

SCIENTIFIC *ETHOS* AND CLIMATE SCIENCE CONTROVERSY: THE HOCKEY STICK
GRAPH DEBATE

by

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(Under the Direction of Celeste Condit)

ABSTRACT

Rhetoric of science scholarship has long posited a distinct scientific *ethos*. Controversies over the science of climate change challenge existing forms of scientific credibility and *ethos*. This study examines transformations in the characters, narratives, and relationships of authority found throughout different media in debates over Michael Mann's so-called hockey stick graph. Changes in scientific *ethos* produced by new content and new media demonstrate the need for rhetorical scholars to re-think the status of scientific *ethos* and explore its various evolving forms.

INDEX WORDS: Scientific *ethos*, Climate change, Rhetoric of science

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CHAPTER 1

RHETORIC, SCIENTIFIC *ETHOS*, AND CLIMATE CHANGE

Introduction

The issue of global climate change is perhaps the most prominent source of public scientific controversy in the United States today. The failure of the formidable scientific and technical expertise and capacity of the Intergovernmental Panel on Climate Change (IPCC) to produce public consensus on either climate science or policy suggests that rhetorics of scientific expertise face significant credibility barriers in this area. Many argue a robust consensus of experts supports the IPCC's assessment of the sources and mechanisms of anthropogenic climate change (Oreskes, 2004). Members of the public and scientists dissenting from the IPCC perspective often call themselves "skeptics." Defenders of the consensus position often call this same group "contrarians" or "deniers." All of these names identify different parties in their relationship to scientific evidence: either it is too inconclusive to persuade or so powerful that dissenters must be in denial. These labels speak as much to relations between different groups as they do to an agreed upon set of scientific evidence. *Consensus*, *skeptic*, and *denier* imply burdens of proof, credibility, group boundaries, and relationships with authority. They refer to the qualities of the messenger as much as they do the message. Different relationships of credibility and authority play a large role in how important parties in the dispute identify and communicate with one another.

Rhetoric offers us the theoretical tool of *ethos* for investigating these issues of credibility, character, and social position. Therefore, rather than treat the confrontation between climate change skeptics and consensus scientists from the perspective of evidentiary accuracy and

adequacy (or pseudo-science versus science) I investigate consensus and skepticism as rhetorical resources and postures deployed in the construction of scientific *ethos*. Climate science controversies occur at the intersection of increasing scientific and communicative complexity, the emergence of human-generated global environmental risk, and changes in the capacity and appropriateness of different scales of governmental response. These controversies traverse a variety of media environments and rhetorical arenas as, “climate change is part of day-to-day conversation and...it appears almost ubiquitously in newspapers and television bulletins, as well as in the ‘blogosphere’ (O’Riordan, 2010, p. v). Controversy over climate science offers an opportunity for exploring change and continuity in scientific *ethos* in response to new forms, forums, and content.

This study considers the dispute over the accuracy of the so-called “hockey stick graph” and its importance for the rhetorical formation and modification of scientific *ethos*. Out of the hundreds of pages of the IPCC’s 3rd Assessment, the hockey stick graph captured significant public attention, skeptical outcry, and vigorous scientific defense. Originally produced in a paper by Michael Mann, Raymond Bradley, and Malcolm Hughes, the hockey-stick graph’s dramatic visual appearance and inclusion in the IPCC’s Summary for Policymakers garnered significant attention and usage. The hockey stick controversy began in earnest with the publication of a critique authored by two Canadians, an economics professor, Ross McKittrick, and semi-retired mineral industry consultant Stephen McIntyre. Their 2003 paper, “Corrections to the Mann et. al. (1998) Proxy Data Base and Northern Hemisphere Average Temperature Series” possessed a modest title but expressed ample doubt regarding the accuracy of the well-known graphic (Stephen McIntyre & McKittrick, 2003). Initially, many prominent climate scientists expressed doubt regarding the credibility of this critique because it was published in an

interdisciplinary journal, *Energy & Environment*, long thought friendly to climate skeptics (Walden, 2004). However, Mann's subsequent publication of a Corrigendum in *Nature* in 2004 and McIntyre and McKittrick's publication of an additional article in the prominent journal *Geophysical Research Letters* fed continued media and scientific interest.

Mann's accusations that fossil-fuel industry funding tainted his critics and McIntyre's allegations that Mann refused to release relevant data quickly gave the controversy a personal dimension. McIntyre created the blog Climate Audit to continue making his case against the "hockey team" who produced the graph. Alleging that Mann's case was not an isolated failure within the paleo-climate community, McIntyre called for added institutional transparency and disclosure of data and source coding among climate scientists. Mann and several other prominent climate scientists founded a competing blog RealClimate in order to, "be what I [Michael Mann] would call an honest broker in the climate-change debate...to cut through the disinformation and the distortion and focus on the science" (Flatow, 2005). Mann's desire to restore his status as an expert "honest broker" and McIntyre's demand for a thorough audit demonstrate the larger institutional stakes invoked by both parties in this controversy. Both sides appeal to larger issues such as the status of scientific authority, relationships between scientific experts and their audience, and qualities that define authentic scientific behavior.

The rhetorical resource of *ethos* provides a useful lens for examining the institutional and social relationships of authority and credibility that feature strong in the hockey stick controversy. *Ethos*, defined as the persuasive use of character, also includes the social environment and context that shapes expectations of behavior and distributes trust and credibility. *Ethos* brings together questions of trust, credibility, and the changing location of scientific knowledge production. Focus on the persuasive effects of character encourages us to

examine social context, audience expectations and norms, narrative forms, and the demarcation of social groups or subcultures. The hockey stick controversy involves a face-off over the scope of expert authority, personal credibility, and the proper institutional design for coping with scientific disagreement. Raging over a number of different media and featuring strong group affiliations, the hockey stick controversy demands an approach that attends to the rhetorical resources and constraints provided by different sites of dispute. My analysis traces the controversy from its beginnings in McIntyre and McKittrick's academic critique across the competing blogs formed by McIntyre and Mann, and in conventional mass media coverage. The study covers McIntyre and McKittrick's academic paper, the first several years of material on the blogs Climate Audit and RealClimate, and North American mass media reporting from 2003 to 2005. The remainder of this chapter outlines the concept of *ethos* used to examine these discourses and justifies the methodology used to read the different texts in question.

***Ethos* and the Rhetorical Study of Controversy**

To better understand the significance of an *ethos*-focused analysis I will first situate my approach in previous rhetorical treatments of scientific and environmental controversy. Existing rhetorical treatments of scientific controversy privilege ideological and epistemic theoretical models. Rhetorical critics of scientific and philosophical methods argue these approaches neglect that rhetoric influences epistemology (Scott, 1967). Controversies involve more than contests over accuracy and validity as these very epistemic standards are up for debate. In response, rhetorical theories of deliberation stress the importance of the institutional designs that structure argumentative interactions. From this perspective, social incapacity for resolving complex scientific and environmental controversies is a symptom of a "rhetorical crisis" that marks the breakdown of normal patterns of communication (Cox, 2009; Farrell & Goodnight,

1981). According to deliberative theorists, over-reliance on technical reasoning atrophies the critical, rhetorical and argumentative capacity that a fully developed rhetorical *praxis* and public sphere would provide (Farrell & Goodnight, 1981). Climate change is one environmental crisis among others whose resolution will involve shifting our understanding of the epistemic to include the rhetorical. Green deliberative democrats share this desire to displace dependence on technical expertise at the expense of argument (Dryzek, 2005).

Ideological perspectives on controversy argue that rhetoric operates constitutively. Dominant rhetorics shape or hail audiences into an identity incompatible with or antagonistic towards change. Difficulties in arriving at a consensus on the magnitude of climate change result from entrenched political-economic interests and the power of an ideological system of values they represent and maintain. Viewed from this perspective, the success of climate skeptics reflects a concerted effort on the part of specific economic interests (i.e. fossil fuel companies) and the support they provide for a network of pseudo-scientific activities (Jacques, Dunlap, & Freeman, 2008). These observations support either a muck-racking style response aimed at discrediting the false information that clouds deliberation or indicate the need for a critique that undermines the appeal of industrial or capitalist ideologies. Rhetorical critics discrediting the argumentative strategies of skeptics have traced their historical ties to the construction of “faux controversies” that use expectations of consensus to create a false impression of uncertainty (Panetta, 2007). Others argue that skeptics exploit journalistic norms of balanced coverage, creating a false impression of divisions within the scientific community (Freudenburg & Muselli, 2010).

The latter ideological critique hopes critics can restore the power of a disinterested scientific *ethos* and respect for internal expert consensus. These critical and journalistic

approaches demonstrate that the mythology of disinterested expertise *ethos* remains powerful in how we imagine scientific expertise. However, they raise questions about the effectiveness of modern scientific *ethos*. Revealing industry ties for skeptical research presumes that scientific credibility rests on the appearance of moral purity. McIntyre and McKittrick take pains to meet these expectations or counter with charges of distorting influence of grants and money flows generated by claims of an impending crisis. The importance of appearance and institutional location in this line of research suggest ideological critique might benefit from a consideration of *ethos*. This is particularly true for the hockey stick controversy in which both sides of the controversy construct similar appearances and commonly rely on the rhetoric of debunking that juxtaposes ideological illusion and scientific fact.

Conceptualizing *Ethos*

Epistemic and ideological concerns dominate these approaches to climate science controversy. Theorists staking out a constitutive role for rhetoric hope to explain the importance of argument for building particular worldviews. The relationship between how people know (*episteme*) and what they know clearly represents interesting ground for the rhetoric of inquiry and the importance of rhetoric for constructing and maintaining worldviews. In *Social Epistemology*, Steven Fuller argues:

‘Having knowledge’ is not a matter of possession, as the having of a mental representation is in classical epistemology. Rather, it is a socially ascribed status that a knowledge producer can (and normally wants to) earn in the course of his [sic] participation in the knowledge process. A producer ‘has knowledge’ if enough of his [sic] fellow producers *either* devote their resources to following up his [sic] research (even for purposes of refutation)...Thus, ‘having knowledge is ultimately a matter of *credibility*. But given the numerous ways in which producers can draw on each other’s work, the fact that there are centers of credibility in the knowledge production process does not necessarily imply that the producers agree on anything more than who credible knowledge producers are (Fuller, 2002, p. 30).

Credibility refers to the dependence of knowledge on the ascriptions of others. *Ethos* draws our attention to processes of characterization, ascription, and narrative that distribute credibility. *Ethos* controversies involve different “centers of credibility.” The recognition that others ascribe credibility to a particular source produces rhetorics designed to re-center or re-locate epistemological authority. What changes if we focus on the dimension of *ethos* rather than *episteme* alone? Epistemic inquiry typically asks questions about what is known. Rhetoricians interested in an epistemic role for rhetoric frame their approach as providing a rhetorical alternative to traditional epistemic criteria (Scott, 1967). An *ethos*-focused analysis asks relational questions: *who* knows and who is capable of knowing? What narratives and characteristics shape who is credited with knowledge? In the hockey stick debate, skeptics and consensus scientists characterize credibility, assign authority, and narrate scientific activity differently. I now turn to the theoretical material in Rhetoric that informs my understanding of *ethos*, attending particularly to scholarship on the “scientific *ethos*.”

***Ethos* and Changing Social Environments**

Though the lens of *ethos* may prove valuable in analyzing controversy, we must confront the difficulty of adapting the concepts of classical rhetoric to modern social situations, especially in the case of an institution as modern as specialized scientific communities (Gaonkar, 1997).

James Baumlin proposes that in the most general sense:

[E]thos concerns the problematic relation between human character and discourse; more specifically, it raises questions concerning the inclusion of the speaker’s character *as an aspect of discourse*, the representation of that character in discourse, and the role of that character in persuasion (Baumlin, 1994, p. xvii).

Baumlin cautions us that social concepts of self and character have undergone dramatic changes in the shift from the Greek city-state and Roman Senate to contemporary society (Baumlin, 1994). Similarly, Marshall Alcorn Jr. (1994) argues Aristotle’s “ideas are not outdated, they are

restrictive” (p. 17). Given the lasting importance of Aristotle’s terminology, it is worth considering these limitations and their effects on contemporary rhetorical theories of *ethos*. Aristotle’s division of *ethos* into three dimensions, good sense (*phronesis*), virtue (*arête*), and good will (*eunoia*) suggests *ethos* succeeds only when a rhetor constructs a character who appears to share their audience’s expectations in each of these aspects (Kennedy, 1992). If *ethos* is understood relationally, we cannot reduce *ethos* a possession of either rhetor or audience. An intersubjective and multidimensional construct, *ethos* involves processes of articulation and representation. Rhetors construct a particular character but cannot control how an audience ascribes characteristics.

Aristotle’s theory of *ethos* presumes the context of an easily identifiable rhetor and a specific audience, and as a result is in tension with the current media environment and scope of rhetorical analysis. The contemporary ubiquity of print and televisual media, along with changing communication networks, all contribute to different circumstances of self-presentation and construction than found in the confines of a Greek city-state (Alcorn, 1994). Sociological research on the omnipresence of “facework” and the importance of non-conscious self-presentation suggests our understanding of audience must include more than a specific group of addressees (Hyde & Mitra, 1998). Criticism of a model of discrete rhetorical situations made up of static and self-identical rhetors and audiences challenges the notion of *ethos* as a static rubric of credibility that could easily be projected by a rhetor or assessed by an audience (Biesecker, 1989). Several scholars suggest reanimating the classical connotations of ground, habitat, or environment found in the terminology of *ethos* (Hyde, 2004; Reynolds, 1993). This study attends to the changes in self-presentation, characterization, and narrative across different media.

In this study, the different environments of technical publications, competing scientific blogs, and mass media source present different challenges for rhetors arguing over scientific credibility.

Tied to the expectations of an audience and a community, Aristotelian *ethos* presumes the importance of being-in-common for persuasive speech and the ability to project similarity as the foundation for credibility. In the classical context, *ethos* referred to the persuasive means for an elite leadership to present themselves in persuasive terms for relatively homogenous publics. Aristotelian *ethos* unifies collective character and distinctive individual charisma. For contemporary rhetorical analysis, the homogeneity of the audience and the relative importance of the force of individual character and the power of social norms both pose difficult analytical challenges. Where theorists and critics draw the boundaries and standards crucial for *ethos* differs substantially. In his *ethos*-centered analysis of U.S. Supreme Court confirmation hearings, Trevor Parry-Giles (2006) argues for a “broader, social sense of ethos,” but traces the effects and importance of *ethos* in American society to the founders’ concern with individual reputational character (pp. 6-7). In such an analysis, *ethos* refers to the ability of an individual to exemplify communal standards:

The characterological nature of the American Constitution permits, indeed compels, a character/leader-based politics. The result is the embodiment of ideology, and the commitments that constitute ideology, with particular individuals facing scrutiny as they attempt to lead (Parry-Giles, 2006, p. 7).

Parry-Giles emphasizes leadership as a form of ideological embodiment and condensation. Controversy occurs when increasingly fragmented audiences construct conflicting visions of their leaders or experience severe ideological conflict. Arguments over the moral character of leaders are battles over the meaning and shape of points of ideological context (Parry-Giles, 2006, pp. 80-83).

While Parry-Giles perceives moments of public controversy over character as opportunities for democratic participation in shaping the overall character of the community, rhetoricians of science often begin by discussing *ethos* as a strategy for identifying the distinctive standards of a strongly demarcated subculture (Keränen, 2010; T. Lessl, 1989; Taylor, 1996). To use Thomas Lessl's (1989) terminology, the *ethos* of "bardic" communication, in which a community addresses itself, may differ substantially from that of the "priestly" communication, which translates between different subcultures. Lessl's priestly "traffic cop," policing the gate between the rituals and myths of a privileged subculture, may be a leader, but is expected to embody qualities that demarcate the scientific community rather than define the larger polity (1989, p. 186). Without a central binding document like the Constitution, arguments over character and leadership in this environment involve more fluid disputes over the diverse institutional and rhetorical legacy of scientific expertise. The hockey stick controversy features both important leaders and the everyday interactions of nearly anonymous blog commenters. Standards used for assessment and the valence assigned to similar characterizations display diversity even where the themes of modern scientific *ethos* remain important. The discourses considered in this study include both the demarcation of scientific subculture and the invocation of a broader social struggle.

