hang in the balance. Consequently, technical experts strive to invent rhetorical practices and argumentative strategies that appeal to non-scientific audiences. One such strategy involves the use of popular fictional films to support technical arguments that bear on public policy questions.

Film references are not simply clever labels or cursory illustrative examples, but important communicative acts that serve a unique rhetorical function in public argument on scientific matters. Scientists, science journalists, and science educators use films as metaphors, narratives, or heuristics to help galvanize public attention or teach scientific and technological principles to non-scientific publics. However, this rhetorical exercise invites debate over the appropriateness and efficacy of using fictional films to educate publics about factual science. The citation of film as evidence in public argument expands the rhetorical landscape to include texts that transcend traditional modes of address within the scientific community.

This dissertation draws from rhetorical theory and film studies theory to investigate how science interlocutors reference films in public discussions of science. It examines three public discussions of science and the film references highlighted in such discussions: *The China Syndrome* and the Three Mile Island accident, *GATTACA* and policy debates over genetic science controls, and *The Day After Tomorrow* and climate stewardship policies. Each case study

reveals how advocates articulate and maintain the boundaries of acceptable scientific arguments.

By attending to how the use of films as resources for the invention of arguments, this research

suggests avenues for engaging scientific controversies that are not predicated on intimate

knowledge of a particular scientific practice.

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1. Science, Fiction, and Public Discourse

Science Fiction now has the job of providing for us the symbols with which conceptualisation of our rapidly changing world is even possible…At its best, science fiction provides the most supple and the most popular means of exploring questions of diversity and difference; it opens up new possibilities; it makes us think. Science fiction most effectively addresses the questions that have defined the age we live in: technology, gender, race, history. (183)

- Adam Roberts

1.1. Science Fiction in Science Debate

In the summer of 2004, the weekly magazine of the American Chemical Society, *Chemical and Engineering News*, introduced a regular feature called "Reel News" that invites readers (mostly scientists, engineers, and science teachers) to review feature films. Victoria Gilman, an assistant editor to the weekly, remarks that when they announced the feature, she was "flooded with people who wanted to do it." The reviewers were not only asked to evaluate films for scientific accuracy, but also for their entertainment value. Gilman maintains that, "we want to do not just the science, but how well does it entertain. I mean, it's not really getting the message across about the science if people are falling asleep in the theater" (qtd. in Kennedy 2004, B1).

If this attention to film was unique to the American Chemical Society, "Reel News" could easily be dismissed as an idiosyncratic gesture to appeal to a wider audience. However, *the Chemical and Engineering News* is not the only scientific publication to provide commentary on the factual and fantastic elements of science fiction cinema. *Science*, *Nature*, and *Scientific American* also publish articles that comment on the latest science fiction fare to either correct scientific infidelities in the film or laud its scientific veracity.

This scientist-as-film-critic role is not limited to scientists using their professional insight to comment on the scientific fidelity and entertainment value of popular cinematic fare. Scientists, science journalists, and science educators use films as metaphors, narratives, or

heuristics to help galvanize public attention and teach scientific and technological principles to non-scientific publics.

In 2004, seismologists screening NBC's critically-panned miniseries about a massive earthquake that rocks the west coast, *10.5*, argued that the depicted events were scientific impossibilities and requested the network to preface the show with disclaimers about its scientific infidelities and provide sources where audiences could find credible information about earthquakes (CNN 2004).

In 1997, the University of Illinois hosted the week-long "Cyberfest 97" using HAL 9000's birthday, the insecure artificial intelligence in Stanley Kubrick's 1968 film, *2001: A Space Odyssey*, as a pretext for soliciting high-profile scientists and engineers from various academic and government institutions to discuss the current state of artificial intelligence and space travel as it is depicted in the film. HAL's birthday had also inspired numerous scholarly and scientific works that discuss the scientific probability of a computer having the capabilities of HAL (Stork 1997).

The list of examples where science fiction films surface in public scientific discourse does not end there: The *Matrix* trilogy finds purchase in discussions of computer technology (Swoboda 1999), *GATTACA* and *Jurassic Park* references emerge in debates of genetic engineering (Kirby 2000; Vogel 1997; Yam 1997), *The China Syndrome* surfaces as a dramatic illustration in public discussion of the Three Mile Island accident, (Burnham 1979), and *The Day After Tomorrow* bursts on the scene in debates over climate stewardship policy (Booth 2004; Tourtellotte 2004).

The use of fictional texts in public discussions of science may strike one as a curious rhetorical choice. It is understandable that scientists would want to correct scientific

misunderstandings found in a film on the rather valid assumption that most people's exposure to science is through media, in particular film. Inaccurate portrayals of science, as the "public understating of science" advocates would argue, can hurt scientific appreciation and by extension the formulation of responsible science policy, a legitimate concern given that cultivating an educated citizenry on matters of science is seen as a central goal in a healthy democracy (Brown 1998b; Fuller 1997a).

However, science rhetors do not just engage films to correct scientific errors; they also use cinematic artifacts as conduits to communicate scientific information to non-scientific audiences. This more expansive mode of rhetorical invention raises potential concerns. In an era where public scientific knowledge is arguably quite low and scientific authority faces numerous challenges (Ziman 2000b, 2001; von Baeyer 1998) the usage of fictional film references in scientific discourse as arguments or metaphors may blur the boundary between science fact and science fiction, complicating efforts to improve uptake of scientific principles as they play out in policy discussions. The blending of science fiction with science fact could be understood as symptomatic of a "postmodern" culture, where the lines of fact and fiction are becoming increasingly blurred (Baudrillard 1994; Jameson 1991). Indeed, such cultural analyses provide significant insight into how science fiction inundates society with series of tropes (Bukatman 2002) and how science fiction serves as a critical tool to negotiate oppressive social relationships (Haraway 1991).

This dissertation posits that film references in public scientific discourse are not just ornamentations used to "dumb down" a specialized discourse for mass consumption, but are discursive practices that alter the landscape of scientific communication between scientific communities and non-scientific publics. These film references are forms of evidence that not

only support substantive arguments in public scientific discourses, these references also problematize prevailing standards as to what qualifies as acceptable public scientific arguments. Therefore, it is not surprising that films, being popular and recognizable texts, surface as discursive switching stations where rhetors, both scientific and non-scientific, go to generate conversation about scientific matters. This dissertation explores how films can function as sites for the invention of argument and how their deployment as evidence supporting particular policy arguments alters public scientific discourse.

A rhetorical approach is especially well-suited to guide this inquiry for three reasons. First, the central research question centers on the discursive implications of using films as forms of evidence in public spheres. How evidence functions discursively to advance arguments, specifically in deliberative spheres, has traditionally been the domain of rhetoric. This dissertation does not attempt to make claims about the "internal workings" of science or the evidentiary standards used *within* science. Rather, the focus is how the rhetorical choices of science interlocutors involved in specific public discussions of science elucidate what qualifies as appropriate forms of evidence. Since there are underlying public policy issues in each case study, these public discussions of science are often framed within deliberative rhetorics where film references function as evidence in persuading audiences to hold a particular perspective or accept a specific course of action. To that end, I inspect how these forms of evidence are marshaled by rhetors in various deliberative spheres.

Because science fiction is often understood metaphorically (Disch 1998; Seed 1995), its applicability to scientific discourse becomes a site of contestation in framing scientific and technological issues. The use of tropes in scientific discourse has occupied the attention of rhetoric of science scholars for some time (Campbell 1990; Ceccarelli 2001; Gross 1996; Krips,

McGuire, and Melia 1995). A great deal of extant scholarship engages in rhetorical hermeneutics to reveal aspects of scientific discourse aimed to persuade various audiences, usually scientific audiences. My research examines how science presents itself rhetorically, with an emphasis on understanding the relationship between scientific and non-scientific discourses. This effort comports with rhetorical scholar John Lyne's view that rhetoricians of science would do well to "contemplate how specialist and non-specialist discourses interact, or how they fail to interact, due to factors such as compartmentalization, mystification, or political manipulation." "Those who choose to work under the sign of argument," he adds, "are usually interested in getting back to performance within a public space" (Lyne 1998, 4). Lyne suggests that rhetoric of science scholars should examine how the discourse changes to meet the needs of situated audiences, be they scientific or non-scientific audiences. The focus on films as evidence marshaled in public scientific debates reveals how complicated and metaphoric texts alter public discussions of science in ways that traditional forms of scientific evidence do not.

Second, film references are situated within discursive contexts that are contingent on particular circumstances. Rhetoric, a field of study concerned with the contingencies and the particularities of discourse production, provides a critical vocabulary that helps us better understand how the demands of the situation, often based on audiences and constraints, shape the contours of discourse. Attention to the influence of context in the production of discourse should help us better understand the dimensions of scientific discourse as it moves from laboratory bench tops and laptops into public spheres.

Third, this research examines how interlocutors articulate the boundaries of acceptable public scientific argument. The effort to construct the boundaries of acceptable public scientific argument is a rhetorical exercise. As my case studies illustrate, the mere inclusion of science

fiction film references in public discussions of science often become the focus of debate, eclipsing issues of how the cinematic content affects the framing of debate. In such instances, interlocutors engage in rhetorical "boundary work," where norms of discussion are contested, negotiated, and revised. Previous rhetorical studies of this general process contain valuable insights that are particularly useful for explaining the dynamics involved in the cinematic turn. Although scholars recognize that popular fictional films influence social thought, the extent of that influence is a matter of considerable debate.

In laying the groundwork for examining how science fiction films impact public scientific argument, I first provide a brief history of the science fiction genre and identify some of prominent features of the genre. I argue that the literary, cinematic, and metaphoric properties of science fiction have a discursive kinship with scientific practice, as evidenced by how the tropes of science fiction circulate in the scientific community and the larger social landscape. Unlike other portrayals of science, be they media coverage, science popularization programs, and the like, science fiction film has unique historical, sociological, and literary qualities that change the rhetorical landscape when deployed in public discussions of science. Furthermore, I explore how scientists currently engage science fiction films. This line of inquiry leads to discussions of science education efforts that directly use films as vehicles for public understanding of science, and to the current relationship between the film community and scientists who serve as consultants to evaluate the scientific fidelity of the concepts illustrated in films. This background helps explain how cinema can function as a suitable source for argument invention in public spheres of deliberation.

Second, I examine how science upholds its epistemic status through rhetorical practices that demarcate science from competing discourses. This section highlights the work of Thomas

Gieryn and Charles Alan Taylor. This literature is most helpful in understanding how the norms of scientific argument become established, challenged, and maintained during scientific controversies that play out in public arenas. Even if scientists use film references "inside the lab," it is when those film references become sites for argumentation in public scientific discourse that rhetorical boundary work commences. When scientific discourses move beyond the lab and into various public spheres, scientists have little control over how non-scientists contextualize these discourses. Consequently, the effort to control what counts as acceptable public scientific discourse becomes a rhetorical exercise to maintain the epistemic integrity of science.

Although science fiction films are entertaining and engaging texts that may "spread the word about science" and function as discursive intermediaries between scientists and non-scientists, these same films often present an unflattering visions of scientists, science, and technology (Sobchack 1997; Telotte 2001, 1995). Consequently, films become part of an argumentative terrain that is best understood through the theoretical lens of rhetorical demarcation.

1.2. The Influence of Science Fiction on Science Fact

From dime store novels to pulp magazines, B-movies to computer generated imagery, the history of science fiction reveals little to recommend the genre as fulfilling critical prerequisites for artistic relevance. Ray guns and spaceships used by extra-terrestrial characters were not considered products of an author's erudite and mature prose; rather, they were the toys that littered the playground of a child's imagination.

And yet, science fiction, since its generic inception with the pulp magazines, has enjoyed a large public following. The original, and most widely accessible, science fiction pulp magazines, *Amazing Stories* and *Science Wonder Stories,* were influenced heavily by editors who viewed science fiction as fantastic accounts of science and technology that served to both increase public exposure to science and generate popular support for scientific activity (Davin 1999).

Science fiction, as a term of art, did not exist prior to the rise of the pulp magazine. Hugo Gernsback was a published science fiction author (*Ralph 124C41+: A Romance of the Year 2660*) and former editor of *Modern Electronics*, a magazine dedicated to amateur radio aficionados. In April 1926, he founded *Amazing Stories*, the first magazine exclusively devoted to speculative fiction and science stories. Another outlet for science fiction short stories was established with Gernsback's editorship of *Modern Electronics,* a publication that often included fictional stories about technological innovations amidst more technical and scientific features. As there was a dearth in the science fiction stories when *Amazing* debuted, Gernsback often republished previously existing material, usually from established writers such as a Jules Verne and H.G. Wells.

Gernsback's editorial in the debut issue spoke of a new form of fictional writing dedicated to stories that rested on scientific fact with a narrative style distinct from horror and fantasy stories. Gernsback coined the term "scientifiction" to describe the form of writing that uniquely engaged science and technology in ways that were distinct from other forms of literature. Gernsback defined "scientifiction" as:

> …the Jules Verne, H.G. Wells, and Edgar Allan Poe type of story—a charming romance intermingled with scientific fact and prophetic vision…Not only do these amazing tales make tremendously interesting reading—they are always instructive. They supply knowledge…in a very palatable form…New adventures pictured for us in the

scientifiction of today are not at all impossible realization tomorrow…Many great science stories destined to be of historical interest are still to be written…Posterity will point to them as having blazed a new trail, not only in literature and fiction, but progress as well. (qtd. in Grolier 1995)

Despite Gernsback's effort to articulate a new name for the genre, the readership did not take to the cumbersome term "scientifiction." In 1929, as Gernsback founded a new pulp magazine, *Science Wonder Stories*, he introduced the term "science fiction" which shared the same basic definition.

Gernback's editorial mission was to select stories that were primarily about science; the narrative, setting, and characters were secondary to the importance of science. Gernsback's attentiveness to the science, specifically an adolescent fetishization of technology, has drawn criticism from modern critics who believe Gernsback initially cursed the genre with a childish ethos (Disch 1998).

However, the science fiction pulp magazine continued to gather a rather large following. This popularity resulted in a number of imitators. The most famous and most influential pulp outside of *Amazing* was *Astounding Stories of Super Science*, founded in 1930. The magazine's second editor, F. Orlin Tremaine, believed that *Astounding* should align itself with contemporary scientific practice, and thus "serve as an exponent of scientific advancement." J.P. Telotte (2001) argues that *Astounding*, with its high salaries, premium on scientific accuracy, and sensible illustrations, became the flagship science fiction pulp by "exert[ing] a strong influence on the development of the form, and particularly on the nature of its audience" (70).

Astounding Stories cemented its influence in 1937 when John W. Campbell Jr. assumed the editorship of the magazine. Campbell continued Tremaine's dedication to the science stories that did not directly contradict established scientific fact. Unlike Gernsback, who had few literary sensibilities, Campbell wished his contributors to dedicate themselves to honing their

literary craft, writing compelling stories while appreciating scientific fact. Campbell, who many

credit with ushering in the Golden Age of science fiction, left his mark on science fiction as

evidenced by the stable of writers he published in *Astounding*: Isaac Asimov, Robert Heinlein,

Fritz Leiber, and A.E. Van Vogt.

Campbell did not wish his authors to engage in banal speculation that simply valorized

technological advancements, a vision of science fiction Gernsback readily endorsed. Rather,

Campbell altered Gernsback's definition of science fiction by introducing not just scientific fact,

but scientific methodology as a generic marker for science fiction. As Campbell writes,

"Scientific methodology involves the proposition that a well-constructed theory will not only

explain away phenomena, but will also predict new and still uncovered phenomena. Science

fiction tries to do much the same—and write up in story form, what the results look like when

applied not only to machines, but to human society as well" (qtd. in Grolier 1995).

For Campbell, science fiction operated like an experiment, where a problem is outlined

and the story reads like a hypothetical rumination on the interaction of science and technology

with larger society. The science fiction stories, like scientific practice, must provide a

scientifically plausible explanation, one that comports with existing science fact and is logically

consistent within the world created in the story. Unlike Gernsback, Campbell was interested in

the setting and background of the story and how science and technology would impact future

societies.

Despite their differences, Gernsback and Campbell shared both a liberating and

constraining view of the genre. Each has been criticized for allowing an undercurrent of racism,

sexism, and jingoism to seep into early science fiction work. Additionally, Campbell used his

editorial leverage to ensure that humans always triumph, conquering the machine or the alien at

the story's conclusion. Such constraints obviously limited possibilities for social critique. However, as the genre evolved, more authors saw the possibilities for science fiction to interrogate our relationships with science and technology as well as the "other." The works of Ursula K. Le Guin, J.G. Ballard, and William Gibson are illustrative of stories that employ the generic methodological approach to challenge established social norms (Hollinger 1999).

As science fiction moved from the page to the screen, the criticisms levied against the young literary form reemerged (Telotte 2001). Most notably, in her 1965 landmark essay "Imagination of Disaster," Susan Sontag (1966) argues that science fiction films, artistically shallow and intellectually fallow, often simplify ethical and scientific dilemmas, flattening complex issues surrounding technology and science. Unlike more intellectually challenging films and exemplars of science fiction literature, she held that these films offer little insight into broader cultural issues of human identity and societal interaction with science and technology. Sontag notes, "the films perpetuate clichés about identity, volition, power, knowledge, happiness, social consensus, guilt, responsibility, which are, to say the least, not serviceable in our present extremity" (Sontag 1966, 225). Yet, to her dismay, Sontag contends that science fiction films, void of any social criticism, indeed reflect society's larger failure to engage such issues in any involved manner. However, with the production of more critically acclaimed science fiction films (*Metropolis*, *Alphaville*, *2001: A Space Odyssey*, *Blade Runner*) and the emergence of new cultural theories (Baudrillard 1994; Jameson 1991), film scholars have developed more positive evaluations of the science fiction film genre, often directly responding to Sontag's essay and foregrounding the social and artistic importance of science fiction films (Bukatman 2002; Kuhn 2000; Sobchack 1997; Telotte 2001).

In assessing the impact of science fiction, science fiction writer and critic Brian Stableford argues that even if science fiction does not directly educate or excite audiences about science, it does have a communicative function to identify and amplify popular anxieties about science and technology. Stableford (1987) argues that, "Science fiction writers have usually been quick to seize on such popular anxieties as overpopulation and environmental pollution. Response to these emergent concerns was rapid, and, more significantly, exaggerated. Science fiction writers have always been ready not simply to *reflect* anxieties of this kind, but also to *amplify* them. It seems to be not simply a matter of registering the existence of such anxieties and maintaining them, but of actively feeding them, emphasizing their importance" (148). In essence, science fiction, according to Stableford, has a rhetorical function of not only providing images and narratives of social anxieties, but science fiction writers, and certainly filmmakers, serve as town criers, calling attention to problems that warrant further attention.

But science fiction is not without an intellectual or cognitive element. Literary critic Darko Suvin argues that the science fiction is a product of two conflicting tendencies: cognition and estrangement. Suvin notes that science fiction is a sociologically and historically situated practice that responds to social alienation as well as scientific advancement. Suvin (1979) contends that science fiction is the "literature of cognitive estrangement." He notes that science fiction "takes off from a fictional ('literary') hypothesis and develops it with totalizing ('scientific') rigor" (6). In this process, the author develops a critical distance from the "object" of study, much like the distance a scientist attempts to maintain experimentation and observation. The estrangement fundamental to the science fiction genre is both cognitive and creative, it is the intellectual space to grasp the alienation in society, in particular one ensconced in ubiquitous science and technology.

As Suvin notes, "Science fiction is, then, a literary genre whose necessary and sufficient conditions are the presence and interaction of estrangement and cognition, and whose main formal device is an imaginative framework alternative to the author's empirical environment" (8). Suvin argues that the realm of the imaginary and the realm of science as inherently linked together through the tropes and discourses that both share. He notes that the natural sciences of the nineteenth century eclipsed the literary imagination, yet "in the Twentieth Century SF [science fiction] has moved into the sphere anthropological and cosmological thought, becoming a diagnosis, a warning, a call to understanding and action, and-most important--a mapping of possible alternatives" (12). The cognitive dimensions of SF play out in this mapping of possible alternatives, one that comports with existing "scientific horizons." Suvin contends that "significant modern SF, with deeper and more lasting sources of enjoyment, also presupposes more complex and wider cognitions: it discusses primarily the political, psychological, and anthropological *use and effect of knowledge, of philosophy of science*, and the becoming of failure of new realities as a result of it" (14).

Science fiction is not judged on the actual portrayal of scientific fact, although scientific fact is often present, but rather on how well the science fiction narrative reflects the "non-scientific" elements of scientific practice and scientific discourse. Consequently, the cognitive component of science fiction is the application of knowledge within imaginary, but realistic, settings.

To negotiate how science fiction operates between the poles of estrangement and cognition, Suvin introduces the term "novum" to explain the literary device that differentiates science fiction from other forms of literature. The "novum" is the introduction of something new—whether it is material or conceptual—that is distinct from the existing world, even if that is

a world far removed from our own. Consequently, the novum, which could be a technology or scientific discovery, is a break from the existing world, but one that nonetheless makes sense within the context of the cognitive estrangement. Suvin notes that "science in this wider sense of methodically systematic cognition cannot be disjointed from the SF innovation" (65). In essence, the novum operates like the scientific method— a process of observation or experimentation in an effort to understand the world.

Science fiction writer and scholar Adam Roberts (2000) pushes Suvin's articulation of the genre even farther, suggesting that science fiction is uniquely equipped to address a number of issues regarding science and technology in society. Roberts notes that whereas "realist fiction seeks to reproduce the experience of living in a particular milieu exactly and often exhaustively, and aims for a sense of documentary verisimilitude," science fiction permits and, in fact, encourages, imaginative freedom. Unlike realist fiction, science fiction is not hamstrung by expectations of verisimilitude and accuracy to real world experience. The imaginative freedom, however, does not suggest that science fiction is divorced from all modes of realism. Roberts continues to note that "if the science fiction text were entirely concerned with 'estrangement' then we would not be able to understand it; if it were entirely to do with 'cognition' then it would be scientific or documentary rather than science fiction" (8).

Roberts argues that science fiction provides a symbolic language that engages both the material and imaginative spheres. He argues that science fiction actually possesses numerous realistic elements that transcend the realism associated with mainstream fiction:

> SF has more in common with realism than it has with other, more obviously imaginative, mainstream literatures. To elaborate this point it is worth noting that 'realism' is only one form of mainstream writing: much ordinary fiction introduces 'symbolic' devices, various imaginative strategies to provide 'discontinuities' with our experience of the world, without thereby becoming science fiction. But the textual function of these nova in SF sets them apart from

other usages. In other words, SF gives us a unique version of the symbolist approach, one where the symbol is drained from transcendental or metaphysical aura and relocated in the material world (17).

Roberts argues that this is most evident where the worlds of science and the scientific imagination begin to blur. He notes that science fiction has enjoyed such symbolic capital "that there isn't any longer a 'science' as applied to the real world that is distant from 'science fiction.' When science makes any sort of imaginative attempt to apprehend the world of lived experience, it becomes SF" (52). Whereas Suvin suggests that science fiction reflects the actual practice of science, Roberts goes further to contend that the tropes of speculation and imagination replete in science fiction actually inform scientific inquiry.

Errol Vieth's (2001) study of the mutual influence of science and science fiction, *Screening Science: Contexts, Texts and Science in Fifties Science Fiction Film*, validates Roberts argument that science fiction films of the 1950s introduced rhetorical codes for circulation in the public discussions of science. He notes that science fiction "films are not simple reflections of the threads that constitute 'the era,' but filmmakers and audiences contribute to the discourse of science and science fiction through making and viewing films. Thus, [SF] films are both a product of and contribution to that discourse" (38).

Roberts identifies three influences of science fiction on scientific discourse. He argues that there is a close relationship between first, the metaphors used by science fiction, second, the metaphors that define science fiction, and third, "the metaphors that shape our appreciation of the world beyond our immediate experience…Thinking metaphorically is thinking fictionally, however grounded in science those metaphors might be" (Roberts 2000, 53). Even if science fiction does not correctly depict scientific fact, the metaphoric quality of science fiction, as

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understood through the introduction of the novum, remains as a way of viewing science that has discursive effects.

This metaphoric understanding of science fiction comports with rhetorical studies of how metaphors inform our modes of thought (Lakoff and Johnson 1980). If science fiction provides discursive and metaphoric potential for actual scientific practice, in particular speculative science, then exploring influence of science fiction in public scientific discourses yields a great deal of intellectual possibilities. Philosopher Donald Schon's (1980) examination of the generative properties of metaphor provides further insight into how science fiction film references color public arguments on policy issues. Schon, primarily concerned with the use of metaphor in social policy formulation, argues that metaphors constitute various perspectives or frames that help us make sense of reality. Heavily influenced by the works of philosopher Ernst Cassirer, Schon's conceptualization of metaphor usage embodies two distinct considerations. First is the question of interpretation, or how we infer what rhetors think by what they say and do, and "whether their thinking involves a generative metaphor." Schon identifies this as the hermeneutic problem whereby "the concern here is to understand the kinds of inferences by which such interpretations are made, the sorts of evidence pertinent to them, and the criteria by which they should be judged and tested." Second, Schon analyzes a metaphor's generativity, or "how we come to see things in new ways" and how these new ways impact thought and action. He believes that the inherent difficulty in social policy debates has less to do with problem solving and more to do with problem setting. He contends "problem settings are mediated . . . by the 'stories' people tell about troubling situations-stories in which they describe what is wrong and what needs fixing" as opposed to how to fix it (255). Schon's argument suggests that in deliberative spheres, the determinant factor in framing the discourse is not the evidence itself,

scientific or otherwise, but the narrative and metaphoric processes that prioritize the issues. This is particularly important on public deliberations over science and technology where understanding the verbiage, practices, and implications of such advancements can elude non-scientists, and likely even scientists.

Although Schon's primary concern is how the concept of generative metaphor functions as an interpretive tool for critical analysis of social policy, his approach requires critical engagement that is attentive to both the interpretation of the metaphor itself and how it generates new perspectives to address the issues under examination. In this respect, his strategy resonates with my approach. When rhetors discuss a film as part of public scientific discourse, they import the metaphoric nature of the film to frame the particular scientific or technological issue in both its imaginative and materialist elements. Even if contestation exists over the depiction of scientific fact within a film, the film's metaphoric elements—informed by the novum—remain as a way of viewing the scientific discussion. This metaphoric quality of film references requires critical consideration to both the cinematic text and the context in which it surfaces in public discourse. Furthermore, the film itself possesses an agenda-setting function where the particular scientific issues are highlighted to gather greater public attention. The film then serves as a conduit for science rhetors to engage publicly scientific issues that they believe receive inadequate public attention. Although Schon's analysis does not consider the importance of metaphors informed by fictional texts, the narrative qualities of generative metaphors are essential to understanding generative possibilities of film references.

1.3.   Scientists Go to the Movies

In the February 2005 keynote address at the American Association for the Advancement of Science (AAAS) annual meeting, AAAS President Shirley Ann Jackson argues that the promise of scientific advancements and technological breakthroughs are threatened by the forces of misunderstanding and resource competition. To rectify this problem, she suggests that there needs to be a concerted effort to not only promote science education and literacy among a non-scientific public, but also to encourage more citizens, especially young people, to pursue scientific careers (Jackson 2005).

Jackson's concern that science is under threat by the forces of misunderstanding and apathy is a widely held belief among scientists and scholars (Brown 1998a; Fuller 1998; Gregory and Miller 1998; Vincent 1997; Ziman 2001). Although popular and media accounts of science are often dismissed as simplistic accounts of science that contribute to public misunderstanding (Bucchi 1998; Farago 1976; Lewenstein 1995b; Nelkin 1987), the persuasive power of film, as a source of scientific engagement and misunderstanding, is recognized by a number of practicing scientists. Physicist Gregory Benford calls for scientists to pay attention to the images of science offered for public consumption. In a November 2001 article in *Nature*, Benford (2001) writes that:

> Science could better convey much of its mystery and excitement if it paid attention to how writers view it. Ideas usually begin in literature and migrate into the visual media. To alter how science is perceived, we would do well to pay attention to the storytellers and dreamers who are our bards. Science fiction is our biggest mirror, reflecting the imagery of science. Since Mary Shelley's *Frankenstein*, the prospects that science opens have played a significant role in our culture. We should realize that such culture currents run both ways. Often science fiction writers get their ideas from science, whereas the dreams the professionals had when young can fuel their scientific efforts. (399)

In essence, science fiction nurtures an environment where science, technology and their implications are negotiated. Science and science fiction enjoys a symbiotic relationship that often deals in the realm of imagination. Benford suggests that, "Written science fiction thrashes through thoughtful speculations long before they arrive in common culture. Alas, few journalists or commentators mine this seam of imaginative experimentation" (399). Strikingly, Benford calls for even more engagement with science fiction, in order to generate excitement about science that is lacking among the non-scientific population. Benford is not as concerned with the potential scientific infidelities depicted in the film, but how the imaginative ethos of science fiction can help us understand science, not as a series of facts, but articulations of scientific passion and significance. Ultimately, Benford says that "Fiction brings us down to the intensely personal ground of the heart. But science should also shed its illuminations upon our fevered passions, and should be better seen through fiction's magnifying lens" (Benford 2001, 399).

Benford is not alone in his call for scientists to take seriously the role of science fiction films in scientific understanding. Jean-Marc Levy-Leblond, a physicist-philosopher at the University of Nice, suggests the connection between science and fiction goes beyond the language of imagination. Levy-Leblond notes the etymology of fiction is intimately tied to the roots of hypothesis, a fundamental concept in the scientific enterprise. He engages the question of fact versus fiction and notes "rejecting fiction is meant to insure the positivity of scientific knowledge against the risk of uncontrolled imagination. Yet, the drafting of hypotheses—that is precisely *fictiones* in Latin—is one of the first endeavors of scientific activity." He further notes that "it is the very history of language, then, that advises us not to oppose fictions, as inventions and creations, to figures as representations and models…It now becomes possible to think that science and fiction are not incompatible—in spite of the purposely oxymoronic use of the two

words in naming of the literary genre known as science fiction" (Levy-Leblond 2001, 573). Both Benford and Levy-Leblond echo sentiments of Suvin, suggesting that science and science fiction have a deep kinship, in that they both deal in imaginative and inventive registers and embody a rigorous and explanatory approach to dealing with imagination.

Many scientists have heeded such calls, embracing science fiction films as conduits for further understanding of science. Efforts to promote the excitement and understanding of science has found tangible form in differing pedagogical approaches that use science fiction films in science education. Leroy Dubeck, a physicist at Temple University, was one of the first instructors to use film systematically as a vehicle for teaching students about science. In *Science in Cinema*, Dubeck provides high school science teachers ten lessons based around specific films. Each lesson illustrates a particular scientific concept and how the film correctly portrays or misappropriates that scientific fact. Dubeck rarely recognizes when films get the "science right," instead he only focuses on correcting misunderstandings. Dubeck justifies his pedagogy by arguing that science fiction promotes the necessary awareness and interest in learning about science:

> We have tried to tap the great attraction this form of "media magic" holds for young people and to use science fiction films as educational tools to build interest in and awareness of real science and its interaction wit the world. We believe that, with appropriate supporting materials and science teachers trained in using this new technique, science fiction films can help reverse the negative attitudes that many students have toward real science by moving them from familiar experiences they enjoy to unfamiliar experiences they expect to be dull and difficult—like learning physics, astronomy, biology and chemistry. (Dubeck, Moshier, and Boss 1988, x)

At the college ranks, physics professors Costas Efthimiou and Ralph Llewellyn at the University of Central Florida have extensively researched the effectiveness of using science fiction films to teach science, as either exemplars or bastardizations of scientific fact. They argue

that since the public is largely misinformed about science, which usually comes from the media

and the entertainment industry, it is important to go to the source of misinformation and teach

students the critical thinking skills necessary to recognize that many of the cinematic depictions

of science are false (Efthimiou and Llewellyn 2003). As a result, Efthimiou and Llewellyn

developed *Physics in Film,* a course for non-science majors that uses popular science films for

vehicles to teach science. Efthimiou and Llewellyn argue that "student performance on

individual exams and overall is improved in the *Physics in Film* sections when compared with

those in traditional Physical Science section" (Efthimiou and Llewellyn 2004a, 9). Due to the

overwhelming success of the program, Efthimiou and Llewellyn intend to package the course for

other fields, where instructors could use film as a launching point for teaching various materials,

as well as creating a textbook for other physical science classes (Efthimiou and Llewellyn

2004b). They argue that the class, which is currently in its fourth year, is a success because it

both increases student excitement and knowledge about science.

Both Dubeck and Efthimiou and Llewellyn argue that by imbuing in students the critical

thinking skills necessary to recognize real science from non- or pseudo-science, students will be

able to transfer those skills into other media. However, it is noteworthy that the films they choose

to identify as getting the science wrong are often considered bad science fiction films by many

critics. Such films fall prey to many literary critiques, such as Sontag's, in that they offer little

critical insight. As a result, the pedagogical goal to look only at the science facts drains the film

of any critical potential as discussing our relationship to science.

In response, Noel Gough, a pedagogical theorist, suggests that such a method squanders

the full pedagogical benefit of science fiction films. Gough, in a direct response to Dubeck's

pedagogy, suggests that "their approach devalues the educative potential of SF by suggesting it is

deficient unless it illustrates the 'one true story' of modern science 'correctly,' and also occludes the possibility of reading the films as critical and creative probes of issues in science, technology and society that their makers and consumers consider to be problematic" (Gough 2000).

Gough argues that by addressing only how films get the science wrong, educators lose the critical elements of the narrative and visual effects and thus reinforce a top-down model of science education. Gough's call to import the narrative elements in scientific pedagogy is echoed by Jane Gregory and Steve Miller who argue that merely educating non-scientists on factual, scientific matters does not ensure public understanding of science:

> While facts may be interesting and no bad thing in themselves, knowledge of facts does not imply an understanding of their significance or implications, nor of their place in the wider scheme of science. More important, knowing the facts is often little help to citizens who are trying to come to terms with contemporary issues in science. (Gregory and Miller 1998, 90)

Gough suggests that the line between science fiction and science fact is becoming increasingly blurred, and therefore that science fiction cinema functions as a productive, generative metaphor for use in science education. Science fiction films not only attempt to assess the impact of scientific fact, but also explore the web of relations that guide scientific inquiry. In essence, films demonstrate how technoscientific discourse operates, even without a clear understanding of scientific facts. Gough argues that "the most prudent and effective method for teaching and learning science is to assume that the world in which science education is performed and represented is a fiction—a paraspatial, heterotopian zone; we should imagine that we are teaching and learning inside an enormous SF novel (or movie, or computer game, or…), that we are taking science curriculum into a hyperspace of simulation—metaphorically, into a zone in which we can push propositions and suppositions beyond their limits" (Gough 2000).

Reflecting on his experience, Gough argues that "school students require little encouragement to mix and juxtapose narratives of 'scientific fact' with narratives of SF. Indeed, they may be more willing than their teachers to mix and juxtapose these 'seemingly disparate elements' in critical and creative ways. The difficulty for science teachers is that many seem to have cast themselves in roles as 'defenders of the faith'—defenders of the privileged status of science and technology—rather than 'understanders' of myth, narratives, and rituals which constitute science as a social and cultural practice in the contemporary world" (Gough 2000).

Gough's assessment points to questions of demarcation, a topic dealt with later in this chapter. Although the films are used to generate excitement and interest among students, science educators, argues Gough, remain the ultimate arbiter of scientific information. In other words, science teachers dismiss the film once it has served its educational purpose by generating student interest in the science. Gough contends that this results in a missed opportunity for educators to use the film to interrogate other questions the film advances.

Scientists are not only concerned with educating people about science in the classroom; they also seek to prevent scientific misinformation from entering into entertainment products. In July 2004, the American Film Institute (AFI) offered an unprecedented and exclusive, fifteen-person workshop for aspiring screenwriters to learn the art of script writing. Unlike the countless screenwriting workshops offered every year, the AFI limited the course to practicing scientists wishing to pen a script. The fifteen participants, selected from over fifty applications, gathered at the AFI "to learn how they could help improve the image of science and scientists in the movies" (Knight 2004, 720)

Although many of the scientists entertained screenwriting as an engaging hobby or a possible career change, their attendance at the convention echoed a larger concern among

scientists—the cinematic depictions of science and scientists. Because the dramatic constraints of popular cinema, in particular science fiction film, often militates against scientific accuracy and positive portrayals of scientists in favor of captivating plots and generic stereotypes, the public, they contend, is often misinformed about real science.

The scientists at this workshop are not alone in their concern over inaccurate or unflattering portrayals of science and scientists in film. Diandra Leslie-Pelecky, a material scientist at University of Nebraska and project leader for a National Science Foundation investigation into media effects on children's attitude on science, suggests that cinematic portrayals of scientists as uncaring and distant dissuade interest in science. This concern over how scientists and science is portrayed on screen has been one factor that stokes scientists' interest in working behind the scene.

Biologist turned science communication scholar David Kirby engages extensively in the role scientists play in producing films to ensure scientific fidelity. His investigation on the role scientists play in the film-making process gestures toward the important communicative function films play in the articulation of public scientific discourse. Kirby argues that when scientists function as consultants to fictional films, they become part of the public discourse on science. Because of the heterogeneity of scientific knowledge production, as illustrated in numerous cultural investigations into scientific production, Kirby argues that scientific discourse is often quite fragmented, even though science attempts to construct a coherent picture of its knowledge production. Consequently, as Kirby notes, all contributions to scientific discourse, including film, warrants attention. Film occupies a unique position in amplifying scientific discourse because it is a highly popular and visual medium. As Martin Kemp argues, science itself is becoming much more of a visual practice. He notes that the more visual scientific claims find

much more support than epistemic claims that do not have visual elements (Kemp 1997). This comports well with Bruno Latour's claim that the visual elements of science are necessary for generating allies and public support of certain scientific claims (Latour 2002). Kirby continues to note that:

> Given the importance of representation in science, it should not surprise scholars of science and technology studies that highly visual and rhetorically persuasive media, such as fictional films and television, can be a factor in scientific epistemology. This potential impact becomes more apparent when we take into account additional elements that increase visually based media's capability to 're-present' nature and enhance their rhetorical power, including an aural component, highly advanced representational technologies (i.e. special effects), a complex system of signification, and a narrative framework designed to highlight the representation's 'reality' and to make opaque its construction. (Kirby 2003b, 232)

Unlike writing, film possesses numerous diagetic elements that help shape the meaning of the narrative and the depiction of the science or technology. Lighting, set design, and camera placement all determine how a film is interpreted and understood by its audience (Harrington 1973). Scientists, as film consultants, ensure that there is a recognizable relationship between the film and the science itself by helping directors make the science seem natural and realistic.

Kirby suggests that films operate as "'virtual witnessing technologies' that depict natural phenomena in such a way as to convince the audience that the representations accurately display the natural world" (Kirby 2003a, 234). In this view, audiences do not directly witness scientific phenomena, but instead 'virtually' witness them. For Kirby, these cinematic portrayals of scientific knowledge function as alliance builders, where the images and narratives influence how individual understand and accept, or reject, scientific knowledge. Kirby, heavily influenced by Bruno Latour (2002), contends that the rhetorical and visual power of cinematic representations stems from their ability to move from screen to discourse without losing their effect. Films, in the Latour sense, are 'immutable mobiles,' able to be transported from their

place of origin and remain unchanged. As discourses move from sphere to sphere, the imagery and the rhetorical force remain constant, enabling rhetors to mine the film for productive and contextualizing discourses that possess broad appeal.

Sociologist Scott Frank, in a similar study of scientists working as film consultants, notes that "consultants provide two major services to the entertainment industry productions: (1) they furnish the cues that allow filmmakers to give the fictional images and situations on screen a greater sense of perceptual reality; and (2) through the social force of symbolic capital they are presumed to possess, both enable the filmmakers to feel better about the products they create and become part of the studio publicity machine that tries to impress upon us, the viewing public, that their production partakes of the Real" (Frank 2003, 428).

As Frank argues, "the job of a science consultant is to help make things that are referentially unreal (dragons, fake volcanoes, incredible hulks) into objects and situations that seem perceptually real" (430). Frank, like Kirby, argues that this transcends purely visual imagery and moves to the plausibility of the given scenarios. To that end, Frank introduces notions of 'veritable' truth and 'dramatic' truth. Frank argues "if veritable truth is that revealed by real scientists, dramatic truth is the version of that truth that is entertaining and commercially viable—in other words the veritable truth that appears on screen once it is filtered through the social and structural limitations imposed upon it by the filmmaking process" (432). It is the veritable truth that adds to the reality of the story, but it is the dramatic truth that often resonates with the audience and is the vehicle for understanding the implications of scientific information.