Scientific *Ethos* and Controversy

The "rhetoric of inquiry" directs the attention of scholars to the rhetorical dimension of specialized and technical disciplines (Nelson, 1987). The place-based connotations of *ethos* feature strongly in rhetorical criticism devoted to uncovering rhetorical patterns within the bounds of particular disciplines or areas of specialization. It is in this context that rhetoricians began borrowing Robert Merton's concept of a distinct "scientific *ethos*," or characteristics and

norms that defined inquiry and conduct within scientific institutions. Rhetorical research on “scientific ethos” generally follows two paths, working either from the “inside-out” to discover the unique rhetorical features of scientific discourse or from “outside-in” to demonstrate that specialized scientific discourses rely on rhetorical forms. Working from the “inside-out,” rhetoricians identifying the features assigned to the scientific *ethos* start largely from the norms internally held to govern scientific conduct. Lawrence Prelli’s (1989) topological rhetoric of science borrows Merton’s normative definition, “The ethos of science is that affectively toned complex of values and norms which is held to be binding on the man [sic] of science” (Merton, 1979). Prelli follows Robert Merton’s normative schema of disinterest, communalism, organized skepticism, universality and humility while adding counter-norms that may be rhetorically useful. Such an approach adheres to the classical rhetorical model of identifying effective *topoi* for a particular type of rhetorical activity and audience. Scientific arguments require rhetorical strategy but commitments to self-effacing forms of presentation and hostility towards the intrusion of subjectivity place significant constraints on modifications to the scientific *ethos*. Consensus is an important element of scientific rhetoric because it reflects the norms of evidence gathering, presentation, and respectful disagreement driving properly scientific inquiry. The resonance and relative priority accorded to the Mertonian norm of organized skepticism feature strongly in the dispute between consensus scientists and climate skeptics. The hockey stick dispute is a fruitful area for considering the enduring rhetorical legacy of Merton’s norms and modernist institutional arrangements.

Rhetoricians working from the “outside-in” tend to begin with the issue of demarcation. Rhetoricians identify case studies of scientific controversy as important moments for constituting the demarcation between what is science and what is not (Taylor, 1996). Controversies offer

opportunities for charting how the boundaries of scientific communities and methods form. Charles Taylor (1996) formulates this approach as, “concerned fundamentally with the functional use of discourse to define, redefine, even to deconstruct, the implicit boundaries of those social practices we consider scientific” (p. 15). As a result, such a perspective generally regards rhetoric as playing a constitutive role in the demarcation of science from the rest of society. Even those working within this method, exemplified by both Taylor and Lisa Keranen (2010), draw from the same Mertonian norms accepted by Prelli. This reflects the conviction that, “Much of the authority of science in the twentieth century rests as well on its success in persuading decision-makers and the public that the Mertonian norms present an accurate picture of the way science ‘really works’” (Jasanoff 1987, quoted Keranen, 2010, p. 27). Characteristics ascribed to science and scientists reflect rhetorical accomplishments rather than intrinsic and continuous features of a scientific way of knowing.

Controversy over climate science includes arguments over the internal procedures used by climatologists for ensuring credibility and the relationship between the field and the larger public. In the hockey stick controversy, the public airing of arguments about internal procedures raised questions typically restricted to either expert or public audience. Sheila Jasanoff, describing the issues faced by climate scientists after the “climate-gate” email scandal, argues conflicts between internal and public standards for accountability shapes the rhetoric of controversy:

In earlier times, it was enough to build trust within a researcher’s community of scientific peers. Disciplines were small and methodologically coherent. Research neither drew heavily on public funds nor profoundly affected public decisions. Today, the circle of stakeholders in science has grown incomparably larger. Much public money is invested in science and, as science becomes more enmeshed with policy, significant economic and social consequences hang on getting the science right. Correspondingly, interest in the validity of scientific claims has expanded to substantially wider audiences. It is not only

the technical integrity of science that matters today but also its public accountability (Jasanoff, 2010, p. 695).

Controversy over the hockey stick graph reflects the intersection of expert and public accountability. Public audiences encountered competing claims from within different scientific communities about the standards, credibility, and character of climate science. Climate scientists face *ethos* difficulties because their character and social role is not well established:

Standards of individual good behavior are especially difficult to identify and enforce in evolving scientific domains with under- developed histories of accounting to external audiences. Divergent national traditions of openness and confidentiality present additional hurdles for climate scientists, who are involved in international, as well as inter- disciplinary, consensus-building (Jasanoff, 2010, p. 696).

The hockey stick controversy includes a rhetorical posturing and competing claims influenced by the lack of clear standards or a comparison between standards for behavior among climate science specialists compared to other scientific disciplines. Various actors in the controversy try to demarcate between legitimate and illegitimate behavior, though their standards and proposals for institutional credibility vary substantially. The weight and role assigned to skepticism in the hockey stick controversy demonstrate the ongoing rhetorical influence of Mertonian norms as well as their evolution.

Science Studies and *Ethos*

Each of these rhetorical perspectives on scientific *ethos* is indebted to scholarship in science studies and the sociology of scientific knowledge. Though such research rarely refers to *ethos* in any sense other than Merton's, other terminology suggests a strong relationship between habits, institutional abode, and the formation of common sense. Steven Shapin and Simon Schaffer (1985) argue that the success of a particular modern scientific form of communal sensibility and the techniques for producing credible knowledge has often obscured its historical, habitual, and situated qualities. Shapin and Schaffer borrow Wittgenstein's concept of "form of

life,” or “integrated patterns of activity,” to analyze the production and consolidation of scientific methodology. Historical controversy over what was counted as scientific methodology is a dispute “over different patterns of doing things and of organizing men [sic] to practical ends” (1985, p. 15). Solidifying experimental methodology as “common sense” required a quite literal form of common sensation, a culture of visual testimony, combined with a particular spatial arrangement of human bodies and institutions into a laboratory culture (Ezrahi, 1990). The regulation and disciplining of the laboratory space changed the distribution of “publicness” of particular forms of sensation and witnessing. Tension between the need for a form of witnessing “accessible” to all and still “reliable” and “credible” produced competing pressures to open and restrict the laboratory space (1985, p. 336). Shapin and Carpenter ask, “How and why were certain practices and beliefs accounted proper and true?” (2007, p. 14). Treating truth as an effect rather than a foundation for inquiry suggests relational *ethos* is crucial for the production of even those norms treated as primarily “internal” to a scientific community. Knowledge produces significant effects primarily through habituation or the accommodation and arrangement of behavior beyond the individual:

[N]o single individual can constitute knowledge: all the individual can do is offer claims, with evidence, arguments, and inducements, to the community for its assessment. Knowledge is the result of the community’s evaluations and actions, and it is entrenched through the integration of claims about the world into the community’s institutionalized behavior (Shapin, 1994, p. 6).

Such a process is not unidirectional. Though constructed character may be important for shaping community evaluations, habituating audiences to particular spatial arrangements and narratives influences their standards for evaluation. Yaron Ezrahi (1990) suggests the “commonsense” (*eunoia* in Aristotelian terms) of visually attestive public culture in the U.S. is breaking down

with the increasing fragmentation of the polity. Audiences habituated to consensus and a *sensus communis* have difficulty adjusting to controversy:

Frequent shifts in the normative and cognitive parameters of public actions can diminish the authority of instrumental norms in the context of public action. Dissent over the goals of public policy, as well as controversies among experts concerning the appropriate measures to advance such goals, undermine the power of scientific and technical norms to substantiate the claim of the public authority that it is acting for the public as a dispassionate agent. Once the resources for depersonalizing and objectifying public actions are depleted, actors find it more difficult to persuade their audience that their actions do not stem from personal or partisan considerations (Ezrahi, 1990, p. 51).

His question, “What liberal-democratic concepts of political action, authority, and accountability can survive in a society of skeptical reflexive observers?” (p. 127) bears strongly on the significance of skepticism and consensus for the scientific *ethos*. McIntyre and Mann offer radically different versions of individual accountability and credible witnessing.

Risk, Scientific Authority, and *Ethos*

The hockey stick dispute involves strongly divergent perceptions of risk. Audience perceptions and relationships to risk suggest we should consider the role that risk plays in reshaping scientific *ethos*. This study is informed by Ulrich Beck’s theory of the “risk society” that argues our society is undergoing a radical transformation in the arrangement of (scientific) institutions and values. Beck claims that the modern institutional configuration of science as a separate, sacred, and trusted sphere breaks down in the face of the uncertainties and risks manufactured by the application of modern techno-science (Beck, 1995). Most clearly in the area of environmental risks exemplified by climate change, the ozone hole, the Chernobyl and Bhopal disasters, technological power and scientific expertise appear more frequently as a source of social problems (Beck, 2009). The dominance of scientific evidence and expertise in modern society results in part from the ability of scientific disciplines to quantify and calculate the consequences of decisions, granting the appearance of greater levels of control. However, the

blind spots in traditional risk assessment (and scientific assurances of safety and sufficient technical expertise) have been undermined by events whose impact was unforeseen or given little credit. Modernization initially displaced the privilege accorded to religious worldviews and the hierarchies of rank in favor of rationalization and merit. The privilege accorded to scientific rationality and technological capacity is vulnerable to the same process of displacement once modernity turns in on itself. This process of “reflexive modernization” changes the distribution of credibility (Adam, 2000).

The transition to a risk society entails significant changes for scientific *ethos* and the ability to resolve controversy with appeal to scientific evidence. Discourses in the hockey stick controversy suggest that different risk perceptions shape different narratives regarding the purpose and value of science. I will argue that precautionary norms play a powerful role in shaping the *ethos* of consensus science. Skeptical formulations of scientific *ethos* retain modernist commitments to an understanding of knowledge as mastery, or control over phenomena, demarcating scientific and technical expertise from the production of risk, a set of commitments that consensus climate scientists, as producers of risk information rather than control over phenomena, face difficulties meeting. In light of these difficulties, appeals to science as disinterested appear particularly fraught by the linkage between the hockey stick dispute, risk, and the production of policy-relevant science.

Investigating the Role of *Ethos*

This section outlines my method for an *ethos*-oriented reading and comparison of artifacts in the hockey-stick graph controversy. Examining the role of *ethos* in scientific controversy, I analyze both argumentative habits and habitats, that is, the presentation and ascription of character and its interaction with patterns of social expectations, virtues, and values

in different contexts. In this approach I investigate the collections of discourses from different media for the role characterization plays in persuasion. Existing rhetorical scholarship on characterology suggests the importance of “descriptive clusters” and recurrent patterns in the description of particular individuals or the roles that individuals occupy (Keränen, 2010; Parry-Giles, 2006). I have designed each chapter around the following set of questions about character:

- 1) What are the clusters of terms (or labels and names) and rhetorical patterns that appear in connection to character?
- 2) What narrative orientation, ends, or relations between characters are established or implied by these descriptive clusters?
- 3) Do the term clusters and narratives change based on media? If so, what changes and what remains consistent?

The theory of *ethos* outlined earlier suggests that the effects of *ethos* are pervasive in shaping those roles available to rhetors and shaping the forms of argument an audience is likely to accept. Characterization in this rubric refers to more than ascriptions to particular individuals. Given the importance of the inter-institutional relationships raised by different theories of controversy (as outlined earlier), I also track the significance of institutional characterization. Such institutional characterizations raise additional questions. What institutional locations are authorized to produce climate science? What, if any, alternative institutional arrangements are deemed necessary for credible findings? How often does an individual become the focal point for judging an institutional or disciplinary category or institutional location (i.e. Mann and paleoclimatology)?

My conceptualization of *ethos* argues that relationships between individual, audience, and social institution is complicated by the multiplication of media and the expansion of rhetoric

beyond an exchange between an easily identifiable individual rhetor and audience. Rhetorical critics Edwin Black (1970) and Philip Wander (1984) argue that the analysis of different personae offers a method for understanding how relationships are constructed between rhetors and audiences in these complex circumstances. Black's conceptualization of the second persona asks us to consider what "the rhetor would have his [sic] real auditor become" (Black, 1970, p. 113). Black uses the second persona to facilitate moral judgments made nearly impossible by the destruction of shared *ethos* in the modern world. This method of deducing competing, but nearly total, ideological orientations shares much with the later constitutive turn. An *ethos*-oriented use of the second persona retains Black's insight that persuasive texts invite auditors to share in modes of interpreting their world. However, for the purposes of this controversy, we are more concerned with comparing competing formations of second personae. Controversies over demarcation may display second personae with strong similarities. I ask what role skeptical critics and consensus advocates offer to their auditors. Similarly, what relationship do they postulate between the first and second persona? How do competing claims of expertise invite either participation or verification of authority?

Wander's "third persona," the "negated" "silhouette" of the second persona asks us to attend to the potential of language to "spell out" what is "unacceptable, undesirable, insignificant" (Wander, 1999, pp. 369, 370). The distribution of credibility engages those aspects of "negation" that include, "the ability to produce texts, to engage in discourse, to be heard in the public space" (Wander, 1999, p. 370). Are there tokens, figures, or shibboleths that indicate and filter group affiliation and character? As a relationship between different characters and social locations, an *ethos* must both invite and deny participation. Keranen argues for the importance of such relationships for understanding personae in scientific controversy:

Science-based controversies, and the characterizations that accompany and sustain them, therefore rely on, shape, extend, and reconfigure tacit understandings of who the scientist is and what his or her relationships are to the various stakeholders whose lives and well-being are thoroughly and deeply reliant on its practices and outcomes. These emergent personae reveal as much about our collective desires and anxieties about science as they do particular scientists who find themselves in the crossfire (2010, p. 118).

This concept of persona creates an analysis that combines elements of the first, second, and third personae. As credibility is relational, rather than purely self-authorizing, rhetors both provide and respond to standards for evaluating their claims. Whether these standards are explicitly stated or left implicit reflects a different relation between rhetor and audience. My analysis demonstrates that these relationships change in different media in the hockey stick controversy. The influence of changes in social and media context is crucial for gauging the role of *ethos* in this controversy. The competing explanations offered earlier identify different locations for crucial actors and varying degrees of difference in the ability of different institutional locations to appear scientific. Surveying and comparing material from traditional points of public address for coping with policy controversy as well as newer locations for scientific controversy provides a sense of the habits and expectations characteristic of different spaces of controversy.

Ethos-based inquiry also demands analyzing rhetorical patterns in lines of argument and narrative context. The regularity and types of arguments directed at the character of skeptics and consensus representatives both hold significance. This investigation understands character as typically connected to a larger narrative context. Narratives provide mechanisms for both describing and resolving controversy. Different narratives for situating the climate science controversy provide alternative resolutions both for the particular issue in dispute (i.e. the validity or credibility of a set of conclusions about possible climate change impacts) and larger questions of policy, institutional, and social arrangement (i.e. peer-reviewed scientific evidence should direct policy even if it lacks public popular support). Dominant narratives set the

boundaries for which characters may appear and provide the orienting objectives that shape audience evaluations of the ends individuals pursue. Traditionally, audiences consider only a limited set of ends appropriate for scientific characters (Prelli, 1989). Different explanations for the climate controversy suggest several important issues in the construction of narrative frames. Traditionally, the public face of science presents an activity directed by the search for truth rather than the prescription of action. Narratives of discovery fit comfortably within the bounds of a disinterested *ethos*. The possibility for the application of scientific discovery unites discovery with increased capacity. The context of climate science, and the prominence of the hockey stick graph in the IPCC assessment, presents difficulties for this narrative structure, potentially creating impetus for significant changes in narrative structure.

Organization of the Study

Chapter two begins by examining McIntyre and McKittrick's initial paper. Facing high burdens of credibility, they frame their work as a re-balancing of scientific activity in favor of skepticism. However, they retain many of the traditional characterizations and narratives of modern scientific rhetoric. The second part of chapter two illustrates the change in the scope of McIntyre's critique in the move to the blogosphere. His "audit" narrative opens up a new role for his audience to participate in the skeptical de-bunking of consensus. Chapter three considers the response of Michael Mann and other climate scientists in their formation of the blog RealClimate. I argue that their characterizations and narratives retain modernist commitments to strong demarcation between scientific experts and their publics even as they attempt to establish a more personal relationship between experts and an interested and engaged public. Chapter four analyzes the presentation of the hockey stick dispute in mass media sources. This media environment most closely adheres to the rhetorical conventions of modern scientific *ethos*. The

final chapter offers my conclusions regarding the rhetorical efficacy and strategy of the participants in the controversy. I pursue this assessment as a critic engaged by competing formulations of *ethos* and explore changes in the role of the rhetorical critic focused on *ethos* rather than ideology.

CHAPTER 2

AUDITING SCIENTIFIC CONSENSUS

This chapter introduces Steve McIntyre and Ross McKittrick’s critique of Mann’s hockey stick graph and their articulation of a skeptical scientific *ethos* built around the narrative of “auditing” the performance of mainstream climate science. Though their initial criticisms in an academic journal appeal to dominant norms found in modern scientific *ethos*, they emphasize transparency, replication, skepticism, and technical ability over collaborative research. Moving his activities to Climate Audit, McIntyre’s interactions with his sites commenters perform an auditing *ethos* built on immediate and transparent participation by the larger public.

Characterizing existing climate science as tainted by interest in grant money, McIntyre builds his credibility by positioning himself as an independent auditor, unbound by the personal loyalties and social pressures of the insular consensus community. Climate Audit’s anti-elitist *ethos* negates collective belief and trust in favor of individual liberty.

Immanent Critique – Using Scientific *Ethos* Against Scientists

The first portion of this chapter examines the rhetorical frame established by McIntyre and McKittrick in their more traditional academic papers¹. These documents introduce important features of the self-presentation of skeptical scientific character and *ethos*. McIntyre and McKittrick attempt to establish their own procedures as truly scientific through comparisons of

¹ I use this terminology to refer to McIntyre and McKittrick’s papers published in *Energy & Environment*, later paper in *Geophysical Review Letters*, and their responses to critics in academic journals. I will consider the criticism of *Energy & Environment* as a proper or credible forum, but for the purposes of this analysis, it is important to distinguish between these papers and blogging.

rigor, relevant expertise, replication and transparency of methods and data. These are dominant modernist *topoi* for producing scientific credibility. Skeptical efforts to present their work in conventional terms acknowledge the significant credibility challenges they face. Appropriating conventional characteristics for their unconventional conclusions shields their arguments against out of hand dismissal. The relative weight assigned to transparency and exact replication and the threshold established for transparency distinguish the skeptical characterization of the scientist from consensus accounts. Scientific *ethos* oriented by extreme transparency shifts burdens of proof and challenges consensus scientists accustomed to previous norms and appearances.

Characters – Absent-Minded Professor vs. Fact-Checking Auditor

The structure of McIntyre and McKittrick's initial critique suggests their need to contest Mann's credibility from within accepted norms of scientific expertise. They take pains to suggest that their procedures and results reflect accepted norms while labeling Mann's behavior deviant. Challenges to Mann's individual character in this context of academic publication remain implicit, but the terminology used to describe Mann's procedures clearly implies personal failings. In the process of presenting themselves as the only genuinely scientific actors performing the difficult work of replication, McIntyre and McKittrick introduce a more fundamental challenge to the framework taken for granted by Mann. They urge their readers to interpret errors or insufficiencies in a single study as proof of generalized failure or inadequacy of the consensus position.

First, we should consider the terminology used by McIntyre and McKittrick to characterize Mann and his team. The abstract of their 2003 paper argues Mann's research contains, "collation errors, unjustifiable truncation or extrapolation of source data, obsolete data,

geographical location errors, incorrect calculation of principal components and other quality control defects” (Stephen McIntyre & McKittrick, 2003, p. 751). While these are characterizations of the data set, readers are encouraged to interpret these as a product of individual character insofar as proper “quality control” on the part of the authors would have avoided these errors. Each dispute focuses readers on the poor decision-making employed by Mann’s team. Their use of “fill” data in particular temperature series where original data is available appears “inexplicable” (Stephen McIntyre & McKittrick, 2003, p. 757). Mann missed an “obviously impossible result” in copying the same temperature value for several Mexico-Texas sites in 1980. These characterizations have an importance beyond the interpretation of the particular study. This is clearest in the interpretation of the use of “obsolete” data:

For the purposes of this study, it is immaterial whether the MBH98 datasets were obsolete as at the time of publication of MBH98 or whether they have become obsolete subsequently. However, at least some datasets used by MBH98 were already obsolete in 1998. In response to an inquiry about series #51- #61, WDCP confirmed that the updated versions for four of the series were available as early as 1991-1992. [WDCP, pers. comm., Sept. 2003] (Stephen McIntyre & McKittrick, 2003, pp. 759-760).

Though “immaterial” for the evaluation of the competing reconstructions of temperature, the inclusion of this commentary and the efforts made to track down the timeframe for the availability of data clearly demonstrate the relevance of this information for comparing the rigor of the scientists producing the reconstructions.

In contrast to Mann’s sloppy handling of data and poor application of technique, the self-presentation of McIntyre and McKittrick conveys to the reader the image of a trustworthy, diligent, and clever investigator. It is their perspicuous observation of a single anomaly that initially provokes their critical interest in the data used to construct the hockey stick graph:

Upon request, Professor Mann instructed an associate to supply the collated proxy set, together with applicable weights, to the first author. When attempting to replicate MBH98 principal component (PC) calculations, an extremely low (6%) explained

variance for those in the Texas-Mexico dataset was noticed, leading to a close examination of the data collation. Anomalous start years (see details below) were noticed and it was verified that these occurred only in MBH98 data and were not due to collation errors on our part. Explained variance improved significantly by moving the MBH98 data one year later, confirming that an MBH98 collation error had almost certainly occurred. We then noticed copy errors in the 1980 values for these series and stretches of identical values in other places in the database. This led to a systematic comparison of MBH98 data to original data, identifying obsolete versions and undisclosed truncation of time series. Independent calculations of the proxy principal components convinced us that those in MBH98 were erroneous we updated and corrected the database and then applied MBH98 methodology, as publicly disclosed, to construct a temperature index from 1400 to 1980 (Stephen McIntyre & McKittrick, 2003, p. 752).

Though this narrative remains, according to scientific convention, in the passive voice, the qualities of the two investigative teams are clear. While Mann's team carelessly uses unusual and particular data in unjustifiable support for broad conclusions, McIntyre and McKittrick confirm that a single variation indicates a structural problem. Their investigation is "close" and "systematic" and their rigor evident in their double-checking that the collation errors were not their own. The characterizations provided by McIntyre and McKittrick are not novel, but draw their power from the norms expected of scientific behavior. Investigative rigor and thoroughness are supposed to insulate scientific findings from spurious or erroneous data fit the character of a scientific expert. However, the narrative context of these competing characterizations repurposes rigor as support for generalized skepticism rather than confidence in gradually improving understanding.

McIntyre and McKittrick frame their investigation as an "audit" of Mann's findings (2003, p. 762). More familiar contexts for the "audit" storyline in American culture, business and taxation, provide a novel backdrop for evaluating Mann's behavior. This context draws on an analogy between two areas of expertise presumed to involve arcane quantitative and statistical procedures. However, the "audit" storyline dramatically repositions the status of the expert practitioner. The traditional economic context of the audit refers to characters presumed to be

acting according to rational self-interest. Auditing checks the actual choices of economic actors against their public disclosure. The *ethos* of a successful auditor relies on their skepticism, precision, and independence from the entity being audited. Such a position changes the significance of the terminology of “Corrections” in the title of the 2003 paper from improvements made in the pursuit of a common investigative *goal* to direct challenges made on behalf of third party testing a common investigative *method*. At issue is not only one particular result that may or may not support community consensus, but also the standards for behavior within that community. The auditor must not share a common interest with the target of the audit. In this way, trusting or cooperative behaviors between scientists may appear inappropriately interested. Shifting the role of scientist to align with the distance of the auditor implies scientists should maintain the same studied disinterest from fellow researchers they are expect to display toward their data.

Provisional acceptance of the techniques provided by Mann establishes the capability of McIntyre and McKittrick as skilled technical statisticians and diligent fact-checkers. Though data is “corrected” and “updated,” no new data is provided and the important findings are couched in negative terms. Comparisons of relative skill focused on the application of technical expertise appear more objective than competing models used to interpret data:

Without endorsing the MBH98 methodology or choice of source data, we were able to apply the MBH98 methodology to a database with improved quality control and found that their own method, carefully applied to their own intended source data, yielded a Northern Hemisphere temperature index in which the late 20th century is unexceptional compared to the preceding centuries (Stephen McIntyre & McKittrick, 2003, p. 766).

Confirming their ability to beat Mann at his own game or on his own ground opens up the possibility of a larger challenge to the status of the products of paleo-climate research and the factors audiences should include in evaluating the presentation of these products. With the

character of researchers in doubt, subsequent disagreements of method or choice of source data will be weighted toward those of superior character. Deploying the auditing narrative frame changes the significance of negative results. Experimenters testing common data reporting negative results cast doubt on the validity of a particular model or interpretation. Auditors reporting negative results cast aspersions on the modelers. McIntyre and McKittrick emphasize that Mann's results are being "audited" against his own standards and stated methods, "We replicated the methodology of MBH98 as closely as we could using publicly available documentation and such private assistance as we were able to obtain" (2003, p. 763). Failure in this area implies a failure of integrity and honesty:

These fills are neither required nor justified statistically and exceed MBH98 disclosure. There is no disclosure of the extent of data filling or its potential impact on the constructed temperature index in the text of the Nature article and, their supplementary web page (http://www.ngdc.noaa.gov/paleo/ei/data_supp.html) says only "Small gaps have been interpolated. If records terminate slightly before the end of the 1902-1980 training interval, they are extended by persistence to 1980" (Stephen McIntyre & McKittrick, 2003, p. 758).

In the relatively formal environment of academic publication these attacks operate enthymematically. Later analysis will demonstrate that changes in media encourage a move from indirect insinuation underneath the traditional language of formal cooperation to direct antagonism regarding the sufficiency of disclosure and integrity.

Artificial Constructs vs. Natural Observations

The characterizations and narrative of auditing undermine the status of the scientific products of Mann's research. Beyond casting doubt on the validity of the hockey-stick graph, this storyline enables a shift in direction of the activities of observation and witnessing. Modern scientific *ethos* focuses on producing a shared "common-sense" between investigators and witnesses. Shifting the gaze of the witnesses from inside collaborator to outside auditor subjects shared

sensation to additional skepticism. As an initial gambit, McIntyre and McKittrick introduce a change in nomenclature:

2MBH98 refers to the index resulting from their calculation as a “reconstruction.” This is a misnomer since it is a novel index, rather than the recomputation of something previously observed. Therefore it will be referred to herein as “construction” (2003, p. 752).

Rather than an interpretation of observations, this exercise involves the “construction.” This is an attempt to emphasize the subjective element of paleo-climatology. If these findings are a result of intervening procedures that involve choices on the part of those “constructing,” their status changes from “observations” to artifacts produced by human actors:

The Australian PC1 is one of relatively few MBH98 series that shows anomalous 20th century behaviour and which closes on a dramatic “uptick”. The correct computation shows that this feature of this particular MBH98 series is entirely an artefact of incorrect calculation (Stephen McIntyre & McKittrick, 2003, p. 762).

The character of the skeptical auditor plays a more prominent role if scientific investigation and authority depends on the technical skills of applying methods and techniques to data rather than observing or gathering data. McIntyre and McKittrick’s emphasis on Mann’s poor implementation of statistical procedures focuses attention on an issue where the disparity in prestige and experience in climate science become irrelevant. In an environment that privileges coding and methodological choices, high thresholds for transparency and disclosure appear more reasonable given that replication depends upon the application of construction techniques in place of common vision. Scientists properly distanced from one another will display greater rigor evaluating methodological choices because they share no prior common interest in consolidating consensus.

Re-placing Scientific Data – Providing Context for Artifacts

The status of the hockey-stick graph as a flawed human artifact coincides with the different “setting” for the audit narrative. The feature of McIntyre and McKittrick’s paper that violates the customary presentation of scientific research in a formal academic context is their introduction of an external political context. They take pains to reference the prominence of Mann’s paper and its inclusion in the IPCC’s summary for policymakers (Stephen McIntyre & McKittrick, 2003, pp. 752, 776-767). They adopt the colloquial and public appellation of “hockey stick” to refer to Mann’s findings (a label that does not appear in Mann et. al. 1998). While we might expect that the attempt to present oneself as a scientist would preclude such references, the invocation of a larger political context is used to indict the consensus scientists as unduly interested in the results of their research. Establishing the symbolic importance of Mann’s research deflects charges that his conclusions remain unimportant for the important elements of the climate change consensus. If Mann’s graph achieved such prominence, yet remains unimportant for the core of the consensus this proves climate research has not been sufficiently insulated from interference by political actors. Alternatively, if Mann’s graph is flawed and passed through peer review and IPCC review, this undermines the credibility of these procedures. Explicit acknowledgement of the political consequences of climate research proves that skeptics must operate on a terrain that is not truly scientific. That the “hockey-stick” is “well-known” or “extremely influential” suggests that its appearance and transmission result from powerful interests rather than from powerful scientific conclusions (Stephen McIntyre & McKittrick, 2003, pp. 752, 766). Their reference to the “press release accompanying Mann et al 1999),” suggests that research supporting the consensus position is implicated by worldly concerns, but fares worse through failure to acknowledge this fact (Stephen McIntyre &

McKittrick, 2003, p. 766). Positioning the Mann paper as prominent, and therefore crucial, assists McIntyre and McKittrick in shifting the burden of proof to their opponents:

[T]he extent of errors and defects in the MBH98 data means that the indexes computed from it are unreliable and cannot be used for comparisons between the current climate and that of past centuries, including claims like “temperatures in the latter half of the 20th century were unprecedented,” and “even the warmer intervals in the reconstruction pale in comparison with mid-to-late 20th-century temperatures” (see press release accompanying Mann et al 1999) or that century no longer highest Mann et. al. 1998 contains data errors the 1990s was “likely the warmest decade” and 1998 the “warmest year” of the millennium (IPCC 2001) (2003, p. 767).

Unlike the scientific collaborator, the auditor must take into account the interests that shape the decision-making processes and the effects produced by the adoption of particular techniques or standards. Placing scientific action in a controversial political and policy context credits an auditor even though it might endanger scientific authority premised on strict demarcation. In this way, skeptical characters can possess both the worldly qualities of engagement with subjective interests and the disinterested and objective detachment characteristic of a modern scientific observer.

Re-positioning paleo-climatology in a highly interested context alters the value of special expertise. McIntyre and McKittrick imply that climate experts act either out of naïveté or illegitimate political interest. Thus, their claims to special expertise prove they are either ignorant of the structural interests guiding their discipline or experts in a corrupt enterprise. The specialization of the sub-discipline produces suspicion rather than deference. An explicit charge that interest in continued funding produces over-specialization and encourages dramatic claims does not appear in McIntyre and McKittrick’s academic papers, but is supported by their change in narrative. Mann’s attempts to claim authority on the basis of his multi-proxy technique are re-characterized as the naïveté of an over-specialized and under-supervised sub-discipline:

Although the “multiproxy” approach was apparently a novelty within the climatological community, the same algebraic and statistical methods are commonly used in economics, business and elsewhere in the social sciences, though the terminology differs from discipline to discipline (Stephen McIntyre & McKittrick, 2003, p. 752).

Statistical expertise becomes the marker of a general form of authority than enables the audit of specialized practitioners borrowing methods they fail to understand deeply. The generality of this language strengthens the institutional criticism of climate science and the procedures of climate scientists. They fail to follow or understand the methods commonly used in other disciplines because they are not authentic experts. Institutional deviance on the part of climate science as a sub-discipline must result from political interference by powerful interests.