It is this relationship between the veritable truth and the dramatic truth that drives filmmakers to request the services of the scientific consultant. Frank notes, "Perceptual and referential reality describe why science consultants are hired, and provide a theoretical model for

explaining why science is incorporated by Hollywood. Veritable and dramatic truth address how informants—scientists, science consultants, and insiders from the entertainment industry-seem to envision scientific knowledge and understanding when speaking with each other" (433). Kirby substantiates Frank's claims by noting that, "'Realism', in fact, is the reason film-makers consult scientists in the first place. A science consultant's job is to make sure that the scientific images are not 'fiction' but that they conform to 'natural theory'" (Kirby 2003, 239).

The importance of depicting science correctly for a broad audience is what often drives the consultant to participate in the film making process, despite a legacy of filmmaking playing fast and lose with the science. Kirby contends, "most scientists view their consulting work on fictional media as a popularizing activity that can help to counteract the overall negative portrayal of science documented in prime-time television shows and in horror films" (241).

While science consultants shape representations of science to lay audiences, Kirby identifies three effects science consultations have on public understanding of science. First, science popularization helps secure the necessary resources for specific lines of research. As Kirby contends, "popularization is akin to promotional activities of scientists, especially with regard to obtaining funding or other support for research" (242). For example, Kirby identifies *Armageddon* and *Deep Impact* as helping solidify funding for asteroid detection, Spaceguard, and Near Earth Object (NEO) research. While accurate portrayals of science may encourage greater funding, negative portrayals of science may harm specific research agendas. For example, the events of Three Mile Island nuclear tragedy and the release of *The China Syndrome*, as we will see in Chapter Two, dramatically impacted public perception of the nuclear energy industry.

Second, Kirby argues that fictional films may actually "shape scientific knowledge itself" (246). Supported by Stephen Hilgartner's (1990) and Bruce Lewenstein's (1995a) research on non-technical modes of science communication, Kirby argues that scientists use means of communication beyond the technical literature to advance scientific arguments. Both Lewenstein's (1995b) and Hilgartner's models illustrate the how science communication is more complex than a simple bifurcation of popular science and technical science. Rather, science popularization often has a tangible impact on the modes of technical science communication, despite efforts on behalf of scientists to draw distinctions between the two forms of scientific discourse. They argue that oftentimes public responses to science help guide scientific inquiry. Therefore, it is impossible to ignore public perceptions of science in influencing scientific inquiry. Consequently, Kirby's research illustrates the importance of non-technical means to articulate particular knowledge claims.

Third, science fiction films operate as spaces for negotiating the relationship between science and society, especially as scientific debates unfold in the public arena. Kirby argues fictional films help foment consensus views on particular scientific issues, thereby helping bring closure to scientific controversies. Consequently, the vision of science or technology offered by the consultant becomes amplified as the "correct" science, even if that epistemic view remains contested among scientists. He notes "the socially constructed nature of scientific knowledge means that scientists' knowledge claims only become 'facts' when consensus is reached…The consultant's version is offered to viewers as realistic and natural within the fictional world system. Fictional films, in essence, force a consensus through the 'reality effect'…This is why film-makers hire consultants in the first place, to enhance this 'reality effect'" (258). Kirby's

central example comes from *Jurassic Park*, which advances the idea that dinosaurs were warm-blooded, an unconfirmed theory that film consultant and paleontologist Jack Horner promotes.

This relationship between science fiction and science, from the shared language or imagination to the interaction of science consultants and filmmakers, becomes increasingly problematic when tangible stakes in determining what is or is not science hang in the balance. And yet in public discussions of science, the overarching idiom that describes the connection between science fact and science fiction is illustrative of the need for drawing such a distinction. As film references surface in public scientific discourse, they are often placed along a spectrum of scientific reality. For example, public scientific rhetoric attempting to generate public enthusiasm for science often highlights how science fiction is becoming science fact or how science fact is beginning to resemble science fiction. These rhetorical maneuvers attempt to capture the imaginations of curious publics. In this sense, rhetors embrace science fiction not as distractions, but as useful resources to engage public scientific discourses. However, the converse is equally true. Rhetors can belittle and dismiss discourses by labeling them as science fiction and not scientific fact, and thus unworthy of consideration. This distinction between science fact and science fiction provides rhetors with a set of discursive tools that help articulate the boundaries of science. These discursive tools are most prevalent in the literatures on how science creates its boundaries.

1.4.   Rhetorical Demarcations of Science

Demarcating good science from bad science and real science from pseudoscience involves both epistemological and materialist considerations. Although the vast majority of science studies scholarship centers on how science functions as an epistemic enterprise, I am

most interested in the materialist considerations of scientific practice. There are oftentimes very tangible implications for upholding certain aspects of scientific argument that go beyond traditional notions of science as a purely epistemic enterprise: the acquisition of scarce resources, the attention of scholars, the securing of tenure, the notoriety of a scientific breakthrough, the maintenance of institutional control. These issues enumerate a series of rhetorical concerns that are distinct from institutional (Merton 1938), paradigmatic (Kuhn 1996), and methodological (Popper 2002) markers of science. Whereas these sociological, historical, and philosophical perspectives focus on ontological definitions of science, a rhetorical perspective on the boundaries of science is most appropriate for addressing the discursive elements of science, especially when considering how factual and fictional accounts of science intermingle in various public domains.

Most notably, Thomas Gieryn's (1999) investigation of the cultural boundaries of science and Charles Alan Taylor's exploration into the rhetoric of demarcation offer valuable insight into the rhetorical dimensions of public scientific discourse. In the *Cultural Boundaries of Science*, Gieryn, a sociologist by trade, takes a discursive view of how science is defined as a cultural practice that enjoys epistemic authority. He argues that the markers that define the scientific enterprise are neither essentialist nor universal, as previous efforts to define science would suggest: Merton (1938), Kuhn (1996), or Popper (2002). Rather, he finds that the boundaries of science are rhetorically constructed as the epistemic authority of science is challenged. Gieryn refutes the notion that as scientific controversies enter into the public realm, where science interlocutors articulate competing "scientific" claims, the epistemic authority of science is undermined in the public's eyes. Gieryn notes that "as each side brings science to the battle in defense of its claims, the link in principle between science and the truth or reliability is

sustained—even as some supposed facts and interpretations get canceled out as unscientific, false, or risky" (3). Consequently, advancing argument in the name of science, whether such claims are valid, suggest that science is the arbiter of serviceable knowledge claims.

Gieryn argues that science is not a practice that operates in isolation. Instead, science is part of the larger cultural fabric that derives its credibility not only from its pragmatic contributions, but also how it rhetorically distinguishes itself from other explanatory or truth-claiming discourses. Gieryn, heavily ensconced in a map metaphor, suggests that there is a cartography of epistemic claims that comprises the entirety of discourses that offer conduits to truth and reality. The lines that separate these competing discourses become most visible when the credibility of science is challenged by religious, political, social, aesthetic, non-, and pseudo-scientific discourses that make claims on reality.

The attendant debates are not about science itself, since debating about science only solidifies its epistemological authority, but rather the representations of scientific claims. What counts as science, Gieryn suggests, can not be answered by only looking at the "internal workings" of science, but its presentation as science that is distinct from competing discourses. Narrative and discursive elements in presentations of science provide persuasive reasons why science is the best mode of explanation.

Gieryn argues that the boundary work in science does not unfold as part of a sustained, disciplinary endeavor, but in episodic and situated circumstances where the representations of science become highlighted and contested within the larger cultural arena:

> Epistemic authority does not exist as an omnipresent ether, but rather is enacted as people debate (and ultimately decide) where to locate the legitimate jurisdiction over natural facts. Such spatialized allocations—to science provisionally and workably bounded, or to some other putative worthy source of knowledge and guidance—are local and episodic, extant then and there for interpretative finding-

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one's-own-way of for practical fact-based decisions but also for seizing/denying the spoils of credibility contests. (15)

In Gieryn's view, the contingent boundaries of science are not determined essentially by the natural world but are instead negotiated by interlocutors competing to persuade audiences that their interpretations of the world are most persuasive. Gieryn identifies three major rhetorical tools of boundary work: expulsion, expansion, and protection of autonomy. First, expulsion is a form of boundary work that seeks to separate orthodox science from all other discursive forms that claim to be scientific: junk science, fraudulent science, popular science. This boundary work becomes a "means of social control" where the norms are established for real science as opposed to its charlatan counterparts. Scientists who transgress such "calcified" norms risk exclusion from the community of science. The juxtaposition of these discourses validates the epistemic authority of "real" science.

Second, expansion is boundary work that does not seek to discredit an epistemic authority as non-scientific, but demonstrate that one form of scientific discourse is more truthful and reliable than another. This boundary work is most present when the natural or physical sciences lock horns with social sciences for epistemic authority. This practice is most relevant as one begins to consider scientific controversy seeps into deliberative arenas.

Third, protection of autonomy is boundary work that "results from the efforts of outside powers, not to dislodge science from its place of epistemic authority, but to exploit that authority in ways that compromise the material and symbolic resources of scientists inside" (17). Gieryn argues that this is most present when outside sources, such as mass media, assume responsibility to negotiate and adjudicate scientific claims. As a result, scientists who are subject to external judgment engage in boundary work that seeks to distance themselves from the consequences of

such research. Gieryn notes that, "scientists will draw boundaries between what they do and consequences far downstream—the possible undesired or disastrous effects of scientific knowledge—in order to escape responsibility and blame (which often come coupled with intrusive demands for accountability or restriction)" (17). This distancing from the consequences of scientific research allows scientists to maintain an ethos of objectivity, a necessary component of science's epistemic authority.

Gieryn contends that boundary work in science is a layered rhetorical phenomenon, with all three discursive practices working in concert, to distinguish real science as a separate realm of inquiry deserving unique epistemic authority. In the three scientific debates examined in the following chapters, the science rhetors make use of all three rhetorical techniques in the contestation over the efficacy of film references in scientific debate, even as other rhetors, including scientists, advance films as arguments in the scientific debate. However, it is the last two rhetorical maneuvers, expansion and protection of autonomy that are most present in this project. As scientific controversies unfold in deliberative arenas and advocates reach particular rhetorical techniques to the reach non-scientific audiences, the question of expansion comes to the forefront of boundaries issues. However, the theoretical limitations of Gieryn's contribution to this research must not be overlooked.

All of Gieryn's case studies are examinations of boundary work after the dust has settled from scientific controversy. Thus, it becomes easier for us to adjudicate the effectiveness of the discursive practices scientists used to demarcate their position as one of epistemic and cultural ascendancy. The critical implications of Gieryn's work, although rhetorical in spirit, are still historical and sociological surveys of boundary work that can be judged materially. His view of

rhetoric requires that one judges rhetoric based on its "effectiveness," whether the discursive strategies actually persuade an audience about a particular view of science.

These are not grounds for criticism, but demonstrations of Gieryn's theoretical limitations in a project where the controversies have not settled and the discursive choices of scientists may not be fully understood. Indeed, many science controversies do get "resolved" through a series of rhetorical practices that solidify the boundaries of science. Similarly, scientists, mindful of the stakes involved at various science controversies, consciously engage in a rhetorical process that demarcates science from other competing discourses (even if they do not realize what they are doing qualifies as rhetoric). However, science fiction, as stated earlier, resides in the realm of the imagination and speculation and science fiction film references are often deployed in scientific debates where the science is unsettled and the technologies are undeveloped. In essence, science fiction film references are often found in scientific debates where the boundaries have not been established and the science remains rather speculative. Because of the unsettled nature of these boundaries, it is important to find avenues into these debates to ensure equitable discussion and full consideration of all possible arguments.

Charles Alan Taylor's *the Rhetoric of Demarcation* (1996) adds texture to Gieryn's (1999) claims by advancing a rhetorical perspective on science that suggests the boundaries of science are the product of science in action. Like Gieryn, Taylor argues that rhetorics of demarcation occur in localized and situated moments of scientific controversy, where the practices of scientists help articulate the boundaries between science and non- or pseudo-sciences.

> … [T]he meaning of science, as a set of social practices, is constructed in and
> through the discourses of scientists as they respond rhetorically to situations in
> which certain of their social, technical, professional, and technical interests are
> problematized in ways that may or may not be apparent either to the scientist or

the analyst of her or his activities. Practicing scientists, consciously or otherwise, discursively construct working definitions of science that function, for example, to exclude various non- or pseudo-sciences so as to sustain their (perhaps well-earned) position of epistemic authority and to maintain a variety of professional resources. (5)

Unlike Gieryn, Taylor suggests that the rhetoric of demarcation is not always a product of conscious discursive choices on the part of science rhetors. Rather, scientific practice, in all its forms—from the lab to the media—is an ongoing effort that helps articulate the boundaries to science. Therefore, no matter how subtle or unintentional, science rhetors are engaged in the process of boundary work. Taylor, however, is not content to understand the rhetoric of demarcation as a product of solely historical or sociological reflections (although Taylor makes it painstakingly clear that he grounds his inquires in defined sociological and historical contexts).

Taylor parts company with Gieryn on the consequences that a rhetorical or cultural understanding of science demarcation has for the critic. Gieryn concludes his book with an examination of the present-day science wars, where the epistemic status of science has been challenged by science scholars informed by a series of post-modern, cultural and critical theories. He posits the rhetorical question: why bring up "current events" after a "painstaking and dispassionate sociological study of old credibility contests in which rival parties manipulate the boundaries of science" to legitimate their epistemic authority and secure material resources? For Gieryn, this gesture attempts to make the science wars "historically mundane," just another chapter in the continual effort to draft the cultural boundaries of science. Gieryn's noble intent is to "cool off" both sides of this heated debate by offering a mediating sociological approach, informed by the historical examples, that identifies the reasons for such vitriol in hopes to demonstrate how both sides mutually benefit from the science wars. Therefore, Gieryn's mediating approach leaves the critic with the tools to uncover the rhetorical practices of

demarcation, but not necessarily theoretical gumption to challenge the discursive practices of scientists.

However, Taylor sees little trouble in engaging in the science wars. Taylor advances a more "critical rhetoric" that seeks to uncover a series of power relationship that operate discursively within the rhetoric of demarcation. The cultural ascendancy of science as an epistemic authority ascribes science with a degree of symbolic power that, as Taylor suggests, should not be uncritically accepted. This rhetorical power enables scientists to readily dismiss films as fictional, and therefore unworthy of broader consideration, without warrant that goes beyond invoking the credibility of science. By recognizing that the boundaries of science are the product of a rhetorical enterprise, the threshold for engagement in public scientific discourse is lowered. Instead of just recognizing how science maintains epistemic authority, Taylor hopes to uncover ways to challenge science, not to undermine it as a source of knowledge production, but to level the discursive playing field to allow more voices, in particular non-scientific voices, into the arena of science debate.

Taylor, who is not alone in his effort to "democratize" scientific debate (Fuller 1988, 1993; Locke 2002) identifies rhetoric as both a tool scientists use for demarcating science and a tool critics employ for interrogating scientific claims used in the process of demarcation. Taylor is careful not to suggest that science is wholly rhetorical (Gross 1996). Likewise, he argues a rhetorical perspective on demarcation does not displace the epistemic status of science and reposition knowledge in the hands of rhetoric. However, by promoting a critical rhetoric perspective, Taylor hopes to expand scientific deliberation beyond the purely technical sphere to include interlocutors that are not privileged by the epistemic status of science.

However, both Gieryn and Taylor focus on the rhetorical dimensions of demarcation with regard to the internal workings of science, such as scientific controversies that remain mostly within scientific circles. The boundaries of science, as Gieryn suggests, are developed and maintained in moments of controversy and disagreement where the rhetoric of demarcation operates as situated responses to science falling under attack from outside sources or pseudo-scientific challenges. These controversies that occupy Gieryn's attention focus primarily on the process of knowledge production where competing epistemic claims are debated as credible, or scientific, modes of explanation. However, the rhetoric of demarcation also operates in moments where science is challenged not on epistemic grounds, but on its ability to understand the social implications of various knowledge claims.

As epistemic claims migrate into the social sphere and policy decisions are made with the support of scientific evidence, critical intervention invites a rhetorical perspective that helps us understand how discourse operates in deliberative spheres. The rhetorics of demarcation focus on defining science as an epistemic enterprise, not as a discursive tool in public deliberation. Both Gieryn's and Taylor's assessment of scientific boundary work lacks a robust understanding of how this rhetoric operates where specialized and social discourses interact as sites of argumentative invention. To that end, we must import rhetorical theories that can help contextualize these scientific discussions as they move into public spheres where non-scientists engage these discourses. In particular, I turn to the literature on rhetorical situations and narrative theories to add depth to this analysis. These theoretical approaches are valuable for two reasons. First, rhetorical situation theories provide the critical tools necessary to understand how rhetors respond to, or create, situations that can be addressed through discourse. These situations are most noticeable in public deliberative spheres where rhetors articulate discourses that move

beyond specialized spheres. Second, narrative approaches to these discourses identify how the normative dimensions of technoscientific discourses play out in public discussions of science where non-scientific audiences adjudicate competing epistemic claims. Together these theoretical approaches function to identify what constitutes acceptable forms of evidence in public discussions of science and how that begins to articulate the boundaries of science beyond specialized scientific circles.

1.5. Rhetorical Situations and the Boundaries of Science

The boundaries of science, as Gieryn suggests, are developed and maintained in moments of controversy and disagreement where the rhetoric of demarcation operates in situated responses to science falling under attack from outside sources or pseudo-scientific challenges. The controversies that Gieryn investigates focus primarily on the process of knowledge production where competing epistemic claims are evaluated as credible, or scientific, modes of explanation. However, the rhetoric of demarcation also operates in moments where science is challenged not on epistemic grounds, but on its ability to grasp the social implications of various knowledge claims. As epistemic claims migrate into the social sphere and policy decisions are made with the support of scientific evidence, critical intervention invites a rhetorical perspective that helps us understand how discourse operates in deliberative spheres. Because the rhetoric of demarcation literature focuses on defining science as an epistemic enterprise, it lacks the theoretical tools necessary to understand how specialized and social discourses interact as sites of argument invention. A different sort of theoretical perspective is necessary for this task. Rhetorical situation theories provide operative critical tools to examine how rhetors contextualize scientific

discourses for public spheres and how those rhetorical performances identify what constitutes acceptable forms of evidence in public discussions of science.

In 1968, Lloyd Bitzer (1968) introduced the rhetorical situation as both a descriptive and prescriptive tool for understanding and producing rhetorical discourse. A situational approach suggests that rhetoric provides both the theoretical tools for the rhetor to produce discourse appropriate for certain circumstances and the critical tools to uncover the failures and successes of a rhetor in addressing the needs of a situation. Grounding his rhetorical theory in Aristotelian conceptions of rhetoric, Bitzer posits that certain events or situations call forth certain types of discourse to address a situation. For example, eulogies are predicable rhetorical performances, where we expect the speaker to extol the virtues of the deceased as well as draw out important lessons to learn from that individual. Conversely, the lack of a eulogy at a funeral service or utterances that excoriate the deceased are responses unfit for the situation.

All rhetorical situations, according to Bitzer, possess three constitutive elements: exigence, audience, and constraints. All three elements act in concert to help shape discourses that address a given situation. Bitzer defines an exigence as "an imperfection marked by urgency" where some action must be taken to alter the deficient situation. Although every situation is marked by some form of exigence, only a rhetorical exigence can be changed though language. For example, if one steps out in front of a moving vehicle, no amount of discourse will stop the advancing car. However, an individual across the street who notices the car and an individual about to cross its path could shout a warning to the pedestrian to notice the oncoming traffic and thus prevent tragedy from occurring. Whereas the former is indeed an exigence, only the latter is a rhetorical exigence, because language could change the outcome of the situation.

Bitzer's situational approach assumes that rhetoric comes into existence, and becomes significant, only as a response to a real situation. Much like a question begets a certain type of answer, the rhetoric is "controlled" or determined by the nature of the situation. However, like a question that may go unanswered, rhetorical situations may not always receive a response, even though one is called for. Bitzer suggests that rhetorical situations are dynamic and temporal, for they "mature" and "decay" as time advances. Therefore, the response must be a timely production of rhetorical discourse that seeks to change the reality of the situation. The timely response, however, does not guarantee that such an utterance would be appropriate or "called forth" by the situation. An inappropriate response can easily create a new series of exigencies, where new utterances are "required" to rectify the deficiencies in the new rhetorical situation. For example, a rhetor who delivers a speech calling for stricter illegal immigration laws and utters an unsavory ethnic stereotype creates a new situation, an utterance that may jeopardize his or her effort to address the original exigence, the perceived influx of illegal immigrants. That rhetor, however, may not realize the offensive nature of his or her speech until later, usually through some type of response that highlights the problematic utterances. In turn, a new exigence develops that calls for an apologia on behalf of the rhetor, provided that rhetor desires contrition, sincere or otherwise.

Like the notion of exigence, Bitzer makes distinctions between a rhetorical audience and a non-rhetorical audience, in that an audience can only be rhetorical if it possesses the agency to be moved by discourse. An audience unable to address the deficiencies or needs of the situation is not rhetorical or persuadable. Therefore, the audience must have the power to alter reality in response to the speaker's utterances. Consequently, one may eloquently persuade a group of

fourth graders that a particular individual would make the ideal President of the United States,

but since that audience is unable to vote or change reality, they are not a rhetorical audience.

Constraints are those forces that influence the possibility of rhetorical discourse altering

the situation. Constraints can be discursive (evidence, facts, documentation) or non-discursive

(motives, beliefs, attitudes) and can originate from the audience or the speaker. According to

Bitzer, effective rhetorical production must account for situational constraints; otherwise the

rhetorical discourse will fail as a persuasive act. Specialized discourses, such as scientific

terminology, can often serve as constraints that problematize persuasion across various

discursive spheres.

Bitzer's conception of the rhetorical situation, while a significant contribution to the art

of rhetoric, incorporates a series of the objectivist and deterministic assumptions that trouble a

variety of critics (Biesecker 1989; Consigny 1974; Grant-Davie 1997; Tompkins 1980; Vatz

1981). To better understand the limitations of Bitzer's inventional scheme, I identify three

primary criticisms levied at the rhetorical situation model and suggest how a revised theory of

situated rhetoric helps us grasp the nuances of fictional film references in scientific discourse.

First, Bitzer defines the situation in very objective terms, inviting a perspective whereby an

impartial rhetor with the proper critical tools can objectively assess the situation and

appropriately invent discourse that remedies its deficiencies. This objectivist approach assumes

an absolutist framework where the rhetor acts with ethical clarity in assessing the needs of the

situation. Second, Bitzer over-determines causality in defining the rhetorical situation. In other

words, the situation possesses a direct relationship with the production of rhetorical discourse.

This suggests the rhetor does not invent situational discourse as much as he or she recognizes the

discourses necessary to respond to the situation. Third, as a consequence of the previous two

observations, Bitzer's conception of the rhetorical situation minimizes the creativity of the rhetor to marshal evidence and produce discourse in an inventive and artistic manner.

Most of these criticisms generate from Bitzer's objectivist definition of exigence. Alan Brinton argues that identifying the exigence as an objective deficiency in the real world assumes the presence of objective values to judge the deficiency and that the rhetor can correctly judge such deficiency. Brinton contends that by understanding the exigence as based in the real world, Bitzer posits a casual connection between the rhetorical situation and the rhetorical act. The assumption of an objectivist exigence makes the individuality of the rhetor rather superfluous; as long as the rhetor possesses the appropriate critical tools and adopts Bitzer's objectivist framework, the invented discourse will be the same regardless of who is addressing the exigence. As Brinton contends, Bitzer's model promotes a determinism whereby types of discourse are "called forth" by the demands of the situation and are not distinctive rhetorical acts advanced by individual rhetors (Brinton 1981).

Brinton identifies the rhetor as a creative actor, actively choosing discourses to best address the exigence. Unlike Bitzer's more scientific, or possibly journalistic, approach to discourse production, Brinton seeks to rehabilitate agency in rhetorical invention. Like Brinton, Richard Vatz (1973) valorizes the creativity of the rhetor as key to discourse production. Vatz approaches the rhetorical situation intersujectively, noting that the rhetor's choice of events to address makes such events notable. Vatz argues, "once the choice is communicated, the event is imbued with *salience*, or what Chaim Perelman calls 'presence,' when describing this phenomenon from the framework of argumentation." Moreover, Vatz argues, "the second step in communicating 'situations' is the translation of the chosen information into meaning….To the audience, events become meaningful only through their linguistic depiction" (157). For Vatz, the

question of "choice, interpretation, and translation," and therefore rhetoric, is the centerpiece of analysis. Although Vatz focuses critical analysis on the actual discourse, the translation of salient events into meaningful situations requires that the rhetor possesses the credibility that others will recognize the situation's importance and meaning. For example, locals affected by the TMI crisis who liken their experience to something from *The China Syndrome* may not alone suggest that the film has entered into the discourse that evidences the dangers of nuclear energy. However, the film's use in government reports and national newspapers as a way to explain that accident increases the salience of the film in the TMI discourse. The choice of the film as a communicative tool becomes even more salient when ostensibly objective discourses use a commonplace that may damage scientific arguments.

For Vatz, how a rhetor invests a situation with meaning is not, as Bitzer would suggest, limited by the "necessities" of the situation. Vatz contests Bitzer's notion that a rhetorical situation is a discreet, identifiable moment where one can and should respond. Rather, the situation is boundless and there are limitless rhetorical possibilities in the governing the meaning or interpreting a situations.

Rhetorical critics Scott Lybarger and Craig Smith (1996) extend on Vatz's analysis by suggesting that there are multiple exigencies in any event and that each exigence helps influence the discursive options available for various rhetors. Lybarger and Smith tweak Bitzer's rhetorical situation by identifying the "postmodern" elements of current society noting that any robust theory of situated rhetoric must account for mass mediated coverage and societal fragmentation. Characteristic of mass media is the need to address multiple audiences with disparate interests, faculties and agencies. Lybarger and Smith's argument is that rhetorical situation theory must account for the fragmented nature of society. Bitzer's original theory, according to Lybarger and

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Smith, does not appreciate how mass mediated information, diverse audiences and multiple exigencies affect a rhetor's complete understanding of an event and thus the rhetor's ability to produce discourse to address the needs of a particular situation. This fragmentation requires the critic to appreciate all discourses that may influence, or create, exigences. Therefore, it behooves the rhetorical critic to consider how mediated discourses, such as films, serve as reservoirs of argument invention that surface in public discussions of science. This appreciation for social fragmentation and the influence of mass media on rhetorical situation theory compounds the difficulty for a rhetor to bridge these fragmented discourses and disparate audiences.

Although Vatz's rhetoric centered analysis reveals the possibilities for an unlimited number of discursive options in each rhetorical situation, he neglects to appreciate how rhetors and audiences may be separated by incommensurate discursive spheres characterized by different levels of rhetorical freedom. The selection of discourses to bridge these linguistic divides can affect how one understands the demands of an exigence, as either an audience member or a rhetor. However, neither Bitzer's notion of constraints nor Vatz's notion of the creative rhetor appreciates fully limitations on rhetorical production when rhetors operate across specialized and social discursive spheres.

Although an audience's lack of knowledge of a specific technology or the terminology of a particular scientific practice certainly qualifies as a constraint on discourse production, science rhetors encounter similar difficulties in articulating the nature and possible consequences of a scientific practice or technological artifact. As a result, rhetors seek commonplaces with audiences to help bridge such discursive and knowledge gaps. Scott Consigny's (1974) understanding of rhetoric as "an art of 'topics' or commonplaces, showing how a command of topics provides the rhetor with a means for exploring and managing indeterminate context" helps

us negotiate around the difficulties of differing discursive spheres (176). Consigny suggests that both Bitzer and Vatz are partially correct and partially incorrect. He argues that Bitzer is correct insofar rhetorical situations are defined by a series of particularities, but those particularities do not determine the rhetorical production. Likewise, Vatz is correct that the rhetor is a creative agent, but a rhetor cannot arbitrarily create exigencies, for there are constraints that influence the possibility of an exigence to arise.

To mediate between the two competing understandings of rhetoric, Consigny suggests that viewing rhetorical situations, and therefore rhetoric, as an art of topics or commonplaces, we can begin to understand how a rhetor may craft responses to a situation that are limited to a series of constraints that are not wholly arbitrary. This is more significant in rhetorical productions where the discourses purport to be products of objective inquiry. Scientific discourse assumes rhetorical force based on its perceived objectivity. To ensure such objectivity, science rhetors adopt an "anti-rhetoric" that positions scientific knowledge and the methodologies used to obtain it as free from human intervention and other odd and sundry rhetorical acts (Fuller 1998; Gross 1996; Krips, McGuire, and Melia 1995; Prelli 1989). Thus eschewing its rhetorical dimensions, scientific discourse ensures its ascendancy as a vehicle for truthful, thus very persuasive, knowledge claims. How scientific utterances comport with the demands of rhetorical situations becomes an essential area of further academic inspection.

Rhetorical situations are neither determinant, as Bitzer suggests, of the types of discourse a particular exigence requires nor are they contextually indeterminate, as Vatz posits. Consigny argues that "the rhetor who finds himself thrown into a rhetorical situation must transform the indeterminacies into a determinant and coherent structure; and in this activity he is constrained

by the recalcitrant particularities of the situation which bear on his disclosure and resolution of the issue" (178).

Consigny posits that rhetoric is both a heuristic art and a managerial art. As a heuristic art, rhetoric equips the speaker to discover the recalcitrant or fundamental issues at play in a given situation; and as a managerial art, rhetoric allows the interlocutor to actively engage the situation and produce discourse to provide some resolution to the issue. However, since every rhetorical situation is distinct and changes over time, the rhetor must develop both the universal capacity for finding appropriate topics as well as the receptivity to adjust to the changing dynamics of a situation. Such is true with a rhetor's use of film references as a mode of argumentation in deliberative spheres involving highly technical and scientific issues. This rhetorical choice demonstrates how the selection of topics can rearticulate the discourses available for public scientific argument.

Following Vatz's logic, the inclusion of a film to help frame an issue, or even as an analog to a perceived reality, ingrains salience to that rhetorical choice. The salience of this rhetorical choice is furthered by responding to it as an argumentative frame. By responding to a film or incorporating it into public argument, such a rhetorical choice confers relevance to the cinematic text as a credible form of argumentation and thus alters the rhetorical landscape of available arguments. The salience of such rhetorical choices becomes magnified by the dissemination of the discourse through the mass media.

G. Thomas Goodnight and Kathryn Olson's (1994) investigation into the rhetoric of the anti-fur controversy further explains how a rhetor's discursive choices can both alter the content and norms of a given debate. Norms of argumentation are important for rhetors and audiences to produce, understand, and adjudicate discourses. However, in moments of social controversy,

those norms fall under scrutiny as the question of what counts as legitimate argumentation becomes a topic of debate. Goodnight and Olson note that traditional understandings of public sphere arguments assume a "more or less consensual vocabulary" shared by all interlocutors. However, equal access to those discourses is not always available. As a result, alternative modes of rhetorical address, such as non-discursive modes of communication emerge to shake up calcified argumentative norms and expand possibilities for persuasion. In their analysis of anti-fur protest rhetoric, Goodnight and Olson argue that protesters employed persuasive tactics that were not illustrative of straightforward deliberative rhetoric. Instead, the protesters utilized dramatic visual and emotive rhetorical techniques that shifted the focus away from 'rational,' discursively based norms of acceptable argumentation. By incorporating arguments not traditionally associated with rational, deliberative rhetorics, the anti-fur protestors introduce arguments that possess a rhetorical force that is not grounded in the discursive practices established by hegemonic discourses.

Specialized spheres, where scientific argumentation and technological reasoning constitute the norms of acceptable argumentation, often militate against non-traditional, or non-scientific, rhetorics, as evidenced by the rhetoric of demarcation literature. However, as scientific discourses migrate into public spheres where deliberation implicates issues that transcend narrow technological considerations, the opportunities for deployment of non-traditional forms of argument become more numerous. As Goodnight and Olson suggest, when rhetors employ non-traditional forms of argument that are particularly appealing to a broad audience, their rhetorical performances rearticulate the landscape of acceptable argument within deliberative spheres, even if they are not appropriately scientific. This is magnified further when we consider the types of arguments rhetors advance when invoking film references.

It should be clear that scientists do not mistake film references, no matter how scientifically accurate the films may be, as actual contributions to specialized, scientific practices or discourses. However, this does not dismiss films as efficacious contributions to public scientific discourses. As Kirby argues, realistic depictions of science enhance the believability and effectiveness of a film's narrative. It is this sense of scientific realism that better enables a film's narrative to resonate with audiences, thereby generating insights into society's relationship with science and technology that translate into public discussions of science. In other words, if the film enjoys a high degree of scientific fidelity, then the observations and normative claims about science and technology made in the narrative possess greater saliency in particular public discussions. To substantiate these claims throughout this dissertation, I draw on Walter Fisher's (1989) concept of the narrative paradigm to add texture to my analysis of how these films operate in these public discussions of science.

The importance of narratives in human rationality receives a great deal of scholarly attention (Brown 1991, 1998b; MacIntyre 1984; Phelan 1996). As opposed to more specialized forms of reasoning, narratives offer accessible conduits for transmitting ethical, social, or cultural values that inform action. For Walter Fisher, narratives are fundamental to human communication. He argues that the warrants for human action and decision-making are best understood in the context of the narrative paradigm, a fundamentally rhetorical logic that concerns practical knowledge. Fundamental to the narrative paradigm is the importance of values in human action. As a contrast to technical logic, that possesses "a systematic set of concepts, procedures, and criteria for determining the degree of truthfulness or certainty in human discourse," narrative rationality rests on the principles of narrative coherence and narrative fidelity (27). To advance this paradigm, Fisher postulates that humans are fundamentally

storytellers who possess the innate ability to evaluate narratives based on standards of coherence and fidelity.

Fisher defines narrative coherence as how well a story "hangs together" and is judged in three respects: its argumentative or structural coherence; its material coherence (how it compares and contrasts to other stories); and its characterological coherence (the believability and reliability of the characters; both the narrators and actors). For Fisher, a narrative must be coherent before we can appreciate how it may influence thought or action. If a narrative is coherent, then one evaluates its narrative fidelity to determine its efficacy in informing action.

Narrative fidelity is the "truthfulness" of the story, measured by the "logic of good reasons." For Fisher, good reasons are culturally and historically situated and are judged using five criteria: fact, relevance, consequence, consistency, and transcendence. First, questions of fact identify the values present within the narrative. Second, relevance explores whether the values within the narrative are appropriate for a particular decision. Third, we must evaluate the consequences to adhering to such values. Fourth, questions of consistency measure how the values are validated by personal experience or the experience of others. Fifth, we ask how transcendent the values present in the narrative are. Together, these criteria help determine the efficacy of a particular narrative within decision-making.

Even fictional narratives, Fisher argues, can meet the criteria of coherence and fidelity and therefore have some bearing on narrative rationality. This is not to suggest a fictional narrative, such as a film, functions as the sole warrant to inform action. However, a fictional narrative can bring certain values that do influence decision-making into sharp relief. This is particularly true for certain films that demonstrate a high degree of scientific fidelity and provide keen insights into society's relationship with science and technology.

Narrative rationality does not deny that discourses include specialized structures of reason, such as technical or scientific reasoning, but "such assessments become useful only insofar as the discourse is considered as a whole, as part of a storied context in which other features of the discourse are taken into account, including mythic and metaphoric elements" (48). In other words, Fisher suggests it is impossible to assess scientific discourses independent from any narrative context. This stands in direct contrast to science pedagogues who argue that science fiction films can function as a "springboard" to generate interest in science. But once that interest is piqued, any value judgments on science and technology made in the film are often ignored in favor of technical discourses that correct scientific inaccuracies found in the film.

Ultimately, Fisher's concept of narrative rationality focuses my critical attention on how films with a great deal of scientific fidelity advance particular value judgments on science and technology that have purchase in public discussions of science. It is my contention that a relationship exists between a film's narrative dimensions (i.e. its coherence and fidelity) and the maintenance of acceptable public scientific argument. I suggest that if a rhetor finds the values in a film objectionable, his or her rhetorical efforts center on undercutting the film's coherence, thereby disqualify the film from public discussions of science and, by extension, the values the film advances. The opposite, I suggest, is equally true. A rhetor who finds the film's depictions of science and technology agreeable will endorse the film's coherence and fidelity. To that end, each case study pays particular attention to how rhetors interrogate a film's coherence and scientific fidelity.

1.6.   Theoretical Approach and Chapter Organization

As Gieryn and Taylor argue, the boundaries of science and the contours of scientific discourse are anchored in localized and episodic discussions of science. For this dissertation, the

focus is on how rhetors use films as evidence to help shape situated public discussions of science. To that end, I consider how these films help shape scientific debate in two ways: first, how particular film references alter the practice of situated public discussions of science, and second, how those film references contribute to the content of such public discussions. In order to ascertain the dynamics of these unique discourses, I analyze specific instances of public deliberation where interlocutors cite film references as proof to bolster particular arguments. In each case, I examine how science rhetors situate films rhetorically in relationship to scientific fact and scientific practice as well as examine how the narrative qualities of the film may provide additional forms of argumentation that add texture to public discussions of science. It is my belief that by examining how interlocutors employ these films, we can better understand how specialized and social discourses interact in various public spheres. In researching how rhetors use films in public scientific discourses, my inquiry begins by searching for texts where film references are employed in the service of public scientific discourse. Consequently, texts produced by film critics are not considered, whereas scientists or science journalists who evaluate a film's scientific fidelity fall under the purview of this study. The primary source materials include, but are not limited to, major United States newspapers, mainstream magazines (for example, *Time*, *Newsweek*, and *U.S. News and World Report*), science journals (*Science* and *Nature*), and government reports. Such broad reach is necessary to develop a comprehensive description of film references in public discourse.

Once I identify the film references, I investigate how rhetors position the film in relation to the broader scientific debate. This invites the following research questions: Does the rhetor identify the film as a welcome contribution to the public discourse? If so, then what contributions does that rhetor believe the film makes to the discourse? If not, on what grounds and how does

that rhetor expunge the film from the discourse? Does the rhetor reference a film to focus public attention on a particular scientific issue, to correct a scientific inaccuracy, to advance a scientific or normative argument? Where does the rhetor draw the line between fact and fiction? To what end does such as demarcation serve? These research questions focus attention on the fundamental rhetorical dimensions at play in public scientific discourses under consideration in the following chapters.

Chapter Two examines how references to *The China Syndrome* shape the controversy surrounding the Three Mile Island (TMI) nuclear accident. Prior to the Three Mile Island incident, the nuclear energy industry enjoyed a relatively clean safety record. Consequently, when nuclear energy critics promoted *The China Syndrome* as a prophetic illustration of the dangers of nuclear power, nuclear energy advocates dismissed it as uninformed hysteria hyping a scientifically improbable event. However, as the TMI crisis unfolded and the similarities between the film and reality grew more apparent, *The China Syndrome*, which was released days prior to the accident, became a more salient reference in public discussions of nuclear energy. This chapter explores the increasing saliency of *The China Syndrome* in public discussions of TMI and nuclear science and the efforts of nuclear energy advocates to discredit the film, especially after the TMI crisis, and expunge it from the public discourses on nuclear energy. I argue that the connections rhetors identify between the film and the crisis presents an exigence whereby nuclear advocates sought to expunge the film from the discourse because of the film's unflattering depiction of the nuclear energy industry. It is important to note that *The China Syndrome*'s central critique is not of the actual nuclear technology, but its mismanagement by the nuclear industry. However, nuclear energy advocates' attempts to discredit the film center on revealing minor scientific inaccuracies that the film depicts and using those failures to undercut

the values the film presents. Analysis of these discursive practices reveals how rhetors use technical arguments to undermine normative claims that may challenge particular scientific practices.