Blogging the Audit

McIntyre’s production of the Climate Audit blog enacts the alternative auditing narrative, its supporting institutional arrangements, and characterizations, introduced in his formal academic critique. The following sections of this chapter will analyze changes in institutional arrangement, character, narrative, and distribution of credibility and expertise produced in the exchange between McIntyre and individuals posting on Climate Audit. . The public forum of the blog and the increased regularity of production, updates, and feedback supports a scientific character dedicated primarily to transparency and availability rather than distance. By producing and linking together individuals into a collective of skeptical witnesses, Climate Audit offers its readership support in turning their internal criticism of a particular study into a direct challenge to paleo-climatology and supporting structures of scientific authority. A public “audit” shifts audience presumptions towards skepticism directed at self-interested actors.

Skeptical Collective

The change to the informal and easily accessible environment of a blog creates possibilities for the articulation of a collective skeptical community and the definition of

skeptical character and identity. First, I will examine the role played by the ease of access in defining the skeptical character in participatory terms. Then, I will outline the consequences for characterization that this change in forum entails. Though exchanges on Climate Audit take place between self-labeled skeptics and their erstwhile opponents, this section will use the opposing consensus position and posters primarily as a mechanism for contrast. Readers should also note that blog comments are copied as displayed on Climate Audit (this is also true for RealClimate comments in chapter 3). Enough comments contain such a large number of errors that noting them would interrupt the flow of reading.

Those participating in the blogging of the hockey-stick dispute often describe their experience as participatory and active. This feature of blogging as media defines scientific activity according to ease of access and the formation of a community. Though the authorship of all posts and editing of Climate Audit resides in the hands of Steve McIntyre (and for a time, an associate named only “John A.”), the exchange of comments is often noted as a value of the site that exceeds the transmission of particular content. McIntyre’s suggests in the “Blog Rules and Road Map” that communal activity and input are important for the character and success of Climate Audit:

I like the feedback. So look at the Categories to crosscut the sprawl here. I’m amazed at the number of hits that the blog receives. It seems to have found a niche and I’m amazed at some of the people who have found it. I particularly welcome the comments and feedback. Lots of hits are for that exchange rather than for me and, if I didn’t get the feedback, I wouldn’t keep up the blog (Steve McIntyre, 2004).

The themes of open exchange, debate, and mutual support (especially in the form of providing additional references or data) raised by McIntyre appear consistently. Conduct and self-presentation or definition act co-productively as comment strings and debates between skeptical commenters and their opponents provide evidence for auditors that their community is thorough,

open-minded, and analytic. One commenter contrasts the exchange on Climate Audit with that of Real Climate (a competing consensus-supporting website), “I read the responses on Real Climate and there were no negative or arguing comments. Even respectful ones. Do they allow such postings?” (TCO, 2005c). In negotiations for producing joint content with another skeptic website, World Climate Report, John A. (Climate Audit’s former co-editor) wrote in an email re-posted on Climate Audit:

I might add that worldclimatereport has no comments allowed and therefore no feedback, making it less informative and more declarative. I think it would be better to have some form of feedback in order to involve an audience and clarify issues. I think that the feedback we have on climateaudit (other than two trolls, easily dealt with) is a positive contribution to the weblog, and stimulates new lines of inquiry, and new articles (2005d).

Building skeptical character around the qualities of openness and active contribution to research offers readers those qualities historically associated with scientific communities. The failure of climate scientists to display sufficient critical activity and commentary establishes that the genuinely scientific community resides in the hands of those who are ignored, excluded or preempted in the formation of expert consensus.

Openness to debate and active participation are most often contrasted with the deferential character of those willing to defer to expert consensus. Replication, an important element of conventional understandings of scientific methodology and procedure takes on added importance in skeptical visions for scientific activity. The treatment of replication as “textbook” scientific procedure highlights the possibility for turning idealized modern images of scientific activity into demands for disclosure:

[T]he real problem with this debate is that many “scientists” have either forgotten, or never knew, what the scientific method entails, or how to comply with it. Science is about measurable facts, not opinions. At school (in the 1950s) my science teachers drummed into me how important it is to carefully write up the experiments that we undertook – the objectives, the methodology, the findings, and in particular to focus on setting down

sufficient information that another interested party, following our methods, could replicate our results (Soper, 2005).

Other comments refer to replication as the “lifblood” or “keystone” of scientific investigation (Eschenbach, 2005; per, 2005). The enduring importance of normative understandings and expectations of insulated scientific communities establishes a difficult threshold when everyday behavior can be compared to normative ideal. Subjective choices necessary for applying complex statistical methods appear suspect because replication of these techniques requires acceding to the researchers procedural choices.

The ability to actively contribute to the verification of results builds skeptical character on the basis of individual technical capacity. The collective witnessing required of visually demonstrative experiments is repurposed for the world of statistical calculation. One’s value as a credible witness is tied to one’s willingness to actively participate in replication. This helps deflect charges of skeptical deference to a new set of experts or elites:

I didn’t straight believe SM [Steve McIntyre], I replicated the Mann PCA step and agreed with the conclusion it was flawed. If I “just believed SM” then I wouldn’t have gone to the bother of doing this. So again, you are wrong (Spence_UK, 2005).

Only active participants can be trusted to arrive at their own conclusions, rather than simply trusting those in positions of authority. Centered on replication, the organized skepticism of scientific procedure becomes highly individualized rather than distributed to specific institutional sites of expertise:

[S]cience is about – transparency, and replication of experiment. Peter, when you actually decide to start discussing science itself, rather than logical fallacies like appeal to authority, then you might gain credibility (SPQR, 2005).

The emphasis on transparency and replication as sources of objectivity is highly orthodox and conservative in its preservation of portions of dominant scientific characterizations. Yet, while such an approach may encourage a conservative and skeptical attitude toward particular results,

this *ethos* shift rearranges the spaces and media producing scientific data. Strong expectations of transparency and replication are well served by media capable of consistent updates and the obvious participation of many individuals (in comment threads).

Blogging facilitates the display of attention to detailed replication and individual commitment to oversight. Relations cultivated between contributors to Climate Audit differ from the institutional isolation and gate-keeping characteristics of an elite “priestly” institution. In contrast to the detached space of the laboratory, Climate Audit’s consistent updates and comment chains make the work of rigorous oversight public. Claims regarding the importance of showing one’s work are performed in the blog’s ability to demonstrate constant activity. McIntyre’s response to Mann’s (and his defenders’) new publications demonstrates his commitment to immediate oversight. A striking example of this self-presentation occurs in McIntyre’s posts in the spring of 2005 responding to research papers by Eugene Wahl and Caspar Amman. Presenting himself as a diligent investigator McIntyre notes his activity before arriving at definitive results:

Just got back from Washington a few minutes ago (I think that the presentations went very well) and saw this press release from Wahl and Amman. The points appear to be ones that have been posted up at realclimate before, which we’ve fully considered and, in my opinion, don’t lay a glove on our criticisms. Here are the links as sent to me. I’ll post up some more comments after I’ve had a chance to look at it (2005g).

One hour later a frequent commenter, “Spence_UK,” responds in the comment thread comparing the source code available in these papers to Mann’s original research:

I was originally optimistic that the source code might reveal clues as to the method applied by Mann (quirks and all) but having briefly scanned the code it looks to me like all the important decision steps are missing and the code only performs the last stage (2005)

Three hours later, McIntyre and “Spence_UK” post a series of comments and responses detailing their search for Wahl and Amman’s R2 measure (of statistical significance) while speculating

concerning reasons for its inclusion or omission. In a post updating the discussion McIntyre makes a point to note that this procedure provides a degree of openness that ought to provide additional credibility:

As I work through their code in the next few days, I will highlight any points of methodological difference and will immediately provide notice of the issue. This is what you're supposed to do in public businesses (and most businesses do) and it's a good policy (2005h)

Over the course of several days, multiple posts catalog progress on working through the code and results of Wahl and Amman's paper. If credibility depended only on the technical accuracy of results there would be little purpose to this style of self-presentation. Initial information sharing does assist efforts at collaboration and verification. However, the consistency of updates and the inclusion of information about the levels of personal activity provide additional proof of character. The comparison to the rapid pace of notification from the world of business attacks the concept of a scientific community insulated from immediate pressure in the interest of research freed from immediate relevance.

If scientific *ethos* rests primarily on the norm of organized skepticism and procedural transparency and diligence, those behaviors can be detached and redeployed to support forms of authority that fall outside the scope of traditional scientific expertise. Moving from a special and thoroughly demarcated space to a set of procedures and relationships that cut across traditional lines of expertise empowers individuals at the expense of a disciplined collective. One commenter explicating the concept of "interdisciplinarity" found on Real Climate claims:

Interdisciplinarity is certainly key just to reconstructing past temperatures, to say nothing of projecting future ones, to say nothing of identifying the causes that will bring about the projections. While some climatologists seem to claim all of this science as their own exclusive preserve, in reality this requires mathematics, statistics, geophysics, astrophysics, botany, geology, common sense, and integrity. ANYONE in possession of a modicum of ANY of these is in a position to make a contribution, and such contributions, I am satisfied, are badly needed in the processes that today are leading straight to enacted

laws. There is NO SUCH THING as an intelligent person who is “not qualified” to contribute to the undertaking, and especially, to criticize completed projects being used for the enactment of laws (Potts, 2005)

While some comments express disdain for a term that appears nothing more than a buzzword used to support consensus science, this comment indicates a significant challenge to institutional specialization as a source of expert authority. My conclusion will explore the significance of re-characterizing a participatory *ethos* for scientific activity in skeptical terms.

Narrative: Auditor vs. Promoter

The audit narrative centered on the heroic efforts of individuals to double-check unjustified claims of authority weakens the concept of science as a thoroughly demarcated space. The audit storyline draws a different map of the relationships between place, practice, and authority. McIntyre considers the hockey stick controversy as proof that consensus scientists already transgress boundaries between science and politics. This claim deflects counter-charges of radicalism against McIntyre’s desire to change peer review and the existing institutional boundaries of modern science. Therefore, the criticism of particular experts need not rely on a criticism of expertise or scientific authority in *toto*. In this account, because climate scientists are already self-interested in their pursuit of research funding, the public must import both individuals and institutional procedures from the self-interested world of business and economics. The audit storyline shifts from a presumption of trust to guilt. McIntyre claims that traditional academic peer review is insufficiently critical because it presumes innocence, integrity, and cooperation within specialized fields. Peer review does not serve the need for oversight because reviewers are deferential and friendly to colleagues but dismissive of those outside their field.

Positioned outside the conventional scientific community, the heroic and independent auditor is free from the corrupting influence of personal connections and interests. The gentility and civility of the academic environment that once served as a strength and source of credibility appears in this story as a source of naïveté and credulity (Shapin, 1994). The comparison of peer review to an audit establishes that the peer review process depends on the good will and personal connections of fellow specialists:

The problem with the PC calculations was known to the authors a long time prior to publication, but they did not discuss this matter in the article. Although the authors were familiar with the problem, I suspect that the referees were not. Applying standards of a business prospectus, it would be the responsibility of the authors to discuss this problem in the article and to notify the referees of this potential problem. This does not seem to have been done here...[W]e pointed out the inadequate disclosure of these matters to the editor of *Journal of Climate* prior to publication of this article and suggested that the matter be brought to the attention of the referees. Instead of doing so, my understanding of subsequent correspondence is that the editor contented himself with the assurance of the authors that they stood behind their calculations (Steve McIntyre, 2005c)

Trading in personal reputation and credibility is prone to re-narration as negligent or corrupt behavior. Academia fails the test of due diligence that a skeptical audience expects of businesses:

The bigger issue is the non-reporting of adverse data by the Hockey Team. If mining promoters didn't report bad holes, you'd call for the security commission or even the police. I mean that literally. The NSF [National Science Foundation] needs a wake-up call (Steve McIntyre, 2005b).

Such a narrative brings to bear the binds between place and character of an *ethos*. Connecting different institutional spaces to distinct experiences, and therefore the development of individual character, makes this story about more than simply the mistakes or misdeeds of a particular scientist. Shifting the presumptions of behavior permits a broader critique, as in McIntyre's insinuation, "A copper trader once told me: people who cheat on big things cheat on little things.

I'm not saying that this is what happened here – I'm merely saying that that is my philosophy in approaching things" (2005a). An exchange between McIntyre and a poster concludes:

As I have a lot of experience during my life of investing (gaining and loosing) money I know a lot, but not all, tricks to convince people to invest their money in uncertain projects. This hockey-stick like shape curve I have so often seen offered by people who were venturer, but not serious people. If nowadays somebody would offer me an investment with such a curve, I immediately would kick him out of my office. Steve: Me too. Hockey stick graphs are much more famliar to business people than to academics. That's what interested me in it in the first place. It looked like a promotion to me (Strafer, 2005).

From the auditing perspective, the hockey stick controversy is a product of interactions between sheltered and trusting academics and powerful interests pursuing a specific political agenda to limit greenhouse gas emissions. For most scientists, life experience in the laboratory lacks the type of hard-nosed and consequential encounter that those making investment decisions must develop. Instead, social pressures to conform to dominant opinion contaminate the research process and even researchers who might be in a position to disagree fail to do so. McIntyre responds to claim that other multiproxy studies verify Mann's work by arguing, "There is a fantastic amount of overlap of authors and proxies, so that these other studies are not 'independent' as ordinary people understand the term" (2004). What appears to be consensus is in fact the product of the close ties between researchers and their methodological choice:

[O]ther proxy climate reconstructions are just as bad as Mann; Steve's been picking them apart steadily, but just hasn't gotten everything he's found into journal articles yet... Finally the reason "hundreds of other scientific studies" reach the same conclusions is most easily explained as "follow the leader". People want their work published so they mold their findings to match what is expected whether the actual data fits or not (Dardinger, 2005)

Merton's vision of "organized skepticism" devolved into institutions that are too organized and insufficiently skeptical. This narrative also identifies self-interest as the reason skeptical arguments are marginalized in mainstream scientific publications. The importance of place in

ethos helps account for this narrative's ability to differentiate between the activities of skeptics and consensus scientists. Skeptical efforts occur outside dominant institutions, while consensus efforts to replicate Mann's results become further evidence of defensiveness and gullibility on the part of the privileged.

Consensus scientists are vulnerable to the primary villain in the Climate Audit narrative, the promoter. Naïve trust is an especially dangerous characteristic in an environment in which greed, ego, and interest drive much of individual behavior. In this narrative, the IPCC and the climate science community are not as separate from the self-interested world of business as they would like the larger public to believe. In a post titled, "The Significance of the Hockey Stick," McIntyre clarifies the role that business-like promotion plays in consensus science:

Recently, as the hockey stick looks more and more splintered, some climate scientists have argued that the hockey stick graph was merely incidental in Kyoto promotion. As someone with actual experience in business promotions, this proposition has seemed peculiar to me, since the hockey stick graph was displayed so prominently by IPCC. This view was re-inforced by an interesting essay by David Deming here. To understand the role of the hockey stick in Kyoto promotion, one need look no further back than the IPCC Second Assessment Report in 1995. The millennium temperature history portrayed in that report is shown in the diagram below...Simply looking at this diagram shows the problems that IPCC promoters would have. You couldn't sell the public with this graphic. Deming's essay summarize the problem for climate promoters at the time: '...With the publication of the article in *Science*, I gained significant credibility in the community of scientists working on climate change. They thought I was one of them, someone who would pervert science in the service of social and political causes. So one of them let his guard down. A major person working in the area of climate change and global warming sent me an astonishing email that said "We have to get rid of the Medieval Warm Period"' (2005f).

Climate science is already divided into camps, with specific affiliations and interests. By portraying the climate science community as partisan, fractured, and interested, auditors preempt the criticism that they support dominant interests. The consensus charge that skeptics are in the pocket of energy interests loses its force if that same charge originates from a partisan opponent. References to consensus science as part of a "promotion" tie it to the interests of governments or

scientists pursuing funding. In the place of disinterested discovery, skeptics find interests in grant money or support driving much of the research agenda. John A. refers to the “standard pitch for more money to research...based on the climate catastrophe fad-of-the-moment” that guides consensus science (2005d). According to another commenter, only the corrupting influence of money could account for the aggressiveness of “promotion:”

The piece I still don't understand is why would so many highly educated people, obviously well placed in society support this lie to the public? I assume there is money somewhere. Is it because the lie changes the flow of research funds or does it create a new fake industry of “pollution control”? What then is Kyoto really about? (St. Andre, 2005).