Chapter Three presents a case study where rhetors openly embrace a film as an ideal resource for examining the social and ethical implications of a particular technology. In this chapter, I explore how the film *GATTACA* functions as evidence in public discussions of genetic engineering. Specifically, the chapter investigates how the Australian Law Reform Commission (ALRC) and the Australian Health Ethics Committee (AHEC) use *GATTACA* as a text to thematize the major ethical and social concerns regarding genetic engineering. In their 1100-page report on the future of laws governing genetic science submitted to the Australian parliament, the ALRC/AHEC seamlessly incorporates a series of references to *GATTACA* with the traditional technical discourses one expects to find in government report on science policy. In speeches promoting the report, David Weisbrot and Brian Opeskin, executives at the ALRC and authors of the report, reference *GATTACA* without qualification, arguing the film effectively articulates the social, ethical, and legal implications of genetic science under consideration in the report. The ALRC/AHEC report endorses the continuation of genetic research and openly embraces the benefits of such science, therefore the report does not use the film to criticize the technology. Rather, the report references the film as a cautionary tale illustrating the dangers of and unquestioned genetic deterministic mindset. In this chapter, I consider how the ALRC's use of *GATTACA* expands the available discourses in public discussions of genetic science to interrogate genetic determinism without undercutting the value of genetic science. This chapter pays particular attention to how the cinematic devices used in *GATTACA* cultivate audience identification with the protagonist, a genetically disadvantaged individual who struggles against

the prejudices inherent in a society governed by genetic determinism. Because the genetic determinism mindset operates in subtle ways, I believe narratives are particularly poignant settings for exposing possible dangers of genetic determinism that more technical discourse fail to illuminate. This chapter demonstrates how the ALRC's use of *GATTACA* achieves such a goal.

Chapter Four examines the global warming debate that followed the release of the 2004 blockbuster, *The Day After Tomorrow*. Whereas Chapter Two focuses mainly on how rhetors attempt to expunge *The China Syndrome* from public discussion and Chapter Three primarily attends to rhetors' efforts to expand public discourse with the inclusion of *GATTACA*, Chapter Four analyzes how interlocutors on both sides of the global warming debate react to *The Day After Tomorrow* as a powerful, yet scientifically suspect, depiction of runaway climate change. The climate change debate often centers on four issues: the existence of global warming, the extent of human contributions to global warming, the severity of climate change, and the advantages and liabilities of combating global warming. Although most scientists now agree the Earth is experiencing a human-induced warming trend, mobilizing public action to address global warming is a unique rhetorical challenge. Because the effects of global warming are slow to develop and efforts necessary to reduce it often entail considerable economic sacrifices, rhetors promoting anti-warming policies face resistance from well-meaning publics who believe more immediate and tangible financial concerns eclipse the distant and imprecise effects of global warming. *The Day After Tomorrow* offers science rhetors a dramatic and visually stunning depiction of the effects of global warming. However, the film depicts the onset of global warming as happening at an unrealistic, in fact ridiculous, rate. Although cinematic narrative conventions require global warming to occur at such a rate in order to produce a compelling,

character-centered story, rhetorically, the film is a mixed bag for climate advocates. While the film may focus public attention on the effects of global warming, its over-the-top depiction of warming risks trivializing the importance of climate change. This chapter considers how science rhetors attempt to extricate the elements of *The Day After Tomorrow* that focus public attention on addressing global warming from the film's scientific shortcomings. In addition to exploring how advocates negotiate the efficacy of the film in public discourses on climate change, I investigate how critics of the film, mostly warming skeptics, exploit the scientific infidelities in the film to discredit arguments advancing the dangers of global warming. Unlike the previous two chapters, this analysis highlights the film as the centerpiece of the public discourse; science rhetors openly debate the efficacy of *The Day After Tomorrow* in public scientific debates on global warming.

The final chapter suggests that scholars should not ignore the influence films have on public scientific discourse. Indeed, there are numerous analyses that consider how films reflect social anxieties or cultural tendencies. However, I posit that there exists a series of rhetorical dimensions to the role of film in public discourses that the extant literature fails to consider. The preceding chapters demonstrate that films can have a noticeable effect on public discussions of science by adding visual and narrative texture to specialized scientific discourses. As a result, film references begin to broaden public discussions of science by incorporating rhetorical dimensions that are not predicated on publics understanding complex scientific terminology. To that end, Chapter Five suggests that a careful consideration of how rhetors reference films in public discussions of science can highlight opportunities to broaden these discourses. My analysis reveals that the argumentative practices that many rhetors seek to maintain are not extant to ensure judicious scientific argument, but to exclude competing discourses.

Consequently, I suggest that this research increases the transparency of how rhetors invoke scientific discursive practices in public discussions of science to articulate a particular characterization of science.

Although this research weaves together critical tools and intellectual interests from a variety of academic perspectives, my primary audience lies with rhetoric of science scholars. In general, rhetoric of science scholarship represents a diverse critical effort to unearth discursive dimensions in science. Rhetoric of science scholars face considerable resistance from rhetorical critics who argue that the tools of rhetorical criticism are unsuitable for analyzing scientific discourse. To close the study, I focus primarily on Dilip Goankar's warning that rhetoric, the historic art of producing persuasive discourses for public spheres, lacks substance and rigor when scholars apply it in unintended ways. I argue that this type of research addresses Goankar's chief concerns by foregrounding rhetoric as a productive art that broadens argument invention for deliberation in public spheres. My final points of analysis identify future research trajectories that embolden critical rhetorical efforts that seek to understand relationships between scientists and non-scientists.

2. *The China Syndrome* and TMI: The Rhetorical Struggle to Separate Fact from Fiction.

2.1. Introduction

On March 16, 1979, *The China Syndrome* (Bridges 1979) opened in 669 theaters to largely favorable critical reviews and strong box office numbers. Anti-nuclear protestors praised the film for its dramatic indictment of industrial mismanagement of nuclear power. Conversely, nuclear energy advocates criticized the film for its irresponsible portrayal of the nuclear industry. Furthermore, critics of *The China Syndrome* argued that the film misrepresented the likelihood of a nuclear meltdown, depicting such an accident as inevitable. However, on the morning of March 28, 1979, the "improbable" occurred at Metropolitan Edison's (Met-Ed) Three Mile Island (TMI) nuclear power plant outside of Harrisburg, Pennsylvania; The TMI Unit-2 nuclear power generator experienced a pump malfunction in the secondary loop that set off a series of unlikely accidents, scientific uncertainties, and communication gaffes that left public officials and their constituencies rattled.

As the worst nuclear accident on record at the time, the TMI crisis garnered unparalleled national and international media attention. Although nuclear plant accidents prior to TMI received press coverage, these accidents were often short and harmless. More importantly, accidents prior to TMI were always contained prior to public notification of the problem. Public disclosure of such accidents usually consisted of a single, coherent press release rife with technical jargon and assurances of the plant's safety. These press releases identified the responsible acts of the well-trained technicians and reliability of nuclear technology as demonstrative of a commitment to safety (Friedman 1981).

The TMI emergency, however, unfolded in the public arena where the disagreements and uncertainties over the nature and extent of the accident were made transparent by reporters who lacked the technological understanding of nuclear power. Well rehearsed public arguments that touted nuclear energy as a clean and safe alternative power supply promising energy independence suffered as speculation about future accidents swirled in the wake of the TMI crisis. Amidst a perfect storm of misinformation, uncertainty, contradiction and urgency, numerous interlocutors struggled to sort out events and control the trajectory of public argument.

Plant officials and nuclear technicians, including representatives from the Nuclear Regulatory Commission (NRC) found it difficult to explain a problem they did not fully understand, especially to non-scientists. Government representatives, such as Pennsylvania Governor Richard Thornburgh, also frustrated with the inconsistent information coming from plant officials, faced the difficult task of ensuring public safety without causing undo panic. Journalists, mostly uneducated in matters of nuclear science, searched for an understandable story line that would capture the technical complexity of the event.

Unlike natural disasters, visible acts of destruction non-scientists can easily understand, a large scale nuclear accident risks the release of radiation, an invisible threat that only scientific instruments can detect. As a result, publics depend on scientists to notify them of any potential dangers arising from such a contingency. In the TMI case, assessments of danger were the responsibility of plant officials. However, as the crisis progressed, plant officials were greeted with increasing public suspicion as contradictory messages regarding the plant's safety began to mount. The inscrutable terminology of nuclear science only compounded these increasing suspicions of those entrusted with safe production of nuclear power.

The TMI crisis presents a distinctive case for examining how a film functions rhetorically as specialized and social discourses interact in public settings. The communicative difficulties evident during the TMI emergency demonstrate how prevailing rhetorical practices possess limited utility in a crisis where expert uncertainty is made visible to publics largely unfamiliar with nuclear technology. Consequently, the instability in the modes of communication invites non-scientists, such as journalists, public officials and affected locals, to make sense of the accident using reductive, non-scientific discourses to better capture the complexity of the situation. Such discourses, however, risk the oversimplification of a complex, technical problem, often enabling reactionary fears from non-scientific publics to surface. In order to rehabilitate the modes of science communication and assuage public fear, rhetors must discredit and expunge the critical and simplistic discourses from public conversation. To understand this dynamic, this chapter investigates how references to *The China Syndrome* surface as a way to contextualize the TMI crisis and the rhetorical efforts of nuclear energy advocates to undermine the film's contributions to public discourses on nuclear energy.

I argue that the most evident boundary work occurs before and after the TMI crisis. Prior to the TMI accident, both critics and advocates of nuclear energy debated the accuracy and fairness of *The China Syndrome*'s portrayal of nuclear science and the nuclear energy industry. For both sides, there were considerable stakes in resolving whether or not *The China Syndrome* was a credible depiction of the nuclear energy industry. Critics of nuclear energy hoped the film would bring considerable public attention to the potential harms of nuclear power. For nuclear energy advocates, the film's slanderous depiction of the nuclear energy raised concerns that it could generate public suspicion and mistrust toward the nuclear energy industry. However, nuclear energy advocates continually pointed to a casualty-free safety record as evidence of its

commitment to public safety. However, after TMI, the rhetorical options for defending the

nuclear industry changed dramatically. Although no individual died as a result of the TMI

accident, arguments lauding nuclear power as a clean and safe power source no longer had the

same rhetorical cache for skeptical publics. *The China Syndrome*'s unflattering depiction of the

nuclear energy industry as full of corporate malfeasants who will sacrifice safety for corporate

profits only compounded this negative public image. The rhetorical struggle for nuclear energy

advocates to rehabilitate the credibility of the nuclear energy had many fronts, including the

expulsion of references to *The China Syndrome* as a realistic analog to the "innerworkings" of

the nuclear energy industry.

  The debate over the credibility of *The China Syndrome* centers on how well the film

represents the "reality" of nuclear power, especially its susceptibility to accidents and the

effectiveness of industry safeguards deployed to ensure plant safety. *The China Syndrome*

references in public discourses over nuclear technology most pointedly surface before and after

the TMI crisis where rhetors could more leisurely examine the film's applicability to public

discourse on nuclear technology. However, the press coverage of corporate cover-up and

communicative difficulties during the crisis reflect many of the storylines found in the film that

did not rest solely on technical arguments. This is not to posit a causal relationship between the

film and the press coverage, but rather to highlight how the similarities between the film and the

real event illustrate rhetorical dimensions to the crisis not discussed in existing scholarship. To

simply state that the reason *The China Syndrome* surfaced in discussions of TMI was a result of

its timely release ignores the complexity of nuclear energy proponents' vitriolic response to the

film both before and after the TMI crisis. I suggest that the use of the film during the crisis as a

way to understand and interpret the event, in particular by non-scientists, indicates the persuasive

potential of a popular, fictional text as a site for argument invention. I argue that understanding the rhetorical practices interlocutors use to include or exclude *The China Syndrome* as part of the discourse on nuclear power, especially in light of the TMI crisis, helps elucidate how distinctions between traditional and non-traditional scientific discourses are maintained to either include or exclude broader public involvement in the debate over nuclear energy.

In any given debate that touches on issues of science, especially science policy, rhetors invent arguments that both contribute to the content of a scientific debate and articulate acceptable modes of public scientific argumentation. This inquiry focuses on how rhetors rhetorically demarcate science in public arenas by examining how certain types of evidence, such as *The China Syndrome*, are granted efficacy in public deliberations of science. I argue that the conjunction of the TMI crisis and the timely release of *The China Syndrome* presents a series of exigencies that precipitate in this form of boundary work. To that end, this chapter examines how *The China Syndrome* is discussed in various media sources before, during and after the TMI crisis. I pay particular attention to how critics of the film utilize tactics informed by rhetorics of demarcation to challenge the film's probative value as an efficacious contribution to understanding the impact of nuclear technology. Although *The China Syndrome* is more of a critique on the nuclear energy industry than nuclear science and technology,[1] critics of the film indict the film's depiction of nuclear science to discredit its condemnation of industrial mismanagement. By indicting the film's scientific and technological accuracy, nuclear energy advocates and critics of the film seek to undermine, in Walter Fisher's terminology, the film's coherence, and consequently, the principled indictments it presents.

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[1] This separation of the science and technology from its application is, as Bruno Latour (1997, 2002) argues, artificial. However, the film makes clear that the object of criticism is the nuclear energy's inattention to safety.

2.2. *The China Syndrome* and Making Sense of a Disaster

Although fictional films are not traditionally accepted as legitimate forms of evidence in public discussions of science, *The China Syndrome* provided a timely and popular discursive commonplace where rhetors, in particular journalists and lay people, attempted to comprehend the nature of the TMI crisis by juxtaposing the actual accident with the one depicted in the film. Also, the relationship between the film and the actual emergency emerged as a topic that received attention from the numerous governmental and academic inquiries of the event. Peter Sandman and Mary Paden, reviewing the journalism coverage of the event for the *Columbia Journalism Review*, ask "What, indeed, made T.M.I. such a story? For one thing, the accident came at a time of heightened awareness of nuclear issues. *The China Syndrome* was proving a box-office hit and had already made 'melt-down' a household word" (Sandman and Paden 1979, 58). Rhetorical scholars Thomas Farrell and G. Thomas Goodnight contend that the film strikingly demonstrates that the participants in the crisis, even the specialists, are powerless in the face of the technological failure where the "problems of communicative competence" thwart both the specialists and the 'public' assessment of the problem (Farrell and Goodnight 1981, 280).

Governmental investigations into the Three Mile Island event recognize *The China Syndrome* as having an effect on the coverage of the TMI crisis. The Kemeny Commission (1979a) on emergency preparedness notes that because a nuclear accident has no real-life analog, popular depictions of the risks of the radiation, like *The China Syndrome*, "contributed to a set of popular stereotypes about radiation and radiation release, which correct or not must have entered into people's thinking" (147). The same commission, focusing on how the public's right to know was served during the TMI crisis, finds that the popularity of *The China Syndrome* and the

timeliness of its release helps precipitate greater media scrutiny on nuclear technology and public

relation strategies of the nuclear industry to address issues of public safety (Kemeny 1979b,

173). The Nuclear Regulatory Commission's report suggests a major reason the Met-Ed officials

lacked credibility during the crisis is a result of the negative depiction of public officials in *The

China Syndrome* (Rogovin and Frampton 1980, 1069).

Prior to the TMI crisis, proponents of nuclear power enjoyed empirical validation for

their assertions that accidents were improbable and that depictions of nuclear meltdowns in

popular media were irresponsible. Investigations into the nuclear power industry revealed that no

one had ever died as a direct result of working with nuclear energy and the probability of a

widespread accident were extremely remote. The Rasmussen Report (1974), which suggests that

a nuclear meltdown is as likely as a large meteorite striking a major metropolitan area, provided

a welcoming endorsement for nuclear power as a safe and efficient alternative to costly fossil

fuels.

Despite a burgeoning anti-nuclear movement and a relative lack of public knowledge on

nuclear power, the rhetoric of nuclear energy was permeated with discourses of progress and

technological advancement (Dionisopoulos and Crable 1988). However, the events of TMI

magnified problems with the nuclear industry that belied its promise as an acceptable substitute

to fossil-based fuels. The case for nuclear power no longer rested on relatively secure

technological arguments that promised an effective alternative energy source. The technology,

and in particularly its management, became a featured part of the public debate over nuclear

power.

According to Dorothy Nelkin (1981), after TMI, nuclear power was no longer simply a

technological issue. Nuclear energy debates now fold in complex rhetorics that engage social,

political, and economic relationships that are potentially affected by nuclear power managment. Nelkin argues that the scientists at Three Mile Island "were more than simply investigators seeking the causes and dimensions to the accident. They served as publicists, image makers, and sources of credible information [for the press]" (139). They no longer occupied the role of technicians, but were the public face of the nuclear energy industry. The only sources of information for the press, and the rest of the public, were the scientists and nuclear technicians, who themselves were uncertain of the nature of the problem and lacked the necessary public relations understanding to assuage public fears during the crisis. Consequently, the uncertain, and at times, contradictory information that came from these sources precipitated an increasing distrust of nuclear power and the nuclear industry, even if the science rhetors were honest in their assessments of the situation.

As the crisis eclipsed exclusively technological considerations, nuclear technicians encountered difficulty in communicating with non-scientists who were equally frustrated with the "experts'" inability to bridge terminological chasms. For example, the initial representative from TMI to discuss the problem, Jack Herbein, a Met-Ed vice president, had little experience dealing with the press, and was often considered irascible and impatient with those ignorant of nuclear science. His initial assurances that TMI crisis was under complete control were later proved incorrect, only furthering mistrust between the media and plant officials and cultivating an ethos of deceit and insincerity on behalf of TMI management.

Like the coverage of the TMI crisis, *The China Syndrome* is not as much an indictment of nuclear technology as it is a focused criticism on the nuclear energy industry and its practices (McMullen 1995). The technoscientific discourses used to mobilize support for nuclear power often relies on scientific claims that identify the efficiency and safety of nuclear power, as

opposed to the use of fossil fuels for power generation. However, as Nelkin argues, the public

discussions of nuclear power during the TMI crisis transcends exclusively scientific claims

which open the door for more participants to engage in the discourse. Even though nuclear

technology discourse employs rather inscrutable terminologies, there exist argumentative

grounds that rhetors could use to criticize the nuclear energy industry, arguments that come into

sharper focus after the TMI crisis.

The China Syndrome presents a distinctive case where a film is produced with a high

degree of scientific fidelity in order to advance arguments that decry the management of the

technology. The premium on achieving a sense of reality and adhering to technical accuracy

creates a narrative that attempts to fictionalize a realistic probability. Like Suvin's novum, *The*

China Syndrome ruminates on our relationship with nuclear technology and the technoscientific

discourses that surround it. Although nuclear power plants existed for years prior to the film's

release, the topic of nuclear technology remains relatively foreign to the larger public. In an

attempt to come to terms with such a complex technology, *The China Syndrome* posits a "what-

if" scenario based on the technology running amok.

2.3.   Coverage of *The China Syndrome* After the Film's Release

Although the film's production demonstrated signs of trouble, *The China Syndrome*, the

$6 million thriller boasting bankable actors and a savvy director, grossed nearly $26 million in its

first eleven days despite cries from nuclear advocates who suggested the film promoted an

irresponsible and inaccurate portrayal of nuclear energy (Burnham 1979). Given the political

activism of its stars (Jane Fonda and Michael Douglas) and the message of corporate greed, *The*

China Syndrome was oft considered a tool of liberal propaganda, masquerading as an informed scientific assessment of nuclear technology.

The China Syndrome, a film made with a great deal of backing from powerful figures in Hollywood, centers around the mishaps and cover-ups at a Southern California nuclear power plant discovered by a couple of lucky and tenacious journalists. While filming a fluff piece on nuclear power for a California news station, news woman Kimberley Wells (Jane Fonda) and cameraman Richard Adams (Michael Douglas) witness an incident at the plant that raises suspicions that something dangerous may have occurred. The plant supervisors assure the reporters that nothing is wrong and that all technicians are following standard operating procedure, even though they look panicky. When the reporters return to the station to air the piece, the station managers confiscate the tape arguing that airing the piece could constitute libel, subjecting the station to possible legal action. In response, Adams steals the recording and shows it to a group of nuclear scientists, who tell Adams that he and the rest of Southern California are lucky to be alive. The scientists watching the tapes indicate that the plant nearly averted a nuclear meltdown, or a "China Syndrome," a term of art used to describe a nuclear meltdown. Ironically, one of the scientists remarks that if there were a core meltdown, an area the size of Pennsylvania would become uninhabitable.

A concerted effort by Adams and Wells follows to expose the cover-up by identifying evidence of mismanagement and corporate greed at Edison Electric, the fictional power supply company who runs the Ventana nuclear power facility. Wells finds a sympathetic nuclear engineer at the plant, Jack Godell (Jack Lemmon), who, after overcoming a series of intimidation tactics, is willing to blow the whistle on the plant's safety problems. Godell is a rather conflicted character; he is a long-time company man who believes in the promise of nuclear power, but is

disenfranchised with the company's disregard for safety and candor. Godell's loyalty ultimately

rests with the technology; he never admonishes the failures of nuclear power as a beneficial

technology, but harbors grave concerns about the mismanagement of the plant and the plant

officials' duplicity in such mismanagement.

The effort to expose the problems at the plant reach a level of desperation when Godell

barricades himself in the plant's control room, demanding Wells interview him to report the truth

about the plant's mismanagement. However, in a public relations effort, the plant managers

attempt to discredit Godell as a crazed mad man, thus assuring a weary public that the plant is

safe. The rhetorical tactics the plant officials use assume a rationalist posture that identifies

Godell as irrational and old, no longer able to discern fact from fiction. The film concludes on a

rather cynical note, Godell's noble pleas for a safe plant and public disclosure of problems at the

plant are discredited as being products of hysteria.

In an effort to achieve scientific fidelity in the film, the original scriptwriter Mike Gray,

an engineer by trade, models the technical failures the film depicts after real-life accidents. A

stuck needle on a water level gauge that set in motion a series of errors and malfunctions, as the

film depicts, comes from a real life incident at the Dresden II nuclear power plant in Morris,

Illinois. A number of other depicted incidents, caused either by humans or technical

malfunctions, have real life analogs, such as a disabled coolant system at a Detroit breeder

reactor and falsified welding reports at a Boston nuclear power plant.

To ensure that the dialogue and scenery also comports with existing knowledge of

nuclear power plant operations, the film producers enlist the services of MHB Associates, a

consulting firm of former General Electric (GE) nuclear engineers who resigned in protest over

perceived inattention to safety matters. The three former nuclear energy engineers, Greg C.

Minor, Richard D. Hubbard, and Dale G. Bridenbaugh, formed the consulting firm to represent those critical of nuclear power and testify at plant licensing hearings as to the danger of nuclear power (Harmetz 1979, D1). Although many argue that the technical aspects of the film are superficial and bordering on artistic license, the depicted technology at least shares a workable resemblance to actual nuclear power plants. According to director James Bridges, the Ventana Power Plant control room is a button-for-button reproduction of a control board from an Oregon nuclear power plant and the rest of the plant is an amalgam of existing power plants and reactor designs.

Given its anti-nuclear subject matter and its outspoken, liberal-leaning, stars, *The China Syndrome* was a lightning rod of controversy before it was even released. During filming, the Department of Energy declined cooperation with the filmmakers and certain nuclear power plants refused permission for on-location filming if any of the content was deemed too controversial. Although the filmmakers were eventually allowed to film at the Trojan Nuclear Power plant in Oregon, the degree of controversy grew more intense prior to the film's release.

Notably, General Electric withdrew its sponsorship of a March 13, 1979, Barbara Walters special where Jane Fonda was a featured interviewee. General Electric released a statement which concluded that it was "inappropriate" for a supplier of nuclear power to endorse a program with "material that could cause undue public concern about nuclear power" (Brown 1979). Although the film's 72-page press kit refrains from using the term "nuclear" or explains what the title means, nuclear advocates respond to the film as another foray into the debate over nuclear energy policies. Nuclear power advocates gave film reviewers information about nuclear energy and excerpts of pro-nuclear speeches by the American Medical Association, the NAACP, and other groups from the Atomic Industrial Forum, in order to provide balance to the anti-nuclear

message of the film. A good portion of the January/February 1979 issue of *Reddy News*, an energy trade magazine, is devoted to rectifying perceived inaccuracies in *The China Syndrome*. One article argues that "just in case you don't have enough grief, this 'contemporary thriller' will open in your service area March 16…As for the slant, consider the proclivities of the principles and draw your own conclusions—co-stars Jane Fonda and Jack Lemmon are anti-nuclear activists; executive producer Bruce Gilbert worked in support of Daniel Ellsberg and Tony Russo in the Pentagon Papers trial and Mike Gray, who wrote the original screenplay, includes among his credit 'the Murder of Fred Hampton,' a documentary on the Black Panthers" (qtd. in Harmetz 1979).

The differing rhetorics on how the film is received by both pro- and anti-nuclear forces is best illustrated in a *New York Times* feature ten days prior to the TMI crisis. Reporter David Burnham interviews six nuclear technology experts, three opponents and three proponents of nuclear power, to get their reaction to *The China Syndrome*. He asks them to answer four general questions: (1) is there a danger of a meltdown triggered by a minor malfunction as depicted in the film? (2) if unlikely, are there other minor errors that could lead to a meltdown? (3) is it possible that a power plant could manipulate safety records? (4) does *The China Syndrome* make a worthwhile contribution to the debate over nuclear energy?

Burnham notes that all the experts agree on the possibility of a minor malfunction causing a serious nuclear accident, but they disagree on the likelihood of such an event. They also all agree that the film is released at a critical time where the debate over nuclear power hit a high water mark. MIT nuclear engineer and author of the Rasmussen report, Norman Rasmussen, notes that although there exists a minute possibility that a meltdown could occur, reactors are designed with numerous back-up systems that would prevent any external problem. Rasmussen

says of the film, "What I got is a suspenseful story that mixes fact and fiction and makes a very entertaining package. I don't believe it is factual but it has some credibility" (qtd. in Burnham 1979). Rasmussen best illustrates a mediated ground between how the two camps perceive the film, noting that nuclear critics would assign the film documentary status, whereas nuclear industry advocates would dismiss the film as wholly unrealistic. Rasmussen assumes a posture of objectivity, conceding that factual elements do exist in the film, yet stopping short of identifying what elements of the film remain "credible." Rasmussen's rhetoric does little to expunge the film as a credible contribution to the discussion of nuclear technology, but sets up the rhetorical tactics used to understand the film's place in the public discussions on nuclear power as one of possibility versus probability.

David Rossin, a nuclear research engineer at Commonwealth Edison, adopts a similar rhetorical technique but reaches very different conclusions. Even as a scientist who does not believe in absolutes, he places his faith in the redundant safety technologies of nuclear power plants to prevent a serious accident from ever happening. Although Rossin concedes that some of the accidents in the film are based on actual incidents, he notes that the depicted events are simplified for dramatic purposes and that "if they had stuck to the facts, there wouldn't have been a movie" (qtd. in Burnham 1979)

The most vociferous response to the film comes from John Taylor, the vice president of reactor management at Westinghouse Electric Corporation, manufacturer of numerous nuclear reactors in service. Taylor notes that the film is a "character assassination" of the nuclear power industry and its officials who are depicted as socially irresponsible and ethically bankrupt. Taylor's retort rests on citing the safety record of nuclear power plants and the studies that demonstrate the infinitesimal risk of core meltdown. Like Rasmussen, Taylor situates his

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argument in the effectiveness of the redundant systems that would prevent such an accident from

occurring, further noting that the film depicts numerous technical flaws that fail to appreciate

these safety systems.

The critical responses against *The China Syndrome* not only come from those involved in

nuclear power issues, but also notable conservative columnists. George Will, in the April 2, 1979

edition of *Newsweek* (which went to press prior to the TMI crisis) provides a pointed criticism of

the film, arguing that the film "uses fact, where convenient, for believability, and implies,

falsely, that the fiction is a light coating on a heavy core of fact. The movie is meticulous where

it does not matter…[the] movie rests on fantasy rather than fact because fact would not be as

entertaining" (Will 1979b). He contends that the artistic license to stray from factual constraints

is indefensible because the film attempts to "manipulate" the audience into an anti-nuclear

hysteria by suggesting a wanton disregard for safety at nuclear power plants. Will's argument,

like most nuclear power advocates', rests on the remoteness of a nuclear accident. Like other

defenders of nuclear power, Will mobilizes historical evidence that no one has ever died from a

nuclear accident, and that any near accidents were averted by the defense-in-depth systems. He

contends, rightly, that unlike nuclear power generation, there have been numerous causalities

that result from oil and coal power generation.

Will dismisses the film as moralistic statement regarding extremely remote probabilities

made by anti-intellectual Luddite protesters in search of a cause. He notes "most liberal-arts

graduates have no significantly greater comprehension of modern science than a hod carrier, but

unlike a hod carrier, they regard scientists as rivals for a scarce resource, prestige." Will's

criticism centers mostly around Jane Fonda, who argues "that the film is a testament against

corporate greed and not necessarily an attack on nuclear energy; if we intended to indict nuclear

technology, we would have made a documentary" (qtd. in Will 1979b). Will turns such comments against the actress, noting that a documentary based on facts would be a much more fair evaluation of nuclear energy, but less financially successful film, thus "As Fonda says, her film is about greed." Will's discourse echoes a series of *ad hominem* attacks that assume anti-nuclear arguments are informed by a lack of knowledge on nuclear energy, and that lack of knowledge informs a series of insecurities.

Although the arguments of the nuclear advocates to dismiss the film vary, they all assume three rhetorical postures to undermine the film's credibility. First, nuclear power advocates suggest that the film sensationalizes the probability and seriousness of a nuclear accident. The arguments by Rasmussen and Rossen, both nuclear scientists, assume an argumentative stance that recognizes the possibility of risk, but suggests the probability of an accident is so remote, usually as a result of highly effective defense-in-depth technologies, that it negates the warrants against nuclear power. Will advances a similar argument that assuming a zero-risk stance to inform energy policy is an untenable and unproductive strategy. He argues that the NRC's decision to close five nuclear power plants in the Northeast because of structural problems that could not withstand a serious earthquake, the likes of which that have never been seen in the Northeast, as evidence of the NRC buying into a zero-risk mindset. This criticism becomes more focused in that the film may illustrate what could happen in the event of an accident, but it does not properly indicate the probability of a nuclear accident. Although the film may properly illustrate the "what-if" of a nuclear meltdown, it fails to come to grips with the likelihood of that "what-if." The failure to properly illustrate the remoteness of a nuclear accident, critics argue, advances the idea that there is a much higher risk of an accident than is scientifically probable.

Second, advocates place faith in the technology to reduce the risk of an accident. The argument that posits that the numerous back-up and fail-safe systems would prevent such an accident minimize the impact of human error; even if the properly trained human makes a mistake, the technology, perfect and objective, will correct for such an occurrence and prevent any further damage. This rhetorical practice, as Gieryn suggests, is common among science rhetors who protect the science and technology by distancing them from human involvement, but since scientists are the only ones capable of administering such technology, they maintain a position of control. Such a rhetorical technique suggests that the film (and the filmmakers) is launching an attack against the technology by creating strong relationships between the actual technology and the technology in the film. Therefore, arguing that the film is an attack of the technology itself enables critics to dismiss the film on grounds that it is irrational and technophobic.

Third, advocates pepper their attacks on the film, including the filmmakers and those in support of the film, with *ad hominem* assaults suggesting the filmmakers had a political agenda that is shrouded in a veneer of scientific fidelity. The partisan nature of story, the argument suggests, disqualifies the film as an objective evaluation of the technology. The aforementioned rhetors position the filmmakers and actors as adopting an agenda that is anti-industrial and Luddite in nature, where audiences are supposed to come to their own conclusion. As scientists and nuclear engineers line up all the arguments in favor of nuclear power—past safety record, environmental friendliness, and energy independence—and compare them to what they describe as reactionary, anti-progress arguments of nuclear power critics, the enthymemes become rather persuasive. This rhetorical strategy attempts to decouple the factual elements of the story, i.e. the

scientific fidelity that adds believability to the story, from the fictional elements of the story that indict the nuclear power industry.

In contrast to nuclear energy advocates, the anti-nuclear rhetors adopt rhetorical positions that build upon the plausibility of a nuclear accident, as conceded by nuclear scientists, and reposition the argument to focus on the consequences of such an accident. In other words, they argue that the effects of a nuclear accident are so great, that even the small probability of such an accident occurring is too much of a risk. Furthermore, anti-nuclear rhetors argue that even though nuclear technology and all its safeguards may decrease the risk of a nuclear accident, there are numerous other factors, such as profit motives and plant mismanagement, which increase the likelihood of an accident. These rhetors contend that *The China Syndrome* not only demonstrates the problems associated with the technology, but also illustrates how intervening variables could contribute to nuclear power mismanagement.

Daniel Ford, the director of the Union of Concerned Scientists and strong critic of the Rasmussen Report, concludes that the film "is a composite of real events and provides a scenario that is completely plausible." He notes the film's depiction of a loss of coolant accident, a precursor to a meltdown, and the falsification of welding reports are all based on real-life incidents. Ford suggests the film is "a major corrective to the myth that was drilled into us as children, that nuclear energy is a beautiful, endless, cheap source of electricity. The movie shows how that dream has been perverted by companies that operate the plant and how susceptible the program is to human error and industrial malfeasance" (qtd. in Burnham 1979). Ford argues that the only possible incongruity between the film and reality is the depiction of the NRC officials who are more likely to be incompetent bureaucrats than nefarious administrators.

Anthony Roisman, an attorney for the Natural Resources Defense Council who undertakes legal challenges against the nuclear power industry, concedes that a number of systems would have to fail before a meltdown would occur, but these systems are not free from technical or human error, therefore making a serious accident possible, even if unlikely. Roisman argues that the problem is that nuclear safety concerns are inherently wrapped up in efforts to maximize corporate profits.

Frank von Hippel, a senior research physicist at Princeton University and member of the NRC team that evaluated the Rasmussen Report of reactor safety, suggests that the film fails to go into the defense-in-depth systems that are designed to prevent a minor malfunction from escalating into a major accident, ignoring the technological safeguards that nuclear energy proponents isolate as essential to reducing the likelihood of an accident. However, von Hippel identifies situations recounted in the Rasmussen Report where minor mishaps, such as workers repositioning two of hundreds of safety values incorrectly, could, if not properly recognized, result in a meltdown. He notes that "this is an example of a serious design defect that has been identified and now hopefully dealt with, but it is also an example of where the defense-in-depth theory does not always work."

Von Hippel argues that the film could have considerable impact on the public debate over nuclear energy, noting that "for those who believe we need nuclear energy, the film probably will be viewed as an unfair scare tactics, I'm an agnostic as far as nuclear energy myself. But the debate has gone on so long and gotten people so nervous that I think the film can cut deeply and have a strong impact, perhaps forcing the government to search harder for alternatives such as conservation and solar energy" (qtd. in Burnham 1979)

Similar to the pro-nuclear rhetors, the anti-nuclear forces concede that the likelihood of an accident is quite low and that the technological safeguards are proven effective in preventing minor accidents from become larger disasters. However, intervening factors, such as corporate profit motives, contributes to a mindset that minimizes risk calculations.

Despite the indictments of the film, Robert Gillette, a reporter from *the Patriot*, notes that "'The China Syndrome' has become embroiled in a nationwide controversy over the accuracy with which it displays nuclear technology." Gillette, who, like Burnham, watched the film with nuclear science experts, suggests "the perspectives of pro and con are almost impossible to reconcile, for they bring very different value judgments to bear on issues of risk and benefit. It seems fair to say, however, that 'China Syndrome' succeeds as a documentary with small deviations in portraying possibilities by drawing on real safety problems that have plagued the industry. But it fails to provide a sense of probability for accidents serious enough to jeopardize the public" (Gillette 1979). Even if the odds of a nuclear accident are one in a million, *The China Syndrome* depicts that one time.

The anti-nuclear advocates concede that the possibility of an accident may be remote, but adds that the consequences of such an accident are so great that it warrants rethinking a commitment to nuclear power. This rhetorical strategy to emphasize the factual elements of the film demonstrates that possibilities for accidents do exist, and that small errors—mostly human based errors—can set off a chain of events that could lead to such a disaster. The argumentative position of the anti-nuclear forces, even more evidenced after the TMI crisis, is not an attack against nuclear technology per se, but the mismanagement and inattention to safety by the nuclear power industry. However, the TMI crisis radically changes the discursive situation by undercutting the persuasive force of arguments regarding the probabilities of a nuclear accident.

Prior to the TMI tragedy, nuclear energy advocates could tout the casualty-free record of the nuclear industry as evidence of its commitment to safety. In other words, these interlocutors possess the rhetorical clout to admonish *The China Syndrome* for an unfair and unsubstantiated depiction of the nuclear industry. Yet after the TMI crisis, the discourses available to nuclear energy advocates fundamentally change.

2.4.   The TMI Crisis: A Rhetorical Meltdown of Nuclear Proportions

Prior to the weeklong crisis in March of 1979, Metropolitan Edison Three Mile Island Unit 2 nuclear power reactor experienced a number of financial, political, and technological setbacks (Mathews et al. 1979). Only operational for three months, the TMI Unit 2 automatically shut down on March 28, 1979 at 4 a.m. when pumps in the secondary loop, which absorbs heat from water in the primary loop that directly runs through the reactor core, malfunctioned. Because there was no heat being transferred to the secondary loop, the temperature in the primary loop began to rise, by itself a non-threatening and rather common event that is corrected by the automated opening of the PORV, or the pressure relief valve, that allows steam and water pressure to escape the primary loop, thus returning the temperature to stable levels. Although back-up pumps in the secondary loop turned on, the valve that allowed water to reach these pumps remained closed, thus the water in the secondary loop remained motionless. Although the control room gauges indicated that the back-up pumps were working properly, operators were unaware the pumps remained disconnected from the loop by a closed valve.

To reduce heat in the primary loop, the control rods that are intended the slow down the nuclear reaction were lowered down into the core. However, the valve to the PORV remained open, despite control board lights indicating that the PORV valve was closed. With the valve still

unknowingly open, water and steam continued to escape the primary loop, risking core exposure

and a Loss of Coolant Accident (LOCA). Without water to cover the reactor core, the nuclear

reaction will continue to produce vast amounts of heat and energy which can result in either the

control rods or the nuclear core melting away, burning though the bottom of the reactor chamber

and contaminating the surrounding area, resulting in a "China Syndrome."

 All these events happened within the first ten seconds of the initial malfunction. It was

not until two minutes into the event that Emergency Injection Water (EIW) was released into the

primary loop to prevent a LOCA. As operators noticed the water level rising and the pressure

decreasing, they shut off the EIW assuming the water pressure in the primary loop was stabilized

and any further problems were averted. However, with the PORV valve still open, the EIW and

steam continued to escape despite what the instruments suggested in the control room. Eight

minutes into the event, an operator noticed the valves for the back-up pumps in the secondary

loop were still closed. He then opened them and the secondary loop resumed normal operations.

Although the gauges for the primary loop showed high water levels, the water in the primary

loop continued turning into steam escaping into the PORV. Nearly an hour and a half after the

initial alarm, the pumps in the primary loop, now circulating little water and mostly steam, began

to shake violently and shut down. The non-circulating water and the rising steam allowed the

core to heat up, triggering the control rods to lower to relieve excess heat from the core.

However, the superheated steam reacted with the control rods to create an excess of hydrogen

and radioactive gases that only further exacerbated the risk of core exposure.

 Two and a half hours later, a control room operator noticed the PORV temperature was

excessively high and thus closed the PORV valve to the primary loop. However, operators failed

to recognize that the water level in the primary loop remained low and the core risked further

exposure and damage. Within minutes, the sensors indicated rising radiation levels and radiation

alarms began to sound; a site emergency was declared. A debate among nuclear technicians and

operators ensued as to whether the core was uncovered or not. Regardless, water was pumped

into the primary loop even though the pressure remained high. A dramatic increase in pressure

readings accompanied by a loud thump caused heightened concern in the control room as

operators attempted to assess the risk of core exposure. Technicians soon discovered that it was

hydrogen exploding inside the containment unit. This occurrence incited debate among

technicians as to where the hydrogen bubble came from.

With the primary pumps turned on and sufficient water circulating though the primary

loop, the core temperature began to stabilize and the meltdown was assumed to be averted.

However, the rising radiation levels and the increasing hydrogen bubble inside the reactor

continued to concern the technicians.

Although the potential for meltdown, or possible "China Syndrome," had been assumed

to be averted, technicians believed there was still a risk that the hydrogen bubble would burst,

creating an explosion that would contaminate the surrounding area. Over the next five days,

technicians feverishly attempted to relieve the hydrogen bubble to prevent an explosion risk. It

was not until one nuclear engineer realized they were using the wrong formula to calculate the

explosion risk that they realized there was no oxygen in the containment unit that would enable

an explosion. Although the crisis had been averted, the impact on the nuclear industry would be

lasting.

According to the Kemeny Commission, the assumption of safety, as evidenced in the

Rasmussen Report and echoed in the rhetoric of those dismissing *The China Syndrome* as a

realistic depiction of a nuclear accident, lulled plant administrators and NRC representatives into

a false sense of security that resulted in the a lack of preparedness to address issues of public safety in response to a nuclear emergency.

A *Newsweek* article shortly after the accident states, "one of the first casualties of the Three Mile Island nuclear accident was scientific credibility…Baffled and frightened, laymen could only ask wonderingly: which scientists can we believe?" (Gwynne et al. 1979) The TMI crisis shook public confidence in nuclear power by not only demonstrating how scientific discourse creates difficulty in formulating public policy, but also how that terminology obfuscates public understanding of the accident and how that undermines the credibility of the nuclear power industry and its workers.

Because of the uncertainties and disagreements among experts over the severity of the accident and how to respond to it were made transparent by extensive media coverage, the credibility of the nuclear industry and nuclear science became rather suspect. In response, nuclear technicians, scientist, and some government officials accused the press on sensational coverage of the TMI crisis. The Kemeny Commission and other media studies of the crisis, however, absolved the media of inaccurate reporting, noting that the press responsibly covered the uncertainty and confusion experienced by actors in the crisis by balancing pessimistic and optimistic accounts of the event. Moreover, the reporters were bound to a limited number of sources, all dealing with the crisis and experiencing various levels of confusion.

Proponents of nuclear power were faced with the rhetorical exigence of distancing the TMI crisis from assurances that nuclear power was a safe and effective source of energy. Furthermore, the nuclear power advocates also had to distance the nuclear industry from charges of malfeasance and inattention to safety on behalf of the plant operators. However, the former was much easier to accomplish than the latter.

The events at TMI exposes numerous problems in the management, regulation, and technology of nuclear power, once dismissed as trivial by utility operators, nuclear scientists and emergency management teams. The previous rhetorical tactics to dismiss *The China Syndrome* as liberal slander of the nuclear industry rests on assumptions based on the effectiveness of the technology and the benevolence of the plant administrators. After the TMI crisis, those arguments lost key supports. The film, retrospectively, became a harbinger of a nuclear accident that could not be easily dismissed. During the crisis itself, many rhetors made reference to the film as a measuring stick to understand the nature of the accident, as both a technical failure and a rhetorical failure.

Proponents of nuclear power often dismiss the film on the grounds that the malfunctions, like the ones depicted in the film, are technological improbabilities. Even though each malfunction and human error is based on a real instance at existing nuclear power plants, critics argue that the entire series of the events are highly unlikely because the safeguards and redundancies built into the system would prevent such events from transpiring. As evidenced in the recalling of the sequence of event during the TMI crisis, there exists numerous opportunities for human and technical failures to compromise safety measures.

Rhetors began to note the parallels between the real life TMI crisis and *The China Syndrome* quickly after the TMI crisis started. Joseph Hendrie, chairman of the Nuclear Regulatory Commission, called before the House Subcommittee on Energy and the Environment, was continually prodded by members of the committee to justify evidence that the surrounding area was free from danger. When Senator Gary Hart asks if he has seen *The China Syndrome*, Hendrie responds that "I can't be absolutely sure that parts of the fuel haven't melted but we think we'd see more and different fission products if the fuel had melted. As for *The*

China Syndrome, we were nowhere near it, nowhere near it" (qtd. in O'Toole and Peterson 1979). Likewise, Blaine Fabian, a TMI spokesman, assures a weary public early in the accident that the event "is not a 'China Syndrome' type situation" (Janson 1979). Although he is referring to the term that the film made popular, the ironic element is that the rhetorical posturing of the plant officials is very similar to those officials depicted in *The China Syndrome*, where officials adopt a strong rhetoric of assurance that attempts to assuage concerned locals. Without substantial evidence to the contrary, plant officials, notably Herbein, are quick to point out that the situation is not like *The China Syndrome*. However, as evidence mounted that demonstrates scientific uncertainty regard the nature and the degree of the accident, the parallels to the film increase.

A March 30, 1979, a *New York Times* editorial suggests that statements from TMI representatives that the system worked because it automatically shut down strikes an eerie parallel with the rhetoric from officials in *The China Syndrome*. Although the editorial suggests that it is too early to tell if TMI would experience a meltdown, the connection between the TMI crisis and *The China Syndrome* is established in the minds of journalists and the surrounding population. What allows the connections to be developed is not necessarily based on the scientific fidelity, but the rhetoric the plant officials used to describe the situation. Assurances of public safety and control of the situation are often followed by contradictory statements that indicate a much more grim assessment.

Although no one directly died as a result of the Three Mile Island tragedy, the TMI events highlights not only the numerous failures in nuclear technology, but also the shortcomings in public scientific communication, emergency management plans, public policy formulation, and public information access. The Kemeny Commission notes the primary communicative

failures were products of insufficient information outlets, institutional disunity, ill-preparedness, and inscrutable jargon.

The rhetorical dimensions of the crisis further illustrate the communicative difficulties for all parties involved. Farrell and Goodnight argue that one of the defining characteristics of the TMI event is that no language exists between the technical and public sphere to sufficiently allow communication to occur between the two. As a result the accidental quality of the event leads to slippages in the language, which leads to what they call "accidental rhetoric:"

> A rhetorical crisis occurs when discourse fails to fulfill ordinary epistemological and axiological expectations. Previously functional practices of communication and techniques of persuasion break down, proliferating disbelief when informed consensus is demanded, foreclosing options when cooperative action is seen as vital…. [therefore] rhetors search awkwardly for language capable of defining, explaining, and assimilating urgent events. Audiences struggle to understand information, set criteria for policy evaluation, and locate viable options for action. Unlike a rhetorical exigence, the crisis does not so much 'invite' discourse as defy it. (Farrell and Goodnight 1981)

Farrell and Goodnight argue that crisis might be a result of "cultural fragmentation," in that there is an insufficient number of common terms that help public understanding of the event, which in turn, thwarts public discourse. This becomes extremely apparent in the news coverage, where journalists are unable to adjudicate technical claims and report all the "facts" as a largely misunderstood whole. Concomitantly, technicians and government agencies unable to decipher the spirit of a journalist's question further adds confusion in describing the nature of the accident.

Farrell and Goodnight argue that communication exchanges between government institutions, regulatory agencies, scientific and industrial communities operate through normalized, predictable and routine modes of communication. However, when those normal lines of communication break down, accidental rhetoric becomes apparent and previously accepted persuasion tactics become functionally irrelevant.

A rhetorical crisis, therefore, presents an occasion where previously available discourses and modes of address are no longer serviceable. Such an occurrence directly clashes with Bitzer's notion that there exist "proper" discourses for the rhetor to address the problem. As Farrell and Goodnight argue, the crisis does not "invite" discourse, but "defies" the available discourses. In other words, the existence of a rhetorical crisis jolts participants into fits of rhetorical creativity where they search for alternative discourses in an effort to address the crisis.

In reference to *The China Syndrome*, Farrell and Goodnight argue that, "what was so alarming about *The China Syndrome* was its glaring departures from the Seventies prototypes. Although this film is ostensibly the story of a disturbed reactor programmer who takes increasingly drastic action to warn of an impending nuclear catastrophe, the accident itself never occurs. The viewer is left with the impression that it 'is only a matter of time'" (280)**.** Furthermore, the film illustrates the "problems of communicative competence" between specialists and publics. Communication is central to the drama, as the protagonists relentlessly attempt to find someone to speak out against the machinations within the nuclear power plant, and the struggle to overcome the silencing mechanisms that are both institutional and rhetorical.

In addition to technical languages that complicate communication about the TMI event, the effects of the TMI disaster could not be seen. It is impossible for outsiders to see what is going on inside the plant. Likewise, the technicians and the engineers could not see inside the reactor unit. Hence, unlike other types of disasters where the evidence of destruction is visible, evidence of radioactivity is mediated through the technical gadgetry that requires further translation from experts who are already subject to suspicion. Consequently*, The China Syndrome* provides a visual analog for the disaster. Even though the film does not "show" an actual disaster (like in real life, radiation can not be seen), it provides a set of visuals that capture

the situation. As David Kirby suggests, the power of film in popular depictions of science rests primarily in its visual element. Although a disaster is never seen, *The China Syndrome* is the only visual analog for a nuclear accident that could provide a frame for understanding the events, in that the film provided icon images of nuclear energy production and nuclear power discourses.

In order to make sense of the event, affected individuals use various cognitive mechanisms to understand and interpret the unfolding tragedy. As with most forms of crisis response, those affected engage in a process of normalization, finding analogs to describe the situation, thus making the foreign familiar. Lonna Malmsheimer, who studied residents' responses to the Three Mile Island emergency, argues that normalization occurs as affected individuals turn to various interpretive schemes to make sense of the events. These schemes are the product of a larger cultural inventory that includes past experiences, educational backgrounds, media coverage, and fictional accounts of similar events. Given the unprecedented nature of this emergency, few had past experience or knowledge of nuclear power. As a result, the most timely and accessible part of the cultural inventory is the fictional portrayal of a nuclear crisis, *The China Syndrome*. Although it is easy to dismiss a cinematic text as "just a movie," Malmsheimer contends, "common popular assumptions about the irrelevance of fictional materials to real life, as well as the obvious difficulties in gaining access to cognitive processes under stress, have often led to both oversimplifications and underestimations of the ways in which cultural inventory, including shared fictions, is drawn upon in decision-making" (Malmsheimer 1986, 36).

Even though individuals recognize that using a fictional account, like a film, as an interpretative scheme seems irrational, they continue citing it as an explanatory mechanism. Malmsheimer's research reveals that "the film [*The China Syndrome*] was mentioned invariably

by those who had seen it and often by many who had not. The actual emergency led some, who might not otherwise have done so, to see the film and others to suggest that they 'did not need to' because they had 'lived through it'" (Malmsheimer 1986, 45).

Although Malmsheimer's study investigates primarily cognitive and psychological questions that reside on a more personal level, as these references move beyond the individual and into more mass mediated accounts of the TMI crisis and its relationship to *The China Syndrome*, the discursive stakes become even more magnified. William Gamson and Andre Modigliana argue that journalists, in reporting there stories, often find ideas and terminology from popular culture forums, including notable fictional sources like film. By incorporating these cultural reference points, journalists "contribute to their own frames and invent their own clever catch phrases, drawing on a popular culture that they share with their audience" (Gamson and Modigliani 1989, 3). As a result, "journalists straddle the boundary between producers and consumers of meaning." (9)

The use of particular cultural frames helps infuse a story with particular meaning. The TMI crisis was initially a story that was so foreign to the press and to the broader population, that assigning meaning to it became increasingly difficult. This requires journalist to draft stories that imbues the story with meaning while maintaining an ethos of journalistic objectivity. Gamson and Modigliana argue that *The China Syndrome* is the high water mark for anti-nuclear discourse because it provides the vivid illustration of a nuclear disaster:

> The apogee of anti-nuclear discourse in the effect on popular consciousness came with the release, a few scant weeks before TMI, of a major Hollywood film, *The China Syndrome*. The film numbered among its stars Jane Fonda, an actress so closely identified with the antinuclear movement that pronuclear groups used her as a symbol of it. The themes emphasized by the film suggest the public accountability and runaway packages, but its most important achievement was to provide a concrete, vivid image of how a disastrous nuclear accident could happen. (21)

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As a result, it is important for rhetors, especially those facing a public relations dilemma, such as nuclear energy advocates and TMI plant supervisors, to "control" what commonplaces surface in the public discussions. In other words, the use of the film to bridge these discursive constraints creates an exigence for nuclear power advocates. The rhetorical connections made between the film and the actual accident compound the public relations nightmare for the nuclear energy industry. Therefore, the active attempt to expel the film from the public discourse helps advocates insulate the nuclear energy industry from criticisms of malfeasance.

2.5.   Efforts to Repair the Rhetorical Meltdown

The efforts to dismiss the film by nuclear energy advocates echo the same arguments as those proffered prior to TMI, with a few significant exceptions. In these rhetorical choices, we can begin to see how the rhetorical boundaries are formed and scientific ethos is reconstructed. The historical record of nuclear power safety, at least as a rhetorical tool to defend the promise of nuclear power, no longer possesses a great deal of persuasive force following the event. The TMI crisis was such a highly visible media event that any argument positing the safety record of nuclear power plants would have little persuasive power. However, nuclear energy advocates continue to maintain that the safeguards prevented a "China Syndrome" and that the nuclear industry still has a casualty-free safety record.

Myron Kayton echoes a majority of the arguments used to defend nuclear power against its critics. Kayton notes that "despite the wildly improbable sequence of human errors, the plants safety systems worked and the public was protected" (Kayton 1979). Kayton argues that the journalists' inability to appreciate the probabilities of a disaster scenario directly contributes to the misunderstandings during the TMI event. He notes that if plant officials are asked if a

meltdown is possible or the hydrogen bubble could cause an explosion, "being good engineers, they said 'yes' but were interrupted before they could explain the probability of these catastrophes were remote." The unstated assumption is that the scientists are being properly scientific, adhering to the norms of science that there are no absolute certainties and that the chance of nuclear meltdown could not be completely dismissed. However, media depiction of the event, like the film, suggests that the probability of a doomsday scenario is more likely than scientifically possible.

Nuclear advocates, like Kayton, position the anti-nuclear arguments as irrational and emotional responses lacking the subtle, and scientific, understanding of risk. Kayton, echoing sentiments of a number of nuclear energy advocates (Kach 1988; Rhodes 2000), assumes that scientific education on the nature of risk would evacuate the emotional and irrational responses to nuclear power, clearing the way for a previously weary public to embrace nuclear energy. Richard Meehan, President of Earth Science Associates, suggests that public education on the nuclear education is more complicated than informing non-scientists about the technology. He argues that the divisions on nuclear safety are "deeper and more bitter among the scientifically literate than in the general public" and that "nuclear safety is more of a quasi-religious than technological conflict" (Meehan 1979). Likewise, Kayton concedes that scientific arguments will have difficulty countering emotional arguments against nuclear power. He notes that "if some of the nuclear power problems are emotional, as I think most of them are, than regrettably no engineering solution is possible." As a result, the educating individuals, whether they are scientists or journalists, must adopt a critical perspective that negotiates issues that transcends exclusively technological claims. Meehan's claims reflects Gough's position that science education, with specific reference to films as heuristics, must incorporate discourses that

critically examine how technoscientific claims are ensconced in numerous other discourses as a fuller understanding of scientific issues.

Nuclear energy advocate Patrick McCurdy attempts to construct the pro-nuclear energy argument, not in terms of scientific justifications, but as an emotional counter-argument that positions anti-nuclear arguments as informed by hysteria. McCurdy concedes that the crisis at Three Mile Island should not be underestimated or minimized; there are flaws in the system that need addressing. But, the nuclear technicians at the power plant acted responsibly and should be condoned for their swift and determined response to avoid harm to the public. He juxtaposes the responsible actions of the scientists and the nuclear technicians to the negligent coverage of the crisis by many journalists and "self-appointed experts:"

> Many commentators have tried to liken Three Mile Island to the film "The China Syndrome." They have it all wrong. What Three Mile Island shows is that the film is a gross parody. In the real world, reactors don't act that way and people don't act that way. Only Jane Fonda and Jack Lemmon act that way. They may have shown what real acting is all about. But real people living in the real world have shown what the human spirit is all about. Behind "The China Syndrome" is a syndrome perhaps more fearsome than the potential problems the film explores: the fear of living. (McCurdy 1979)

The assumption behind McCurdy's argument is that risk is inherent to living and to eschew risk, especially remote risk, is tantamount to capitulation, a general fear of life. Ultimately, McCurdy's rhetorical gesture is an effort to position anti-nuclear arguments as driven by emotions not informed by any semblance of scientific rationality.

Possibly the most vociferous defense of the nuclear industry comes in Samuel McCracken's June 1979 *Commentary* article rebuking the relationship between *The China Syndrome* and the actual events of the Three Mile Island emergency. McCracken, an ardent defender of nuclear power, employs a series of rhetorical techniques that highlight the improbability of reactor core meltdown and the irresponsible portrayal of corporate malfeasance.

He argues that the film "begins rather like Three Mile Island, but which proceeds to an uncomplicated shutdown, not without an immense amount of implausibility and downright inaccuracy." He continues "the touches of authenticity [in the film] include an elaborate mock-up of a reactor control room and real technical jargon which the characters sling about with more enthusiasm than accuracy" (McCracken 1979, 29). McCracken's argument, like Will's pre-TMI attack against *The China Syndrome*, attempts to minimize the technological fidelity of the film by dismissing it as superfluous to the central scientific issues. McCracken notes that "the film, which has been widely praised, resembles less a documentary than that meretricious *roman a clef* in which actual persons, having been sketched with just enough authentic detail to identify them, are then subjected to savage misrepresentation" (29).

However, the inaccuracies that McCracken challenges are not the technical aspects of the film, but rather its portrayal of the nuclear industry as a mendacious business. He isolates the "film's master representation is the notion that it is in the financial interest of an electric utility to ignore a serious malfunction in one of its reactors" (29). Consequently, he concedes the possibility of a malfunction, like any reasonable technician, but he displaces the technical criticisms found in the film onto what he considers an irresponsible portrayal of the business. McCracken concedes that a devastating nuclear catastrophe would cripple the nuclear energy industry. Then it should be obvious, he argues, that nuclear industry officials would act with the "rational self-interest," and not engage in business practices or safety shortcuts that would jeopardize the nuclear industry. As a result, it makes no sense that real nuclear industry official would act similar to those officials depicted in the film.

In addition to assigning real life nuclear energy officials with rational self interest, McCracken proceeds to develop a long list of problems in the film, from the technical accuracies

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of the film to the depiction of plant security to how the media operates. McCraken's rhetorical technique is a consistent effort to marshal a series of inaccuracies within the film, whether scientific or not, to discredit the film as a whole. He notes "*The China Syndrome* is, in sum, a consistent act of fabrication. It is a slick disaster film, generally superior to the run of such films because of the performances of actors apparently willing to prostitute great talents to bamboozle that American people. This is, of course, not behavior substantially different from what we have been led to expect from Hollywood" (33). The argument is one of complete dismissal, suggesting that it is impossible for a film to capture the complexity of such a controversial issue, and the attempt to do so results in dangerous and ill-informed public policy.

McCracken suggests that the real life event of TMI vindicates the pro-nuclear power position, noting that "the fact of the matter is that, taken as a whole, the accident at Three Mile Island generally confirms what we have been told about nuclear power. Where it does change our understanding, it not only suggests ways we can improve nuclear safety, but also that we have in some respects underestimated the degree of the safety we have already attained" (37). The gesture toward the need for improved safety is virtually negated by his follow-up statement regarding the effectiveness the system demonstrated in averting an accident.

McCracken attempts to invert the events of the movie (in that there is never a meltdown, like TMI) and the emergency at TMI to prove the safety of nuclear power technology. He notes that the only way to "prove" effectively that the defense-in-depth safety measures work is for a near-accident to occur. Because, there is no accident, McCracken, like Will's follow up article after the TMI crisis (Will 1979a), suggested that this "trial and error" method demonstrates that the system works.

Defenders of the film, post-Three Mile Island, adopt a similar rhetoric to those who wish to expunge the film from the public scientific discourse. However, after the TMI accident, the vitriolic responses that attempt to discredit the technical similarities between the film and the actual event do not disarm the non-scientific critiques of the nuclear industry. Anti-nuclear advocates concede that the film did indeed stray from real life, in that the Three Mile Island accident is worse than anything the film depicts. Dennis Williams, in a *Newsweek* article shortly after the TMI crisis notes that "where life and art part company, the real events proved more frightening." Unlike the near accident in the film, where the nuclear core was never exposed, the nuclear core at the TMI plant was uncovered, precipitating a partial meltdown. Furthermore, the film never depicted actual radiation leakage, the need for evacuation, and the existence of a hydrogen bubble, all events that did occur at Three Mile Island (Williams et al. 1979). Even the nuclear experts who gathered at TMI after the accident begrudgingly admit that *The China Syndrome* did possess some credibility. Nuclear Regulatory Commission spokesman, Thomas Elsasser notes, "We at the commission didn't come away from the movie saying it was utter hogwash, we said there are some points of credibility" (Williams et al. 1979).

However, the most efficacious element of *The China Syndrome* in the public discussion of nuclear power following the TMI crisis is its illustration of how profit motive could contribute to the increased likelihood of a nuclear accident. It was later discovered later that the TMI reactors experienced a number of problems with its secondary pumps prior to the accident. But those problems are often overlooked by plant and NRC officials as parts unrelated to larger safety concerns. Likewise, the problematic welding reports and safety records demonstrate a history of safety oversights at the TMI plant. The profit motives to build nuclear power plants at a pace that may compromise safety concerns are evident in the policy toward nuclear energy. In

an effort to promote nuclear power, power companies often receive tax breaks for constructing reactors by certain deadlines. Such was the case with Met-Ed at TMI. The retort against possible profit motives by nuclear energy supporters rests on arguments that rationality dictates that nuclear power companies would operate in the interest of safety because to do otherwise risks public backlash. Nuclear power supporters attempt to dismiss discourses about corporate malfeasance by suggesting that such arguments are emotional responses informed by an anti-science bias and a misunderstanding of risk.

2.6.   Conclusion

The China Syndrome debate, in conjunction with the TMI crisis, demonstrates how a discursive exchange can complicate the role of popular culture in public scientific discourse. As noted in Chapter One, science popularization presents a unique dilemma for public understanding of science efforts. Such efforts may generate greater public interest in science and technology, but at the cost of simplifying science to consumption by non-scientific audiences. The double bind becomes more evident in cinematic portrayals of science. Although films may present the most pervasive and entertaining depiction of science, those same films may also present images of science and technology that may damage support for the scientific enterprise. Furthermore, many of the films that ruminate on society's relationship with science and technology contextualize scientific and technical claims into social discourses that are better understood by non-scientific audiences. Such is the case with *The China Syndrome*.

The film is made with a concerted effort to achieve scientific fidelity in its depiction of nuclear power. By hiring nuclear engineers as technical consultants, the filmmakers are able to produce a film that, at the very least, looked real. As Kirby argues in Chapter One, filmmakers

employ technical consultants to achieve a perception of reality in order to enhance the believability of the story. Furthermore, scientists that serve as technical consultants have the opportunity to amplify their own arguments within the public domain, which, as Latour would argue, help the alliance building of process of the scientific enterprise. For *The China Syndrome*, the technical consultants became part of the controversy. Nuclear energy advocates attempt to discredit MHB Associates by suggesting that their motives are informed not by achieving the highest degree of scientific or technical fidelity in the film, but by a vengeful effort to harm General Electric.

However, efforts to discredit the film, especially prior to the TMI crisis, center on proving incorrect the technical and scientific elements of the film and emphasizing the film's failure to articulate the improbability of a nuclear accident. By isolating scientific and technical inaccuracies, critics of the film attempt to the discredit the entire film as a simplistic account of naïve Hollywood leftism that fails to appreciate the promise of nuclear technology. After the TMI crisis, these criticisms become more vitriolic, condemning nuclear opponents as anti-intellectual and anti-scientific forces that prey upon public fear for personal gain. And yet, those involved with the film, with the exception of Jane Fonda, distance themselves from the film as to not be seen as a profiting from the tragedy in Pennsylvania.

The China Syndrome's presence in the public discussions of the TMI crisis changes the discursive landscape by introducing an accessible *topos* that highlights discourses that challenge the credibility of the nuclear industry. The challenge for the press during TMI is to attempt to isolate various topics, or commonalities with their audiences, to create serviceable news stories that informs the public (Sandman and Paden 1979; Schardt, Howard, and Foote 1979). The rhetorical choice of referencing *The China Syndrome*, even if casually, presents a series of

rhetorical exigences for the nuclear energy advocates whereby they need to expunge *The China Syndrome* from the discourse to prevent any further damage to the credibility of the nuclear industry.

In the end, film references in public discourse not only comment on the actual events as they unfold during the TMI crisis, but also demonstrate a change in the communicative practices of public scientific discourse. The film introduces a series of non-scientific discourses that enables rhetors to makes sense of TMI that are not dependent on specialized discourses. Because the film is so critical of the nuclear industry, using *The China Syndrome* as a device to make sense of the accident could only threaten the credibility of the nuclear industry.

Although *The China Syndrome* clearly did not cause a massive overhaul in the nuclear energy industry; it is interesting to note that since the TMI crisis, no new nuclear power plants have been built in the United States. Yet, the debate over nuclear power may once again become a centerpiece of national energy policy debates. The rising cost of oil, the increasing concerns of global warming, and growing instability in oil producing nations have become warrants for nuclear power only briefly mentioned in TMI debates twenty-five years earlier.

The ironic parallel between the accident in the film and the accident at TMI is that in both cases, there is no accident; no one dies and the radiation is largely contained. The safety technology, in the end, works. Whether such an occurrence was a product of luck or quality design is difficult to fully determine given the arguments deployed by both pro and anti-nuclear forces. However, the consistent message that no one died therefore the technology worked, demonstrates a failure to learn the lessons of Three Mile Island. According to the Kemeny Commission, a contributing factor to the Three Mile Island crisis is that the nuclear industry, both private corporations and government regulators, adopt a mindset that the risk is so remote

that there will be a neglecting of safety concerns. A mindset that assumes little risk of a nuclear accident and the effectiveness of the defense-in-depth systems, believed to be confirmed by the events of TMI, only gives further license to seek maximum profits and decreases any inherent motivation to enhance safety measures. A *Newsweek* (1980) editorial noted that the nuclear safety measures in the United States are primarily geared toward preventing accidents caused by a single fault and that relatively unimportant individual pieces receive little attention regarding safety, even though the composite failure of the such parts could contribute to a nuclear accident, as it did at Three Mile Island.

Indeed, public concerns over nuclear power persist today. Richard Rhodes and Denis Beller argue in "The Need for Nuclear Power" that "physical reality—not arguments about corporate greed, hypothetical risks, radiation exposure, or waste disposal—ought to inform decisions vital to the future of the world" (Rhodes and Beller 2000). However, as Richard Garwin argues, "the industry continues to suffer from an unacceptable level of worker errors. The lack of quality control compromises safety. The pressure to cut costs has also lead to management at some plants to cut safety corners" (Garwin 2000). All told, both sides concede scientific calculations of probability should inform our decisions over nuclear power, but what variables one includes in such calculations is the center of the debate.

3.   Cinematic Genetics: The Impact of *GATTACA* on Science Policy Discourse

3.1.   Introduction

In March 2003, the Australian Law Reform Commission (ALRC), along with the Australian Health Ethics Committee (AHEC), published the official Inquiry, *Essentially Yours: The Protection of Human Genetic Information in Australia* (ALRC 96), the result of two-year study designed to determine the legal changes necessary to address the rapid development of genetic technology. The Terms of Reference, as dictated by the Australian Attorney General, required the ALRC to consider an array of matters, including "how to best protect privacy, protect against unfair discrimination, and ensure the highest ethical standards in research and practice" with regard to genetic information. Although the ALRC's original charge is to identify and attend to the legal and social implications of genetic technologies, its observations ultimately illuminate broader questions on how we understand the role of genetics.

The successful mapping of the human genome and the rapid advancements in genetic technology precipitates the ALRC's effort to renegotiate informed consent laws and legal protections to keep the law in step with, if not ahead of, scientific progress. To maintain a balance between advancements in genetic science and protections of individual liberties, the ALRC must determine if genetic information should possess the same legal protections as other forms of medical information or should genetic information be subject to stricter legal protections. The potential for one's genetic make-up to affect an individual's mental and physical conditions invites questions of personal liberties with regard to an assortment of issues, including insurance coverage, employment protections, and health benefits. Furthermore, because genetic composition is hereditary, personal disclosure of genetic information may violate a relative's

right to privacy. Without adequate legal protections, the ALRC argues, genetic information could function in the service of discriminatory and unethical practices.

Given the breadth and complexity of the subject matter, the ALRC worked closely with the AHEC and countless other experts in the fields of genetics, medicine, chemistry, religion, philosophy and law to produce a comprehensive report on the future of genetic technology. The Inquiry identifies a central tension that informs debates on regulating genetic information: the challenge of maintaining individual privacy while promoting the development to new genetic technologies. The Inquiry clearly advocates the advancement of genetic technology in light of its potential to combat numerous genetic diseases and disorder. However, underlying this central tension is the extent to which genes determine one's physical, mental, and even social, future. The possibility of genetic determinism, even if scientifically unsubstantiated, invites a discursive framework that validates genetic information as over-determining one's physical or mental capacities. Consequently, as genetic science advances and the mapping of the human genome continues, there is a potential "black-boxing" of genetic determinism which, at least rhetorically, invites a series of serious social and political considerations, including the erosion of civil liberties and the reinforcement of existing prejudice.

Because the contributions of genetic science could have very pervasive social implications, the ALRC, whose methodology actively promotes public outreach in formulating legislative recommendations, submitted *Essentially Yours* as a far-reaching legal document that includes arguments, concerns, and evidence gathered from numerous forums, meetings and correspondences. In the spirit of public outreach, the Commission translates the input from numerous academic, scientific, and public sources into comprehensive policy recommendations written in an accessible language understandable by policy makers and members of the non-

scientific public. As a product of its comprehensiveness, the Inquiry weaves together numerous discourses that inform the debate on genetic science in order to advance legal reform.

The Inquiry envisages issues governing genetic information as inherently inseparable from scientific, legal, ethical and political questions. The scientifically-informed probability that identifies the likelihood of various genetic conditions can not, according to the Inquiry, be separated from issues of legal protections. For example, individuals who possess a genetic predisposition to inherit a particular disease or condition face possible insurance discrimination. Although similar practices inform existing insurance policies, the breadth and precision of information genetic technologies promises only heightens the possibility of such inescapable prejudices. Envisioning the extent to which genetic information would impact legal and social discourses presents a rhetorical challenge to the ALRC. Because most laws are reactive, rectifying social problems after they appear, the Inquiry's attempt to anticipate the social and legal implications of genetic science presents an opportunity to consider evidence that do not rest on empirical observations, rather informed speculation.

Although government reports routinely incorporate professional and public input for policy recommendations, the Inquiry adopts a distinct rhetorical technique rarely found in official government documents, one that seeks to illustrate the marriage of these dissimilar discourses and speculate on the legal and social impacts of genetic science. In addition to the expected background information and legislative recommendations found in a government commissioned report, the Inquiry incorporates numerous references to the film, *GATTACA*, a 1997 science fiction film that follows a genetically "inferior" individual through a world governed by genetic essentialism. At the 2003 Symposium for Law and Genetics in Melbourne,

Australia, ALRC Commissioner Brian Opeskin introduces the Inquiry at the Centre for Law and

Genetics by noting:

> The art of prediction has not been confined to the dustbin of history. Consider
> Andrew Niccol's 1997 film *GATTACA*, which many of you will know….The film
> is both fascinating and chilling because it demonstrates the power of human
> genetics to inform not only about what we are today, but also about what we
> might become. That is the starting point for the reference that we have been
> pursing the last 18 months. (Opeskin 2002)

As Opeskin suggests, *Essentially Yours* is a speculative document of legal recommendations that

identifies the power of genetic science to radically influence the make-up of society. The

speculative nature of the science, and consequently the legal protections necessary to govern

these scientific advancements, certainly invites the use of a science fiction film as a *topos* for

argument invention. In following Darko Suvin's assessment of science fiction, the genetic

science as a "novum" in *GATTACA* not only enables spectators to ruminate on the cultural and

philosophical implications of such a technology, but how the current social climate help

contextualize the reception of such science.

Furthermore, because of the "public" nature of the Inquiry, it is not too surprising that

rhetors employ a popular, recognizable text in these discussions about genetic information. The

film, a popular, recognizable text, serves as "springboard" for conversation, eliciting public

attention to the serious nature of genetic science. However, the ALRC's employment of a film

reference in an official government document that is geared toward legal reform suggests that

GATTACA is more than an ornamental trope the Commission uses to spark public interest in

genetic science. Amidst numerous references to the film, *Essentially Yours* section 4.3 notes that

"*GATTACA* identifies many themes that are central to the present Inquiry," including the

possibilities of subtle genetic discrimination and the ability to the genetically disadvantaged to

defy scientific expectation (ALRC and AHEC 2003). The ALRC places film references

throughout the Inquiry, seamlessly alongside other forms of evidence more commonly found in government reports.

In the search for new avenues to promote public involvement into science policy formulation, the Inquiry's use of the film illuminates a new entryway into scientific discourse that promotes the examination of various discourses that inform the public discussions on genetic science. The goal for this chapter is to identify two contributions the Inquiry's use of *GATTACA* makes in public discussion of science. First, I hope to prove that the film's visual and narrative elements introduce a series of discourses that the authors use to both inform and complicate genetic science debates. The ALRC's use of the film as a *topos* for discourse production reinforces the film's evidentiary qualities and highlights the importance of narrative discourses to examine and contextualize public scientific debates. Second, and inherently tied to the first observation, I argue that how the film cultivates identification in *GATTACA* helps contribute to public discussions of science by illuminating ethical and social discourses that do not require scientific knowledge for entry into the broader discussion.

To accomplish these goals, this chapter explores first, existing scholarship on the public debate over genetic science, with particular attention to the tensions between the fear and fascination we associate with these technological developments; second, how narratives function to impact public understanding of genetic technologies to both illuminate these fears and fascinations regarding such scientific practices, which particular attention to the themes developed in *GATTACA*; and third, how the ALRC utilizes the film within the Inquiry to craft particular understandings of genetic science that seeks to influence genetic science policy. Ultimately, this chapter inspects how *GATTACA* operates as a site of rhetorical invention used by the authors of the Inquiry to introduce non-technical discourses that impact genetic science laws.

3.2.   Our Relationship with Our Genes: A Dilemma of Fear and Fascination

At the heart of genetic discourses is a rhetorical double bind. On one hand, promising scientific evidence suggests that genetic information could be instrumental in fighting inherited diseases like Alzheimer's and Parkinson's disease. The elimination of genetically transmitted diseases and the ability to control the transmission of undesirable traits promises the possibility for a healthier and enhanced quality of life. In addition to the promise of genetic information to combat human maladies, the ability to manipulate genes offers the possibility to develop more nutritious and disease-resistant fruits and vegetables that can potentially feed the countless starving. However, the viability and efficacy of such practices remain the subject of serious debate (Mehendale 2004; Rowe 2004; Schmidt 2005).

On the other hand, such fascinations also give rise to fears of Promethean proportions. Scientific evidence that genetic engineering could effectively combat various genetic disorders assumes genes possess deterministic qualities. Thus, the ability to manipulate the fundamental building blocks of life, even to combat disease, awakens fear of nefarious omnipotence, unlocking a Pandora's Box that could lead to a practice of eugenics or genetic mutations that could threaten humankind. Depictions of genetic science in popular fiction, from *Frankenstein* to *Jurassic Park*, have given narrative and visual form to these fears. The rhetorical challenge, therefore, for the ALRC is to endorse the scientific potential of genetic therapy to eliminate disease without sanctioning the use of genetic technology to further discriminatory and unethical practices. French Anderson, University of Southern California genetics professor and voluntary scientific consultant for *GATTACA*, captures the dilemma when he argues that medical science is entering into a fourth revolution where genetic science will profoundly alter the process of diagnosis and treatment. He warns that beyond medical treatment, the effects of genetic science

will have substantial cultural and social impacts, for good or ill depending on the wisdom we use to govern genetic science. Anderson notes that "our only protection is to accept clear stopping points. And the only way to achieve those is to make sure society is informed and can recognize the dangers and prevent misuses before it is too late" (Anderson 2000, 74). Anderson's warning suggests that public understanding of genetic science coupled with legal safeguards to govern genetic science is necessary to prevent any nightmare scenario.

Although traditional accounts of public understanding of science suggest that increased public knowledge of genetics alleviates irrational concerns over genetic science advancements, public concerns about genetic science are less about the technology and more about the use and regulation of genetic technology. Research on public opinion regarding genetic science reveals that public perceptions of genetic technology are not informed by an understanding, or lack thereof, of genetic science. Rather, public confidence in the regulatory agencies that govern genetic technology, the perceived use of genetic information, and the various religious and moral codes that intersect with genetic practices all contribute to any public skepticism regarding genetic science (Condit 2001, 812).[2] While more public knowledge on genetic science may enhance the quality of public discussions of science, increasing scientific information does little to resolve debates over these regulatory, pragmatic, and ethical considerations. As Jane Gregory and Steve Miller argue in Chapter One, raw scientific fact or technical information does not advance public understanding on the use or consequences of various technical advancements and scientific breakthroughs. Therefore, the contextualization of scientific information is often more determinant in evaluating public understanding of science.

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[2] Although exclusively religious arguments contribute greatly to the debate over genetic science, they will be only marginally discussed in this chapter. Since the ALRC endorses the advancement of genetic technology, arguments that dismiss genetic manipulation en masse (i.e. stem cells promote abortion or genetic engineering is tantamount to playing God) do not figure prominently into understanding how the rhetorical double-bind is negotiated.

Although there is debate as to whether the gene is actually as deterministic as some scientists believe (Collins, Weiss, and Hudson 2001; Keller 2002), popular conceptions of genetics magnify essentialist discourses that encourage fears and fascinations regarding genetic science. For sociologists of science Dorothy Nelkin and Susan Lindee (1995), mass media coverage of genetic science ascribes the gene and DNA the status of cultural icon. Their examination of the popular coverage of genetic science suggests that popular conceptions of genetics promote a discourse of "genetic essentialism," where humans are reduced to their genes and their genetic composition becomes a determinant factor in influencing one's physical, mental and social futures:

> DNA in popular culture functions, in many respects, as a secular equivalent of the Christian soul. Independent of the body, DNA appears to be immortal. Fundamental to identity, DNA seems to explain individual differences, moral order, and human fate. Incapable of deceiving, DNA seems to be the locus of the true self, therefore relevant to the problems of personal authenticity posed by a culture in which the "fashioned self" is the body manipulated and adorned with the intent to mislead. (2)

In essence, the deterministic discourse repositions subjectivity away from individual agency to an "objective" and biologically predetermined condition. The articulation and reinforcement of a deterministic discourse, Nelkin and Lindee conclude, ascribes the gene, no longer just the carrier of hereditary information, with the rhetorical power to influence and explain human relationships and social cohesion. Genetic essentialism creates the ostensibly objective criteria for judging human abilities and actions. This reductive approach promotes a new form of eugenics, one based on a more seductive discourse of individual choice. The seemingly objective decision to engineer one's child with a favorable genetic composition only calcifies existing assumptions on what constitutes advantageous traits. Likewise, this decision endorses, even if unintentionally, a mindset of genetic determinism. Although popular

conceptions of the genetic science reinforce the iconic states of the gene, scientists rarely eschew, and often accept, genetic deterministic discourses. Consequently, the prevalence of a deterministic discourse that emanates from both popular and scientific conceptions of genetic science, Nelkin and Lindee suggest, risks the "black-boxing" of essentialism, an epistemological position that risks fundamentally challenging individual liberty despite its attendance in discourses of choice and freedom.

Echoing Nelkin and Lindee's observations, science studies scholar Elizabeth Shea suggests the consequences of genetic discourses are less scientific and more rhetorical. She argues that the discursive function of the gene as determinant is inherently tied to the development of the term "gene." Shea contends that the "authority and power of the gene as a cultural icon is supported by the rhetorical figure of the gene, a figure that was established when the term was established" (Shea 2001, 506). The gene, as it was originally conceived, was an objective, identifiable marker of coded information that manifests itself in various physical markers. The connection between the gene and the physical trait is enveloped in a rhetorical position that advances a deterministic discourse. Shea posits that the deterministic rhetoric associated with the term "gene" promotes a line of reasoning that greatly influences the way genetic knowledge is accepted in societal discourses that moves the gene from an abstract concept into a real artifact. As a result, even if the determinant status of the gene remains scientifically uncertain, our existing discourses on genetic science ensure that discoveries regarding genetic information will be contextualized within the discourse of essentialism.