Most activity based on information other than absolute certainty can be characterized as “promotion.” As a result, an auditing *ethos* is paramount for fields, like climate science, that interface directly with political communities. Only those with prior experience in seeing through promotional tactics deserve public trust. In such a storyline, the burden of proof rests entirely with would-be promoters and negative critical activity gains social currency.

A narrative frame that demonizes the irresponsibility of promoters also insulates McIntyre from criticisms of business *ethos* as unscrupulous or competitive to a fault. Positioned as the auditor, rather than the business executive, McIntyre implicitly compares the paleo-climate scientific community to firms like Enron and the Canadian mining company Bre-X. Such a narrative potentially resonates with audiences both sympathetic and antagonistic to big business. For those skeptical of business interests, the auditing frame positions McIntyre outside of the profit motivation responsible for the corruption of Enron or Bre-X. Audience members sympathetic to the business world may hope that auditing subjects the scientific community to the same pressures they face in a post-Enron world. The increased auditing scrutiny in the United States brought about by the Enron scandal and the passage of the Sarbanes-Oxley Act of

2002 might be expected to generate resistance to the auditing *ethos* among a business-friendly audience. However, by channeling this resentment into increasing expectations for transparency in the climate science community, the auditing narrative offers these audience members the opportunity to demand of others what they now believe is expected of them.

Negated Persona – the Believer

A skeptical scientific *ethos* must respond to an obvious tension between an ideal of openness to debate and criticism and the formation of a communal identity premised on a shared position regarding climate change. A Climate Audit comment in response to McKittrick's paper, "What the Hockey Stick Debate is About," encapsulates this dilemma:

My only complaint is a trace of triumphalism, especially at the end which will be off-putting to those who want to read it to make up their minds. Of course skeptics who need bucking-up will probably take heart for the same reason" (Dardinger, 2005).

A skeptical posture that remains open to persuasion runs into difficulty with any attempt to definitively resolve controversy contrary to the consensus position. Simultaneously, those building support for a minority position likely need the ability to "take heart" in the strength and validity of their stance. The shifting narrative context of triumphal scientific discovery to careful supervisory auditing and discovery of error imposes constraints on a skeptical persona. As a result, much of the skeptical character on Climate Audit is constructed in contrast to both the content and form of mainstream scientific consensus. In this context, an excluded "third persona" plays an important role in permitting the definition of skepticism in negative and oppositional terms that preserve the characteristic of individual liberty and openness to objective evidence.

The third persona of skeptical narratives is defined by their willingness to trust and believe instead of test and apply strict critical scrutiny. Skeptics contrast their own diligent

efforts at de-bunking with uncritical belief. As with the general appropriation of scientific skepticism as a form of anti-dogmatism, this specific contrast uses rhetorical resources provided existing elements of a scientific *ethos*. Dogmatic religious belief as the antithesis of rigorous scientific verification is a powerful touchstone in the historical formation of scientific identities (T. Lessl, 1989). Though not used frequently, John A.'s suggested label for "climate warming alarmists" is "credophiles" (2005c). Several comments analogize the consensus position to religious belief:

I think Peter [a pro-consensus poster] is having difficulty understanding the difference between a scientific theory — in this case, AGW [anthropogenic global warming] — which is subject to all the normal testing of the scientific process, is falsifiable, and thus no religion, and the high priests or clergy or what-have-you of the movement (Political? Religious? Or what? But certainly not scientific.) that is loosely based upon this theory. It seems pretty self-evident that, aided by the scientific illiteracy of the media, politicians and the general public, they have taken and perverted the AGW theory in such a way as to make it unfalsifiable, at least in their own eyes, and the questioning of it a heresy: THAT is what is tantamount to a religion. It is certainly not science (JEM, 2006).

Believers succumb to a moralizing frame that assigns particular opinions heretical status. A later section of this chapter will treat the critique of the priestly voice contained in this characterization more extensively (and the implications this may have for the rhetoric of science). For now, we should note the equation of "belief" with "trust" or relations of expert authority rendered unacceptable by skepticism. John A. suggests in an argument with Australian climate scientist John Hunter in one comment thread that the dynamic of trust in specialized expertise rests on the idea that climate scientists are "saintly" and "incorruptible" (2005a). For commenter Michael Ballatine it is the "blind faith" in the ability of climatologists to "see temperature signals...no matter how much noise there is" that is "simply miraculous" (2005). Exchange on the issue of analogizing consensus science to religion produced several threads, some of which object to the caricature of consensus proponents as religious believers. However,

even among those skeptics refusing to label the consensus position as equivalent to a religion do so because the consensus position on anthropogenic climate change excludes non-human causes (e.g. (Norman, 2006). Such a distinction makes “belief” that much more undesirable as a characteristic. One of the prominent consensus commenters on Climate Audit, Peter Hearnden confirms this in responding to this criticism by claiming, “I’m not one for beliefs, beliefs are for the religious” (2005). The suggestion that the hockey-stick graph is part of a “pathological science” in which “no one but the true believers can replicate the results,” censures the concept of belief as excusing the failure of verification and replication (Hissink, 2005).

Skeptical Criticism – Selective Iconoclasm and “Spot the Hockey Stick”

One of the significant effects of denigrating the persona of “believer” is the effect that it has on the critical practice of Climate Audit skeptics. If unjustified belief and mass consent to powerful interests are significant threats, unmasking the sources of that belief becomes critically important. While McIntyre performs complex statistical analyses and debates, other Climate Audit visitors are invited to participate in an activity called, “Spot the Hockey Stick.” Co-editor “John A.” posts links to academic publications, news sites, educational sites, and speeches or announcements by governmental officials that contain the image of Mann’s hockey stick graph. Readers are invited to post their own links in the comments sections of such posts. The cultural and media criticism that occurs in “spotting the hockey stick” reveals an awareness that the power of scientific evidence depends on rhetorical effectiveness. One commenter notes, “It’s easily the most popular climate change-related graphic out there...If it fails...the IPCC loses its most powerful tool for persuading the public of the case for drastic action” (Love, 2005). In asking what the skeptical *ethos* offers its participants, we must account for the pleasures of occupying the position of being in the know instead of a dupe:

One of the fun parts about finding the Hockey Stick is the many guises in which it appears. If you didn't know what you were looking at, you could easily miss the significance of the information provided for you by people in authority (John A, 2005b).

The sophisticated consumer of scientific information recognizes it as information that changes in significance as it changes contexts. One comment notes that the probability caveats contained in Mann's original paper and in the IPCC's assessment are often dropped in the presentation of the graph (Spence_UK, 2005). Labeled a "totem" or "icon," the hockey stick graph takes on added importance when considered as a cultural product rather than merely a piece of scientific data.

Its effects exceed the question of its veracity:

The Hockey Stick has become THE emblematic representation—a logo of sorts—of climate change science, entirely unmoored from its ostensibly humble and cautious origins in the TAR [IPCC's Third Assessment Report]. It pops up behind John Houghton, in IPCC climatologist Andrew Weaver's lectures and public seminars, in all manner of government-sponsored climate change propaganda, in environmental advocacy literature, in media reports, you name it. It is immensely influential, and its discrediting would deprive climate change advocates of a powerful propaganda tool...[H]ere's an analogy: I could claim—per Hunter—that based on a statistical analysis of the proportion of biblical verses devoted to it, the story of (say) David and Goliath has been insignificant to western culture. Of course, I would have to boneheadedly ignore the mountains of references to it in all manner of literature, its use in religious ceremonies as an example of the power of the Judeo-Christian God, its common use as an all-purpose underdog metaphor, and so on (Love, 2005).

The orthodoxy of skeptical understandings of scientific methodology does not extend to a literalist interpretation of scientific effects. Claims for the importance of certainty and replication amplify the case that paleo-climate constructions should be treated as media artifacts rather than scientific data. In this fashion, skeptical posters can position their opponents as those blind to the effects of ideology or institutional power:

Virtually no-one has read the SPM [IPCC Summary for Policymakers] (not even, one suspects, most policymakers)—yet the Hockey Stick features prominently in all manner of scientific, technical, environmental, governmental, and other popular treatments of climate change. Now how did THAT happen? ...[T]he Hockey Stick is clear, having been reinforced in countless viewings outside of the TAR in all sorts of contexts (Love, 2005).

The relationship to scientific authority displayed in “spotting the hockey stick” works as a form of iconoclasm or ideology criticism. If readers consider the Hockey Stick a potent symbol of an elite priesthood or untrustworthy elite rather than one scientific study amongst others, the technical details of this dispute take on added importance as a challenge to existing authority. Each piece of data or study referenced by consensus supporters may also be suspect, because only those concepts, data, and conclusions that align with dominant interests are likely to receive airtime.

Larger Stakes – The Costs of Belief and Skeptical Prudence

Climate Auditors often use the hockey-stick controversy as proof of a larger battle between political forms that privilege liberty and those founded on consensus. Based on usernames (and content) the commenters on Climate Audit appear to reside primarily in industrialized states but are not restricted to the United States and Canada. Rather than restrict the debate over scientific authority and institutions to a national context, many comments suggest governments (or pressure for an international government) drives the production of consensus. Scientific consensus as a form of dogmatic adherence is grouped with larger threats to liberty:

Concerning the personal attacks on the skeptics: those people advocating the “consensus” seem(ed) to imagine that they are/were the leaders of a society that is able to impose its opinions on all the people – it’s enough to say that someone is bad and disagrees with the “Party” of consensus scientists – and perhaps even connected with the capitalists – :-) and the person is eliminated (and not allowed to publish). This worked in Germany and the Soviet Union for a couple of decades – but it only worked because the leaders had military and other tools on their side. On the other hand, we are living in democracy where we usually enjoy the freedom of speech and scientific inquiry – and it is absolutely clear that the tendencies to make the opposition silent without arguments just can’t succeed. It’s great that a more balanced set of papers is being published recently, and I hope that this development will continue and people will start to check the important statements – not just the Hockey Team, but also other things that could be comparably problematic... Now the topic will get popular enough so that many people may jump on the bandwagon and investigate the available data and papers critically (Motl, 2005).

Liberty orients skeptical *ethos*. Auditors' refusal to give into to consensus judgments proves their commitment to individual freedom. Witnesses and participants in the critique of consensus take the opportunity offered to play the role of a skeptic unconstrained by the demands of others. A strong value commitment to liberty facilitates an interpretation of the hockey stick as symptomatic of structural problems. The power and resources arrayed by consensus and collectivism help explain that pockets of dissent remain limited. References to the "priestly" voice of scientists demonstrate the power, ignorance, and paternalistic attitudes of consensus science:

I applaud his honesty in admitting that scientific results that he has produced should only be made available for any sort of check by people he personally approves of, whether or not he took taxpayers' money in doing so. Climate science, in Hunter's estimation, should only be shared by people who share his beliefs about its conclusions, but the rest of us feeble-minded peasants should provide him all of the facilities that he should ever require for his papal pronouncements from that gilded ivory tower, and we should be grateful for the privilege (John, 2005).

Though part of an individualistic *ethos*, comments like this indicate the importance of solidarity for a skeptical *ethos*. Solidarity built around a common sense of persecution by powerful forces offers auditors opportunities to share conclusions and values rejected by mainstream consensus. Accusations against the elite priesthood distance auditors from alignment with the status quo. When confronted with accusations that powerful vested interests support skeptical science, one commenter responds:

RE: #45 – The array of corporate power I am part of (albeit as a public "go with the flow" and a private objector) is actually a massive force promoting climate change hysteria and increasingly draconian "Green" legislation. The main victims of such legislation will be small business owners and individual entrepreneurs, as well as tax payers and consumers in general. This is something the average person fails to comprehend. Draconian "Green" laws do nothing in the grand scheme of things to reduce business profits. Costs get passed along to consumers baked into selling price. Social churn like this presents new markets and product opportunities. Imagine GM for example. What they don't want you to do is buy an H3 and keep it for 10 years. They want you to buy (or lease!) for 2 years then go get something new. As for "Big Oil" that

is a misnomer. Firstly, Western energy companies are small by global standards. Secondly, they are just that, energy companies. Scratch the surface of most solar panel sellers and you will find either energy company or semiconductor company money. But hey, go ahead and believe your conspiracy theories, they are more fun than understanding reality (Sadlov, 2007).

Skeptical auditors occupy a position distinct from elites and the “average” person duped into believing mainstream claims. Belief that the truly powerful will not benefit from consensus opinion ignores the only the truly powerful have the capability to manufacture consensus. Working as a “private objector,” the individual auditor may gradually build support for challenging the overwhelming power of consensus. From within the auditing narrative, opposing claims about corporate power prove that the opposing worldview operates ideologically. Such arguments distribute credibility according to the alignment of forces rather than individual conviction. Reasoning on these terms is spurious:

“What is the array of corporate power aligned against changing the energy infrastructure?” Well, Exxon predicts substantial growth in wind power between now and 2030. Therefore, since Exxon says this, it cannot be true. The other day I met an Exxon executive. I asked her if $2+2=4$. She said yes. I don’t believe her (Mosher, 2007).

Auditors feel they align on the basis of factual assessment rather than ideological ad hominem. Narratives of powerful consensus interests ensure that skeptical auditors may claim to operate beyond the range of dominant institutions and interests. Supreme valuation of liberty within the auditing *ethos* supports the individualization of authority. Individual authority and judgment deserve the final say against the powerful interests and institutions of the scientific priestly class.

CHAPTER 3

MODERATING SCIENTIFIC CONSENSUS

We turn now to the response organized by Michael Mann and his collaborators to the credibility and character challenges issued by McIntyre and McKittrick. Facing accusations they concealed data and made fundamental calculation errors Mann and his colleagues seek to re-establish their expert “honest broker” status. Portraying McIntyre as unqualified amateur, they hope to maintain conventional demarcation between expert and non-expert. However, characterization of expert authority changes from the distant expert to the helpful “moderator” in the move to the less formal environment of blogging. Mann and other climate scientists created the blog RealClimate to respond to McIntyre and McKittrick’s criticisms. Acting as blog moderators, these scientists screen the comments allowed to appear on the site. Moderating activities make demarcation activities obvious to the consuming public. Moderators interact with their audiences in order to produce mutual boundaries on expertise and science. These interactions are not governed by the institutional and stylistic distance characteristic of modern scientific *ethos*. This chapter charts the effects of those changes as well as the limitations on the wholesale abandonment of modernist norms.

Demarcation – Presumption vs. Activity

The blog RealClimate responds to contemporary problems of demarcation, adapting familiar goals to a new media. Sociological and rhetorical researchers interested in demarcation have analyzed strategies or behaviors that constitute a boundary between scientific and non-scientific. These researchers demonstrate that the boundaries of scientific demarcation are an ongoing and contingent social process rather than an objective distinction. In the environment of

peer-reviewed publication, these boundaries are often taken for granted or treated as presumptive. In the case of RealClimate, we find a site where demarcation becomes an active and obvious process, even if the value of demarcation remains a presumption. The name, “RealClimate,” and banner, “Climate science from climate scientists,” make a fundamental distinction between genuine science (and scientists) and pseudo-science (and pseudo-scientists). Readers navigating to the “About” portion of Real Climate encounter a mission statement that makes the gate-keeping function of expertise clear:

RealClimate is a commentary site on climate science by working climate scientists for the interested public and journalists. We aim to provide a quick response to developing stories and provide the context sometimes missing in mainstream commentary. The discussion here is restricted to scientific topics and will not get involved in any political or economic implications of the science (Schmidt et al., 2004a)

Though this statement presumes that a distinction between (working) experts and non-experts in climatology can be made, it nonetheless accepts that the traditional mechanisms that support this demarcation are ineffective. In particular, traditional mechanisms that depend upon the response of the scientific community that cross the boundary between academic and popular run on a slow academic pace. Even if the problem of protecting “real” science hews to a classical framework, scientific self-presentation must adapt to a new set of challenges. RealClimate’s founding in 2004 was (likely) the result of direct challenges to the credibility of individual climate scientists as representatives of climate science as a discipline. To establish the qualifications of climate scientists and the reality of climate science, RealClimate’s above statement makes clear the distinction between the results of climate science and its “political or economic implications.” The “About” page offers a further “disclaimer” to distinguish between RealClimate and the advocacy position of its webhost:

RealClimate is not affiliated with any environmental organisations. Although our domain is hosted by Science Communications Network (and previously Environmental Media

Services), and our initial press release was organised for us by Fenton Communications, neither organization was in any way involved in the initial planning for RealClimate, and have never had any editorial or other control over content (Schmidt et al., 2004a).