Rhetoric scholar Celeste Condit illustrates further how historical perspectives on genetics influence public discourses on genetic science. In the *Meanings of the Gene*, Condit uncovers the development of genetic science discourse since the discovery of the "gene." She identifies four

distinct historical periods where the genetic discourses exemplify a particular metaphor or theme. The "classical eugenics" period (1900-1935) embodies the language of stockbreeding. The rise of Nazi experimentation with eugenics resulted in Americans rejecting the language of stockbreeding, ushering the "family eugenics" period (1940-1954) that focused on heredity aspects of genetic science. Watson and Crick's discovery of the double helix of DNA began the "genetic experimentation" (1956-1976), where the discourse turned to the scientific elements of genetic information. Finally, the period of "genetic medicine and beyond" (1980-1995) accentuates a discourse of the medical potential for genetic information to advance medical wellbeing. Throughout these periods, Condit argues that three concerns about genetics endure: the deterministic function of genes, the discriminatory potential of genetic information, and perfectionist thinking with regard to children. Although certain discourses dominate each period, the counter discourses are present, even if they are muted. Condit's historical/archeological approach seeks to identify such oppositional discourses to frame public discussions of genetic science to present more complicated account of our relationship to the gene.

Often critical of Nelkin and Lindee, Condit's further studies suggest that genetic essentialist discourses present in the media do not always reflect public attitudes regarding genetic science (Condit, Ofulue, and Sheedy 1998; Condit 1999a; Condit et al. 2001). As evident in *Meanings of the Gene*, Condit suggests broader public discourses have an impact on scientific discourse, itself not a profound observation. However, Condit argues that publics possess more complicated approaches to genetic science, not merely reflections of media accounts of genetic essentialism. Although her studies suggest that media do not fully create genetic essentialism with public understanding of science, she does argue that "public translations of scientific research on human genetics can be accompanied by the development of public vocabularies that

recognize the ways in which genetic factors influence on human outcomes without portraying those factors either simplistically or as all-powerful. Public education efforts should encourage development of such vocabularies" (Condit, Ofulue, and Sheedy 1998, 983). The question, however, remains, what type of vocabulary is necessary to facilitate public education.

Condit et al.'s conclusions hint at a deficit model approach to public understanding of genetic science where a greater vocabulary would increase the sophistication of public discussion of genetic science and prevent popular misconceptions regarding the power of genes from influencing public discourse on genetic science. This discursive solution suggests that it is necessary to strike a balance between advancing genetic science and preventing the abuse of genetic technology. However, if we believe that the vestiges of genetic determinism are inherent to the concept of the gene, reasserting the vocabularies of genetic science presents the possibility of re-inscribing a determinist mindset. Furthermore, the development of such vocabularies only encourages publics to appreciate the scientific complexity of genetic science (i.e. how numerous biological and environmental factors interact to produce particular effects), but does not equip publics with the tools to diagnose the ethical and social dimensions of genetic science. Consequently, the fear/fascination equation remains unresolved.

In the conclusion to *the Meanings of the Gene*, Condit suggests that future discourses about genetics will incorporate both elements of promise and panic. Condit contends that to protect ourselves from the nightmare scenarios, society needs a commitment to responsible use of genetic information, including regulations on widespread genetic testing, civil protections against decisions made purely on one's genetic make-up, and support for client-centered genetic counseling (Condit 1999b). Her recommendations rest on the assumption that discourses of genetic essentialism, even if scientifically unsubstantiated, should not inform legislative

responses to genetic technology. A scientific vocabulary that properly evaluates the influence of genes, however, does not guarantee that all the vestiges of genetic essentialism are eliminated from the public discourse without an appreciation for the context of reception, especially if continued scientific investigation further advances a determinist discourse.

As evidenced in Chapter Two, many scientists find media coverage of science simplistic and inadequate, especially with regard to assessments of scientific probability. For example, the major criticism against *The China Syndrome*, particularly before the Three Mile Island accident, was not its depiction of nuclear technology but its inability, or unwillingness, to contextualize the risk of a meltdown. Even if the probability of a nuclear meltdown is infinitesimally small, the film only demonstrates the one-time chance occurrence as if the risk is not very remote. Unlike discourses on nuclear energy risks, the scientific discourses on genetic determinism do not particularly rely on notions of risk assessment. Although probability plays a role in one's genetic make-up and the chance those genetic factors could influence one's physical or mental health (for example, a certain genetic composition could leave one with a percentage chance of developing a particular condition), it is the deterministic discourse that fuels the fears and fascinations that makes public understanding of genetic science complex. This complex combination of fear and fascination is evident in media coverage of individual stories of genetic science.

In August 2000, A British couple gave birth to Adam Nash in order to provide his older sister, the victim of the rare genetic disease Fanconi Anaemia, with the bone marrow cells necessary for her to survive when no other donors were available. Adam Nash, born as a result of in vitro fertilization, was carefully screened as an embryo to ensure he did not carry the defective gene. Science scholars Bridget Nerlich, Susan Johnson, and David Clarke examining the

discourse surrounding the Adam Nash case argue that media coverage of the event utilize rhetorical practices that blends factual scientific information with fantastic accounts of science fiction. They argue that "new developments in genetics, such as these (the 'designer baby') throw up fresh ethical questions almost everyday and doctors, scientists, policy makers, the media and the public are ill-equipped to find answers to these questions on scientific, legal, or moral principles alone. The media and general public have therefore often recourse to cultural, literary, or linguistic knowledge to fill this ethical void" (Nerlich, Johnson, and Clarke 2003, 472). Because the progress of genetic science surpasses the available discursive options to rhetors who seek to contextualize the advancement, turning to fictional sources for an ethical vocabulary to describe the science presents both possibilities and limitations to public discourse on genetic science.

This inclusion of fictional discourses to generate normative claims on genetic science rests neither on publics understanding the intricacies of genetic science nor possessing the appropriate scientific vocabulary to appreciate how genes interact. Rather, the fictional examples illuminate the ethical and social dimensions of the scientific breakthrough. These references to fictional sources are particularly notable because they are the preexisting discourses available to contextualize the scientific procedure. As Nerlich, Johnson and Clarke conclude, "when scientists do anything new, there is often a ready-made public perception of how good or how bad it is going to be, derived from social, linguistic, literary, and cultural preconceptions" (493).

Nerlich, Johnson and Clark's examination of media coverage reveals two major themes. Media coverage that references *Frankenstein*, science fiction depictions of eugenics, and even *GATTACA* help cultivate trepidation on behalf of the public. They argue that this type of coverage media criticism condemns the technology as inherently problematic, eschewing the

potential benefits of its application. However, less fear-based news coverage did not identify Adam Nash as a Frankenstein's monster or the product of a *Brave New World*; rather, more balanced coverage suggests that his birth is the product of thoughtful, rationale deliberations where the parents appreciate the medical, scientific, and social consequences of their decision. Such news coverage does not fault the technology as a malevolent agent threatening human order, but a benevolent tool for rational agents to advance human wellbeing. This news coverage employs fictional references in more ironic ways, demonstrating that the fears that these fictional sources exhibit are proved untrue in light of scientific development. Nerlich, Johnson and Clarke argue that "this type of discourse—using fictional references, metaphors and clichés in ironic ways—might prepare the ground for normalization and regularization of this new technology. It now stands between the discourse of fear, which thrives on fictional references and threshold metaphors, and the discourse of normality, where fictions have been replaced by socially acceptable practices" (495).

Nerlich, Johnson, and Clarke correctly note that the discourse of normality replaces a rhetoric of fear, informed by the fictional references, when we realize such fears fail to materialize. However, this conclusion undervalues the potential role of fictional references to provide more sophisticated discourses on genetic technology. As Lonna Malsheimer argues in the previous chapter, fictional references help the normalization process during times of crisis by providing cultural commonplaces that recast scientific uncertainties into recognizable analogs. But by recasting the boundary between fact and fiction as a product of normalizing discourse, Nerlich, Johnson and Clarke position scientific discourse as the appropriate evidence for public discussion without appreciating the possibilities for non-scientific discourses on genetic technology.

Jose Van Dijck argues that the problem with media's use of fictional references in public discussions of genetic science is not the use of the fictional references to the contextual scientific discovery, but their simplistic usage into what he dubs the "imagination deficit." His examination of media coverage of Dolly the cloned sheep reveals "an 'imagination deficit' on the part of scientists and journalists that prohibits a fuller, better understanding of what we do with genetic technologies and what the technologies are doing to us" (Van Dijck 1999, 9-10). Van Dijck argues that when journalists and scientists tap into cultural resources, like science fiction texts, they too often present reductive or essentialist references that ignore the more complex narrative elements that could add texture to public discussion. Such reductive moves reinforce simplistic notions of individuality and identity and bypass the philosophical, ethical and educational contributions the fictional source can offer.

Media references to *Brave New World* and *Frankenstein* attempt to elicit fears of technology as a threat to human existence and as a tool of social oppression. However, Van Dijck argues that media references to such works ignore how these texts are more criticism of the social misuses of technology than the technology itself. Van Dijck, like Darko Suvin and Adam Roberts, believes science fiction creates an imaginative space for "what-if" scenarios that often "entails a criticism of present technologies or social arrangements" (12). Consequently, an appreciation for the multiple discourses found within a fictional text enables a more complicated approach to public discussion of genetic science than simplistic references to a science fiction text. Van Dijck's arguments echo Gough's critique of how science instructors use science fiction films as pedagogical tools, by just highlighting a film's scientific infidelities, pedagogues miss an opportunity to explore further the social and cultural dimensions of science and technology. Specific to this chapter, Aline Kalbian and Lois Shepherd argue that science fiction narratives

about genetic science are particularly helpful in negotiating ethical dilemmas because "popular narrative accounts allow us to imagine ways to challenge prevailing assumptions about the good of prenatal genetic testing. Without the constraint of needing to appear value-neutral, they suggest specific values about the connection between genes and human well-being" (Kalbian and Shepherd 2003, W15). The translation of these values into scientific discourses on genetic science, however, becomes a more difficult rhetorical effort.

3.3.   *GATTACA* and the Limits of Genetic Science Discourse

In pushing Van Djick's argument further, I contend that the power of *GATTACA* and the ALRC's use of the film references, lies in prompting identification with the plight of the protagonist, Vincent Freeman, who faces the harmful implications of essentialist discourses. The process of identification with the main character presents a perspective that illuminates arguments and discourses that demonstrate the oppression of genetic essentialist discourses without isolating the science as inherently harmful. Unlike other films that investigate the consequences of genetic science (*Jurassic Park*, *Alien Resurrection*) where the technology is often embodied by a dangerous "other," *GATTACA* admonishes essentialist discourses, as informed by the perceived potential of genetic science, though a single individual's effort to overcome the external limitations placed upon him by the accepted essentialism.

Mike Michael and Simon Carter argue a unique contribution of science fiction is that "they offer identities though which to read scientific texts that are at once both local and distributed or diffuse" (Michael and Carter 2001, 11). In other words, science fiction films present identities that are individuated, necessary for the cinematic narrative, but informed by collective scientific concerns that are translatable into broader social discourses.

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Plenty of film studies scholarship analyzes the role of identification in film viewing (Harrington 1973; Staiger 2000; Wood 2002). However, the unique aspect of film viewing in relation to scientific understanding is that there is a complex relationship between the identification with a character, and the emotional and intellectual challenges he or she faces, and the identification with the epistemic claims in the film. Like Jane Gregory and Steve Miller, Michael and Carter suggest that "scientific knowledge is necessary to 'read' these fictional texts (in the broadest sense), yet the 'interpretation' and the discourses, metaphors and narratives of fictional genres may shape 'understanding' of science." It is my contention that a more rhetorical understanding of identification enables us to better comprehend how *GATTACA* cultivates a criticism of genetic essentialism and how those discourses are used, in particularly in the Inquiry, to point out the harms of essentialism.

Considered intellectual science fiction, *GATTACA* receives a great deal of praise from scientists, bioethicists, and philosophers (Kirby 2000). Paul Thacker, of *Chemical and Engineering News* notes that "what science fiction does best is to tweak social norms and exhibit how this impacts human relationships. No film released in the '90s does so better than *GATTACA*. This sleeper classic manages not only to explain the nature/nurture paradox better than any college professor, but does it with a sense of style you'll never find in a classroom" (Thacker 2004). Geneticist French Anderson, a volunteer science consultant to *GATTACA*, notes that the film lacks major flaws in genetic science and aptly portrays the social consequences associated with the technology, especially in light of a genetic essentialist mentality (Holden 1997, 1019).

The effusive praise for *GATTACA* is also evident in the calls to revisit the film as a resource to contextualize discussion of genetic science (Hamilton 2003). Natasha Scott-Despoja,

in discussing the dangers of the genetic testing for the *Courier Mail*, notes "it is now possible to distinguish identity on the basis of genetic make-up, making some aspects of *GATTACA* a sobering reality" (Despoja 2001, 15). Sharon Begley, exploring the dangers of life-saving genetic technologies being used for designing babies, suggests "it isn't hard to foresee a day like that painted in last year's film *GATTACA*, where only the wealthy can afford to genetically engineer their children with such 'killer applications' as intelligence, beauty, long life or health" (Begley 1998, 61). In discussing the limits of genetic science, Gretchen Vogel argues that "for the moment, the big safeguard against the misuse of gene therapy—and against the world depicted in *GATTACA*, in which choice jobs are reserved for the genetically enhanced—is that the technology does not work very well" (Vogel 1997, 1745). In each case, rhetors employ the film seamlessly into their discourse with little qualification, accepting the world *GATTACA* depicts as a realistic possibility that we must diligently guard against.

All these commentaries identify *GATTACA* as a world where we do not wish to live. *GATTACA*, in these references, becomes a term that stands in for a set of circumstances that indicate the dangers of genetic essentialism. However, such references do not recommend *GATTACA* as a *topos* for discourse production distinct from other films or film references. Undeveloped references to *GATTACA* in discourses about genetic science risks being subject to Van Dijck's criticism that trite fictional references re-inscribe simplistic discourses on genetic technology, eschewing the more nascent discourses present in film. However, a unique element to the public scientific discourse regarding *GATTACA* is how the Inquiry centers on the plight of the protagonist, Vincent Freeman, as the site of criticism of genetic essentialism.

The film references that recount Vincent's story seeks to cultivate identification with the main character. It is this process of identification that is quite evident in the ALRC's report that

illustrates how discourse becomes integrated into the scientific discourse. To understand how the film functions rhetorically, it is important to understand how the narrative helps substantiate identification with the main character and how that can serve as a vehicle for discourse production.

3.4. Cinematic Identification and *GATTACA*

Uncomfortable with psychoanalytic conceptualizations of identification in cinema studies (Metz 1977; LeBeau 2001), film theorist Berys Gaut presents an alternative approach that seeks "to rehabilitate the notion of identification for cognitivist theories of film, to show that the notion does not suffer from the deep conceptual confusions alleged against it, and to demonstrate that it has explanatory power in accounting for spectators' emotional responses to film" (Gaut 1999, 201). Gaut contests traditional conceptions of identification, noting the impossibility of complete identification and the nonsensicality of believing audiences are entranced by illusionary nature of cinema. He contends other theories of identification simplify the process of relating to a character by providing no explanatory function justifying why spectators feel for the character. Gaut suggests imaginative and empathetic identification as alternative theoretical approaches:

> …the act of imaginative identification involves imagining—not, strictly speaking, being that other person, but rather imagining being in her situation, where the idea of her situation encompasses every property she possesses, including all her physical and psychological traits (so we imagine the world from her physical and psychological perspective). (203)

Gaut articulates four aspects of imaginative identification: visual (seeing what the character sees), affective (feeling what the character feels), motivational (motivated by what motivates the characters), and epistemic (knowing what the character knows). These processes of identification do not rest on exclusively psychoanalytic or subconscious understandings of how

films are received. Rather, these aspects of identification appreciate more cognitive understandings of the film reception that are more translatable into public discourse. Moreover, Gaut's approach to identification comports well with science fiction films where the epistemic value of the film is to posit a "what-if" scenario that allows viewers to ruminate the implications of a "novum." As Adam Roberts suggests, science fiction films must possess enough realistic elements to the present condition to allow audiences to appreciate and comprehend the "novum." In *GATTACA*, those connections unfold throughout the narrative with our identification with Vincent, who faces prejudiced acts that are magnified by genetic essentialism.

From the very beginning of the film, *GATTACA* announces itself as concerned with the present condition and how existing prejudices can inform social reception of emerging technologies. As the final title card in the opening sequence indicates, *GATTACA* takes place in the "not too distant future." The film introduces a world where natural reproduction becomes a social liability. A child's genetic composition is no longer a product of chance; rather, for those with ample resources, babies are genetically designed to ensure minimal susceptibility to physical maladies as well as to remove socially undesirable traits that invite prejudice. The narrative follows Vincent Freeman, a naturally conceived child ("invalid," "in vitro," "God-child") in his attempt to join the Gattaca Corporation, the company responsible for space exploration, and fulfill his enduring dream of space travel. However, his genetic constitution reveals a ninety percent chance of heart failure by thirty, disqualifying him from gainful employment, especially an occupation like space travel that requires an enormous investment in training. Although "genoism," discrimination based on genetic make-up, is illegal, enforcement is neglected in favor of economic considerations. As Vincent notes in the voice-over, "they have discrimination down to a science."

Despite his best efforts to find employment at the Gattaca Corporations, achieving extremely high scores on all non-physical tests, Vincent's application is continually denied. Vincent, still determined to experience space travel, finds opportunity in the genetic black market. As Vincent narrates, "for the genetically superior, success is easier to attain, but it is by no means guaranteed. After all, there is no gene for fate. And when, for one reason or another, a member of the elite falls on hard times, their genetic identity becomes a valued commodity for the unscrupulous." For a steep fee, Vincent becomes a "borrowed ladder" or "de-gene-rate" and adopts the genetic identity of Jerome Eugene Morrow, a genetically superior specimen ("valid," "vitro," "made-man") crippled by a car accident. Vincent, as Jerome, easily obtains a job at Gattaca and quickly ascends it ranks. His interview with Gattaca consists of only a blood test. Once on the inside, Vincent's intellect and tenacity catches the eye of his superiors, and is soon assigned a space mission.

Assuming Jerome's genetic identity constantly requires Vincent to painstakingly eliminate any traces of his invalid self, including daily rituals of exfoliating dead skin, trimming hair and nails, and preparing urine and blood samples to pass security checks. Vincent meticulously cleans his workstation, removing all evidence of his DNA, while Eugene supplies Vincent with replacement parts to leave as evidence of Vincent's assumed genetic identity. To avoid suspicion, Vincent intentionally leaves flakes of Eugene's skin and strands of Eugene's hair around his cubicle in order to "pass" periodic DNA sweeps designed to ensure no unauthorized individual has breached Gattaca's security measures.

A week prior to Vincent's mission to the Jupiter moon, Titan, a director at Gattaca, who wishes the space flight cancelled, is found murdered. In an extensive investigation, the police discover vestiges of Vincent's actual DNA. Although no one initially suspects one of Gattaca's

best workers, Vincent fears the investigation will eventually reveal his fraud. The narrative weaves together Vincent's efforts to escape notice of investigators, his developing friendship with Jerome, and his burgeoning relationship with fellow coworker, Irene. While *GATTACA* is part science-fiction, part film noir, and part love story, it clearly outlines arguments against the reductive tendencies of genetic determinism.

The film announces its argument both discursively and visually. First, the film's title is spelled out by referencing the four base amino acids that constitute DNA: **A**denosine, **G**uanosine, **T**hymine, and **C**ytosine. The title, like Vincent and the corporation he works for, is understood only as the sum of its individual parts. The motif is reinforced during the opening credit sequence, as the actors names fade away, the letters A, G, T, and C in their names momentarily remain, emphasizing the reductive nature of genetic determinism (Kirby 2000, 205). Additionally, the names of the two main characters illuminate the divide between the "valids" and the "in-valids." Vincent's last name, Freeman, intimates his alienation, clearly outside the bounds of the cultural constraints substantiated by genetic essentialism, while Jerome Eugene are homophones of "genome" and "gene," suggesting the reductive and constraining elements of the determinist ideology.

Although the narrative addresses the crippling pressures and expectations associated with Eugene's genetic "superiority," *GATTACA* is Vincent's story. He is present in virtually every scene and is the locus of audience identification. Vincent, an everyman saddled with immutable liabilities, embraces his ordeal with remarkable resolve, showing little reservation in living a charade to realize his elusive dream. Fundamental to its narrative, *GATTACA* articulates a world dominated by a technology that is presently in its infancy. Consequently, there exists no analog

in the present reality, thus forcing the spectator to imagine a situation informed only by scientific speculation.

Identifying with Vincent becomes even more important for the audience, as he is our guide to this fictional world. The first act of the film is marked by Vincent's first person narration, providing appropriate back story on his difficult life as "faith-birth" child. He recounts how his father, Antonio, named him Vincent, saving his namesake for the younger brother, the genetically enhanced Anton. This is only the beginning of Vincent's highly competitive relationship with his brother. Vincent describes his competitive relationship with his brother, his inability to live up to his father's expectations, and his emerging fatalistic belief in his own incapability. These trials are trite narratives, but their universality is essential to forging character identification, especially in a film that both posits a nonexistent, but scientifically probable, world and cautions against the discursive and prejudicial elements of such a world. His struggles serve as familiar points of motivational identification.

The visual elements of the film reinforce our identification with Vincent. In *GATTACA*, there exists few pronounced point-of-view (POV) shots. However, a notable POV shot demonstrates Vincent's affection for Irene, his romantic interest from Gattaca. Disadvantaged by myopia and without the aid of his contact lens, Vincent crosses a busy road to meet Irene on the other side. With the cars out of focus, the shot simultaneously suggests Vincent's physical limitations as well as his distorted view of the "reality" he inhabits, unwilling to acquiesce to the limits of his underprivileged birth and undeterred by the obstacles that prevent the realization of his passions. This shot personalizes his struggles, further forging perceptual and affective relationships with Vincent.

In addition to his love interest, Vincent's fundamental goal to head to space clearly resonates with audiences. Vincent's desire to realize his goal of space travel is uniquely personal. Having abandoned his family years ago and having few personal connections, save Jerome and Irene, Vincent's motives are wholly egocentric; he is not intent on actually proving to others his ability to overcome his supposed genetic disadvantage. His story and his subsequent successes, therefore, are reserved for the audience, a testament to transgressing socially constructed limitations. Vincent's closing narration highlights his alienation. He notes "for someone who was never meant for this world, I must confess I am suddenly having a hard time leaving it. Of course, they say every atom in our bodies was once part of a star. Maybe, I'm not leaving. Maybe, I'm going home."

Ironically, Vincent is the only character truly meant for the world, for he is the only one conceived naturally. However, the discourse of genetic determinism in the world of *GATTACA* has become naturalized. Vincent's account of his parents' decision to conceive their second child in the "natural way" by turning to genetic engineering best illustrates to pervasiveness of the determinist ideology. Laboring over what physical attributes they wish their child to possess, the parents want, with the exception of screening for diseases, to leave some characteristics up to chance. The doctor, ironically black, persuades the parents to give their child the best possible advantage and screen for "socially prejudicial conditions" such as premature baldness and obesity, for "there is already so much imperfection built in."

As Nelkin and Lindee suggest, society is enamored with the possibilities of genetic engineering. The promise of eliminating hereditary diseases and safeguarding against potential physical "maladies" is enticing and rhetorically attractive. As illustrated by the parents' conversation with the doctor, these genetic selections based on social reasons are rather

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seductive. No parent would want their child to experience any form of discrimination, even if it was solely based on height or weight. However, by suggesting that genetically unmodified, or "faith-births," are "unnatural," *GATTACA* makes our present natural condition strange. Barring any overnight scientific breakthrough, it is safe to assume all present-day spectators are natural, genetically unmodified births. Although we can not directly empathize with Vincent's plight, he is the only character that is recognizable, in that we all share an accidental quality to our genetic composition. This is best illustrated in earlier cuts of the film that has concluding title cards that highlight those who would not be born in a society governed by genetic determinism including: Albert Einstein, Jackie Joyner-Kersey, Abraham Lincoln, and, ironically, Charles Darwin. The final card reads, "Of course, the other birth that may never have taken place is your own"(Kirby 2000, 209). Despite scientists screening the film who suggest this segment is one of the most important elements to the film, the filmmakers cut the scene because audience testing surveys indicate that the scene left audiences "personally attacked" as inferior beings. However, this personalizing move demonstrates an intentional, and rather successful, effort on behalf of the filmmakers to articulate a very personal argument regarding genetic determinism.

Vincent's narration not only functions to advance the plot or to identify with Vincent, as the main character, but it also highlights the technoscientific discourses that inform his world, thus expanding Gaut's notion of epistemic identification by positing broader epistemological questions concerning genetic manipulation. In essence, it is a more rhetorical understanding of identification where Vincent becomes more than a character in a fictional drama, but also an advocate of an anti-deterministic counter-discourse. Therefore, the audience identifies with Vincent the character and Vincent the argument. Gaut's notion of identification enables this move to appreciating these epistemological aspects of identification:

> [Identification] plays a significant part in teaching us how to respond emotionally to fictionally delineated situations. The first is that through empathy our emotional reactions mirror those of a character, and that as she grows emotionally we do, too, learning to respond to situations in a way that we and she would previously have found inappropriate. The second basic type of learning results from identifying with a character, but coming to realize that her reactions are in some way inappropriate to her situation, and discovering that there is a deeper perspective on her situation, different from her own. (Gaut 1999, 213)

This suggests that character identification is not an ephemeral, affective response; rather the impact of identification possesses lasting pedagogical effects. In essence, the emotional journey the spectator shares with the identifiable character provides an argument (justification, reason) of how to or how not to react emotionally in a given situation. However, in a futuristic film like *GATTACA*, audience members, as of now, will never experience truly analogous situations. Yet, the frustrations of discrimination and the appeal of Vincent's tenacity provide a recognizable emotional compass for audience members. Thus, the power of *GATTACA* is how these emotional responses are inherently entwined in the broader intellectual argument. In other words, the pedagogical effect of *GATTACA* is not simply that our empathetic identification with Vincent's teaches how to respond emotionally to similar circumstances, but rather our affective relationship with Vincent enables us comprehend the anti-determinist discourse.

Like Gaut, rhetorical theorist Kenneth Burke argues that there is no such thing as complete identification; individual humans possess an infinite number of emotional, psychological, and intellectual states, therefore even the attempt to forge perfect identification among individuals, fictional or not, is inherently an unproductive endeavor (Burke 1969). But Burke, like Gaut, does not abandon a notion, or goal, of identification, and that rhetoric relies on efforts to foster identification. Burkean notions of consubstantiality suggest that rhetors seek identification through the employment of shared relationships and experiences. Although Gaut never invokes rhetoric into his discussion of identification, a rhetorical understanding of how

identification works in narrative film yields productive results in analyzing *GATTACA* as a text

that utilizes imaginative and empathetic identification to promote an epistemological argument.

As J.P. Telotte argues, science fiction fantasy films serve as testaments of how we

understand ourselves as humans (Telotte 2001). In *GATTACA*, we are confronted with a world

that promotes a particular idealization of humans, based solely on their genetic constitution.

However, through Vincent's struggles, *GATTACA* exposes the discursive nature of the genetic

determinist ideology and develops a persuasive warning against the seductive nature of such

technological possibilities. Viewing *GATTACA* as an argumentative text highlights how

identification functions rhetorically, promoting both an emotional and intellectual identification,

and its subsequent pedagogical elements. It is elements of identification that translates into the

ALRC's use of *GATTACA* as evidence in their Inquiry.

3.5.   The ALRC/AHEC Inquiry and the Protections Against Genetic Essentialism

By act of Parliament, the Australian Law Reform Commission was established as a

federal advisory body to examine and recommend legislative changes. Although the ALRC is

unable to initiate its own inquires, once the parameters of its study are developed by the Attorney

General, the ALRC operates with little government oversight. In February 2001, then Australian

Attorney General Daryl Williams and Minister for Health and Aged Care Michael Wooldridge

instructed the ALRC, in conjunction with the AHEC, to investigate the type of regulatory

framework necessary to protect against unethical uses of genetic information in order to protect

citizens from various forms of genetic discrimination. *Essentially Yours* is the product of two

prior documents that helped initiate the public debate. First, Issue Paper 26 (IP 26), released in

November 2001, balances the need for familiarity with the technology and the promotion of

public input by providing a thorough primer on genetic science and the issues under inspection. Second, Discussion Paper 66 (DP 66), released in August 2002, is the product of further study designed to give shape to public debate. Over the course of the two year study period, the ALRC held 15 public forums and over 200 meetings with specialized agencies, committees, and scholars. Additionally, the ALRC received 316 written correspondences from a variety of individuals and institutions.

The breadth and comprehensiveness of the Inquiry has received international celebration. ALRC President David Weisbrot, in his speech to the 8th Australia Institute of Health Law and Ethics (AIHLE), shares that "the report (ALRC 96) has been getting great amounts of attention and high praise over the world—including the United States, Canada, the United Kingdom, New Zealand, China, Korea, and Japan—and in international forums such as the OECD and HUGO" (Weisbrot 2003b). He also notes that Doctor Thomas Murray, the chair of the Human Genome Project's first Ethical, Legal, and Social Issues Working Group wrote, "the ALRC and the AHEC have done an extraordinarily fine job of explaining the science, identifying what is important for the people of Australia, and offering sensible advice….*Essentially Yours* sets a standard for advice to the public and policy makers on how to understand and protect genetic information" (qtd. in Weisbrot 2003b).

The ALRC identifies two countervailing public attitudes on the progress of genetic science. Publics support the advancement of genetic research on the grounds that it promises better medical diagnosis and treatment as well as increases the effectiveness of law enforcement through the DNA testing. However, there is heightened public anxiety that such technology precipitates in the loss of privacy, the potential for genetic discrimination, and decreased oversight and increased insularity of genetic science. Ultimately, the Inquiry wishes to promote

innovation, yet ensure that such practices are subject to "proper ethical and legal controls." Fundamental to negotiating these competing needs is developing a legal framework able to sufficiently keep pace with the development of genetic science. The current method of regulation and conflict resolution involve a patchwork of national and local laws, institutional and professional standards, and ad hoc public oversight committees. All told, the Inquiry's central challenge is to determine whether the current legal and regulatory structure requires standardization with minor alterations or wholesale legislative change.

The extent of legal change necessary is predicated on which of the prevailing scientific discourses regarding the predictive role of genetic information the ALRC adopts. Specifically, the Inquiry considers the validity of both the "genetic exceptionalist" and "genetic inclusivist" positions. On one hand, the "genetic exceptionalist" position posits that genetic information is qualitatively distinct from all other forms of medical information based on its predictive and individual qualities. The exceptionalist approach assumes that genetic information is both fundamentally distinct from and more determinant than all other forms of personal medical information that it requires unique forms of legal protection. Legal protections regarding genetic information even transcends individual concerns. As rhetorical critics Gordon Mitchell and Kelly Happe argue, genetic information fundamentally changes informed consent laws because an individual's decision to become subject of medical testing and genetic screening has demonstrative effects on relatives and related racial groups (Mitchell and Happe 2001). In other words, an individual genetic test not only reveals information about the test subject who gave informed consent, but also information about genetically related individuals who may not wish to have their genetic information shared. Moreover, a genetic exceptionalist position assumes an essentialist discourse that facilitates reducing individuals to genetic information to the exclusion

of intervening medical and environmental factors. Consequently, genetic predispositions, at least

rhetorically, are more predicative of possible conditions than intervening environmental factors.

On the other hand, the genetic inclusivist approach considers genetic information level

with other forms of medical data in its ability to predict an individual's physical wellbeing. The

inclusivist approach seeks to contextualize genetic information without privileging such

information over other intervening variable. Such an approach presents a scientific discourse that

attempts to eschew notions of essentialism without abandoning the scientific contributions of

genetic technology. As a result, genetic testing and genetic information only becomes necessary

under specific circumstances. The Inquiry concludes that the inclusivist approach best meets the

legal and social needs to both advance genetic science and protect individual liberties.

The ALRC frames these fundamental tensions by invoking references to *GATTACA*. In a

2003 speech introducing the report, Opeskin posits the question whether the world of *GATTACA*

will be fact or fiction. He notes that since the film's initial release, a number of scientific

breakthroughs make the world of the film plausible: the cloning of Dolly, the mapping of the

human genome, the proliferation of gene therapy. Opeskin's admission suggests that the film is

not "just a movie," but worthy of consideration beyond its artistry, for it is a text illustrative of

realistic fears of unchecked genetic technology (Opeskin 2002).

Although *GATTACA* is used as a framing device in the final report, references to the film

were not part of the original intent of the ALRC. Issue Paper 26 (IP 26), the initial document

published by the ALRC to solicit discussion regarding laws governing genetic science, makes

only one reference to the film, noting that in "light of recent scientific advances, popular culture

is again beginning to consider the chilling vision of a society organized around genetic

determinism" (ALRC and AHEC 2001, 93). IP 26 proceeds to identify *GATTACA* as a film that

demonstrates the problems of genetic determinism. The statement that references *GATTACA* is

immediately followed by a cautionary statement by a biologist who warns us not to accept a

reductive dichotomy that equates genetic factors with determinism and environmental influences

with individual freedom. The biologist argues that when science writers criticize genetic

determinism, they only replace it with a form of environmental determinism.

This arrangement suggests that *GATTACA* is too reactionary or reductive, even though it

identifies many of the concerns about genetic science. This use of the film falls subject to Van

Dijck's critique that we often lose the critical dimensions of a science fiction referent if it is

reduced to its basic narrative tension. However, the quantity and quality of references to the film

increase dramatically from Issue Paper 26 to Discussion Paper 66 (DP 66).

DP 66 incorporates six distinct references to *GATTACA*. The first reference opens the

paper's second chapter, "Planning for the Future," in the subsection titled "A Glimpse of the

Future?" Quoting the opening title sequence from the film, the report indicates that *GATTACA*

"portrayed life in a 'not-so-distant future' in which genetic engineering permits parents to screen

embryos before implantation for the purpose of reproduction — avoiding those that are

genetically imperfect and selecting those that offer a genetic guarantee of health, stamina and

physical attractiveness" (ALRC and AHEC 2002, 87). The report follows the reference with a

film reviewer's summary of the narrative which extracts the difficulties Vincent faces and how

he transcends his "genetic prophesy." The report suggests that:

> *GATTACA* identifies many themes that are central to the present Inquiry: the
> prospect that genetic science may in time enable a person's genetic destiny to be
> mapped out at birth, with all their flaws, predispositions and susceptibilities; the
> prospect that those with better genetic profiles may be favoured over those with
> weaker profiles, creating a class of 'healthy-ill' or 'worried-well'; and the
> prospect that those who are genetically disadvantaged may defy scientific
> predictions and succeed beyond expectations, while those who are genetically

advantaged may not fulfil their potential — because, as Vincent Freeman states, 'there is no gene for fate.' (88)

The report's discourse suggests the real, and perhaps inevitable, scientific possibility of mapping one's entire genetic composition could give rise to a genetic caste system. The report's following subsection indicates that the not so distant future is closer than anticipated. The report observes that at the time of its release, *GATTACA* was greeted as either a "chilling vision of the future" or dubious depiction of the capabilities of genetic science. However, "the intervening years offer fresh insights into the plausibility of *GATTACA*'s underlying premise" (89). A series of genetic science advancements, such as the cloning of Dolly, the sex-selection through sperm sorting, and the mapping of the human genome, demonstrates that the science fiction may soon become science fact. The title of this subsection, "The March of Science," suggests the inevitability of scientific progress in uncovering the power of genetic information. The report is clear in suggesting that the "march of science" is not inherently problematic, rather nascent developments associated with genetic technology, such as increased testing, availability of information, and commercialization pressures that are the Inquiry's central concerns. As in *GATTACA*, the technology is not faulted, but its applications and the discourses that inform such applications.

The observation that the report adopts a rhetorical technique that demonstrates how science fact is catching up to science fiction is not novel insight. However, the sincerity to which the report discusses the film as evidence of harmful essentialist discourses warrants serious attention. The difference between *GATTACA* references in IP 26 and DP 66 demonstrates this point most clearly. DP 66 reproduces the same paragraph found in IP 26 that references *GATTACA* as evidence of popular culture ruminating over the societal impact of genetic determinism. Unlike IP 26, the same paragraph is followed by a definition of genetic

essentialism, how it is similar to genetic determinism, and the consequences of essentialism. Moreover, this section is followed by a statement from James Watson, a discoverer of the double helix structure of DNA, where he suggests that "[w]e used to think our future was in the stars. Now we know it is in our genes" (220). For this statement, the report suggests that the role of genetic information could fundamentally alter our conceptions of being human and posits the questions as to how a society governed by determinism would influence our evaluations of others. Only after such cautionary statements does the report insert the quote that warns against reductive approaches to biological assessments of determinism.

It is worth noting that the report is careful to not advance such a reductive approach. However, the choice of arguments and their arrangement suggests that determinism is a prominent discourse used in describing genetic science and that the film can not be dismissed as a reactionary and reductive statement about the future. Rather, the film is an important contribution to the discourse on examining the liabilities of adopting essentialist discourse.

The other references to *GATTACA* in DP 66 are quotes from the film, as uttered by the narrator, Vincent. Three distinct quotes introduce the sections on "Anti-Discrimination Law", "Genetic Counseling" and "Genetic Discrimination." In DP 66, the epigraphs do not receive attention within the text itself. However, the quotes share two qualities that are important rhetorically. First, all quotes are first person narrations from Vincent; they are not part of the larger dialogue, but Vincent's intellectualizations of the circumstances he faces. The arguments that the quotes advance are not only important because of their content and application to the particular section, but they are evidence of the identification with Vincent. This demonstrates that the first person narration of Vincent and the epistemic and emotional identification created

with the character serves enables the discourses in the film to be translated into the public discourse.

Second, each quote demonstrates how the discourse of genetic essentialism creates a *fiat accompli*. The Anti-Discrimination Law section opens with the following: "Officially they are called 'In-valids'. … They are the 'healthy ill'. They don't actually have anything yet — they may never have. But since few of the pre-conditions can be cured or reversed, it is easier to treat them as if they were already sick" (264). The Genetic Counseling section begins with Vincent describing Irene's outlook: "Somebody told her she's not going to live forever and she's been preparing to die ever since" (521). Finally, the Genetic Discrimination chapter begins with Vincent's question: "Why should anybody invest all that money to train me, when there are a thousand other applicants with a far cleaner profile? Of course. It's illegal to discriminate — 'genoism' it's called — but no one takes the laws seriously" (669).

Each quotation describes how the acceptance of a genetic essentialist mindset operates in subtle and harmful ways. The essentialism that suggests one possesses genetic inadequacies inherently imposes limitations, even if not scientifically substantiated. Even the science in the world of *GATTACA* concedes that genetic make-up does not guarantee success or failure. However, as a discourse of probabilities that establish preconditions for success, as informed by essentialism, become more accepted, subtle discriminatory practices surface, such as the monetary commitments for someone with a less than ideal genetic composition.

Essentially Yours (ALRC 96) reproduces the same references to *GATTACA* as in DP 66 with one notable exception. The same quote that opens the Anti-Discrimination Law section is followed by the observation that, "this quote, from the film *GATTACA*, describes an imaginary future world, but discrimination on the ground of genetic status is no longer science fiction"

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(ALRC and AHEC 2003, 290). Like the previous rhetorical gestures, this juxtaposition of the fictional and factual world suggests that the harms of the genetic discourse, as evidenced in the film, are present day problems. Consequently, even if scientific knowledge does not actively endorse genetic determinism, social practices are informed by essentialist and deterministic discourses that can have very harmful consequences.

3.6.   Conclusion

David Kirby, in "The New Eugenics in Cinema," suggests that *GATTACA* offers a text that problematizes the relationship between genetic engineering as a science and as a social practice informed by the prominent discourses of genetic essentialism. Unlike more simplistic cinematic representations of genetic science, *GATTACA* "warns of the problems that arise of we believe that humans are nothing more than our genes"(Kirby 2000, 198). Ultimately, Kirby reads *GATTACA* as an argumentative text, where the filmmakers serve as bioethicists warning society against the trappings of unrestricted gene therapy. Akin to Kirby's observations, scientists and science scholars reference *GATTACA* as a warning of accepted genetic determinism (Holden 1997; Michael and Carter 2001; Yam 1997).

Unlike the debates concerning references to *The China Syndrome*, there is a paucity of science interlocutors who criticize *GATTACA* on the grounds of scientific infidelity. In fact, *GATTACA* is a rather uncontested referent in public discourses on genetic science. Perhaps one reason for a lack of response from science interlocutors is that the film does not indict genetic science specifically at a time when genetic technologies are under harsh scrutiny. As evident throughout this chapter and other studies of scientists' reactions to the film (Kirby 2000), scientists are reluctant to endorse genetic determinism as a beneficial perspective on the role of

genes. Even if the scientific discourses, either in specialized or public spheres, suggest hints of

genetic determinism, actively advocating genetic determinism is a rhetorically untenable

position. Consequently, embracing *GATTACA* as a criticism of genetic determinism entails little

risk for science interlocutors. Rather, this reference helps focus the ethical and social

consequences of accepting genetic determinism. This becomes even more apparent in the ALRC

report.