Both potential policy implications and policy advocacy fall outside the scope of scientific expertise. Such an *ethos* remains bounded by the modern distinction between observed results and their implications. Authority derives from the willingness to narrow authority to a specialty and to reduce that specialty to objective content detached from subjective preference. However, if this demarcation is under threat and must be consistently maintained, the roles and characteristics of scientific experts must adapt to meet changing circumstances.

Characters – Real Scientists, Interested Publics, and Skeptics (or Contrarians, or Deniers)

The relationship between RealClimate contributors and their readership is premised on the demarcation between the scientific and non-scientific. Characterizations that ensure this basic distinction establish relationships premised on a greater distance than a shared collective of skeptics. At a minimum, three characters rather than a dual relationship between “us” and “them” are necessary to preserve the distinction between climate scientists, their “interested public,” and those trying to *appear* scientific. The next sections will analyze the characters constructed in the exchange between RealClimate’s contributors and their supportive and critical readers. The moderated or moderating *ethos* of RealClimate contributors relies on the re-characterization of scientific experts as available, accessible, and responsive to lay demands. These moderator-scientists provide content for an “interested public” that shares a desire for debate grounded in strictly factual analysis. Their common opponent is the disingenuous member of the public whose interests are primarily strategic, and whose participation threatens to lead public debate astray. However, the construction of an opposition or enemy is constrained by the hope that factual evidence can persuade skeptics who are mis-informed or ill-informed.

The moderator *ethos* limits the identification of opponents and generates attention to the fractured character of the potential audience.

Moderated *Ethos* – Re-characterizing the Expert (From Michael Mann to mike)

RealClimate's banner defines scientists by assessing their work. The depersonalization so-long characteristic of scientific *ethos* depends on this privileging of content or knowledge and results over all else. However, as the work of "working climate scientists" changes in location and type, so must self-presentation. How scientists present their activities on RealClimate changes from the formal interactions of conventional academic publication to the informal post and response style of blogs. The tensions between the unconventional space of a blog and traditional boundary-lines between expert scientist and lay public appear in the different forms of self-presentation found on RealClimate. Scientists both contribute the entries on RealClimate and moderate comments and discussions. Moderators approve the posting of comments and are authorized to respond to any comment on a thread. Though the existence of the moderating function is justified by the ability to produce qualified work, the relationship between expert scientists and lay public changes without the distance between scientific results and public consumer. Relationships of distance and distinction are refigured by an *ethos* premised on a lay audience that desires the distinction and, in turn, expects availability.

In RealClimate scientists' relationships with readers, the informality of consistent availability balances the formality and distance of expertise. Contributor biographies follow well-established academic institutional contours, citing educational background, work experience, research interests, and volume and prominence of publications. Expertise and integrity arise from institutional affiliations and recognitions, as in the case of Gavin Schmidt (primary designer of the site):

He is a co-chair of the CLIVAR/PAGES Intersection Panel and is an Associate Editor for the Journal of Climate. He was cited by Scientific American as one of the 50 Research Leaders of 2004, and has worked on Education and Outreach with the American Museum of Natural History, the College de France and the New York Academy of Sciences. He has over 80 peer-reviewed publications (Schmidt, 2004).

Credibility inheres in this individual because of the content and volume of their work, detached from their qualities as an individual or non-institutional relationships. If Gavin Schmidt is expected to publish in forums that limit feedback and presume a degree of expertise that may make them inaccessible, the same cannot be said for the poster and moderator, “gavin.” Those contributors who post and moderate consistently on RealClimate all designate their authorship in the same form, first names (often all in lowercase letters). Moderator comments most often appear with the signoff, “- gavin” (or the appropriate equivalent). Informal interactions between climate scientists and their readership support a characterization of scientific authority that is helpfully authoritative and responsive rather than unidirectional. The dual-aspects of this scientific persona help re-characterize experts as not only well informed, but also dedicated, and helpful. Many RealClimate commenters take pains to thank the contributors, especially for their voluntary dedication to providing additional assistance and information to the public. Many comments offer thanks to RealClimate’s contributors. These comments characterize contributors as providing a useful service express a personalized relationship to their dedicated expertise, “Thanks for all the good science blogs and comments. This is a great site! I am amazed you guys find time to maintain this site. Did you invent a parallel universe? :-)” (Arens, 2007).

Expressions of gratitude introduce a personalized dynamic uncharacteristic of exchange across boundaries of expertise. These interactions support the characterization of hierarchies of expertise as products of audience requests rather than institutional fiat.

Direct interaction and immediate feedback prompt friendly forms of scientific self-presentation. A commenter asks a question about choices in statistical methodology on a post authored by Michael Mann (-mike), “Oh, also, is the sensitivity analysis (“robust with respect to the elimination of any single record”) just another way of saying they jackknifed the data? Would bootstrapping be better? I guess I’d better see if I can read the paper” (Latham, 2006a). As in often the case, the response includes clarification and reference to relevant academic publications, “They've used the jackknife... In this case, I think the jackknife is the appropriate choice. Efron's "The Bootstrap, The Jackknife, and Other Resampling Plans" is a good reference for those who are interested. – mike” (Mann, 2006). Their follow-up exchange highlights the helpful characterization of the expert and the informal relationship this supports:

thanks Mike, sorry I was so lazy. I’ve now read the supplementary info. Looks like their reason for jackknifing was that bootstrapping would have taken up too much time...
 Response: Glad that helped to elucidate things. I think you've put your finger on why the jackknife was the appropriate choice here. Its a far more impressive result, and far more resistant to criticism... - mike
 New question: what is the likelihood that new long term series will be developed to improve on this kind of work? (Latham, 2006b)
 Response: An excellent question... This approach may not be useful for quantitative reconstructions of past spatial patterns of climate fields, e.g. surface temperature, sea level pressure, drought, etc. However, it does allow hypotheses to be tested in a way that is free of the assumptions implicit in regression techniques. Indeed, the paleoclimate community, with help from the various funding agencies, e.g. NSF, NOAA, etc., is actively engaged in work that should extend our knowledge at the relevant temporal resolutions (i.e. decadal) several millennia back in time. The trick is finding proxy archives that can faithfully resolve the very low-frequency variability of interest on such longer timeframes. This is the challenge that the research community must take on. – mike (Mann, 2006).

The next commenter addresses his question directly to “mike.” This exchange displays the dual-aspect of the accessible scientific expert. Mann and his colleagues fuse responsiveness, familiarity, and informality with the demarcation of expert authority. This *ethos* enables public contributions in the form of curiosity but maintains a position of unique authority and expertise

amidst an informal relationship characterized by accessibility. Ultimately, “the research community,” rather than the public, takes on future challenges and provides additional data.

The relationship between the research community represented by RealClimate and the broader public audience often follows the pattern of teacher-student interactions. The joint gate-keeping and pedagogical function of the priesthood remains, but its representatives attempt to speak with a more moderate voice. The priestly voice’s emphasis on synecdoche, the part standing in for whole, lends itself to narratives that define scientific endeavors as part of the sacred essence of all humanity (T. Lessl, 1989). In the case of RealClimate scientists, acting as contributors and comment moderators, there is less inclination to speak in a grand voice that articulates a human essence. Instead, scientific moderators are authorized to serve as “traffic cops” with regards to factual questions in their area of expertise (T. Lessl, 1989). The ever-present threat of conflict, credibility challenge, and charges of covert advocacy encourages strong authority on factual matters and silence on value choices. At times, the audience invokes the character roles of teacher and student, “Thank you, Climate Science volunteers, for your patience. We need you to teach us” (Grundt, 2005). Organizing posts as responses to reader requests softens expertise and authority. In case of a post entitled the “Dummies guide to the latest ‘Hockey Stick’ Controversy,” Caspar Amman, a climate researcher explains, “Due to popular demand, we have put together a ‘dummies guide’ which tries to describe what the actual issues are in the latest controversy, in language even our parents might understand” (2005). Translating climate science into a popular or more familiar idiom declares expert authority while recognizing the limitations it imposes on communication and credibility.

The pains taken to distinguish the climate scientist from environmental advocacy demonstrate an unwillingness to speak in the explicit language of values. When the *Wall Street*

Journal published an editorial suggesting connections between RealClimate and its webhost Environmental Media Services, RealClimate released a disclaimer disavowing any financial or advocacy connection. Commenters responding to this decision were conflicted over the benefits and costs of this demarcation. Those speaking favorably of the distinction reinforce the distinction between scientists and environmentalists:

The misleading characterisation of the RealClimate site as an environmentalist group may very well be intentional, especially since you have questioned some of the science that climate change opponents favor. The environmental regulation opponents have an “if you’re not for us you’re against us” mentality, and if someone is against them the climate change regulation opponents characterise them as environmentalists. The opponents of environmental regulation have attempted to characterise environmental groups as untrustworthy, and if RealClimate is affiliated [sic] with an environmental group it must therefore also be untrustworthy. It was good that you immediately and publically corrected this mistake and negative spin. I do not think that this will be the last time that you will be subject to a misleading characterisation. (O’Sullivan, 2005a).

Another poster argues that accepting the frame of rigid demarcation gives in to a new form of “McCarthyism” (Dave, 2005). Demarcation premised on a purely scientific and informative role creates a political cost, “Apologising and explaining that your not really associated, is playing into their hands. Can’t you see that you are pandering to fascism here? I think you need to ask yourself about the courage of your convictions...” (Gadac, 2005). The response on the part of RealClimate indicates a strict commitment to a scientific character detached from any hint of advocacy, “We are simply correcting an error on the part of the WSJ, because we know some folks would jump to the conclusions that our science was somehow colored by environmental groups' agendas, if we were so affiliated” (Steig, 2005). A self-identified environmentalist argues, “SCIENTISTS follow “THE SCIENTIFIC MODEL” of avoiding false positives...they do not make claims unless there is high confidence that they are right,” in contrast to, “ENVIRONMENTALISTS, those concerned about reducing harm to people and the earth, follow “THE MEDICAL MODEL” of avoiding false negatives” (Vincentnathan, 2005). Debates

among comments speculate over values, strategy, or affiliation, but the contributors display a strong desire to maintain a scientific character dedicated to political neutrality and a neutral, objective, pedagogy.

The Interested Public – Students of Science

The characterization of the “interested public,” one of the named audiences for RealClimate defines “interest” primarily in terms of relative knowledge and curiosity. Such a position offers students of science the opportunity to engage their instructors and display intellectual sophistication and civic engagement. The “Start Here” portion of RealClimate makes clear that the scientific audience can be characterized primarily according to their degree of understanding and familiarity with the consensus position on climate change. The opening once again makes clear the service that scientists provide, “We’ve often been asked to provide a one stop link for resources that people can use to get up to speed on the issue of climate change” (Schmidt et al., 2007). Information resources are divided according to existing scientific knowledge base, “Different people have different needs and so we will group resources according to the level people start at” (Schmidt et al., 2007). The different groups are, “complete beginners,” “Those with some knowledge,” “Informed, but in need of more detail,” and “Informed, but seeking serious discussion of common contrarian talking points” (Schmidt et al., 2007). By encouraging readers to contribute additional sources they found helpful, RealClimate scientists suggest a progressive chain of learning in which the newly educated can inform novices. Reader responses suggest a positive response to the prospect of a public and community characterized by shared interest and curiosity:

Great post – thanks! One thing you could add to it and maintain over time would be a list of climate focused blogs. Many of us maintain links to other blogs with a climate change focus and this helps create community and spread awareness. Since you’ve got a good

following and are well respected, maintaining a clearing house list of such blogs in this post would be a great community service (Dennis, 2007).

The “respected clearinghouse” *ethos* depends on the identification of those who threaten the curious but uninformed with disinformation. Commenters often request expert moderator response to particular skeptic arguments:

I’ve read in another site that there apparently are doubts about current models assuming that climate sensitivity is constant. (Do they indeed assume this?) I’m not a climate scientist, just an interested layperson, and I thought I’d seen all the sceptic arguments, but this is a new one for me. Would appreciate any reply. Thanks! (Tony, 2007).

Disinformation generated to entrap the curious demands that the public encounter information with appropriate warnings or credibility assessments:

Since everyone stumbles on a *wealth* of websites, any commentary on other more dubious websites would also be a good starter. Just to avoid confusion. Perhaps under a header like like “Wat not to visit”? Make sure you provide some hints as to why these sites are not that good”(Arens, 2007).

The “interested public” combines intellectual and civic interest. Participation does not include the production of results, but instead, relationships. The formation of a learned community with previous experience produces information about how information changes minds and supplements the information gathering and dispensing abilities of the expert community. The growth of uniformed reader into interested public defines a useful role for the non-expert. Each individual is a test case for the effectiveness of information and styles of presentation. Their positive character is found in their genuine interest in learning more and their willingness to sift through significant amounts of information they would likely be incapable of producing. In their personal history and learning curve, an interested readership can bend the educational relationship towards the uninformed, ““if we’re going to change hearts and minds (and harvest the resulting political will) of those currently interested but uninformed, let’s converse in a common language devoid of untranslated alphabetitus” (Morlan, 2007). Reflection by the

readership on their status as an inexpert audience provides feedback on how to approach a larger potential audience. If the primary activity of the skeptical collective is mutually supportive activity and de-bunking, the primary duty of the interested public is to provide translation. In being informed by an expert community, the interested public of a blog like RealClimate in turn teaches the expert community how to better provide the information that ought to move the debate. Reflective concern about an expanded audience and procedures of translation produces oppositional characters, but that opposition is fractured by the possibility (or necessity) that any potential opponent may be characterized as genuinely misinformed.

Contrarian, Skeptic, or Denier?

The defining character quality of the “interested public” is the authenticity of its curiosity. The degree to which potential opponents or converts share this quality of authentic interest loosely defines a continuum of dubious characters that act according to strategic and political imperatives instead of being guided by truth. Though the character-labels *contrarian*, *skeptic*, and *denier* are used at times in an overlapping and confused manner, the presence of a variety of terms and a debate over their meaning indicates a vibrant debate over the character of the audience. The term “denier” anchors the negative end of this continuum of characters, as they actively misinform or obscure whereas both contrarian and skeptic may possess positive and negative qualities. The genuinely skeptical may be merely ill or misinformed and are open to persuasion. Analyzing the debate over the use of the labels, and their relationship to scientists and their informed public illustrates that a moderated/moderator’s *ethos* creates strategic dilemmas over whether, when, and how to characterize and engage opponents.