The rhetorical gesture of including a fictional narrative within political and scientific

discourse highlights new possibilities for broader public discourses on science. In particular, the

film provides a common idiom for scientists and non-scientist to converse about the ethical

dimensions of genetic science. Doctor Ian Barns, in a submitted response to IP 26 to encourage

more engagement with *GATTACA,* states:

> …that it is vital that we recognise the fundamental role of the *shared* stories that
> provide the primary matrix within which we develop ethical principles and
> develop our sense of both personal and social moral identity…Perhaps both the
> Inquiry and public consultation initiatives could go further in using such films
> [*GATTACA* and *Blade Runner*] as a context for opening up wider public debate
> and articulate 'background' concerns. (Barns 2002)

Although scientists and science advocates are often quick to dispute popular depictions of

science, such as *The China Syndrome*, the paucity of responses to the ALRC's for its use of

GATTACA suggests that scientists are not too troubled by the referent. In fact, the Inquiry's use

of the film gives welcomed narrative substance to the competing discourses within the scientific

community on how predictive genetic information is in determining an individual's health and

ability and the implications of adhering to a specific scientific view on the role of genetic

information. For a rhetorical scholar who wishes to identify new spaces for public input into

science policy, the Commission's use of a film as a "centerpiece" to explore the discourses

surrounding genetic information becomes extremely relevant. For Professor David Weisbrot, President of the ALRC, the reasons to use *GATTACA* as a "centerpiece" for the report are quite apparent:

> It seems that every Australian has seen the film *GATTACA*, in which we have a highly geneticized future, children are tested at birth, streamed in different occupations, and streamed out of others. We actually had to show the film to our staff because they kept hearing about it at every meeting that they went to. That's the sort of future, of course, we want to desperately avoid. (Weisbrot 2003a)

These meetings Weisbrot refers to are the public hearings the ALRC held between the release of IP 26, with one dismissive referent to *GATTACA*, and the development of DP 66, where *GATTACA* receives greater consideration. This comports with Brian Opeskin's observation that they kept hearing references to *GATTACA* at their public hearings. Unfortunately, transcripts of the public hearing records where individuals reference the film are unavailable. However, personal correspondence with Commissioner Opeskin on October 20, 2004 reveals that the ALRC incorporates *GATTACA* references into the report because of its public recognition and insightful commentary. As Opeskin argues, the ALRC is always looking for ways to better engage public audiences, and *GATTACA* provides the common argot for specialized and public spheres to engage complex scientific issues. This intentional and rather accepted inclusion of *GATTACA* into a government report suggests a reconfiguration of the available *topoi* of public scientific discourse (Opeskin 2004).

The rhetorical exigence, as we glean from the ALRC's Terms of Reference, is the need to develop a comprehensive legislative framework that anticipates and addresses legal or social problems regarding genetic information before advancements in genetic technologies outstrip existing protections. Complicating such an exigence, is a new set of exigences, such as finding a common vocabulary where scientists and non-scientists can discuss the social and ethical

dimensions of genetic science. Unlike the rhetorical exigence Lloyd Bitzer assumes, these

exigences are based on speculation, predicting problems before they become evident and

uncovering the proper discourse to articulate them. This returns us to Richard Vatz's observation

that rhetoric is constitutive, where the creativity of the rhetor defines the exigence. By using

GATTACA as a source for speculating on the dangers of genetic essentialism, the authors of the

ALRC reports, in particular *Essentially Yours*, rearticulate the boundaries of acceptable public

scientific discourse to include narratives as sites for ruminations over the implications of genetic

science.

Although science popularization is often dismissed as deleterious to efforts to effectively

educate the public on science, this is an occasion where popular images of science service the

public discourse. Certainly, not all films discussing genetic science are called to service public

discussions of science. But *GATTACA*'s ability to create cognitive identification creates a

persuasive depiction of anti-essentialist discourses that translates well into public scientific

discourse. Like the ALRC, it is important to not dismiss the role of the film.

Importing a popular narrative to shape the debate on genetic technology echoes efforts to

promote civic discourse on science (Fuller 1993; Brown 1991). Unlike the technical

nomenclature of science, narratives are more accessible forms of discourse that broaden

discussions on science policy. *GATTACA* makes no gesture to isolate the harms of genetic

science, rather it takes aim at the essentialist discourses informed by the science. In doing so, the

arguments the film advances can not be easily dismissed by scientific arguments that suggest that

genes are not as deterministic as believed. In fact, as the Inquiry suggests, the discourses in the

film, such as genetic discrimination, are not science fiction and must be addressed before the

increasing availability of genetic testing and genetic information calcifies such discrimination in

the name of science.

4. Decades Away or *The Day After Tomorrow*?

4.1. Introduction

In recent years, a number of notable films have stirred political controversy, shaping the agenda of public discussions on pressing issues facing society. From Michael Moore's *Fahrenheit 9/11* to Mel Gibson's *The Passion of the Christ*, such films tend to be "adopted" by interest groups as public relations mechanisms to highlight or advance particular messages. In these cases, politically loaded films become more than "just a movie;" they function as pivotal reference points in public debates on significant social issues that transcend cinematic aesthetics.

The Day After Tomorrow (Emmerich 2004), a $120 million-dollar blockbuster that dramatizes an environmental catastrophe, is one of these films that cause considerable public debate. Although the film brings attention to a serious environmental matter, accurate depictions of the effects of global warming are sacrificed in order to make the film's narrative more compelling. This tension between the film's scientific accuracy and its popular appeal places anti-global warming scientists in a rhetorical quandary: How far can interlocutors use the film's popularity to highlight a significant environmental challenge without sacrificing or trivializing scientific fact?

The public debate that surrounds *The Day After Tomorrow* presents a novel case for the study of public discussions of science for a number of reasons. First, *The Day After Tomorrow* hit theaters during the summer blockbuster season of 2004, months before a presidential election where one of the political hot button issues was environmental policy. Political pundits and Republican strategists believed that environmental issues, in particular global warming, were weaknesses in President George W. Bush's re-election drive (Brooks 2004; Cohen 2004; Mencimer 2002).

Second, because of the film's pointed argument and highly visible release, environmentalists and global warming skeptics quickly politicized it. While the film's underlying premise of global warming is grounded in respectable scientific theories, *The Day After Tomorrow* is a work of fiction that depicts the speed of global warming consequences in scientifically suspect ways. Whereas the film provides stunning visuals to an environmental problem that is slow to develop and hard to see, the cinematic conventions that call for a compelling narrative work at cross-purposes with the film's larger scientific and political message. As a result, the debate over the film's efficacy in the public discourse centers on how transparent the film conventions are and how they may interfere with audiences' read of the film's larger message.

This chapter interrogates how the scientific and political reaction to the film and its role in promoting public understanding of climate science impacts public discourse. At the center of analysis is the fact that *The Day After Tomorrow* presents scientists and activists sympathetic to efforts to curb global warming with a rhetorical double bind. On one hand, a major Hollywood blockbuster with dramatic visuals and a clear scientific message clearly presents advocates with a golden opportunity to bring attention to a significant political issue, one that figures into the various environmental and political debates that will have lasting consequences for generations to come. Although there have been numerous films about weather-related disasters, *The Day After Tomorrow* is the only major Hollywood film that frames global warming as a potential catastrophe. Furthermore, the film's protagonist is a paleoclimatologist, an uncharacteristic hero given the history of the genre, who relentlessly attempts to convince the politically powerful to combat the onset of global warming.

On the other hand, the film depicts global warming in a scientifically impossible manner. In a matter of days, the Earth is subject to global super-storms that lead to rapid sea-level rise, ultra-violent weather conditions, and flash-freezing. While the film highlights the potential, long-term impacts of global warming, its depiction of the onset of such impacts opens warming believers and environmental activists to criticism by warming skeptics who argue that the film illustrates the absurdity of warming theories.

Consequently, debate over the efficacy of *The Day After Tomorrow* references in public discussions of climate change center on whether the scientifically suspect drama can bring attention to global warming without sacrificing scientific integrity of efforts to combat global warming. The public debate over the efficacy of *The Day After Tomorrow* in public discussions of climate change incorporates a number of exigences for an array of rhetors with distinct interests. Environmentally concerned science interlocutors face an exigence whereby the film's release presents an opportunity to raise public awareness on the dangers of global warming. However, this raises issues within the scientific ranks as many argue that using a scientifically questionable film for a public face on climate change risks trivializing the dangers of global warming. For global warming skeptics, the film offers a chance to deride global warming claims as far-fetched and reactionary.

To understand the complex dynamics that govern the use of *The Day After Tomorrow* in public discussions of climate change, this chapter explores the aforementioned issues in five sections. First, I provide a brief overview of the global warming debate, with particular regard to the points of agreement and disagreement within the scientific community. Second, I highlight the rhetorical dimensions of the global warming controversy and focus on how advocates struggle with the challenge of rhetorical invention — how to best frame the issue to maximize

attention and action. In the third section, a synopsis of *The Day After Tomorrow* helps uncover

the arguments presented in the film and elucidate how they are translated into public discussions

on climate change. Fourth, I discuss generally how *The Day After Tomorrow* becomes mobilized

in the public discourse and emerges a politicized text used in the service of advancing arguments

in favor of combating the causes and effects of global warming. This section pays particular

attention to how science interlocutors, both policy change advocates and warming skeptics,

respond to the film as a tool to promote public understanding of climate science. Finally, I

discuss how Al Gore and MoveOn.Org use *The Day After Tomorrow* as a targeted indictment of

George Bush's climate policy. This situated and highly political use of the film as a rhetorical

device reveals how scientific boundary work becomes more complicated as scientific discourse

moves from specialized to public spheres. In the end, such analysis reveals that debates over the

efficacy of film references in public discussions of science are not simple dichotomies of those

who accept the film reference into the discourse and those who wish to see it expelled. Rather,

this case study suggests that there is a great deal of rhetorical complexity when rhetors attempt to

resuscitate the critical aspects of a film even though the film fails certain standards of scientific

coherence.

4.2. A Breezy Overview of the Global Warming Debate

The theory that the Earth may be experiencing an unnatural warming trend triggered by

human factors, particularly carbon dioxide emissions, was first advanced by Swedish chemist

Svante Arrhenius in 1896 (Arrhenius 1896). Since Arrhenuis's original theory, there has been

considerable scientific inquiry regarding the possibility of human induced global warming and

the possible effects of warming trends. However, the inherent complexity of the climate makes

determining the existence, causes and effects of global warming scientifically complicated. Since the climate system contains countless intervening variables, traditional scientific experiments using dependent and independent variables that test the effects of certain variables are unfeasible. Global warming assessments are the products of interpreting data from various indexical records, including historical temperature records, air samples from ice cores, satellite data, etc. In addition to meteorological data, the predictions of global warming often rely on General Circulation Models (GCMs), computer simulations that attempt to replicate the climate system. The input of data in these GCMs, such as increases in the carbon dioxide or other greenhouse gases, intends to create climate "scenarios" that demonstrate the possibility and effects of global warming. Despite a near scientific consensus that the Earth is warming as a result of human interventions (IPCC 2001), the entire scientific process assumes various levels of scientific uncertainty.

These varying levels of scientific uncertainty have given warming skeptics ample opportunity to expose perceived problems in global warming science, whether such problems involve incompleteness of climate models, anomalous physical evidence, or dramatic warming scenarios (Michaels 1992, 1993, 2004d; Balling 1992; Michaels and Balling 2000). The debate over global warming becomes even more problematic when these discourse move out of specialized scientific spheres and into more public arenas.

Halting, and perhaps reversing, global warming trends and combating the effects of global warming requires significant legislative change that compels individuals, institutions, and industries to reduce greenhouse gas emissions. Such changes would be financially burdensome, taxing on industries and consumers, both in the United States and abroad. Even though public opinion polls suggest that people find global warming an important issue, it is a lower priority

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than immediate concerns such as a healthy economy and gainful employment (Kull 2005).

Therefore, global warming skeptics gain great rhetorical traction by identifying problems, even if

minor, with the science that confirms the existence and disastrous effects of global warming,

especially when efforts to address global warming are presented as deleterious to economic and

employment considerations.

The debate over global warming pivots on four major points of controversy. First, there is

the technical question regarding whether global warming is occurring and at what rate. Historical

temperature records and GCM predictions often assume a range of temperatures that can

magnify the perception of uncertainty. For advocates pressing for policy change such as

implementation of the Kyoto Protocol, the rhetorical challenge becomes contextualizing these

temperature ranges as evidence of serious warming trends. A second point of disagreement

concerns whether global warming is a product of human causes. There has been evidence of

climate change in the past, prior to the industrial age, and skeptics often point to such evidence to

suggest that human intervention is not linked to warming. Rather, warming trends are naturally

occurring phenomena that have little connection to human activity. Third, there is controversy

over whether global warming will have devastating effects. Global warming advocates highlight

such effects, while skeptics suggest that worst-case scenarios are based on unfounded hysteria

and fear. Fourth, developing policy solutions that attempt to curb the causes and effects of global

warming may be economically taxing. Consequently, cultivating enough scientific uncertainty

may dissuade support for radical changes. Although these four points of stasis are not exhaustive,

they do comprise the major foci of scientific and political disagreement on the issue (O'Donnell

2000).

Therefore, the rhetorical challenge for advocates of change is to counter persuasive skeptical arguments that suggest anti-warming legislation is hostile to economic progress by stressing the scientific consensus on warming and the urgency of the situation (Claussen 2002). This public discourse on global warming is a curious rhetorical illustration of how the boundaries demarcating legitimate science are contested and negotiated discursively.

Science communication scholars Julia Corbett and Jessica Durfee argue that in the journalists' efforts to adhere to conventions of balanced reporting, warming skeptics enjoy public attention that is incongruous with the attention they receive within science circles (Corbett and Durfee 2004). Because there are so few outspoken global warming skeptics, the same individuals are often quoted in various news stories, enabling more consistent arguments, as opposed to the numerous differences between scientists who may disagree on the rate and effect of global warming. This creates an artificial magnification of skeptics' arguments that enjoys equal exposure as the sometimes incoherent scientific consensus.

This amplification becomes even more problematic when we consider the global warming debate as an issue of science demarcation. The rhetorical strategy of warming skeptics, discussed later in greater detail, is to criticize the warming scientists as practicing bad or junk science. Although uncertainty is an inherent part of scientific practice, skeptics exploit any uncertainty as irresponsible scientific practice, amplifying their critique in light of the fact that these scientific arguments seek to inform public policy.

The rhetorical dilemma for scientists and environmental activists is to mobilize public interest and encourage involvement in addressing global warming in ways that counter the arguments of global warming skeptics. Although there are efforts to better translate the indicators of global warming into public discourse (Hansen et al. 1998), the discourse of global warming

skeptics is much more translatable into public discourse. By identifying incongruities in the physical evidence and the computer modeling, skeptics attempt to cast enough doubt on global warming and its effects that arguments about the adverse economic consequences of combating global warming gain trump status in the overall argument.

Casting enough doubt on the existence and effects of global warming is a rhetorical technique often utilized by politicians critical of global warming legislation. Republican communication strategists suggest that voting publics accede to policy changes once the science is settled. Therefore, the adoption and amplification of skeptical arguments on global warming prevents public support from coalescing for sweeping legislative change (Lee 2003).

The arguments against efforts to address global warming cast warming believers as hysterical, operating under a culture of fear. This rhetorical stance, similar to the rhetorical tactics adopted by critics of *The China Syndrome*, portrays warming believers as fear-mongers who do not adhere to objective inquiries.

4.3.   Warming Up to the Challenges of Mobilizing Publics

The debate over the efficacy of using *The Day After Tomorrow* as an attention-getting device closely echoes a much larger debate regarding the rhetorical strategies environmental movements use in addressing global warming. In 2004, environmental activists Michael Shellenberger and Ted Nordhaus published a controversial essay entitled, "The Death of Environmentalism: Global Warming Politics in a Post-Environmental World" (Shellenberger and Nordhaus 2004). This essay questions the failure of environmental movements to effectively promote anti-global warming legislation despite overwhelming scientific evidence and substantial public support. Their thesis suggests that previous legislative successes, such as the

Clean Air Act and the Clean Water Act, created an intoxicating confidence that future efforts would yield similar results. Shellenberger and Nordhaus argue that environmental movements possess a myopic political strategy that focuses on scientific arguments and technical solutions, thus isolating environmentalism as a special-interest group. As a result, environmentalists constrain their arguments and solutions to the "environment" for fear that any argumentative overreach would dissolve their political efficacy. This discursive strategy enables argumentative maneuvers that allow warming skeptics and industry advocates to reframe the debate by raising concerns that warming would affect job security and economic growth. In public debates, these short-term, palpable concerns tend to trump the distant impacts of global warming. As a result, environmentalists are placed in defensive position, accepting small pyrrhic legislative victories that fail to address the broader problems of global warming.

Shellenberger and Nordhaus identify the problems of the environmental movement as stemming from a root rhetorical failure: the inability, and perhaps unwillingness, to reframe global warming issues as fundamental moral problems that affect all aspects of society. They suggest that "environmentalists are in a cultural war whether we like it or not. It's a war over core values as Americans and over our vision for the future, and it won't be won by appealing to the rational considerations of our collective self-interest" (10). They suggest that environmentalists must learn from the rhetorical strategies adopted by conservatives who enshroud their political and economic arguments in religious and mythical discourses that speak to an overarching and visionary value system. The environmental movement's preference to eschew more moralistic rhetoric on the effects of global warming in favor of a more rational, scientific discourse is indicative of its inability to readjust to the new political climate. They recommend a more effective rhetorical strategy that places environmentalism on the offensive.

These recommendations recognize the limits of public understanding of science efforts in relation to political decisions regarding global warming, namely that knowledge of scientific arguments does not always translate into action or a reprioritization of concerns. Rather, in this view, scientific arguments must be put into particular contexts to better promote public understanding of science.

Shellenberger and Nordhaus are widely criticized by environmentalist leaders, including those they interviewed, for failing to understand the complexity of environmentalism, a broad-based, not special-interest, movement that is attempting to deal with a unique environmental issue, global warming. The rhetorical implications of their report are quite obvious. The pronouncement of the "death" of the environmental movement presents serious consequences in fund-raising and recruitment efforts. The most vocal critic of the report is Carl Pope, the president of the Sierra Club. In open memo to environmental grant-makers, Pope distances the report from the rest of the environmental movement, suggesting their conclusions are based in shoddy research that mischaracterizes the movement and their continued successes (Pope 2004). Pope criticizes the report on grounds that it mischaracterizes the environmental movement, offers underdeveloped alternatives, and undermines the movement for personal gain.

Pope, however, does agree with the conclusion that global warming needs to be reframed to become a more persuasive priority for voters and government. For example, he argues that publics associate the advancement of fossil-fuel industries with notions of "progress." Consequently, the public views legislation that limits the development of carbon-based resources, such as oil or natural gas, as evidence of punishing progress. Therefore, the rhetorical challenge is to present global warming as an environmental threat that has more localized and tangible effects.

In light of efforts to reconstitute the rhetorical strategies of the environmental movement to address global warming, the debate surrounding *The Day After Tomorrow* serves as an ideal site for evaluating the possibilities and liabilities of the rhetorical strategies Shellenberger and Nordhaus suggest. In addition to being a film that dramatizes the tangible effects of global warming, the film also depicts the struggle between scientists and government officials that support industrial interests. Consequently, the film is reflective of the actual discourses that inform existing public discussions of science. This illustrates that the rhetorical potential of *The Day After Tomorrow* may not just lie with its depictions of global warming, but also its portrayal of the difficulties in developing anti-warming policies.

4.4. *The Day After Tomorrow* and its Appreciation for Yesterday

The Day After Tomorrow provides environmental activists and warming believers with the opportunity to amplify public attention on the issue of global warming. The $120 million dollar film is replete with dramatic special effects, a notable cast and a bankable director, famous for spectacular popcorn disaster films (*Independence Day* and *Godzilla*). Moreover, the film, as evident by a number of the comments made by both the director and the producer, possesses a clear political and environmental message—the failure to address global warming will result in drastic environmental consequences.

The film does not hide its political intentions. First, the title alludes to the 1983 anti-nuclear ABC mini-series, *The Day After* that depicts the apocalyptic aftermath of a nuclear strike on Lawrence, Kansas and Kansas City, Missouri. *The Day After* was the brainchild of ABC Motion Picture executive Brandon Stoddard who, inspired by *The China Syndrome*, wished to produce a film that dramatically displays the effects of nuclear war. *The Day After* was watched

by over 100 million people (nearly half the adult population in the United States), the largest

television viewing audience for a made for TV movie at the time of its release. ABC promoted

the film with a robust advertising campaign that began months before its November airing. The

network anticipated such a national stir that they opened phone hotlines manned by counselors to

speak with individuals traumatized by the movie. Following the film, ABC televised a public

debate, including Carl Sagan and William F. Buckley, to discuss the scientific merits of the film

(Sagan believed the movie understated the devastating effects of nuclear war). The political fall-

out is rumored to have had a profound impact on President Ronald Reagan, who told *The Day*

After director Nicholas Meyer that his film helped spur negotiation of the 1986 Intermediate

Nuclear Force Agreement in Reykjavik (Niccum 2003).

Second, the advertising campaign for *The Day After Tomorrow* highlights its factual basis

as well as it intention to interrogate existing climate policy. The film's website opens with the

tagline: "There's more truth than hype." The promotional website cites numerous prestigious

science journals, such as *Nature*, *Geophysical Research Letters*, and *Science*, articulating the

likelihood of global warming, abrupt climate change, and a new ice age. Likewise, director

Roland Emmerich, producer Mark Gordon, and primary screenwriter Jeffery Nachmanoff,

despite the studio's superficial effort to keep the film clear of controversy (though no studio will

turn down free publicity), identify their intentions to create an enjoyable popcorn blockbuster

with clear political message (Sibbald 2004). The film's promotional material fully embraces the

political and environmental message; it cites a series of scientific reports and studies that

demonstrates the signs the global warming, even evidence of warming that is not depicted in the

film. Aside from the human drama that drives the personal narrative, the film's political and

scientific arguments are clearly evidenced in the competing discourses between warming

scientists and the discourses of skeptics that ignore them.

The Day After Tomorrow follows the story of Jack Hall (Dennis Quaid), a National

Oceanic and Atmospheric Administration (NOAA) paleoclimatologist, who advances a climate

change theory that suggests a remote possibility that continued global warming could initiate a

cooling cycle that plunges the Northern Hemisphere into a new ice age. His theory posits that

continued warming would melt the polar ice caps thereby decreasing the salinity of the ocean.

Presently, as the salty ocean currents carrying warmer tropical air cools upon reaching the polar

ice caps, salty water sinks to the ocean bottom to return to equatorial waters, creating the natural

oceanic conveyor belt, or the Atlantic thermohaline circulation, designed to keep the Northern

hemisphere hospitable. However, with the decrease in salinity, the Atlantic thermoline

circulation would shut down, preventing the temperate tropical air from reaching the cool

Northern Hemisphere.

His theory, as most climate change theories, is based on a healthy sampling of

temperature records, ice core samples, and sophisticated GCMs. Hall's theory possesses at least

enough credibility that he is invited to an international conference on global climate policy where

he discusses his theory with numerous world leaders. Hall provides a cautious warning that,

although he is uncertain when the world would experience rapid climate change, a warming

induced ice age would be inevitable if global consumption patterns and emission rates failed to

decrease. The most vocal critic of Hall's theory is the American Vice President, played by

Kenneth Walsh who shares an unmistakable and quite intentional likeness to Vice President Dick

Cheney. The Vice President is quick to assert that enough uncertainty remains in the science to

reject a legislative policy that would harm economic growth. Such complete dismissal from the Vice President and an unwillingness to listen to scientific evidence leaves Hall quite distraught.

The plot thickens when the Earth begins to experience dramatic shifts in weather patterns—multiple tornadoes in Los Angeles, grapefruit-sized hail in Tokyo, and massive snowfalls in Delhi. Evidence of rapid climate change begins to mount, validating Hall's theory. Satellite data and GCMs demonstrate that hurricane-like global superstorms are beginning to form, which are far worse than any of Hall's climate change scenarios predicted. The storms are so massive that the eyes of the storms pull down super-cool air from the outer layer of the Earth's atmosphere to the surface, flash freezing everything in its path. Hall tries to convince the White House, in particularly the Vice President, that the upper half of the United States will enter into a rapid ice age within weeks, requiring immediate and massive evacuations into the Southern half of the country and into Mexico. The Vice President continually resists, arguing that unnecessary panic would result, until the President, who possesses a striking resemblance to George W. Bush, accedes to the scientific arguments and initiates an evacuation.

The flash-freezing storm functions as a relentless and inescapable blob-like monster that adds to the requisite tension and impending danger that drives a disaster narrative. The storm separates Hall from his estranged son, who is in New York for a high school academic competition. Fulfilling his promise to rescue his son, Hall journeys through the harsh snowstorms (a practice he is well accustomed to as a paleoclimatologist) in his reliable SUV—an irony to be explored later in this chapter. The film concludes on a bittersweet note; although there are some survivors, there is no evidence that the ice begins to melt, suggesting that the Earth's frigid condition will remain. A contrite Vice President, who assumes leadership after the

President fails to escape the flash-freezing storm, offers a sincere apology on national television (on the Weather Channel) for failing to appreciate the scientific evidence of global warming.

The basic scientific premise of *The Day After Tomorrow* is based upon accepted science. In addition to the scientific studies that suggest the existence of human caused global warming, there are numerous theories that predict global warming would disrupt the oceanic cycle resulting in varying levels of climatic disruption (Weaver and Hillaire-Marcel 2004; Ton 2004; Broecker 2003). Furthermore, there exists scientific evidence that suggests the possibility of abrupt (measured in decades as opposed to weeks, as depicted in the film) and destabilizing climate change (Calvin 1998; Alley et al. 2003).

Although these scientific theories advance low-probability, high impact global warming scenarios, they receive serious government attention. A February 2004 Department of Defense report suggests that because of the scientific possibility of rapid climate change and the onset of a new ice age, the United States must take active measures to prepare for any risks associated with such climate shifts. The authors argue that the rapid onset of a new ice age would spark resources wars and massive refugee migration that the government is ill-equipped to handle. The media and the advertising campaign for the film were quick to recognize the parallels between an official government report and the events depicted in the movie (Whipple 2004; Pearce 2004).

Even though these theories posit low-probability, high-impact global warming scenarios, they are important to consider because their effects would be both devastating and irreversible.[3] Although abrupt climate change theories do not fall within the scientific mainstream because these scenarios develop more quickly and are more noticeably destructive, they are more

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[3] Abrupt climate change theories suggest that the environment (climate, ocean , etc.) has a certain carrying capacity where it can not absorb any more greenhouse gases without a large scale climatic shift. These theories suggest the climate functions like a switch, where change is abrupt and dramatic, instead of a dial, where change is gradual. This change in metaphor is important in demonstrating the possible immediacy and devastation of climate shift. However, even "dial" theories suggest the end state of climate shift may be similar to abrupt change.

dramatic and compelling. However, these theories are also most subject to criticisms for promoting alarmism because of the low probability of such scenarios. The invocation of such dramatic theories might heighten awareness and the need to address global warming, but they also may be criticized as the least scientific. As science journalism scholar Matthew Nisbet argues, *The Day After Tomorrow* offers the requisite drama that recommends it for cultivating public attention on significant science issues (Nisbet 2004). However, the question with respect to this project remains how interlocutors can rhetorically balance heightened awareness and scientific credibility in mobilizing action to combat global warming.

The Day After Tomorrow demonstrates a scenario where narrative conventions of a big-budget Hollywood disaster film can conflict with the scientific message the movie attempts to articulate. That Hollywood takes artistic license with facts to spin a compelling yarn is an obvious and banal observation. However, dramatizing the effects of global warming is an important rhetorical strategy for encouraging publics to act now to curb such a threat. Yet, the extent to which these dramatic liberties indict the more factual elements articulates the central rhetorical dilemma for those invoking the film to increase attention to global warming.

Whereas the stunning visuals may present an opportunity to depict the dangers of global warming, the seeds to its rhetorical ineffectiveness are inherent. Warming needs dramatizing, but it needs to be understood within a scientific context that assumes realistic effects of global warming. However, as evidenced in the first chapter, merely correcting "the science" in a film overlooks and even undermines its possible contribution to public discourses on science. *The Day After Tomorrow* is an illuminating example of how a film can color public discourse multiple ways because the same text can be used for numerous rhetorical ends. To understand the ramifications of such rhetorical decisions, next I explore the scientific debate about the merits of

the film and then examine how the film is used for more political ends. The division between the scientific and political uses of the film is somewhat artificial; global warming science is intimately entwined in deliberative discourses regarding climate policy. However, separate treatment of these dimensions highlights how they interact.

4.5. Will Global Warming Science be Credible *The Day After Tomorrow*?

Weeks prior to its Memorial Day 2004 release, *The Day After Tomorrow* became enveloped in the public scientific discourse on global warming. Scientists, both scientists and skeptics, capitalized on the opportunity to better educate publics on the "reality" of global warming (Bridges 2004; Coren 2004). Newspaper articles, Internet websites, and television specials quoted various scientists who identified the scientific fidelities or falsities in the film, and often to very different pedagogical or political ends. The National Resource Defense Council, Greenpeace, the Environmental Literacy Council, the Union of Concerned Scientists, National Snow and Ice Data Center, the Energy Future Coalition, and the Woods Hole Oceanographic Institution all created websites to answer questions about the science in the film and the reality of global warming. Each institution used images and quotes from the film throughout its website, highlight various dangers of global warming (Griscom 2004).

On the days leading up to the film's release, many of the major newspapers featured stories on the global warming debate that used *The Day After Tomorrow* as a qualified attention getting device designed to spur informed public debate on global warming (Bowles 2004; Hager 2004; Munoz 2004; Sennott 2004; Sibbald 2004; Vancheri 2004). Gretchen Cook-Anderson, a National Aeronautics and Space Administration (NASA) spokeswoman, notes "Whether its premise is valid or not, or possible or not, the very fact it's about climate change could help to

spur debate and dialogue" (qtd. in Barollier 2004). Likewise, Geochemist Michael Molitor suggests that the movie "is going to do more for the issue of climate change than anything I've done in my whole life" (qtd in. Booth 2004). Wallace Broecker, the earth scientist who first identified the link between ocean currents and abrupt climate shifts, believes the film is "wolf-crying science," but he concedes that no researcher will turn down "an opening to get our message out" (qtd. in Dayton 2004).

However, in these cases, scientists are careful not to dismiss the film *carte blanche* as wholly fictitious, placing aspects of the film on a fact versus fiction spectrum that concedes that some aspects of the film reflect scientific fact. Within this fact versus fiction idiom, rhetors are careful to identify how the film reflects some scientific accuracy. For example, climate expert Tom Prugh, in an interview with National Geographic on the scientific fidelity of *The Day After Tomorrow*, answers the question "how realistic is this movie?" by noting, "it has a kernel of truth, although it has been 'Hollywoodized.' There is evidence that abrupt climate change has happened a couple of times in the last 13,000 years, but it's never happened in a few days, as it does in the movie. That's completely impossible." Prugh's comment begins with a relatively positive appraisal of film before conceding its fictional elements. Prugh completes the interview with an endorsement of the film: "I would urge people to go see the movie. I thought it was a lot of fun. I would also urge them to drive to the movie theater together with a few friends [to conserve gas an put less exhaust into the atmosphere] and turn out all the lights in the house before they leave" (qtd. in Lovgren 2004a).

Furthermore, science rhetors sympathetic to the film are deliberate in calling attention to the dramatic elements that are requisites in a Hollywood film. Climate expert Heidi Cullen argues "some of the events in the movie we're beginning to see already. But of course everything

is condensed and dramatized" (qtd. in Bowles and Vergano 2004). Geoff Jenkins, a climatologist at the Hadley Centre for Climate Prediction and Research (which is depicted in the film), also provides a guarded account of the film when he states, "it's a movie and we shouldn't get too po-faced about it. Hollywood's not going to make money out of a bunch of scientists discussing uncertainties" (qtd. in Dayton 2004).

This rhetorical strategy attempts to render transparent narrative film making conventions (aspects of the film that are "just a movie") while maintaining the scientific credibility and significance of global warming. The "fact" versus "fiction" idiom comes into sharp relief as we consider Al Gore's speech on global warming that coincides with the film's New York premier. Gore argues that while the film may be over the top in its depiction of global warming, the real "fiction" is George Bush's climate policy that ignores the existence of global warming. Although I explore Gore's speech in depth later in the chapter, it is important to note that there is an active effort to reverse rhetorically the "fact" versus "fiction" divide. The science rhetors that use the film to promote public interest in climate change demonstrate a complex relationship with the film's rhetorical potential. In each case, these rhetors resist the straightforward classification of the film as "fact" or "fiction."

In contrast to this modulated perspective, there are a number of scientists sympathetic to global warming concerns who argue that the film has no place in the public discourse on climate change. Their fundamental concern centers on how audiences will accept the film and how that might shape public understandings of climate science. Janet Sawin, a climate and energy program director at the Worldwatch Institute, captures this concern when she argues that "there is some concern that what the movie shows is so extreme that people will say, Oh, that could never happen, so I'm not going to worry about it. That blows a very serious issue out of

proportion and could cause people who are skeptical to become even more skeptical" (qtd. in Lovgren 2004b).

A survey of the public discourse suggests that there are three major issues that trouble science interlocutors who wish to expunge the film from public discussion. First, they suggest that warming skeptics exploit the scientific infidelities in the film to indict real global warming science. For example, skeptical scientists argue that the film's suggestion that global warming would initiate a massive ice age defies common sense. While some reputable scientific theories indicate that warming could initiate an ice age, such an idea seems counterintuitive to those not well versed in meteorological sciences. These counter-intuitive depictions of the effects of global warming can prompt some audiences to dismiss global warming as a farce. Furthermore, during the 1970's numerous scientists and climate models predicted the onset of a new ice age. However, more sophisticated climate models and increased physical evidence suggests that steady global warming is the more likely scenario (McGuire 2003). Skeptics exploit this climate "flip-flop" as evidence of scientific uncertainty regarding global warming and the political motivations that inform climate science. *The Day After Tomorrow*, some scientists argue, obfuscates the debate and invites rhetorically powerful skeptic indictments of global warming science (Hopey 2004).

Second, the scientists argue that the cataclysmic events the film depicts, such as the flash-freezing superstorm and the exaggerated tsunami that crashes against the Statue of Liberty, although visually powerful, could confuse audiences as to the effects of global warming. These events are the dramatic devices that are the most obvious departure from scientific fact. Some scientists are concerned that such visual depictions are so ridiculous that audiences would discount global warming itself as a dramatic device and not a serious environmental and political

issue. Goddard Institute climate modeler, Gavin Schmidt notes that "all the climatologists are going to go (to see the movie) and have a good laugh. And perhaps a good cry as well [because] the extreme depiction (of climate change) could provoke a backlash" (qtd. in O'Hanlon 2004).

Bill McKibben, an environmental writer for *Grist Magazine*, clearly identifies the dilemmas of this central tension when he suggests that "It's always been hard to get people to take global warming serious because it happens too slowly" (McKibben 2004). But McKibben argues that while the film may focus attention to global warming and properly illustrate some of the effects of global warming, its depiction of the effects of global warming might set expectations too high. He argues that "if the reason we're supposed to worry about global warming is that it will first send a tidal wave over the Statue of Liberty and then lock it forever in an ice cube, anything less will seem…not so bad" (McKibben 2004).

Third, and perhaps most rhetorically compelling, some fear that the overt political message of the film taints global warming science as politically motivated and not adhering to the "objectivity" good science requires (Bowles 2004). These fears are quite evident in the rhetoric critics use to dismiss the film as liberal propaganda. Paul Dreissen, a senior fellow with the Committee For A Constructive Tomorrow and Center for the Defense of Free Enterprise, argues *The Day After Tomorrow* "breaks new ground in combining horror, propaganda and manipulation of history and science to serve political agendas" (Driessen 2004). Dreissen recasts global warming scientists as doing everything in their power to promote a "fright night" scenario, instilling irrational and scare tactics that oversell the potential impacts of global warming. This rhetoric of irrationality attempts to recast the boundaries between fact and fiction by suggesting that because the film is fictional, everything depicted in the film is therefore

fictional. This metonymic argumentative strategy is reflected in the strongest criticisms of the film.

For example, the most sustained and critical review of the film and its use by anti-advocates comes from Patrick Michaels, an outspoken warming skeptic from the CATO institute, a libertarian think tank. In three separate editorials, *the Washington Times*, *the Washington Post*, and the *USA Today*, Michaels launches an attack on global warming science and its depiction in the film. In these editorials, Michaels articulates a number of arguments in an attempt to discredit the film.

First, in a *Washington Times* editorial, which predates the film's release by over a month, Michaels criticizes the editors of *Nature* for publishing contradictory material regarding the effects of global warming. He argues that "On page 616 of the April 8 issue, *Nature* published an article using a technique [regional climate modeling] that it said, on page 593 of the same issue, was 'oversold,' was inappropriately influencing policymakers and was 'misunderstood by those in search of immediate results" (Michaels 2004c). Michaels argues that such inconsistency decreases the credibility for the magazine, promoting an overselling of a model that informs reactionary policy decisions. Michaels suggests that researchers have "admitted privately" that the models do not give accurate assessments of the regional climate change, and that reporters have been concerned that *Nature*'s handling of the global warming debate has raised concern. He suggests that journalists have expressed concern over the "shoddy reporting" at *Nature* and that a number of articles are published opportunistically, attempting to influence policy decisions. Michaels references the film once, identifying it as a ridiculous and alarmist depiction of global warming. He concludes his piece by noting that "This is nothing but tragic, junk science, published by what is (formerly?) the most prestigious science periodical in the world. There's

been a lot of hype—much of it from scientists themselves—over global warming, but nothing as sacrilegious as this, in such a sacred place." Michaels attempts to simultaneously valorize and excoriate *Nature* magazine. The warrant for his criticism lies in what he perceives as hypocritical stances that are explainable as politically motivated, alarmist arguments. The implication of which is that any alarmist observation or theory advanced lacks scientific credibility. This rhetorical strategy is further magnified by Michaels' more direct attacks on the film.

Michaels' two editorials in *USA Today* (Michaels 2004b) and *the Washington Post* (Michaels 2004a), both written before the film's release (he admits he has yet to see the film), follows a similar argumentative pattern. He first argues that he is troubled by the bastardization of science in the film for political ends. He begins his *USA Today* editorial noting "As a scientist, I bristle when lies dressed up as 'science' are used to influence political discourse." In both articles, Michaels attempts to secure the ethos of an "objective" scientist by contrasting his position with the alarmist and overly political message of the film.

He cites three primary scientific arguments that run counter to the science depicted in the film and in the film's advertising campaign. He argues that, unlike the claims made by the film, tornadoes and hurricanes are becoming less intense, instead of more powerful as a result of warming. Likewise, he argues that there could never be a shutdown of the ocean circulation system that would result in a rapid and massive ice age. For each argument, he cites a single scientist whom he introduces as the most knowledgeable in his or her area of specialty. As a result, his rhetoric positions any exaggerated depiction of global warming as irrational, thereby non-scientific. The upshot of Michaels' position is that adoption of any exaggerated depiction of global warming, as evidenced by the film, by groups attempting to bring attention to global warming, indicts the scientific rationality of consequent arguments.

Michaels' indictment of those who invoke the film in public discussions of global warming is magnified when the film is used to advance more political arguments. Michaels assumes the enthymematic position that a Hollywood film should be dismissed outright because such texts are inherently fictional, liberal propaganda. According to Michaels, the adoption of the film by liberal groups to help make an argument against current environmental policies discredits their entire argument. His argument intentionally over-determines the role of the film in articulating policy. To substantiate this argument, he draws parallels to *The China Syndrome* as evidence of a film causing hysteria and unwarranted policy changes. His argumentative move suggests that as a blanket norm, films should not influence public policy decision-making.