Debate on RealClimate over how to define the characteristics contrarian, skeptical, and denialist depends on different accounts of the source of public disagreement in the face of expert

consensus. A comment expressing frustration over the rhetorical effectiveness of anti-consensus arguments effectively summarizes an inability to understand why many in the larger publics have doubts:

Well all this [RealClimate content] is, fine and dandy, preaching to the choir material. But you would be surprised just how effective the contrarian (so-called skeptic) rhetoric is – as applied to real world events (actual debates by scientists, actual debates in person or on the web, with, or between laypeople). I think the members/creators of this website can attest to that. Also, many people I know, that are reasonable and intelligent, but not necessarily interested in the details of Global Warming were easily swayed by the Swindle Show (“The Great Global Warming Swindle”). Their comments were along the lines of: “very powerful” or “more controversial than I thought” or even “opened my eyes.” All that happened was a few of the usual suspects (the same handful of skeptics) were paraded about, more or less, they made they same tired old (or debunked) arguments, displayed a graph or few, and correlated environmental-ism, as an -ism, that is actual “junk science” that can hurt the impoverished world (like Africa, etc). I am a little confused and disheartened by the fact that – a few hands can be waved about, a few spurious arguments can be made, and one only needs say “it’s actually too complex a system and the debate over what is driving the Climate is still wide open to debate, at this time.” Why is the rhetoric of claiming it is more, or too, complex, and it is still wide open to debate – so effective? (Thomas, 2007)

Contrarian character is mysterious and impervious to deep understanding because of the patent falsity of the “same tired old” claims. However, their predictability is also frightening because their approach remains much the same in a variety of controversies and contexts. These dubious characters interfere with the reasonably intelligent yet “uninterested public,” and while they may display industrious rhetorical effort, they are lazy when it comes to producing work of real quality. The difficult work of producing scientific evidence contrasts with the relative ease of seemingly magical words and gestures. The re-characterization of skeptic to contrarian distinguishes between skepticism as a lack of conviction from solidity of contrary convictions.

Another notes that:

Typically, when I use the term, “climate skeptic,” I simply assume that someone who labels themselves a “climate skeptic” is a climate skeptic...But what I take this to mean is that they deny that the scientific case for anthropogenic climate change has been made when it is accepted by the vast majority of scientists... However, “skeptic” often has a

positive connotation – which is part of the reason why they will use the term...I myself might prefer the term “contrarian” as it is more neutral while implying that their position is at a variance from the accepted scientific consensus...(Chase, 2007d).

As with “skeptic,” the label “contrarian” defines character in relation to scientific consensus.

The reluctance to give up on the potentially positive connotations of skepticism indicates the importance of being perceived as an interested, engaged, and critical thinker. Preserving open-mindedness generates problems in producing and moderating content. Commenters debating whether or not to include skeptical websites in the “Start Here” page lament the possibility that balance will be exploited to produce the illusion of controversy:

Re: #45, “Are there any links to sites with a differnt [sic] viewpoint?” To what end? While it definitely is important to “know thine enemy” (and climate change deniers very much ARE the enemy), the links to sites debunking their arguments point-by-point fulfill that function, without giving them credence that they simply do not deserve (Eager, 2007).

The merely skeptical or obstinately contrarian threatens to turn into truly despicable denial.

Characterized by deliberate obfuscation or spread of misinformation, denial defines the persona negated by moderated *ethos*. A moderated forum depends on the adjudication of comments to limit confusion and provide education. Moderators on RealClimate identify denialism as a discourse marked by “talking points”(Schmidt et al., 2007) . Debates over the comment moderation policy display the conflict over permitting questions but preventing the spread of denial:

moderator: Yes, you did [have a comment eliminated]. It was eliminated on the basis of our comment policy (see our discussion of "signal vs. noise"). Postings which seek to muddy the issues, rather than clarify them, are often eliminated, especially when the tone seems inappropriate. This comment was screened in to make a point (moderator, 2005).

This commenter claims, “There are 4 NH temperature (actual measurements) records which go back at least 200 years... None of these records exhibit any behaviour remotely similar to the

hockey stick shape” (Finn, 2005). He asks, “Don’t you think this is strange?” In response the moderator explains:

This is just wrong. There are 9 that go back to 1777, 4 that go back to 1753. There are many reviews of the data by Jones, Bradley, and others. Please acquaint yourself with the facts before posting.... What appears strange actually, is your willingness to post a comment without familiarizing yourself with the basic facts first. In the future, please make sure to familiarize yourself with facts before posting here. Thankyou (moderator, 2005).

In this characterization, the denier undermines the educational and informational goals of a space demarcated by adherence to facts. The denier is beyond the pale, a “yahoo,” who intimates conspiratorial motives and undermines the integrity of working scientists (FP, 2007). McIntyre and other “auditors” are re-characterized as outside of reasonable, moderate, and moderated debate. In an incident in which an auditor posts on RealClimate asking for raw data, -gavin (Schmidt) responds curtly and is accused by Steve McIntyre of insufficient disclosure, “This directory was not available when you made your original comment and was only placed online yesterday after criticism at Climate Audit” (Steve McIntyre, 2008). Schmidt’s response expresses the dividing line between respectful skepticism and paranoid denialism:

Response: How about you think about it for a second? Why would I link to a non-existent directory? Here's an alternative hypothesis: I put in my link when I'd verified that the data was there (which is not the time that the comment was received, but when it was approved). And you were so convinced I couldn't possibly be correct you didn't even check. Hence your comment (at September 4th, 2008 at 11:33 pm) accusing me of being 'flat out wrong' (echoed by Timo above) and 'full of crap' (September 5th, 2008 at 6:50 am), were in fact many hours after the data was there (ftp file date: 04-Sep-2008 15:14). Your continued and persistent accusations of bad faith based on nothing more than your personal prejudices and apparent paranoia are not particularly surprising, but you might want to consider what impression that leaves. Since you appear to want to be treated professionally, I would suggest you act accordingly. – gavin (2008a).

Authenticity or good faith effort establishes the boundary between the professional *ethos* of a moderated forum and the personally motivated attacks of deniers. Another commenter writes sarcastically, “these results won’t be robust until amateurs with Excel look at the raw data. On

second thought, they won't be robust to the amateurs after that either. Never mind" .(dano, 2006)

The move to RealClimate establishes the difficulty of maintaining professionalism, predicated on distancing and impersonality of roles, and the immediacy of direct moderation in a blog environment. As with the denier's unprofessional behavior, potentially immoderate responses threaten to undermine RealClimate's contributors and interested public.

Re-Telling the Story of the Audit: Incremental Gains & Cyclical Objections

In the narrative structures of RealClimate, McIntyre's audit does not hold scientific professionals to reasonable standards. Rather, such activities obfuscate public debate by generating an impression of controversy. This section will analyze the narratives presented by contributors and readers that re-position auditors as climate deniers who misunderstand scientific methodology and the goals of scientific research. Professional scientific spaces gain authority because they make gradual improvements in their methods and data, while non-experts fail to set reasonable expectations of what science can provide. In this narrative, the linear-progressive qualities of genuinely scientific endeavors are found lacking in the cyclical behavior found in political arenas.

An early post authored by RealClimate contributors as a group defines the hockey-stick controversy as a myth generated by the non-scientific behavior of untrustworthy commentators. The iconic or singular status of Mann's 1998 paper is disputed and placed in a narrative of gradually improving scientific understanding. Rather than a single graph or study, the audience should understand Hockey Stick as shorthand for the consensus view of historical temperature data:

The term "Hockey Stick" was coined by the former head of NOAA's Geophysical Fluid Dynamics Laboratory, Jerry Mahlman, to describe the pattern common to numerous proxy and model-based estimates of Northern Hemisphere mean temperature changes over the past millennium...Numerous myths regarding the "hockey stick" can be found

on various non-peer reviewed websites and other non-scientific venues (Schmidt et al., 2004c).

In RealClimate narratives, the intrusion of non-scientific challenges into a technical and expert-driven field of study threatens to disrupt scientific progress. A 2004 post entitled, “Myth vs. Fact Regarding the ‘Hockey Stick,’” contextualizes the controversy by framing participants as either scientific or non-scientific:

False claims of the existence of errors in the Mann et al (1998) reconstruction can also be traced to spurious allegations made by two individuals, McIntyre and McKittrick (McIntyre works in the mining industry, while McKittrick is an economist). The false claims were first made in an article (McIntyre and McKittrick, 2003) published in a non-scientific (social science) journal “Energy and Environment...” (Mann, 2004).

In this reading, scientific is synonymous with in-field expertise. Those who do not participate in relevant fields cannot be counted on to level accurate and thorough criticisms. A similar distinction between the integrity of moderated spaces of peer-reviewed journals and the amateur environment of ClimateAudit translates the model of expertise to a blogging environment. Mann references comments made by McIntyre that suggest McIntyre’s additional comment submission to *Nature* was rejected because of a “lack of space.” Quoting *Nature*’s comment policy, Mann argues, “One is logically left to conclude that the grounds for rejection were the deficiencies in the authors' arguments explicitly noted by the reviewers” (2004). Tying credibility to presence in institutionally demarcated expert spaces, Mann implies that McIntyre and McKittrick’s techniques and arguments do not meet rigorous standards. A familiar and conventional frame for scientific *ethos*, this theme reappears in response to reader comments. A commenter complains on a later similar post, “All of this technical, statistical jargon is over my head but I get the impression that the data...is so sparse and uncertain that you can’t draw any firm conclusions supporting either MM’s [McIntyre and McKittrick] or Mann’s side of the debate” (Ken, 2005). In his reply, Mann argues:

Even without technical training or a statistical background, you should have an adequate basis for discerning which of the two parties is likely wrong here. Only one of the parties involved has (1) had their claims fail scientific peer-review, (2) produced a reconstruction that is completely at odds with all other existing estimates (note that there is no sign of the anomalous 15th century warmth claimed by MM in any of the roughly dozen other model and proxy-based estimates shown here), and (3) been established to have made egregious elementary errors in other published work that render the work thoroughly invalid. These observations would seem quite telling. –mike (Mann, 2005a).

Mann argues that institutionally demarcated forms of credibility that ought to guide audience interpretations fail to transfer in the move to conventional mass media and the Internet. The early adjudication of this dispute demonstrates the difficulty in adjusting tone for the moderated, yet immediately public and more personal *ethos* of a blog. Reliance on the authority of traditional institutional distinctions informs the *ethos* of RealClimate and the narrative of expert versus non-expert. However, the move to the blogosphere indicates uneasiness with the ability of traditional academic institutional arrangements to cope with new challenges to scientific authority.

According to this narrative, the source of ongoing controversy is the comparative ease in spreading misinformation and denial outside of institutionally moderated spaces. Defending his statistical implementation, Mann argues:

[T]he facts deal a death blow to yet another false claim by McIntyre and McKittrick. However, “however, their false claims have nonetheless been parroted in op-ed pieces of dubious origin and other non-peer-reviewed venues. One of the primary missions of “RealClimate” is indeed to expose the false, disingenuous, and misleading claims often found in such venues (2005b).

Limitations on factual debate and the move to less controlled media both pose a threat to genuine expertise. The danger of debate that lacks a common set of standards is that, as one commenter notes:

[I]t deals a ‘death blow’ only to those who choose to listen or to those who have the time to digest your words. To the ideologues and rubes who believe them, you are [insert pejorative here] and you’ll never change those minds (Dano, 2005).

The audit narrative focuses an audience on a specific mistake or wrongdoing and assigns responsibility for that act. A counter-narrative of gradual scientific improvement implies that readers should focus on procedures, results, and methods that build upon initial problems or criticisms. This is not to suggest that RealClimate contributors concede that their results are mistaken. Indeed, the Corrigendum published in *Nature* fits in this story as further proof of misrepresentation by McIntyre and McKittrick:

The second falsehood holds that...these putative errors compromise the “hockey stick” shape of...temperature reconstructions. Such claims seem to be based in part on the misunderstanding or misrepresentation by some individuals of a corrigendum that was published by Mann and colleagues in *Nature*. This corrigendum simply *corrected the descriptions of supplementary information that accompanied the Mann et al article detailing precisely what data were used*. As clearly stated in the corrigendum, these corrections have no influence at all on the actual analysis or any of the results shown [original emphasis] (Mann, 2004).

Though the initial challenges to statistical methodology and proxy temperature data selection brought by McIntyre and McKittrick receive individual responses, much of the narrative is focused on bringing in other results or new methods to resolve the issue. In the narrative of incremental improvement, these are arguments over relative precision instead of individual guilt. The defensive strategy relies on demonstrating the acceptability of Mann, Bradley, and Hughes’ methodological choices and arguing they reflected practices considered acceptable in relevant literature. In particular that proxy data choices were justified and reflect the best available (if not perfect) data. Gavin Schmidt, in an exchange with frequent Climate Audit commenter, TCO, argues:

[T]his matter is still much in debate. Steve had peer-review accepted replies to the comments. You should read them and evaluate the suitability of his logic, points in engaging on this topic....(TCO, 2005a)

[Response: One could go on debating this point ad nasueum, and despite the fact that it has been shown not to be important for the final reconstruction, there are apparently always new reasons why we have to keep revisiting it. Throw it out completely, it still

makes no difference! So in terms of possible benefit compared to the costs, it does not seem worthwhile to continue. Instead, the scientists involved (which doesn't really include me) move on to testing new methods, incorporating more data and trying to reduce the error bars. This whole debate on the technicalities that don't matter is just a waste of time. There are much more interesting things to do. This field is not quantum mechanics or pure mathematics where there is a 'right' way to do it and everything else is wrong, there are only useful or not-so-useful approaches, and you just want the answer not to have to depend on the (relatively arbitrary) details. In this case it doesn't, so why continue? -gavin] (Schmidt, 2005a).

Narrative context establishes the reason for divergent interpretations over other studies that produce results that are similar, but not the same, to Mann, Bradley and Hughes' original 1998 study. Commenters who agree accept the frame of the dispute as a matter of degrees of precision, "think that Gavin has it about right when he talks about this degenerating into a debate about very, very useful, vs. very useful" (Rabett, 2005). In the audit frame, each new study that is cited appears to contribute to a cover-up or demonstrate the inadequacy of the initial results, conclusively proving individual failure. Read as portions of incremental progress and evidence of relative agreement, each new study or altered technique produces added accuracy. Gavin Schmidt, writing in 2008 regarding an increase in the "number of well-dated proxies," added to a 2008 paper by the original "Hockey Team," argues, "the importance of tree rings can be tested more robustly" (2008c). While describing the 2008 study as part of a "work in progress," the tone is optimistic (Schmidt, 2008c). Commitment to this progressive improvement clearly distinguishes between genuine science and politically motivated debates:

What makes science different from politics? That's not the start of a joke, but it is a good jumping off point for a discussion of the latest publication on paleo-reconstructions of the last couple of millennia. As has been relatively widely reported, Mike Mann and colleagues (including Ray Bradley and Malcolm Hughes) have a new paper out in PNAS [Proceedings of the National Academy of Sciences] with an update of their previous work. And this is where the question posed above comes in: the difference is that with time scientists can actually make progress on problems, they don't just get stuck in an endless back and forth of the same talking points (Schmidt, 2008c).

The defining feature of science is its provision of linear and incremental progress. Increasing accuracy and utility prove the organized efforts of scientific communities produces a forward movement that other institutions cannot. Implicit in this type of narrative is a guiding end point, without which it would be impossible to assess whether progress has been made.

A linear narrative of scientific disputes aims at the production of eventual consensus. Such a frame implies that the audit's emphasis on assigning responsibility for past acts produces cyclical arguments over "talking points." The titles of RealClimate posts critical of McIntyre emphasize the repetitiveness of his arguments, "Hockey Sticks Round 27," "On Yet Another False Claim by McIntyre and McKittrick." Posts that detail consensus science have titles that suggest linear improvement such as, "A New Take on an Old Millennium," and "Progress in reconstructing climate in recent millennia." When TCO, a frequent Climate Audit contributor, confronts RealClimate's claims about consensus by stressing the desirability of open debate, Gavin Schmidt responds that the end of debate is desirable for the progressive advance of scientific study:

Please, let's continue. You say that debate is welcomed in the policy for the blog. Don't slam the door shut on the primary issue of controversy around. Let's dig into the issue and the subissues [sic]. You say that you've proven something. Then you say it doesn't matter. Surely if you've proven it, it's irrelevant if it doesn't matter. Also if a technicality is wrong, you should acknowledge that (regardless of if you think it's effect is minor). (TCO, 2005b)

[Response: Try reading what I said before; It's demonstrably irrelevant therefore it doesn't matter. 'Debate' over. Of course, there are historical precedents for longwinded irrelevant debates, 'counting angels on the heads of pins' for instance, but excuse me if I have better things to do. -gavin] (Schmidt, 2005b).

Differences in narrative structure and the ends orientating each narrative encourage readers to distinguish credible and useful criticism from trivial repetition. Orientation towards personal responsibility ("you should acknowledge that") and useful progress in results ("it's demonstrably irrelevant there it doesn't matter"), defines the confrontation between the scientist and the denier.