Michaels (2004a) cleverly argues that "Let's not forget that the planet is warmer than it was when the Little Ice Age ended in the 19th Century, and that people have had something (not everything) to do with that. But what Gore and the movie do is exaggerate this largely benign truth into a fictional apocalypse." By conceding that there is evidence of warming (warmer than it was after an ice age), Michaels pre-empts counter-arguments that his views fall outside of the scientific consensus that the Earth is warming. But by arguing that the effects are negligible, he suggests that any argument that accepts the dramatization of the effects of global warming, especially ones that are scientifically suspect, are wholly irrational.

In the end, Michaels' rhetorical strategy is to exploit apparent contradictions by climate scientists to validate his assertions that warming science lacks credibility. Moreover, he argues that these contradictions are evidence of political motivations that invariably taint good science. By pointing out that his arguments do not fall prey to such contradictions or motivations, Michaels positions his observations as inherently more scientific. This rhetorical strategy reflects a form of boundary works that seeks to identify the proper methodologies and motivations as

benchmarks to credible science. The irony, however, is that Michaels is not part of the scientific

mainstream. As evidenced in Intergovernmental Panel on Climate Change report (2001), the

scientific consensus is that the planet is warming and humans are the primary cause. Therefore,

the boundary work that Michaels pursues is for public consumption. As a result, casting the film

and by extension the global warming debate into a simple fact versus fiction dichotomy receives

a great deal of rhetorical traction for publics unknowing of the complexities of climate change

science.

4.6. Where is the Real Fiction?: MoveOn.org's Campaign for *Tomorrow*

Unlike the interviewed scientists who believe *The Day After Tomorrow* is a tricky

referent in promoting public attention to global warming, MoveOn.org, the liberal organization

geared toward preventing a Bush reelection, wholly embraced *The Day After Tomorrow's* timely

release as an opportunity to criticize the Bush administration's environmental policies. The

MoveOn.org anti-global warming campaign is particularly notable because *The Day After*

Tomorrow serves as the clear centerpiece. In promoting their anti-Bush global warming

campaign, MoveOn.org employed two main strategies. First, the MoveOn.org campaign, as

evident on their website, asked concerned citizens to pass out pre-made fliers regarding global

warming outside local theaters during the weekend of the film's release. Second, MoveOn.org

sponsored a public rally to coincide with the film's New York premier where keynote speaker Al

Gore condemned the Bush administration for irresponsible and environmentally hostile climate

stewardship polices.

First, the one-page flier, "Global Warming Isn't Just a Movie. It's Your Future," provides

two succinct arguments that suggest the inevitability of global warming save some immediate

action (MoveOn.org 2004). Problem one states that scientific evidence concludes that the Earth is warming faster than at any point in history and evidence of such warming are everywhere— "Glaciers at the North Pole are melting. Sea levels are rising. Storms are intensifying" The flier notes that "the abrupt climate crisis in *The Day After Tomorrow* is over the top. A full-blown ice age could not happen. But global warming could bring dangerously cold temperatures in some areas, while others suffer severe storms, extreme heat, floods, droughts, and water shortages." Problem two identifies a single impediment "to real progress toward stopping global warming: President George W. Bush." "The Solution" to such problems is the development of new, environmentally friendly technologies "that will dramatically cut pollution (and create hundreds of thousands of new jobs right here in America)." The flier concludes by admonishing its reader to "Act now. Because we can't wait until the day after tomorrow."

MoveOn.org's rhetorical strategy attempts to separate the visual force of the film from its problematic science. Although there are numerous indicators of the effects of global warming, the flier identifies those events depicted in the film (melting polar ice caps, sea levels rising, ultra-violent storms) as scientifically valid effects of global warming. The flier makes clear concessions that the film is "over the top" with its depiction of runaway and rapid ice age, but there is no suggestion that the film should thus be disregarded *in toto.* The flier's optimistic rhetoric suggests the solution is appealing to President Bush to support anti-warming legislation, including Senator John McCain (R-AZ) and Senator Joe Lieberman's (D-CT) climate stewardship act, and ratify the Kyoto treaty.

However, MoveOn.org's employment of the film in the public discourse differs from the way scientists cite the film in public scientific arguments, in that MoveOn.org's *raison d'etre* is to prevent the reelection of George W. Bush. The employment of the film is for specific political

purposes and not exclusively a sweeping environmental change. Al Gore's global warming speech for a MoveOn.org "Town Hall" meeting best illustrates this point. Gore's rhetoric suggests that the "real fiction" is George Bush's climate policy and his refusal to appreciate legitimate scientific evidence of global warming (O'Malley 2004). Gore's use of the "fiction" trope echoes the rhetorical strategy of Michaels, enacting an absolute distinction between fact and fiction. Unlike the interviewed scientists who articulate qualified appraisals of the film, parsing through elements of fact and fiction, Gore's position, which clarifies that the real fiction is Bush's climate policy, suggests that *The Day After Tomorrow* is not the "real fiction."

Al Gore is subject to a great deal of criticism from both sides of the scientific debate for his rhetorical endorsement of the film. Gregg Easterbrook, *The New Republic* writer and a believer in human induced global warming, suggests that Gore's support of the film only trivializes legitimate science because of the film's absurd depiction of global warming. Easterbrook's arguments reflect those of scientists hesitant to identify *The Day After Tomorrow* as a positive contribution to public discussions of climate science because such endorsements expose themselves to disparagement from warming skeptics. Expectantly, David Rothbard, the president of the Committee for a Constructive Tomorrow, a free-market libertarian think tank, exploits Gore's association with the film, noting "Since Al Gore had such success peddling science fiction as reality in his book *Earth in the Balance*, it's no surprise he's all ozoned-up about a global warming movie with similar fantasy-as-fact foundations" (Morano 2004). These rhetorical maneuvers, in particular, position the endorsement of a fictional account of science as evidence of problematic science. As a result, type of rhetorical demarcation occurs that relies on determining fact versus fiction.

However, another form of demarcation is at play that does not directly occur within the discourse. MoveOn.org's campaign centers on the notion that *The Day After Tomorrow* is the film George Bush "does not want you to see." This argument becomes quite reasonable given the White House's response to *The Day After Tomorrow*.

The Bush Administration has often been criticized for its lack of support for scientific arguments and investigations. Bush's policies on missile defense, stem cell research, and pollution regulations are subject to intense scientific scrutiny. The Union of Concerned Scientists (Shulman 2004) and Representative Henry Waxman (Waxman 2003) have issued very sustained and poignant attacks against the Bush Administration's response to and silencing of scientific arguments. Separately they argue that the Bush administration consistently misappropriates scientific information to advance political and ideological agendas, while silencing scientific arguments that challenge such agendas. In an effort to maintain an ethos of objectivity, open-mindedness, and rationality, scientific discursive practices always maintain the importance of openness. However, the Bush administration's effort to silence discussion regarding the film substantiates the charges Waxman and the Union of Concerned Scientists advance.

Notably, MoveOn.org's attacks on the Bush Administration are heightened by an internal memo sent out to employees at NASA Goddard Space Administration instructing scientists not to speak with reports regarding the film (Revkin 2004). Scientists at NASA, on condition of anonymity, spoke with *New York Times* reporter Andrew Revkin claiming that such a direction is typical of the Bush Administration's effort to downplay the risk of global warming and silence scientific discourse. The memo suggests that the reason scientists could not speak with reporters about the film is because the producers did not sign a promotional agreement with NASA prior to the release of the film, which could invite copyright problems when it comes to the use of the

NASA logo (Cowing 2004). NASA superiors relented and clarified its position as not silencing

scientific discussion, but clarifying the legal reasons the agency could not engage reporters

(Mahone 2004). The internal memo from Glenn Mahone, Assistant Administrator of Public

Affairs at NASA, suggests that "NASA expects that as colleagues, we will speak our minds,

regardless of whether those views work to the advantage of the agency or not….[and] this

direction [to not speak to reporters] should not be interpreted as an attempt to keep scientists

from speaking out on the issue of climate change. We encourage our researchers to openly

answer all appropriate questions regarding the science explored in the movie" (Mahone 2004).

Although the memo advances a position that encourages open scientific discourse, even if

it runs contrary to the institutional positions, it is a direct contrast to the gag order NASA initially

presents. The initial gag order is couched in a friendly, matter-of-fact discourse that cites the

obstacles that prevents NASA scientists from talking about the film as if they were unfortunate

but necessary legal issues that are unrelated to scientific discourse. However, the consequence of

the memo is still a silencing mechanism that scientists identified as a typical practice under the

Bush administration. The NASA memo is not the only evidence of government silencing with

regard to the film.

To coincide with the release of the film, NOAA developed a website that investigates the

scientific validity of abrupt climate change. Mark McCaffrey, NOAA's science communication

coordinator and the site's lead author, believes the film to be an appropriate occasion to educate

people on global warming and climate systems, and like other institutional efforts, parsing

through the facts and fictions of the science depicted in the film. After receiving permission from

NOAA administrators to go live with the site, McCaffrey was told to put the website

"indefinitely on hold—with no further explanation" (Griscom 2004). After the film's release and

the media storm that accompanied it, NOAA became flooded with inquires about a rumored site that discussed abrupt climate change in relation to the film. Under such scrutiny, McCaffrey was allowed to post the site. Like the NASA scientists, NOAA scientists also demonstrated concern that such actions were typical of an anti-science bias that seeks to curb scientific discourse that runs counter to existing climate policies.

The governmental gag-order on both NASA and NOAA reveals a compelling dynamic regarding the boundaries of science. If the film truly demonstrates laughable science, as the warming skeptics suggest, then its impression on public scientific discourse is at worst negligible. In fact, it seems as if warming skeptics prosper from anti-warming interlocutors invoking the film as a warrant to combat global warming. Warming skeptics often advance the argument that global warming fears are often exaggerated by anti-warming scientists in order to generate baseless public fear. Warming skeptics suggest that the adoption of *The Day After Tomorrow* to promote public attention on global warming is evidence of such alarmist tendencies. As a result, warming skeptics create a rhetorical linkage between the fictional elements of the film and what they label as the alarmist, and therefore irrational, arguments of anti-warming scientists.

However, the gag order suggests that the film may have discursive dimensions that threaten existing government policy. Although the Bush administration has a history of ignoring scientific evidence in the formulation of policy, the active gag-order blocking public discussion demonstrates an intentional anti-science behavior. In essence, the gag order suggests that NASA and NOAA scientists should not discuss this non-scientific film because it runs counter to administration policies. However, such active suppression of public discussion, even if the film depicts bad science, counters science argument norms. By preventing NASA and NOAA

scientists from commenting of the film, the Bush administration rhetorically granted efficacy to the film. Whereas all the other science interlocutors, both advocates and skeptics, construct boundaries of science rhetorically, the gag order institutionally enforces a boundary. Such an act operates counter to the ethos of frank and informed scientific discourse. This act of exclusion becomes even more pronounced in public discussion of science where the boundaries of science are not informed by disciplinary practices, as evident within scientific spheres, but by rudimentary and universal concepts of science. Consequently, the gag order not only irks scientists but raises public suspicions as to why the Bush administration fears open discussion of the film.

4.7. Conclusion

As is often the case with many summer blockbusters, stunning visuals and spectacular special effects often eclipse insightful commentary. Outside of demonstrating the competing discourses between scientists and skeptical politicians, the film possesses few philosophical moments. *The Day After Tomorrow*, by most accounts, is not a very good *film*: the human drama is trite, the script has numerous plot holes, and the characters are flat. Unlike more contemplative science fiction films that ruminate on our relationship with science and technology (*2001: A Space Odyssey*, *GATTACA*, *Blade Runner*), the most notable narrative aspects of *The Day After Tomorrow* are its story of a scientist's attempt to convince reluctant policymakers of future environmental catastrophes and powerful visuals of the effects of global warming.[4]

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[4] By way of an ironic historical example, Nicholas Meyer, director of *the Day After*, intentionally made a lesser-quality film. He did not want people discussing the film's cinematic qualities (the acting, the soundtrack, the script, etc.), but its depiction of nuclear war. Meyer believed that focus on the film as a film distracted from the film's political and visual message.

The rhetoric surrounding *The Day After Tomorrow* and the global warming debate demonstrates that a film's impact on public scientific discourse is determined by a complex negotiation between fact and fiction. As many science rhetors suggest, the film blends some scientific fact with a heavy dose of Hollywood fiction. For environmentally concerned advocates, the rhetorical struggle is to liberate the factual elements of the film, such as illustrating the dangers of global warming, from the dramatic, unscientific elements. My analysis reveals that advocates negotiate this rhetorical struggle by simultaneously calling attention to the need to address global warming while distancing themselves from Hollywood aspects of the film. In other words, each reference to the film is highly qualified with statements that clearly delineate scientific fact from its fictionalization.

Warming skeptics assume a similar rhetorical stance, focusing on the factual and fictional elements of the film to come to the "truth" about global warming. However, their comments emphasize the fictional elements of the film as reflective of what scientists believe. According to warming skeptics, when science rhetors adopt *The Day After Tomorrow* as evidence of dangerous global warming, these climate advocates are only promoting alarmists fears that are based in scientific fictions.

Both rhetorical strategies suggest that the lines between fact and fiction are porous rhetorical constructions. And as rhetorical constructions, they are subject to movement and rearticulation. This idiom of fact versus fiction is particularly salient in public discussions of global warming science. Within specialized scientific circles, warming skeptics remain on the margins. However, in media coverage of global warming science, skeptics receive equal attention from journalists who seek balanced reporting. Since decisions on if and how we combat global warming are products of public deliberation and are not the sole province of specialized

scientific spheres, arguments either for or against action must be put into publicly accessible terms.

Because global warming is likely to unfold gradually, where its impacts are difficult to understand in contrast to the more localized and immediate economic effects, *The Day After Tomorrow* presents an attractive commonplace for science rhetors to promote public discussion. The film's dramatic depictions of the impacts of global warming are visually spectacular, thus giving a visual analog to the impacts of global warming. However, this presents the inherent risk that endorsement of the film as evidence of global warming effects exposes anti-warming arguments to charges of alarmism. This provides warming skeptics with the rhetorical opportunity to indict anti-warming arguments as fictions, especially when interlocutors concede the fictional dimensions of the film.

However, the discursive impact of the film to advance efforts to address global warming does not only reside in film's depiction of science. Government response to the film is illustrative of previous critiques of Bush Administration deals with science. Some of the most notable sociological assessments of scientific practice (Popper and Merton) observe that openness is essential to any good scientific discourse. The initial silencing of NASA and NOAA scientists demonstrate a rhetorical opportunity for warming believers to develop new argumentative strategies regarding the film. Although MoveOn.org identifies the White House's approach to the public discussion, their campaign suggests that such a response is a product of continual anti-democratic tendencies and not as a practice illustrative of anti-scientific tendencies that continually ignore arguments about the effects of global warming. Even though the science in *The Day After Tomorrow* is suspect and falls prey to promoting misunderstandings regarding global warming, the film's depiction of how governmental figures and warming skeptics dismiss

evidence of global warming is not without precedent and might be the most rhetorically efficacious aspect of the film. As Bette Hileman suggests in a review for the Reel Science section of *Chemical and Engineering News*, "the movie's main message is that because the U.S. government ignored scientists' warning about the ravages of global warming, civilizations as we know it ends" (Hileman 2004).

5. The Final Reel

5.1. Introduction

The epistemic fruits of scientific practice can certainly nourish democratic societies. In this view, the tradition of critical inquiry and open exchange of ideas that underwrites scientific enterprises is essential to promote rational and prudent discourses necessary for intellectual, social and cultural progress. However, a commitment to scientific inquiry may also entail civic practices that run against the grain of democratic ideals. The specialization of scientific knowledge ensconced in inscrutable terminologies and detached methodologies often insulates scientific practice from public inspection, even though the processes and products of such knowledge-producing enterprises have a direct and discernable impact on those publics (Fuller 1988). The colonization of public spheres by specialized technical discourses often interferes with processes of democratic decision-making. The ethos historically afforded to scientific discourse combined with its exclusionary terminology functionally truncates opportunities for non-scientific rhetors to engage in collective conversations on scientific matters (Wander 1976).

Although scientific practice functions most smoothly when outside influences are kept at bay, these exclusionary practices, despite introducing anti-democratic consequences, have tangible, negative ramifications on scientific inquiry. For example, expensive "big science" failures (such as the Semi-Conducting Supercollider) and contradictory scientific claims (such as debates over global warming or the effects of radiation) have sown mistrust and heightened tensions between technical authorities and non-scientific publics, placing continued public support for scientific enterprises in doubt. In an era where society looks to science for answers but wishes such enterprises to be reasonably priced with definable and tangible results, justifying scientific inquiry is becoming an increasingly complicated rhetorical task.

On one hand, publics who fund various scientific projects and are affected by the products of scientific labor ought to have input into the scientific enterprise insofar the democratic channels, such as balloted propositions, local hearings, and candidate endorsement, afford such opportunities. Although this is not entirely true for private scientific enterprises, government funded science projects are often subject to public accountability where scientists must articulate and defend their scientific inquiries. Consequently, science interlocutors must speak in terms that non-scientific audiences can understand. On the other hand, scientifically ignorant publics who influence scientific practice risk undermining intellectual progress. Ill-informed public opinions and irrational fears of science and technology distort public discussions of science and can have harmful influences on the development of science policy. As John Ziman argues, anti-scientists who wield rhetorically powerful claims often trump careful and substantiated scientific claims in public spheres of deliberation. Likewise, popular depictions of science can incite irrational fears that can cloud deliberative judgment on scientific issues. Even though these rhetorically powerful statements among non-scientists may lack argumentative and logical merit, they are no less persuasive (Ziman 2000b). The lack of terminological and methodological commonplaces with non-scientific publics often results in scientific claims that are difficult to translate into public discourse, thus undercutting the persuasive potential of such claims.

Efforts to address these dilemmas have taken the form of public understanding of science movements designed to educate non-scientific publics about scientific knowledge:

> With science under threat, scientists around the world began to wonder if the relationships between science and the public perhaps needed a little attention; and their efforts, along with the reactions of social scientists and the activities of politicians, educators, and interest groups, have come together under the banner of public understanding of science with such coincidence and cooperation that both advocates and critics alike speak of a public understanding of science

> 'movement,' which is manifesting itself, in different ways and for different purposes, in many parts of the developed and developing worlds. (Gregory and Miller 1998, 3)

With decreased interest in science careers among Americans, especially among the young, and increased apprehension toward science, scientists and science advocates argue that educating publics on scientific matters inherently promotes greater enthusiasm and appreciation for scientific inquiry. However, traditional approaches to promoting public understanding of science rely on a deficit model where scientific experts bestow knowledge onto unscientific publics yet fail to contextualize scientific information.

Science is not a monolithic entity that produces factual information for public consumption. Competing scientific claims and full-blown scientific controversies are not uncommon in scientific practice. When controversies arise that challenge certain scientific practices, rhetorical boundary work for determining acceptable science quickly follows suit (Gieryn 1999; Taylor 1996). As Ziman argues, the adjudication of scientific controversies within scientific spheres is highly ritualized, for scientific discursive spheres lack the same type of deliberative bodies used to evaluate competing claims in political (the legislative assembly) and judicial (the courthouse) arenas (Ziman 2000a). However, scientific debates are not always determined exclusively by epistemic considerations and are often informed by non-scientific interests and discourse. Ziman argues these "transcience" issues "involve personal, institutional, and cultural interests and values that are systemically excluded from scientific argumentation. These interests are integral to the debate and have to be given public expression, even to the level of the imputation of self-interested motives to individual participants" (197). The critical distance that underwrites the ethos of objectivity is not always relevant to the needs and conditions that influence the reception of scientific artifacts.

These "transcience" issues become more pronounced as scientific debates move from specialized scientific spheres into public deliberative spheres. Although scientific discourse promotes an ethos of objectivity, when scientific claims are presented to non-scientific audiences in deliberative spheres, they are often used in the service of larger policy arguments. In other words, scientific arguments do not "stand on their own scientific merit," but are part of a larger decision calculus that incorporates a series of normative, political, and social dimensions. The rhetorical practices science rhetors use to persuade one another often find little persuasive power in public arenas populated by individuals unfamiliar with the methodologies and terminologies indigenous to a specialized scientific sphere. The translation of scientific arguments into social discourses, however, is a complicated, but necessary, rhetorical task. It becomes even more complicated when non-scientific publics must adjudicate competing scientific claims.

Even public understanding of science efforts that successfully educate non-scientists *about* science do little to provide publics with ways to *judge* science. Given the cultural and epistemic capital of science, publics will often gravitate toward the most "scientific" arguments. However, determining the best science invites considerable rhetorical difficulties. As Thomas Gieryn and Charles Alan Taylor argue, scientists engage in a sustained practice of rhetorically demarcating good science from bad science and pseudo-science from real-science. While there is indeed a public dimension to their observations, both Gieryn and Taylor focus on how scientists employ particular rhetorical gestures for audiences of other scientists to resolve controversies within specific scientific spheres. The theoretical gap in their observations is how science is demarcated for non-public audience. My analysis suggests that examining how scientists employ patently popular discourses in public discussions of science fills this theoretical void.

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5.2.   Common Themes Emerging from the Analysis

If this dissertation makes at least one observation clear, it is that as technical discourses migrate into social spheres, science fiction film references become more salient. The sheer exposure and availability of popular films make them accessible rhetorical commonplaces where scientists and non-scientists can engage discussions of science and technology. The use of films to generate excitement and interest in science receives a great deal of attention from science pedagogues (Efthimiou and Llewellyn 2004a, 2003, 2004b; Gough 2000; Dubeck, Moshier, and Boss 1988). This same dynamic occurs with film references in public discussions of science. However, my analysis reveals that the role of films in public scientific discourses is more than just an attention getting device. Films rarely move into public discussions of science uncontested. As evident in the debates surrounding *The Day After Tomorrow* and *The China Syndrome*, references to the films intending to generate public attention are met with strong resistance from particular scientists.

My research indicates that film references are most prevalent in public discourses where unresolved scientific debates move into public spheres. As David Kirby argues, when scientists serve as film consultants, they participate in a form of public "alliance building" that helps secure public acceptance of particular epistemic claims. Kirby, operating in the same spirit as Bruno Latour, views films as contributing to the construction of scientific knowledge. This process of alliance formation occurs when the science is unsettled and science interlocutors call upon various persuasive tactics to resolve such epistemic debates. I argue that scientists who reference films in public discussions of science are participating in a similar form of alliance-building that generates public support for their contested epistemic claims.

Because the discursive techniques scientists use within specialized scientific spheres do not always have the same rhetorical cachet in deliberative social spheres, it stands to reason that science fiction films can serve such a rhetorical function. However, science fiction films are understood as, first and foremost, fiction, even if the film contains kernels of truth. Non-scientific publics look to science for the "facts." Even if this idea of "fact" is a problematic term for those who study scientific practice (Ziman 2001; Kuhn 1996; Gross 1996), the rhetorical connections between science and fact remain powerfully persuasive devices for non-scientific publics who look to science for objective knowledge. Consequently, when rhetors import fictional texts into factual discussions, there is a collision of discourses that require vigilant efforts by interlocutors to separate the science "fact" from the science "fiction" for public consumption.

My analysis reveals that this rhetorical emphasis on where fact ends and fiction begins, or visa versa, is a form of scientific boundary work for non-scientific publics. This form of demarcation becomes increasingly difficult when we consider films that are produced with particular attention to depicting science accurately. I argue that because science fiction films, such as the ones evaluated in this project, seek to anchor their fictional qualities in elements of science fact to achieve various levels of fidelity, distinctions between fact and fiction become rhetorical constructs. This becomes even more complicated when we consider that these films contextualize scientific and technical issues within narratives that offer normative assessments of science and how we use it. Therefore, debates over the proper boundary between fact and fiction not only affect assessments of a film's scientific fidelity, but also the facts and fictions of the normative claims the film makes. This comes into sharp relief in the debates over *The China Syndrome* and *The Day After Tomorrow*. Both films center on scientific issues that have yet to be

resolved. With respect to *The China Syndrome*, the scientific debate focuses on the safety of nuclear technology and its possible mismanagement. The scientific debate underlying *The Day After Tomorrow* concerns the existence and the extent of human-induced global warming. In each case, the rhetors who initially promote the film as efficacious in the public scientific discourses are the ones who seek some type of policy change, be it greater regulation on the nuclear industry or increased efforts to curb global warming.

Both of these scientific controversies center on issues of probability. In other words, what are the scientifically informed "chances" that a nuclear power plant will experience a meltdown or global warming will devastate the planet, and should we take the appropriate actions to address those possibilities despite the costs? My analysis suggests that these science fiction films operate in this space where scientific probabilities interface with public policy questions, where attending "non-scientific" arguments are necessary to adjudicate these probabilities.

In each case, the film's release presents exigences, or kairotic moments, where science rhetors could capitalize on the heightened public awareness of a specific scientific issue as illustrated in the film to generate public interest in the actual science. However, science interlocutors are not required to use film as a vehicle for promoting a particular scientific argument, therefore the rhetorical choice to use film to generate public discourse, as Richard Vatz would argue, imbues the film with a sense of salience. When we consider a film's saliency, we must consider both the film's scientific *and*, in Walter Fisher's terminology, narrative fidelity. Therefore, determining a film's saliency in public discussions of science becomes increasingly complex when we consider how rhetors respond to expunge the film from the discourse.

This analysis reveals that when rhetors attempt to challenge the efficacy of a film reference in the public discourse, they employ a two-fold process. First, these interlocutors identify a series of scientific inaccuracies within the film. As evident with the anti-*China Syndrome* discourse, nuclear energy advocates, especially after the TMI crisis, parse through a series of minor inaccuracies within the film to undermine what Fisher calls its narrative "coherence." The same is true for *The Day After Tomorrow* critics who focus on the film's scientific failures to highlight how the film is a poor contribution to public discourse on policy matters. As Fisher reminds us, if a narrative lacks coherence, then its contributions to a rational normative discourse becomes suspect. Second, these rhetors use the film's "incoherence" to indict both the normative and scientific claims advanced by the film. For example, critics of *The Day After Tomorrow* use the film's ridiculous depiction of global warming as a way of indicting global warming science and undermining the credibility of global warming activists. In other words, their argument suggests that if global warming activists have to employ a alarmist, fictional film to illustrate the importance of global warming, then, by extension, the global warming argument is equally fictitious and alarmist.

These arguments are rhetorically powerful because they inscribe clear distinctions between fact and fiction. However, they do not appreciate, albeit intentionally, the distinctions between scientific facts and fictions and normative facts and fictions. In other words, just because *The China Syndrome* fails to accurately depict the exact process of a nuclear accident does not necessarily mean its critique of the nuclear industry's inattention to safety is invalid.

Because the transcientific aspects of a film's narrative that contextualize scientific fact are not subject to the same standards of judgments as those standards which judge the fidelity of cinematic depictions of science, the lines that demarcate fact from fiction become muddy. In

other words, the film's human narrative may have an effect that rings true, but the cinematic depictions of science may not enjoy the same level of fidelity in regard to existing epistemic standards, and visa versa. But as I suggest, science rhetors who seek to expel the film from the discourse conflate such standards to judgment in order to dismiss the film entirely, both its depiction of science and the normative claims it makes about the science.

Past scholarship suggests that non-scientific arguments, such as narrative based arguments, can persuasively challenge specialized scientific discourses. For example, Simon Locke argues that individual testimonials can have a more persuasive appeal than well-supported scientific arguments in blocking localized scientific projects (Locke 2002, 2001). Locke bases his interpretation on Michael Billig's concept of witcraft, a mode of argument invention inspired by *dissoi logoi*, the art of identifying countervailing arguments (Billig 1996). Locke suggests that a process of rhetorical invention that entertains a multiplicity of arguments, even those that violate particular scientific norms (such as narrative arguments in scientific discourses), broadens the rhetorical landscape and allows more interlocutors to participate in the public scientific discourse. I argue that films in the public scientific discourse function in a similar fashion, exposing audiences to an even broader array of available arguments. In the end, I believe my analysis has a generative *telos* to "open up" scientific discourse to include a variety of arguments that do not rely exclusively on understanding the complex terminologies of specialized discourses.

Chapter Three demonstrates this potential for film to broaden scientific discourse to include arguments not predicated on intricate knowledge of a scientific practice. The ALRC's decision to incorporate *GATTACA* in the report rests on the fact that they believe the film's narrative effectively articulates the numerous issues at stake regarding the advancement of

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genetic science. Because there is no opposition to *GATTACA*'s inclusion in the report, the film assumes a level of credibility in the discourse. Unlike *The China Syndrome* or *The Day After Tomorrow*, *GATTACA* is not a pointed critique of a particular science or technology (or specific industries). Rather, the film is an indictment of a particular mindset or discourse that few science rhetors, if any, would actively defend. As a result, there is no real effort to discredit the film's depiction of a science or technology. This enables rhetors to focus on how a narrative can help audiences appreciate the complexity of essentialist discourses which can not be expressed though technical scientific discourses. Specifically, this chapter demonstrates how interlocutors can benefit from films to create textured arguments that can influence discourses of science that do not rest solely of epistemic or empirical claims.

5.3.   Rhetoric of Science: The Debate From Within

This project approaches public discussions of science rhetorically. A rhetorical approach to examining scientific discourse provides critical tools to identify how scientists and non-scientists bridge various discursive divides. Despite a great deal of academic work on the rhetorical dimensions of science, there exists no consensus that a rhetorical approach to science studies yields serviceable intellectual or theoretical contributions to understanding the various dimensions of scientific practice. The debate over the efficacy of rhetorical studies is most specifically captured in the 1997 book, *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science* (Gross and Keith 1997). The centerpiece of this work is Dilip Gaonkar's criticism of rhetoric of science that challenges this subfield of rhetorical scholarship. Unlike scientists who question rhetorical approaches to science on the basis that such analysis misunderstands science (Sokal and Bricmont 1997), Gaonkar's primary concern resides with

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critics' misunderstanding and misappropriation of rhetoric. Gaonkar, in his critique of existing rhetoric of science efforts, develops four lines of analysis (Gaonkar 1997).

First, Gaonkar argues that the rhetorical canon developed out of a tradition that emphasizes discourse production and not textual interpretation. The original theories of rhetorical production, beginning with Isocrates and Aristotle and expanded in the work of Cicero and Quintilian, are designed to help interlocutors to participate in the public sphere. Gaonkar argues that because the inherent character of classical rhetoric is geared toward discourse production, the terms of art associated with this tradition do not effectively translate into critical tools useful for interpreting texts.

Second, Gaonkar observes that rhetoric is designed for discourse production comes with heavy theoretical baggage, namely a problematic theory of human agency. In the postmodern condition, according to Gaonkar, ideology and agency are fractured, and notions of agency that informed classical rhetoric have only limited applicability. This is especially true in the case of science, where human agency is limited in scientific spheres where epistemic claims are usually the result of collaboration and community acceptance.

This assessment of rhetorical theory folds into Gaonkar's third concern with rhetoric of science. Because rhetoric germinated as a productive art, the critical vocabulary of production becomes "thin" when employed as a tool of interpretation. In describing thinness, Gaonkar is "referring to the abstract quality of the traditional vocabulary as illustrated, for instance, in the tripartite scheme of proofs (*ethos*, *pathos*, and *logos*) that enables one to find its presence in virtually any discourse practice" (33). In essence, if one looks for rhetoric, one will find it. And, given that the classical tools available are inherently abstract, it is difficult to disprove the presence of rhetoric in any given discourse. The thinness of rhetorical vocabulary, according to

Gaonkar, is evident by the lack of constraints the terms possess. Unlike other theoretical approaches (citing deconstruction and psycholanalysis) that have a more specific and critical lexicon for discourse analysis that advance interpretations subject to falsification, interpretations born out of a rhetorical vocabulary are so thin and abstract that they elude falsification. According to Gaonkar, terminology from rhetorical theory often escapes precise definition, and therefore the quality and depth of rhetorical analysis is limited by the ability to marshal enough evidence to substantiate a legitimate interpretation that enjoys community acceptance.

Gaonkar argues that this thinness leads to, fourth, the globalization of rhetoric that promotes disciplinary anxiety. This is extremely problematic considering the tumultuous history of rhetoric and its second class relationship to disciplines such as philosophy. By repositioning the object of study away from discourse production and making rhetoric subservient to other disciplines' content (for example the *rhetoric of* science or *rhetoric of* economics), rhetoric mortgages its own intellectual value. Indeed Gaonkar advances this argument not so much as an intellectual problem, but one of academic politics. Gaonkar is indeed correct to identify how others in various disciplines are doing rhetorical analyses, even if they do not acknowledge their critical insight as products of rhetorical hermeneutics or ignore the term "rhetoric" altogether.

Charles Willard, in his retort to Gaonkar, suggests that Gaonkar is too reactionary in his assessment of the problems of globalization (Willard 1997). Willard remains unconcerned about the prospects of globalization, citing that other disciplines, such as anthropology and sociology have faced the same globalizing trend, but have remained strong. Such ruminations have particular salience for this dissertation, with its interdisciplinary nature that incorporates objects of study and critical vocabularies that fall under the guise of film theory, media studies, science fiction analysis, and rhetorical criticism.

Critics of Gaonkar concede that such considerations must be addressed to ensure the intellectual robustness to rhetoric of science endeavors. However, many critics suggest Gaonkar's critiques are rather reactionary, indicting the theoretical fortitude of the entire rhetorical discipline and not just rhetoric of science. In defense of rhetoric, in particular rhetoric of science, Michael Leff argues that Gaonkar overestimates the production/interpretation division. Leff suggests that classical rhetorical practice encompassed both production and interpretation. The ancient teachers of rhetoric employ pedagogical activities where students imitate and evaluate discourse to uncover the rhetorical successes and shortcomings of particular rhetorical performances. Leff argues:

> The function of rhetorical education, at least in its more liberal variants, was to impart the practical judgment and linguistic resources an orator needed to encompass particular situations. The oratorical faculty depended upon the ability to make the appropriate response to the circumstances at hand; hence propriety (prepon or decorum) in rhetoric, like prudence in ethics, could not be reduced to technical or theoretical rules. (Leff 1997, 97)

This argument suggests that because rhetoric is more concerned with situations and contingencies, rhetors can not rely on overarching methods and immutable rules to produce efficacious discourse. However, Leff believes this does not disqualify rhetorical criticism as a valid intellectual pursuit that provides value-added interpretations. The value and theoretical robustness of rhetorical interpretations of science, according to Leff, lie in an adherence to case study methodologies, a sentiment shared by many rhetoric of science scholars (Halloran 1984; Ceccarelli 2001; Lyne and Howe 1986). Furthermore, Leff argues that constraints need not lie exclusively with a critical lexicon; rather, the case study methodology provides the necessary constraints for achieving the theoretical validity of rhetoric of science.

John Angus Campbell, extending on Leff's observations, suggests that case studies, as evidenced in most rhetoric of science scholarship, provide the necessary constraints for

theoretical robustness (Campbell 1997). By engaging in specific scientific debates or controversies, rhetorical critics can reveal how issues of text, context, contingency, and situation, all essential elements to the art of rhetoric, produce textured and valuable interpretations. Furthermore, Campbell rearticulates interpretation as performance, a production of rhetorical discourse that is a result of argument invention and persuasive efforts. As a result, the agency of the rhetor producing the analyzed discourse is not overdetermined by the critics, appreciating the fractured nature of agency Gaonkar readily points out. Rather, agency rests with that of the critic. This places the critic in an important position to affect social change by producing discourse that opens spaces for further argument invention, like the rhetors of antiquity. Campbell (1997) concludes "in marrying thought with life, humanism makes critique urgent, civic, demanding, and worthwhile. In the wideness of its understanding of practice—a practice constrained by its subject, circumstances, and setting yet dependent more on the critic than on set methods—the classical tradition provides a rich store of critical tools, not least of which is the example of able performers" (129).

My research benefits richly from Campbell's call to merge practice and criticism into constructive interpretations that advance one's civic responsibilities and as well as the potential for rhetoric to call attention to other modes of discourse that are often overlooked in non-rhetorical critique. This dissertation attempts to adhere to the considerations advanced by Leff, Campbell, and others to advance rhetoric of science scholarship. The limitations of each case study in this dissertation reside not only in limited and situated scientific discourses, but how those discourses filter though the rhetorical use of a particular film. In each case study, the film becomes the conduit through which knowledge claims, scientific practices, and technological innovations are examined, contextualized, and adjudicated. Furthermore, critical inspection on

how rhetors engage such films as worthy or unworthy sites of rhetorical invention helps identify the boundaries that demarcate scientific arguments.

Furthermore, my analysis offers a novel response to Gaonkar in that it considers how rhetors struggle to produce appropriate discourse for situated audiences. Rhetoric is the discursive art associated with the production of targeted discourse to persuade audiences within deliberative spheres. However, the inherent difficulty for science rhetors is the challenge to find ways to express technical discourses to broad public audiences. Unlike the rhetoric of science scholarship that Gaonkar critiques as thinning the theoretical robustness of rhetoric, my analysis engages discourses in public, deliberative spheres—arenas the art of rhetoric is designed to engage. Although this argument suggests that my analysis falls comfortably within the theoretical scope of classical rhetorical theory, I believe this scholarship can have a more expansive reach. The upshot of my analysis is that once that discourse enters into these public spheres and technical discourses are expressed using more social discourses, the opportunity for greater public engagement is presented.

Steve Fuller, in his contribution to *Rhetorical Hermeneutics*, supports Gaonkar's position, but takes it in directions that Gaonkar may not fully endorse. Fuller argues that "the more rhetoric of science looks like classical rhetoric, the less exciting the interpretations seem" (Fuller 1997b, 279) For Fuller, classic rhetorical criticism, employed by the detached rhetorical critic, yields few intellectual results regarding the larger role of science. According to Fuller, the rhetoric of science scholar must take a more active and political role in their scholarship. Fuller's "strong program" exposes scientific disciplines as essentially rhetorical, illuminating the techniques that detract outsiders from fundamentally understanding knowledge production. For Fuller, the failure of academics resides in the calcification of disciplinary boundaries, precluding

the possibility of external inspection. Ultimately, Fuller endorses democratizing knowledge production, given that their epistemic fruits affect those beyond the discipline. He develops his position in two major lines of thought.

First, Fuller argues that scientific disciplines, through various rhetorical devices, insulate themselves from external criticism. For example, Fuller argues that science scholars maintain a practice of disciplinary self-reference, building knowledge claims upon an epistemic foundation already accepted as native to the discipline. This practice of self-reference manifests a specialized vocabulary indigenous to a particular discipline. As a result, knowledge claims are expressed in technical jargon that is incomprehensible to disciplinary outsiders. Fuller spells out the upshot of this by noting, "knowledge differences become reality differences when it becomes impossible to communicate across those differences" (Fuller 1993, 28). Consequently, these disciplines maintain their autonomy, free to pursue any intellectual undertaking without regard to the external impact of their efforts or findings. Fuller finds these insulating practices troublesome in a democratic society. Since products of intellectual labor, such as technology, affect the larger society, external involvement in epistemic enterprises such as science is crucial. While Fuller, whose intellectual roots are in the history and philosophy of science, primarily addresses the internal workings of science, he recognizes the importance of public perception of science in knowledge production. To that end, Fuller, in the second major thread found in his work, suggests a new form of knowledge production, social epistemology.

Fuller introduces the idea of social epistemology in his book by the same name (Fuller 1988). As an alternative to current discipline based forms of knowledge production, social epistemology incorporates the normative qualities from the philosophical tradition and the empirical methodologies of sociology to produce a more responsible and accountable form of

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knowledge. Fuller argues that, "left to their own devices, academic disciplines follow trajectories that isolate them increasingly from one another and from the most interesting intellectual and social issues of our time" (33). It is this increasing isolation from larger sociological issues that he finds most troubling, especially given the sweeping influence of science and technology. Through an agenda of social epistemology, Fuller wishes to include disciplinary outsiders into various epistemic projects, making the citizenry producers, rather than mere consumers, of knowledge.

To that end, Fuller sees two preconditions necessary for rearticulating knowledge production. First, "scientists must be motivated to restructure their research agendas in light of more general concerns about the ends their knowledge serves." Second, publics must be motivated to see "their fate as tied to the support of one or another research program" (31). To complete the aforementioned objectives, Fuller turns to rhetoric as a means of opening up scientific discourse for public involvement. This not only promotes broader engagement in scientific discourse, but also broadens the horizon for argument invention, by merging interpretive theory and rhetorical praxis. This is not to suggest, however, that Fuller's social epistemology is an idealist effort to reform the knowledge making process exclusively on the discursive plane. Once scientific communities are forced to provide a more thorough justification of their knowledge pursuits, based on the need for institutional funding, those external to the discipline become integral members to knowledge formation. Science is then viewed, not as an isolated arena of knowledge production, but as part of a larger cultural fabric.

Although one promoting social epistemology, Fuller contends, must be knowledgeable of the scientific process and the rhetorical tools necessary to "open-up" science to external influences, the democratization of science requires publics not only to be willing to participate in

the process, but also to be knowledgeable about science and technology. To complete his theory, Fuller must, and does, maintain that non-scientific publics possesses a working knowledge of science, and only need to be motivated to participate in knowledge production. This tacit understanding of science and technology is enough for publics to participate in the formation of science policy. Fuller believes that publics do not operate in a false consciousness of how science "truly" works, a claim levied by most scientists. Rather, he holds that publics possess a partial truth, or working knowledge, of the innerworkings of science.

Even if the citizens' understanding of science is not reflective of "true" science, it does not disqualify them from participating in the epistemic enterprise. Whether the public's knowledge of science is misguided or not, Fuller is correct to assert that the public does have some knowledge of science. The question, however, becomes where do publics acquire knowledge of science and how might that affect public discourses on science.

Fuller argues that science education comes from both educational institutions and media. Even if our formal education ends in school, news media track public debates that open play out on science policy. While Fuller makes a passing reference for social epistemology to develop an understanding of the performing arts, rarely is the importance of art or entertainment in understanding science highlighted in his work. While my analysis exposes this blind spot, it also opens the opportunity to identify spaces where non-scientists can produce discourses that engage scientific issues without mastery of the terminology. I agree with Fuller's position that scholars need to approach science rhetorically in order to "open up" scientific discourses to external inspection. My scholarship suggests films can operate as those discursive switching stations where scientists and non-scientists can explore the various normative dimensions of scientific practice.

5.4.   Avenues for Future Research

The history of science reveals that scientific discourses are not just the vehicle for the transmission of epistemic claims, but also conduits for the speculation and imagination of future innovation and scientific advancement. Examination of the rhetorical nuances of speculative scientific discourse, however, often eludes the critical eye of more extensive research on the discursive elements of scientific discovery and rationality.

Furthermore, existing science scholarship provides few critical tools to appreciate how scientific discourses seek to ruminate on scientifically grounded, but patently imaginative speculations, of the future of scientific and technological innovations. The intellectual trajectory of science studies often centers on investigations of the historical and sociological influences that guide scientific practice and the philosophical underpinnings that define it. But as uncovered in Chapter One, the discursive divisions that separate speculative science and existing scientific inquiry are not wholly discrete.

Any casual historical survey of science uncovers a rather intimate relationship between scientists, scientific practice and science fiction. For example, Johannes Kepler, in his story *The Somnium* ("The Dream"), first imagined the possibility of weightlessness in outer space and the feasibility of a journey to the moon. Many fictional works, both literary and cinematic, have been equally prophetic regarding scientific and technological advancements.

Analysis of the relationship between science and science fiction is more than an academic curiosity that extols the prescient gifts of talented science fiction writers and film-makers. The imaginative arena of science fiction has a history of inspiring generations of scientists to engage in scientific practice. Future research that ruminates on the uses of imagination as rhetorical devices for scientific discourse is a reasonable extension of this research. As discussed in

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Chapter One, when science turns to speculation, the tropes native to science fiction begin to surface. This becomes particularly important in the negotiation between the rhetorical demarcations of fact and fiction. The spectrum of science fact to science fiction (or visa versa) is a fruitful trope for rhetors to draw upon in shaping public understandings of science. On one hand, rhetors can claim that science fiction is becoming science fact to either promote enthusiasm for particular scientific or technological advancements or to provide warning of an impending dystopia. Conversely, rhetors can suggest science fact is far from science fiction, rhetorically belittling observations to the contrary as sophomoric products of the imagination. Further research might build on my work to move beyond film to analyze other non-traditional artifacts, thereby reasserting the role of imagination in public scientific discourse.

A similar research trajectory turns the critical lens inward to rhetoric, in particular the debate over the epistemic value of rhetoric. Since Robert Scott's germinal piece on rhetoric as an epistemic practice (Scott 1967), rhetorical scholars have engaged in fruitful debates over the epistemic and aesthetic value of rhetoric (Brummett 1990; Whitson and Poulakos 1993; Cherwitz and Hikins 1990). It can be argued that a rhetor's choice to employ a film to teach a lesson about science constitutes an aesthetic choice. However, there are occasions where those aesthetic choices can have tangible implications for public debates on science. Most rhetoric of science scholarship that seeks to uncover rhetorical dimensions in scientific practice rarely explores the aesthetic dimensions of scientific discourse.

Follow-on research might revisit Nietzsche's criticism of science as an ascetic ideal that eschews the rhetorical and aesthetic dimensions of epistemic claims (Nietzsche 2001, 1998). Nietzsche's valorization of aesthetics as an epistemic enterprise preferable to the objective ethos of scientific inquiry positions rhetoric as an essential means for critiques of science. This

research could provide rhetorical scholars with an additional set of critical tools that are not subject to charges of "thinness."

In the opening section of this dissertation, I identified numerous areas where film references surface in various public scientific arenas, from popular science journals to situated public debates. One such example was last year's inaugural American Film Institute screenwriting seminar for scientists. Interested in not only scratching a creative itch, these scientists-turned-screenwriters were concerned about the misappropriation of science in popular film. The project was deemed such a success that a second annual seminar was held this past summer with many of the participants representing the Pentagon (Halbfinger 2005). This increasing interest in the representation of science in films by scientists, and in particular scientists from institutions such as the Pentagon, suggests that critics need to heed particular attention to all the avenues of public scientific discourse, even if it is just a movie.

Bibliography

Alley, R.B., J. Marotzke, W.D. Nordhaus, J.T. Overpeck, D.M. Peteet, R.A. Pielke, R.T. Pierrehumbert, P.B. Rhines, T.F. Stocker, L.D. Talley, and J.M. Wallace. 2003. Review: Abrupt Climate Change. *Science* 299:2005-2010.

ALRC, and AHEC. 2001. Issue Paper 26-Protection of Human Genetic Information.

———. 2002. Discussion Paper 66-Protection of Human Genetic Information.

———. 2003. ALRC 96-Essentially Yours: The Protection of Human Genetic Information in Australia.

Anderson, W. French. 2000. A Cure That May Cost Us Ourselves. *Newsweek*, January 1, 74.

Arrhenius, Svante. 1896. On the Influence of Carbonic Acid in the Air Upon the Temperature on the Ground. *Philosophical Magazine* 41:237-276.

Balling, Robert C. 1992. *The Heated Debate: Greenhouse Predictions versus Climate Reality*. San Francisco: Pacific Research Institute for Public Policy.

Barns, Ian. 2002. Submission in Response to the ALRC/AHEC Issues Paper: Protection of Human Genetic Information.

Barollier, Pascal. 2004. *Disaster Flick Puts Spotlight on Global Warming*, May 26 2004 [cited May 27 2004]. Available from http://entertainment.iafrica.com/features/324967.htm.

Baudrillard, Jean. 1994. *Simulacra and Simulation*, *The Body, in theory*. Ann Arbor: University of Michigan Press.

Begley, Sharon. 1998. Designer Babies. *Newsweek*, November 9, 61.

Benford, Gregory. 2001. Where Might it Lead? *Nature* 414:399.

Biesecker, Barbara A. 1989. Rethinking the Rhetorical Situation from Within the Thematic of Differance. *Philosophy and Rhetoric* 22 (2):110-130.

Billig, Michael. 1996. *Arguing and Thinking: A Rhetorical Approach to Social Psychology*. Second ed. Cambridge: Cambridge University Press.

Bitzer, Lloyd F. 1968. The Rhetorical Situation. *Philosophy and Rhetoric* 1 (1):1-14.

Booth, William. 2004. Turning Up the Hype. *Washington Post*, May 27, C1.

Bowles, Scott. 2004. "The Day After Tomorrow" Heats Up a Political Debate. *USA Today*, May 26, 1A-2A.

Bowles, Scott, and Dan Vergano. 2004. Killer Weather, or Not? *USA Today*, May 26, 8D.

Bridges, Andrew. 2004. *Scientists Embrace Plot for "Tomorrow"*. AP Wire, May 4 2004 [cited May 5 2004].

Bridges, James. 1979. *The China Syndrome*. United States: Columbia-TriStar.

Brinton, Alan. 1981. Situation in the Theory of Rhetoric. *Philosophy and Rhetoric* 14 (4):234-248.

Broecker, William S. 2003. Does the Trigger for Abrupt Climate Change Reside in the Ocean or in the Atmosphere? *Science* (5625):1519-1523.

Brooks, David. 2004. Clearing the Air. *New York Times*, April 20, A19.

Brown, Kenneth M. 1998a. *Downsizing Science: Will the United States Pay a Price?* Washington, D.C.: The AEI Press.

Brown, Les. 1979. G.E. Quits Fonda Show Over Atom-Power Issue. *New York Times*, February 28, C22.

Brown, Richard Harvey. 1991. Narrative in Scientific Knowledge and Civic Discourse. *Current Perspectives in Social Theory* 11:313-329.

———. 1998b. *Toward a Democratic Science: Scientific Narration and Civic Communication*. New Haven: Yale University Press.

Brummett, Barry. 1990. The Reported Demise of Epistemic Rhetoric: A Eulogy for Epistemic Rhetoric. *Quarterly Journal of Speech* 76:69-72.

Bucchi, Massimiano. 1998. *Science and the Media: Alternative Routes in Scientific Communication*. New York: Routledge.

Bukatman, Scott. 2002. *Terminal Identity: The Virtual Subject in Postmodern Science Fiction*. Fifth ed. Durham: Duke University Press. Original edition, 1993.

Burke, Kenneth. 1969. *A Rhetoric of Motives*. Berkeley: University of California Press.

Burnham, David. 1979. Nuclear Expert Debate *The China Syndrome*. But Does It Satisfy the Nuclear Experts? *New York Times*, 18 March, D1.

Calvin, William H. 1998. The Great Climate Flip-Flop. *Atlantic Monthly* 281 (1):47-60.

Campbell, John Angus. 1990. Scientific Discovery and Rhetorical Invention: The Path to Darwin's *Origin*. In *The Rhetorical Turn: Invention and Persuasion in the Conduct of Inquiry*, edited by H. W. Simons. Chicago: University of Chicago Press.

———. 1997. Strategic Reading: Rhetoric, Intention, and Interpretation. In *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science*, edited by A. Gross and W. M. Keith. Albany: SUNY Press.

Ceccarelli, Leah. 2001. *Shaping Science with Rhetoric: The Cases of Dobzhansky, Schrèodinger, and Wilson*. Chicago: University of Chicago Press.

Cherwitz, Robert A., and James W. Hikins. 1990. Burying the Undertaker: A Eulogy for the Eulogists of Rhetorical Epistemology. *Quarterly Journal of Speech* 76:73-77.

Claussen, Eileen. 2002. Climate Change: Myths and Realities. Paper read at Emissions Reductions: Main Street to Wall Street, July 17, at New York City.

Cohen, Maurie J. 2004. George W. Bush and the Environmental Protection Agency: A Midterm Appraisal. *Society and Natural Resources* 17:69-88.

Collins, Francis S., Lowell Weiss, and Kathy Hudson. 2001. Heredity and Humanity: Have No Fear. Genes Aren't Everything. *The New Republic*, June 25, 27.

Condit, Celeste M. 1999a. How the Public Understands Genetics: Non-Deterministic and Non-Discriminatory Interpretations of the "Blueprint" Metaphor. *Public Understanding of Science* 8:169-180.

———. 1999b. *The Meanings of the Gene: Public Debates about Human Heredity*. Madison: University of Wisconsin Press.

———. 2001. What is "Public Opinion" About Genetics? *Nature* 2:811-815.

Condit, Celeste M., Alex Ferguson, Rachel Kassel, Chitra Thadhani, Holly Catherine Gooding, and Roxanne Parrott. 2001. An Exploratory Study of the Impact of News Headlines on Genetic Determinism. *Science Communication* 22 (4):379-395.

Condit, Celeste M., Nneka Ofulue, and Kristine M. Sheedy. 1998. Determinism and Mass-Media Portrayals of Genetics. *American Journal of Human Genetics* 62:979-984.

Consigny, Scott. 1974. Rhetoric and Its Situations. *Philosophy and Rhetoric* 7 (3):175-187.

Corbett, Julia B., and Jessica L. Durfee. 2004. Testing Public (Un)Certainty of Science: Media Representations of Global Warming. *Science Communication* 26 (2):129-151.

Coren, Michael. 2004. Climate Flick Favors Fantasy Over Fact. *CNN.com*, May 28.

Cowing, Keith. 2004. *New York Times Fans Global Warming Film Controversy with NASA Memos*, April 25 2004 [cited April 29 2004]. Available from http://www.spaceref.com/news/views.html?id=949.

Davin, Eric Leif. 1999. *Pioneers of Wonder: Conversations with the Founders of Science Fiction*. Amherst, New York: Prometheus Books.

Dayton, Leigh. 2004. The End is Not Quite Nigh. *The Australian*, May 26.

Despoja, Natasha Scott. 2001. Personal Genetic Information Must Be Protected. *Courier Mail*, December 12, 15.

Dionisopoulos, George N., and Richard E. Crable. 1988. Definitional Hegemony as a Public Relations Strategy: The Rhetoric of the Nuclear Power Industry after Three Mile Island. *Central States Speech Journal* 39:134-144.

Disch, Thomas M. 1998. *The Dreams Our Stuff is Made of: How Science Fiction Conquered the World*. New York: Free Press.

Driessen, Paul K. 2004. *The Day After the Day After Tomorrow* [website] 2004 [cited April 27 2004]. Available from http://www2.techcentralstation.com/1051/printer.jsp?CID1051-042204D.

Dubeck, Leroy W., Suzanne E. Moshier, and Judith E. Boss. 1988. *Science in Cinema: Teaching Science Fact through Science Fiction Films*. New York: Teachers College Press.

Efthimiou, Costas, and Ralph A. Llewellyn. 2005. *Physical Science: A Revitalization of the Traditional Course by Avatars of Hollywood in the Physics Classroom*, March 1 2003 [cited May 1 2005]. Available from http://arxiv:physics/0303005vi.

———. 2005. *Cinema as a Tool for Science Literacy*, April 16 2004a [cited May 1 2005]. Available from http://arxiv:physics/0404078v1.

———. 2005. *"Physics in Films:" A New Approach to Teaching Science*, April 13 2004b [cited May 1 2005]. Available from http://arvix:physics/0404064v1.

Emmerich, Roland. 2004. The Day After Tomorrow. United States: Warner Brothers.

Farago, Peter. 1976. *Science and the Media*. Oxford: Oxford University Press.

Farrell, Thomas B., and G. Thomas Goodnight. 1981. Accidental Rhetoric: The Root Metaphors of Three Mile Island. *Communication Monographs* 48.

Fisher, Walter R. 1989. *Human Communication as Narration: Toward a Philosophy of Reason, Value, and Action*. Columbia: University of South Carolina Press.

Frank, Scott. 2003. Reel Reality: Science Consultants in Hollywood. *Science as Culture* 12 (4):427-469.

Friedman, Sharon M. 1981. Blueprint for Breakdown: Three Mile Island and the Media Before the Accident. *Journal of Communication* 31:116-128.

Fuller, Steve. 1988. *Social Epistemology*. Bloomington: Indiana University Press.

———. 1993. *Philosophy, Rhetoric, and the End of Knowledge: The Coming of Science and Technology Studies*. Madison: University of Wisconsin Press.

———. 1997a. Putting People Back Into the Business of Science: Constituting a National Forum for Setting the Research Agenda. In *Scientific and Technical Communication: Theory, Practice, and Policy*, edited by J. Collier: Sage.

———. 1997b. Rhetoric of Science: Double the Trouble? In *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science*, edited by A. Gross and W. M. Keith. Albany: SUNY Press.

———. 1998. *Science*. Edited by F. Parkin, *Concepts in Social Thought*. Minneapolis: University of Minnesota Press.

Gamson, William A., and Andre Modigliani. 1989. Media Discourse and Public Opinion on Nuclear Power: A Constructionist Approach. *The American Journal of Sociology* 95 (1):1-37.

Gaonkar, Dilip Parameshwar. 1997. The Idea of Rhetoric in the Rhetoric of Science. In
    Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science, edited by
    A. Gross and W. M. Keith. Albany: SUNY Press.

Garwin, Richard J. 2000. Nuclear Reaction. *Foreign Affairs*.

Gaut, Berys. 1999. Identification and Emotion in Narrative Film. In *Passionate Views: Film
    Cognition and Emotion*, edited by C. Plantinga and G. M. Smith. Virginia: Johns Hopkins
    Press.

Gieryn, Thomas F. 1999. *Cultural Boundaries of Science: Credibility on the Line*. Chicago:
    University of Chicago Press.

Gillette, Robert. 1979. N-Plant Gone Haywire: Good Idea for Movie, But Real-Life Quandary.
    The Patriot, March 29.

Goodnight, G. Thomas, and Kathryn M. Olson. 1994. Entanglements of Consumption, Cruelty,
    Privacy, and Fashion: The Social Controversy of Fur. *The Quarterly Journal of Speech*
    80 (3):249-276.

Gough, Noel. 2000. Locations, Liminalities, and Literacies: Science Education in *the Crash Zone*
    (and other Heterotopian Spaces). In *AARE/NZARE Conference*. Melbourne, Australia
    1999: AARE.

Grant-Davie, Keith. 1997. Rhetorical Situations and Their Constituents. *Rhetoric Review* 15
    (2):264-279.

Gregory, Jane, and Steve Miller. 1998. *Science in Public: Communication, Culture, and
    Credibility*. Cambridge: Perseus Publishing.

Griscom, Amanda. 2004. *The Day After Tomorrow* Never Dies: Film Plot Rings True as NOAA
    Runs Up Against White House. *Grist Magazine*, June 3.

Grolier, Multimedia Encyclopedia. 1995. History and Definition of Science Fiction.

Gross, Alan. 1996. *The Rhetoric of Science*. Boston: Harvard University Press.

Gwynne, Peter, Phyllis Malamud, Mary Hager, and Sharon Begley. 1979. Credibilty Gap.
    Newsweek, April 23, 86.

Hager, Robert. 2004. *The Science and Fiction of "Day After Tomorrow"*. MSNBC, May 27 2004
    [cited May 27 2004]. Available from http://msnbc.msn.id/id/50548474.

Halbfinger, David M. 2005. Pentagon's New Goal: Put Science Into Scripts. *New York Times*,
    August 4, E1.

Halloran, S. Michael. 1984. The Birth of Molecular Biology: An Essay in the Rhetorical
    Criticism of Scientific Discourse. *Rhetoric Review* 3:70-83.

Hamilton, Tyler. 2003. '97 Flick Contains Message for Today. *The Toronto Star*, September 15,
    C01.

Hansen, James, Makiko Sato, Jay Glascoe, and Reto Ruedy. 1998. A Common-Sense Climate
    Index: Is Climate Changing Noticeably? *Proceedings of the National Academy of Science*
    95:4113-4120.

Haraway, Donna J. 1991. *Simians, Cyborgs, and Women: The Reinvention of Nature*. New York:
    Routledge.

Harmetz, Aljean. 1979. Fallout From *China Syndrome* Has Already Begun. *New York Times*,
    March 11, D1.

Harrington, John. 1973. *The Rhetoric of Film*. New York: Holt, Rinehart and Winston, Inc.

Hileman, Bette. 2004. *Reviews: The Day After Tomorrow*, August 25 2004 [cited October 3
    2004]. Available from http://pubs.acs.org/cen/reelscience/reviews/day_after/.

Hilgartner, Stephen. 1990. The Dominant View of Popularization: Conceptual Problems, Political Uses. *Social Studies of Science* 20 (3):519-539.

Holden, Constance. 1997. Didactics of *GATTACA*. *Science* 278:1019.

Hollinger, Veronica. 1999. Contemporary Trends in Science Fiction Criticism. 1980-1999. *Science Fiction Studies* 26:232-262.

Hopey, Don. 2004. Scientist Doubts Such Drastic Results. *Pittsburgh Post Gazette*, May 27, C1-C2.

IPCC. 2001. Climate Change 2001: The Scientific Basis, Contribution of Working Group I to the Third Scientific Assessment Report of the Intergovernmental Panel on Climate Change: Cambridge University Press.

Jackson, Shirley Ann. 2005. The Nexus of Science and Society. Paper read at 2005 Annual Meeting for the American Association for the Advancement of Science, February 17, at Washington, D.C.

Jameson, Fredric. 1991. *Postmodernism, or, The Cultural Logic of Late Capitalism*, *Post-contemporary interventions*. Durham: Duke University Press.

Janson, Donald. 1979. Radiation is Released in Accident as Nuclear Plant in Pennsylvania. *New York Times*, March 29, A1.

Kach, Victor. 1988. How to Deal with Public Concerns and Resistance. *International Journal of Radiation* 31 (1-3):157-160.

Kalbian, Aline H., and Lois Shepherd. 2003. Narrative Portrayals of Genes and Human Flourishing. *The American Journal of Bioethics* 3 (4):W15-W21.

Kayton, Myron. 1979. Nuclear Power--Yes. *New York Times*, April 30, A 17.

Keller, Evelyn Fox. 2002. *The Century of the Gene*. Cambridge: Harvard University Press.

Kemeny, John G. 1979a. Staff Report to the President's Commission on the Accident at Three Mile Island: Report of the Emergency Preparedness and Response Task Force: The Office of the President.

———. 1979b. Staff Report to the President's Commission on the Accident at Three Mile Island: Report of the Public's Right to Information Task Force: Office of the President.

Kemp, Martin. 1997. Seeing and Picturing: Visual Representation in Twentieth-Century Science. In *Science in the Twentieth Century*, edited by J. Krige and D. Pestre. Paris: Harwood Academic Publishers.

Kennedy, Randy. 2004. Forget Star Chemistry. How About the Film's? *New York Times*, September 30, B1.

Kirby, David A. 2000. The New Eugenics in Cinema: Genetic Determinism and Gene Therapy in *GATTACA*. *Science Fiction Studies*:193-215.

———. 2003a. Science Advisors, Representation, and Hollywood Films. *Molecular Interventions* 3 (2):54-60.

———. 2003b. Science Consultants, Fictional Films, and Scientific Practice. *Social Studies of Science* 33 (2):231-268.

Knight, Jonathan. 2004. Hollywood or Bust. *Nature* 430:720-723.

Krips, Henry, J. E. McGuire, and Trevor Melia. 1995. *Science, Reason, and Rhetoric*, *Pittsburgh-Konstanz series in the philosophy and history of science*. Pittsburgh: University of Pittsburgh Press.

Kuhn, Annette, ed. 2000. *Alien Zone: Cultural Theory and Contemporary Science Fiction Cinema*. Sixth ed. New York: Verso.

Kuhn, Thomas. 1996. *The Structure of Scientific Revolution*. Third ed. Chicago: University of Chicago.

Kull, Steven. 2005. Americans on Climate Change: 2005: PIPA/Knowledge Networks Poll.

Lakoff, George, and Mark Johnson. 1980. *Metaphors We Live By*. Chicago: University of Chicago Press.

Latour, Bruno. 2002. *Science in Action*. 10th ed. Cambridge: Harvard University Press.

LeBeau, Vicky. 2001. *Psychoanalysis and Cinema: The Play of Shadows*. New York: Wallflower.

Lee, Jennifer. 2003. A Call for Softer, Greener Language. *The New York Times*, March 2.

Leff, Michael. 1997. The Idea of Rhetoric as Interpretative Practice: A Humanist's Response to Gaonkar. In *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science*, edited by A. Gross and W. M. Keith. Albany: SUNY Press.

Levy-Leblond, Jean-Marc. 2001. Science's Fiction. *Nature* 413:573.

Lewenstein, Bruce V. 1995a. From Fax to Facts: Communication in the Cold Fusion Saga. *Social Studies of Science* 25 (3):403-436.

———. 1995b. Science and the Media. In *Handbook of Science and Technology Studies*, edited by S. Jasanoff, G. E. Markle, J. C. Peterson and T. Pinch. Thousand Oaks: Sage Publications.

Locke, Simon. 2001. Sociology and the Public Understanding of Science: From Rationalization to Rhetoric. *British Journal of Sociology* 52 (1):1-18.

———. 2002. The Public Understanding of Science-A Rhetorical Invention. *Science, Technology, & Human Values* 27 (1):87-111.

Lovgren, Stefan. 2004a. Day After Tomorrow Ice Age "Impossible," Expert Says. *National Geographic News*, May 27.

———. 2004b. *Day After Tomorrow*: Could Ice Age Occur Overnight? *National Geographic News*, May 18.

Lyne, John. 1998. Knowledge and Performance in Argument: Disciplinary and Proto-theory. *Argumentation and Advocacy* 35 (1):3-10.

Lyne, John, and Henry Howe. 1986. "Punctuated Equilibria": Rhetorical Dynamics of a Scientific Controversy. *Quarterly Journal of Speech* 72:132-147.

MacIntyre, Alasdair. 1984. *After Virtue*. Second ed. Notre Dame: University of Notre Dame Press.

Mahone, Glenn. *NASA notice to all Employees Regarding Media Reports about the film "The Day After Tomorrow"* [email]. SpaceRef.com, April 26 2004 [cited. Available from http://www.spaceref.com/news/viewsr.html?pid=12673.

Malmsheimer, Lonna M. 1986. Three Mile Island: Fact, Frame, and Fiction. *American Quarterly* 38 (1):35-52.

Mathews, Tom, William C. Cook, Ron LaBrecque, Richard Manning, Kim Willenson, Mary Lord, and David Martin. 1979. Cooling of the Crisis. *Newsweek*, April 16, 28.

McCracken, Samuel. 1979. The Harrisburg Syndrome. *Commentary*, June, 27-39.

McCurdy, Patrick P. 1979. "The China Syndrome" May Cloak a "Fear of Living". *Chemical Week*, April 11, 5.

McGuire, Bill. 2003. Will Global Warming Trigger a New Ice Age? *The Guardian*, November 13.

McKibben, Bill. 2004. The Big Picture: Climate Change too Slow for Hollywood, too Fast for the Rest of Us. *Grist Magazine*, May 4.

McMullen, Wayne J. 1995. *The China Syndrome*: Corruption to the Core. *Literature Film Quarterly* 23 (1):55-63.

Meehan, Richard L. 1979. Nuclear Safety: Is Scientific Literacy the Answer? *Science*, May 11, 571.

Mehendale, HM. 2004. Genetically Modified Foods Get Bad Rap. *International Journal of Toxicology* 23 (2):79-80.

Mencimer, Stephanie. 2002. Weather tis Nobler in the Mind. *Washington Monthly*.

Merton, Robert King. 1938. Science and the Social Order. *Philosophy of Science* 5 (3):321-337.

Metz, Christian. 1977. *The Imaginary Signifier: Psychoanalysis and the Cinema*. Translated by C. Britton, A. Williams, B. Brewster and A. Guzzetti. Bloomington: Indiana University Press.

Michael, Mike, and Simon Carter. 2001. The Facts About Fictions and *Vice Versa*: Public Understanding of Human Genetics. *Science as Culture* 10 (1):5-32.

Michaels, Patrick J. 1992. *Sound and Fury: The Science and Politics of Global Warming*. Washington, D.C.: Cato Institute.

———. 1993. *Global Warming: Failed Forecasts and Politicized Science*. St. Louis, Mo.: Center for the Study of American Business Washington University.

———. 2004a. Apocalypse Soon? No, But This Movie (and Democrats) Hope You'll Think So. *The Washington Post*, May 16, B1.

———. 2004b. *Day After Tomorrow*: A Lot of Hot Air. *USA Today*, May 24.

———. 2004c. A Feverish Fate for Scientific Truth? *The Washington Times*, April 27.

———. 2004d. *Meltdown: The Predictable Distortion of Global Warming by Scientists, Politicians, and the Media*. Washington, D.C.: Cato Institute.

Michaels, Patrick J., and Robert C. Balling. 2000. *The Satanic Gases: Clearing the Air about Global Warming*. Washington, D.C.: Cato Institute.

Mitchell, Gordon R., and Kelly Happe. 2001. Informed Consent After the Human Genome Project. *Rhetoric and Public Affairs* 4 (3):375-406.

Morano, Marc. 2005. *Gore Warns of "Climate Emergency" While Promoting Disaster Film*. CNSNews.com, May 12 2004 [cited July 20 2005]. Available from http://www.cnsnews.com/Nation/Archive/200405/NAT20040512a.html.

MoveOn.org. 2004. *Global Warming Isn't Just a Movie. It's Your Future.* Leaflet.

Munoz, Lorenza. 2004. Global Warming Run Amok: Activists Say the Disasters Depicted in the Coming Movie *Day After Tomorrow* are Possible. Others Say Relax, It's Just a Movie. *Los Angeles Times*, April 30, E2.

Nelkin, Dorothy. 1981. Some Social and Political Dimensions of Nuclear Power: Examples from Three Mile Island. *The American Political Science Review* 75 (1):132-142.

———. 1987. *Selling Science: How the Press Covers Science and Technology*. New York: W.H. Freeman and Company.

Nelkin, Dorothy, and M. Susan Lindee. 1995. *The DNA Mystique: The Gene as a Cultural Icon*. New York: W.H. Freeman and Company.

Nerlich, Brigitte, Susan Johnson, and David D. Clarke. 2003. The First "Designer Baby": The Role of Narratives, Cliches, and Metaphors in the Year 200 Media Debate. *Science as Culture* 4 (12):472-498.

Newsweek. 1980. Have Three Mile Island's Lessons Been Learned? *Newsweek*, February 2, 79.

Niccum, Jon. 2003. Fallout from *The Day After*: Cast and Crew of the TV Movie Remember How Lawrence Coped with Nuclear Devastation. *Lawrence.com*, November 19.

Nietzsche, Friedrich Wilhelm. 1998. *Beyond Good and Evil: Prelude to a Philosophy of the Future*. Translated by M. Faber. Oxford; New York: Oxford University Press.

———. 2001. *The Gay Science*. Translated by B. A. O. Williams, J. Nauckhoff and A. Del Caro, *Cambridge Texts in the History of Philosophy*. Cambridge, U.K.; New York: Cambridge University Press.

Nisbet, Matthew. 2004. Evaluating the Impact of The Day After Tomorrow: Can a Blockbuster Film Shape the Public's Understanding of a Science Controversy? *CSICOP On-Line: Science and the Media*, June 16.

O'Donnell, Timothy. 2000. Of Loaded Dice and Heated Arguments: Putting the Hansen-Michaels Global Warming Debate in Context. *Social Epistemology* 14 (2/3):109-127.

O'Hanlon, Larry. 2004. *Scientists React to Global Warming Movie*. Discovery Channel 2004 [cited May 26 2004].

O'Malley, Brian. 2004. *Global Warming Controversy Surrounds New Hollywood Blockbuster*. Common Dreams, May 26 2004 [cited May 27 2004]. Available from http://www.commondreams.org/cgi-bin/newsprint.cgi?file=/news2004/0526-10.htm.

O'Toole, Thomas, and Bill Peterson. 1979. PA Reactor Mishap Called Worst in U.S. History; Reactor Mishap Called Nation's Worst; Escape of Radioactive Gases Continues. *The Washington Post*, March 30, A1.

Opeskin, Brian. 2002. Breaking the Code. Paper read at Centre for Law and Genetics Symposium, 29 November, at Melbourne, Australia.

———. 2004. Personal Email Correspondence with Mr. Opeskin, October 20.

Pearce, Fred. 2004. *Scientists Stirred to Ridicule Ice Age Claims*. newscientist.com 2004 [cited May 27 2004]. Available from www.newscientist.com.

Phelan, James. 1996. *Narrative as Rhetoric: Technique, Audiences, Ethics, Ideology*. Columbus: Ohio State University Press.

Pope, Carl. 2005. *There is Something Different About Global Warming*. Sierra Club, December 2004 [cited July 24 2005]. Available from http://wwwsierraclub.org/pressroom/messages/2004december_pope.asp.

Popper, Karl. 2002. *The Logic of Scientific Discovery*. 2nd ed. New York: Routledge Classics.

Prelli, Lawrence J. 1989. *A Rhetoric of Science: Inventing Scientific Discourse*. 1st ed, *Studies in rhetoric/communication*. Columbia, S.C.: University of South Carolina Press.

Revkin, Andrew C. 2004. NASA Curbs Comments on Ice Age Disaster Movie. *The New York Times*, April 25.

Rhodes, Richard. 2000. Changing Perspectives on Nuclear Energy. *Nuclear News*:36-37.

Rhodes, Richard, and Denis Beller. 2000. The Need for Nuclear Power. *Foreign Affairs*:30-44.

Roberts, Adam. 2000. *Science Fiction*. Edited by J. Drakakis, *The New Cultural Idiom*. New York: Routledge.

Rogovin, Mitchell, and George T. Frampton. 1980. Three Mile Island: A Report to the Commissioners and the Public, edited by NRC.

Rowe, G. 2004. How Can Genetically Modified Foods Be Made Publicly Acceptable? *Trends in Biotechnology* 3:107-109.

Sandman, Peter M., and Mary Paden. 1979. At Three Mile Island. *Columbia Journalism Review*:43-58.

Schardt, Arlie, Lucy Howard, and Donna Foote. 1979. Covering Three Mile Island. *Newsweek*, April 16, 93.

Schmidt, CW. 2005. Genetically Modified Foods-Breeding Uncertainty. *Environmental Health Perspectives* 113 (8):A526-A533.

Schon, Donald A. 1980. Generative Metaphor: A Perspective on Problem-Setting in Social Policy. In *Metaphor and Thought*, edited by A. Ortony. Cambridge: Cambridge University Press.

Scott, Robert L. 1967. On Viewing Rhetoric as Epistemic. *Central States Speech Journal* 18:9-17.

Seed, David, ed. 1995. *Anticipations: Essays on Early Science Fiction and its Precursors*. Edited by L. T. Sargent and G. Claeys, *Utopianism and Communitarianism*. Syracuse: Syracuse University Press.

Sennott, Sarah. 2004. *We Have to Think of the Future*, May 27 2004 [cited May 27 2004]. Available from http://msnbc.msn.com/id/5068952/site/newsweek.

Shea, Elizabeth. 2001. The Gene as a Rhetorical Figure: "Nothing But a Very Applicable Little Word". *Science as Culture* 10 (4):505-529.

Shellenberger, Michael, and Ted Nordhaus. 2004. The Death of Environmentalism: Global Warming in a Post-Environmental World.

Shulman, Seth. 2004. Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science. Cambridge, MA: Union of Concerned Scientists.

Sibbald, Vanessa. 2004. "Day After" is Fact-Based Disaster Tale. *The Indianapolis Star*, May 27.

Smith, Craig R., and Scott Lybarger. 1996. Bitzer's Model Reconstructed. *Communication Quarterly* 44 (2):197-213.

Sobchack, Vivian. 1997. *Screening Space: The American Science Fiction Film*. Second ed. New Brunswick: Rutgers University Press. Original edition, 1980.

Sokal, Alan, and Jean Bricmont. 1997. *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science*. New York: Picador USA.

Sontag, Susan. 1966. Imagination of Disaster. In *Against Interpretation and Other Essays*. New York: Picador Press.

Stableford, Brian M. 1987. *The Sociology of Science Fiction*. 1st ed, *I.O. Evans Studies in the Philosophy & Criticism of Literature; v. 4*. San Bernardino, Ca.: Borgo Press.

Staiger, Janet. 2000. *Perverse Spectators: The Practices of Film Reception*. New York: New York University Press.

Stork, David G. 1997. *HAL's Legacy: 2001's Computer as Dream and Reality*. Cambridge, Mass.: MIT Press.

Suvin, Darko. 1979. *Metamorphoses of Science Fiction*. New Haven: Yale University Press.

Swoboda, Victor. 1999. Should Machines be Built to Think? Their Growing Computational Power Will Soon Put the Question in Forefront of Debate. *The Gazette*, May 29, J4.

Taylor, Charles Alan. 1996. *Defining Science: A Rhetoric of Demarcation*. Edited by J. Lyne, D. N. McCloskey and J. S. Nelson, *Rhetoric of Human Sciences*. Madison: University of Wisconsin Press.

Telotte, J.P. 1995. *A Distant Technology: Science Fiction Film and the Machine Age*. Hanover: Wesleyan University Press.

———. 2001. *Science Fiction Film*. Edited by B. K. Grant, *Genres in American Cinema*. New York: Cambridge University Press.

Thacker, Paul D. 2004. Recommendations: *GATTACA*. *Chemical and Engineering News*.

Tompkins, Phillip K. 1980. The Forum: Tompkins on Patton and Bitzer. *The Quarterly Journal of Speech* 66:85-88.

Ton, Thai. 2004. Is "The Day After Tomorrow" Coming? *The Epoch Times*, December 29.

Tourtellotte, Bob. 2004. *Day After Tomorrow* Stirs Things Up. *Reuters Newswire*, May 24.

Van Dijck, Jose. 1999. Cloning Humans, Cloning Literatures: Genetics and the Imagination Deficit. *New Genetics and Society* 18 (1):9-22.

Vancheri, Barbara. 2004. With Spectacular Effect and Multiple Catastrophes, "Day After Tomorrow" Updates a Classic Genre. *Pittsburgh Post Gazette*, May 27, C1-C2.

Vatz, Richard E. 1973. The Myth of the Rhetorical Situation. *Philosophy and Rhetoric* 6 (3):154-161.

———. 1981. Vatz on Patton and Bitzer. *The Quarterly Journal of Speech* 67:95-99.

Vieth, Errol. 2001. *Screening Science: Contexts, Texts, and Science in Fifties Science Fiction Film*. Lanham: Scarecrow Press.

Vincent, Bernadette Bensaude. 1997. In the Name of Science. In *Science in the Twentieth Century*, edited by J. Krige and D. Pestre. Paris: Harwood Academic Publishers.

Vogel, Gretchen. 1997. From Science Fiction to Ethics Quandary. *Science* 277:1753-1754.

von Baeyer, Hans Christian. 1998. Science under Siege. *American Journal of Physics* 66 (11):943-944.

Wander, Philip. 1976. The Rhetoric of Science. *Western Speech Communication*:226-235.

Waxman, Henry A. 2003. Politics and Science in the Bush Administration: The United States House of Representatives-Committee on Government Reform.

Weaver, Andrew J., and Claude Hillaire-Marcel. 2004. Global Warming and the Next Ice Age. *Science*, April 16, 400-402.

Weisbrot, David. 2003a. Paper read at Second Secretary's Advisory Committee on Genetics, Health, and Society, 22-23 October, at Washington, D.C.

———. 2003b. The Kirby Oration 'The Human Genome: Lessons for Life, Love and the Law'. Paper read at The 8th AIHLE Annual Conference, 20 November, at Hobart, Australia.

Whipple, Dan. 2004. *Climate: Maybe Several Days After Tomorrow*, April 19 2004 [cited April 27 2004]. Available from http://www.spacedaily.com/upi/20040419-10200000.html.

Whitson, Steve, and John Poulakos. 1993. Nietzsche and the Aesthetics of Rhetoric. *Quarterly Journal of Speech* 79:131-145.

Will, George. 1979a. As I Was Saying. *Newsweek*, April 16, 100.

———. 1979b. A Film About Greed. *Newsweek*, April 2, 96.

Willard, Charles. 1997. Rhetoric's Lot. In *Rhetorical Hermeneutics: Invention and Interpretation in the Age of Science*, edited by A. Gross and W. M. Keith. Albany: SUNY Press.

Williams, Dennis A., Martin Kasindorf, Gerald C. Lubenow, and Ron LaBrecque. 1979. Beyond "the China Syndrome". *Newsweek*, April 16, 31.

Wood, Aylish. 2002. *Technoscience in Contemporary American Film: Beyond Science Fiction*. Edited by M. Jancovich and E. Schaefer, *Inside Popular Film*. New York: Manchester University Press.

Yam, Philip. 1997. Clean Genes. *Scientific American*:153-154.

Ziman, John. 2000a. Are Debatable Scientific Questions Debatable? *Social Epistemology* 14 (2/3):187-199.

———. 2000b. *Real Science: What It Is, and What It Means*. New York: Cambridge University Press.

———. 2001. Re-thinking Science: Knowledge and the Public in an Age of Uncertainty. *Interdisciplinary Science Reviews* 26 (3):229-232.