The difference in orientation appears in the different labels assigned to characters. The promoter label focuses the narrative on personal integrity. In the linear narrative, deniers are so named because of their emphasis on the personal at the expense of useful evidence or results.

The self-correcting, probabilistic, and evolving status of scientific claims in RealClimate's framing of the controversy disputes the auditor's implied connection between the need for correction and failure of individual integrity. Scientific authority derives from its ability to provide valid results rather than perfect results. As challenges to personal credibility are not self-correcting, this story implies that it is allegations of misconduct that deserve particular scrutiny. RealClimate's comment policy specifically identifies ad hominem attacks for screening (Schmidt et al., 2004b). Therefore, confrontations with McIntyre and other auditors tend to become particularly heated because of allegations of misconduct rather than mere professional disagreement. A RealClimate commenter explains the different argumentative frames:

In a purely scientific debate the question generally is if a study is valid. M&M's [McIntyre and McKittrick's] (as an economist and mining executive) concerns are more politically, philosophically and economically motivated... M&M's criticisms of the hockey stick are not very scientifically rigorous and sometimes venture into personal criticism. This is more of a legal type of argument that would be more common in the business world. Legal arguments are more about disparaging someone or something while scientific arguments focus on disproving an idea (O'Sullivan, 2005b).

Within a frame of incremental improvement, such arguments appear to change the stakes and terms of the dispute. Endeavors to prove guilt or innocence rather than assess validity are interpreted as personal assaults that imply fatal character flaws. Disagreement over whether McIntyre is obligated to produce a more accurate temperature reconstruction finalizes the transformation of legitimate skepticism into legalistic denialism. For RealClimate's contributors, the inability of McIntyre to produce new results, rather than criticisms of existing results, accepted in peer-reviewed sites generates a double standard. Deniers are free to accuse

embattled scientists but not expected to provide results that are useful. Contributor, William Connolley makes this clear in an exchange that appeals to the force of consensus in response to McIntyre:

Re #89: The result is not robust. The various supposedly “independent” reconstructions are not in fact independent either in authorship or proxy selection. There are important defects in each such study individually with proxy quality and robustness with respect to outlier results (Steve McIntyre, 2005e)

[Response: At the moment, this looks like wild assertion / mud slinging. Given that the various reconstructions are the same on the important points, it seems that the major conclusions are robust. Asserting that everyone else is wrong and only you are right is implausible - William] (Connolley, 2005).

Connolley recodes the righteous zeal of the auditor turns as the unconstrained bile of the outsider. A comment sympathizing with the image of the beleaguered scientist attempts and fails to mediate between these two frames:

Thanks for your responses, Dave. I agree that a presumption of bad faith is an almost insurmountable impediment, and one needs to remove this obstacle if one hopes to start communicating again. Gavin, I realize it's not your responsibility to patrol the skeptic hordes, but could you offer a quick summary of how the data set has been updated and where these changes are recorded?...I think (hope?) that McIntyre would happily “move on” and apologize after a clear statement that you were acting in good faith. It's sad that it's necessary to make such statements, but I think it is worth it if it helps people to concentrate on the science rather than the accusations (Kurz, 2008)

[Response: What is the point? The presumption will be that I've just made something up and even if I didn't, I'm a bad person in any case. I have no interest in communicating with people whose first and only instinct is to impugn my motives and honesty the minute they can't work something out (and this goes back a long way)...If McIntyre was half the gentleman he claimed to be, we'd all be twice as happy. - gavin] (Schmidt, 2008b).

The audit narrative re-balances scientific norms with an emphasis on skepticism and transparency. In response, this linear-progressive narrative stresses the importance of *organized* skepticism. Without pretending that relationships within scientific communities maintain consistent collegiality or congeniality, it is clear that in this case, the denier's outside status marks their character as deceptive. McIntyre mimics the conventions of scientific critique and

rebuttal, but fails to accord proper respect to the properly de-personalized *ethos* of scientific spaces. This re-narration responds directly to the characterization of auditors as diligent in comparison to sloppy or misguided scientists. One commenter answering a question regarding McIntyre's accusation that Mann's statistical choices would produce Hockey Stick results even with random data inputs makes this clear, "McIntyre's failure to consider the singular value magnitudes in his attack on Mann was an astonishing oversight. (Well, maybe not so astonishing for a global-warming denier)" (Caerbonnog, 2007). The lack of "surprise" on the part of RealClimate's commenters suggests an interpretive context that bases the reading of the Hockey Stick dispute as merely the latest in a familiar pattern of deception.

Narrative, Historical Context, and Place

For many RealClimate commenters, historical context establishes another point of comparison between the linear progress of science and cyclical objections raised in the path of progress. The distinction between auditor and promoter upheld on ClimateAudit gives way to a narrative in which deniers are aligned, either by intent or by effect, with powerful interests that hope to maintain the appearance of controversy. One commenter addresses his support for Michael Mann in these terms:

According to lay people that I talk to who have been influenced by the op-ed pieces that you mention, "global warming has been disproved". The MM [McIntyre and McKittrick] story is indicative of a pattern in which industry (and now our own government) PR machines latch on to minority scientific articles to claim that an environmental issue has no basis. The journal *Science* (in the late '70s or early 80's) once published an article in which the author claimed that the major components of acid rain were weak acids. The article should have failed peer review and never been published: the scientist conducting the work titrated the samples in open air, effectively measuring not only the weak acids in the samples but also the carbon dioxide from the room. The work was plain wrong. Nevertheless representatives of the power companies parroted the "findings" for several years to claim that acid rain was NOT related to industrial air pollution (Nodvin, 2005).

Historical context demonstrates that scientists, accustomed to rigorous standards, cannot match the machinery that may take up their work to spread disinformation. Such reader analysis often marks the cyclical status of the form of climate denial as well as its particular content. A commenter makes the same naïveté that makes scientists vulnerable a component of their unique *ethos*:

Those scientists who are doing real research and writing peer reviewed articles are facing a shrewd propaganda machine bent on clouding the issues. To large a portion of the American public is woefully uneducated about scientific methodology. The essence of what science is against scientists when facing these opponents. Scientists are now drawn into a world of spin, marketing and distorted meaning that they never have had to face before (Saltzman, 2005).

Fossil fuel industry interests in particular draw substantial criticism on RealClimate. Auditors commenting on RealClimate demand specific documentation to demonstrate claims that a financial interest or industry funding can be linked to McIntyre. However, for many commenters, the political and economic context makes proving direct ties between fossil fuel industries and McIntyre a tangential issue. The effect of challenges to consensus science cannot be separated from an atmosphere in which criticisms will serve the interests of powerful industries. For John Hunter (a frequent consensus poster on Climate Audit and RealClimate) and others, direct financial connections (i.e. being employed by a think-tank or lobbying group) are less relevant than McIntyre's position in a resource extraction industry:

I find it interesting that Michael Mann...describes Steve McIntyre as a “mining industry executive” and McIntyre's own biography...describes him as working “in the mineral business”. Both descriptions are pretty euphemistic. Around the time of the writing of McIntyre and McKitrick (2003; the Energy & Environment paper) and of the above biography (dated in October 2003), McIntyre was actually a “Strategic Adviser” to CGX Energy Inc. who describe their “principal business activity” as “petroleum and natural gas exploration” (cgxenergy.ca/investors/CGX_AR03_part2.pdf). CGX Energy Inc. occupy the same Canadian address given for McIntyre in McIntyre and McKitrick (2003), an address which is also occupied by Northwest Exploration Company, another business which apparently engages in oil and gas exploration (or at least a company with the same name does). McIntyre was also President of Northwest Exploration Company.

Now, if you believe that you can divorce the message from the messenger, then this may all be irrelevant information. However, I still find it interesting that nowhere in McIntyre's biography or in his other public writings can I find any mention of his involvement in the oil and gas industry (2005)

Interests not explicitly stated or easily quantified as direct contributions to fund research appear are less relevant than a sense of *ethos*. There may be no smoking gun to demonstrate that McIntyre's results are tainted, but the space he occupies and the role he plays places him under suspicion. The role that skeptical science plays fits a pattern:

I will be pleased to draw your attention to a similar action taken by the chemical industry against scientists in US. It is the chemical industry's lawsuit against Prof. David Rosner and Prof. Gerald Markowitz....the chemical Industry has hired their own "scientist" to discredit the two professors. M&M have a similar role in their attempt to discredit MBH. It looks like that the same master plan is behind the way the tobacco industry, the chemical Industry, the petrochemical industry and other industries are trying to discredit scientists (Flemloese, 2005)

Posting on Climate Audit, McIntyre quotes the journal *Nature's* requirements for disclosing competing financial interests (Steve McIntyre, 2005d). RealClimate commenters re-apply the auditor's sensibility that the appearance of propriety cannot substitute for full transparency.

Those comments on RealClimate rejecting the adequacy of McIntyre's audit tie it to the intrusion of moneyed interests into scientific debate:

Obviously things that are legally public records need to be treated like that regardless of who's requesting them, but the reason Steve McIntyre generally does not receive cooperation beyond that minimum is because his interest in these matters is not scientific. Even his use of the financial audit meme is fraudulent since financial audits don't just cherry-pick small parts of a company's operations. He's a denialist, just smarter and more polite than the average (Bloom, 2007).

A sense of common purpose or orientation is necessary to actually become scientific, even if one can appear that way. The denier threatens to undermine uniquely scientific pursuits in reshaping the *ethos* of scientific spaces by mixing them with business:

I doubt that Mr. McIntyre is particularly interested in "advancing science"...if you look at his musings...on the difficulties that a hard-working sceptic [sic] has in bringing

climate scientists to book, it becomes evident that what he's really interesting in doing is making the normative standards of the business world those of the environmental sciences as well. Which would make the environmental sciences more tractable, from a business perspective – probably the ultimate point – but they would no longer be recognizable as sciences (Lars, 2005).

Clearly, this narrative context raises the stakes of the hockey stick controversy to include the ability of scientific institutions and principles to provide social direction. In contributor posts, this remains an implicit value assumption rather than stated premise. There may be a vague sense that forces of disinformation would win out over progress towards greater understanding. However, comments make clearer that this controversy also indicates a conflict between different types of institutions and value systems, or between a scientific and economic *ethos*. In the divergence between the explicit limitations of contributor posts and the value premises or contexts introduced by commenters we encounter the limits of a moderated *ethos*.

The Limits of Moderated *Ethos* – Context and Comments

Reader references to previous scientific controversies and the influence of business interests breaks the clean demarcation between science and its political and cultural context. Comments that bring in historical and cultural context for interpreting the Hockey Stick dispute demonstrate the importance of *ethos* as a set of social and cultural relationships. While there are many technically sophisticated posts and comments that breakdown the details of statistical analysis and the minutiae of paleo-climatology, the consistency of references to shared narratives and characters that support judgments of correctness suggests they play a crucial role. Debates over the teaching of creationism or intelligent design and evolution serve as a touchstone for comparison and interpretation for many RealClimate commenters. As in the historical role of business interests, these comments convey the sense that science might lose say in guiding decision-making and defining social values:

[T]here are a lot of similarities between the states of understanding of climate and evolution. In either, there is no credible scientific “skeptical” side that explains reality better or even nearly as well. In fact, nothing comes close... The only scientifically ethical skeptical thing to do would be to present them, but not without placing them in context... The few skeptics with scientific background who thread here spend seemingly endless hours picking on these very few points and attempt to demonstrate that they can invalidate almost everything else... However, in the wide world, what we see is downright fraud (like in the Swindle), underhanded peer-review (Legates and the Soon-Baliunas fiasco), selective picking of facts given much more significance than they have, the list is endless. Then there are ... scientists reporting that they don't dare to speak their minds on the subject for fear of retaliation. Meanwhile, the mind-conditioning machine of the so-called skeptics screams that contrarians scientists are being suppressed by the evil scientific community, who is out on a conspiracy to keep the billions in grants flowing... I wish there were more sites like RC [Real Climate] and that they could be as vocal as the contrarians screamers. The last thing we need is RC giving them even more undeserved credibility... There are plenty of areas that examine that kind of questions [about creationism] (Philosophy) and it is irrelevant to the science itself. Anyone can make an argument for or against whatever version of creation by using Physics. In fact, it is a very good exercise to do one and then a contrary one. If done sincerely, they can come out equally valid. But in both cases, they are irrelevant to the science and will not contribute to improve the purely scientific understanding of reality (Chantreau, 2007).

Though contrarian or skeptical arguments deserve to be heard, they cannot be placed on par with scientific understanding. The ethical importance and social value of science, understanding, is threatened by treating opposing accounts as equivalents rather than merely different answers to separate questions.

Debates about evolution also reveal to these commenters that improving understanding is not sufficiently appreciated by large portions of American society. Explanation and understandings are both duties and supreme values for the “interested public” (Condit, 1999). Evolutionary science debates provide a warning that in the “wide world,” of insufficient attention and unscrupulous characters that giving an inch means detractors will take a mile. Comments dedicated to the question of whether to include skeptical sites in RealClimate's guide to climate change argue, “I personally don't know of any “skeptical” websites that deal in actual science. I mean, would you suggest that a biology department offer a course on creationism just to be ‘fair

and balanced'?" (Ladbury, 2007). Another worries that encouraging climate scientists to address skeptical arguments more explicitly in peer-reviewed material will merely provide the illusion of credibility:

Any time anyone mentions intelligent design in the peer reviewed papers, the Discovery Institute says, "See there! We told you there was a controversy!" At this point, the contrarian views to anthropogenic climate change are no longer a scientific phenomena, but a political phenomena driven by financial interests and ideology. The focus of science should be the phenomena. This is what should drive it and its focus, particularly in the technical papers (Chase, 2007b).

From this perspective, the outside world lacks the moderated *ethos* that guarantees the proper context and filter for understanding different components of debate. In the eyes of this audience, these are pseudo-controversies that mimic the features of genuine disagreement. A moderated *ethos* does not guarantee shared beliefs or opinions and there are many contentious threads on RealClimate. However, a forum with clear allegiance to a scientific worldview and a moderation policy designed to limit the scope of debate to scientific questions facilitates the use of shared history and interpretive frames. Such an *ethos* may be poorly suited to the "wide world." This helps explain the mix of confidence on the part of consensus commenters that RealClimate consistently wins debates on scientific issues and despair that these victories fail to translate into overall success. Somewhat ironically, truth and understanding serve well for providing affiliation, but there is little faith in their effectiveness in the larger immoderate world:

If someone skilled in the art [of the big lie] says something truly outrageous, people are often very likely to believe it. This has a long history, probably about as old as humanity itself. Creationists use it all the time. And yes, it is very effective. So are many informal fallacies – if neither the speaker nor the audience are all that concerned with the truth. Conspiracy theories. Etc. "Us vs. them," which seems especially effective in many circles. When you aren't concerned with the truth, you don't have to qualify – and you can appeal to the worst in people (Chase, 2007a).

An *ethos* predicated on understanding runs into difficulty faced with conflicts that may be irresolvable without shared values. The premise that moderation can limit debates to a common

frame or common facts breaks down somewhat in the interpretation of comments. Not only is this comment itself a form of “Us vs. them” distinction (it is only other “circles” that “appeal to the worst in people”); there remains the question of how this comment is restricted to the science of climate change. What appears political rather than scientific is itself a choice about politics and values. Moderating policy and the posting of comments make the presumption of a shared space both easier to produce and more vulnerable to becoming a source for opposing rhetoric. Lessl argues that the demarcation of science through contrast to religion may undermine scientific *ethos* insofar as probabilistic arguments about future climate change conflict with the demand for strict verification in the case the evolutionary science (T. Lessl, 2008). Citing Chaim Perelman’s theory of “effective presence,” he explains, “arguments intended to achieve immediate persuasive goals may also have presence in other contexts which their authors cannot foresee” (T. Lessl, 2008). *Ethos* as an effect of shared worldviews and spaces often operates as or produces filtering effects. However, in the case of RealClimate filters, responses, and analogies are available in a stark fashion. That they become fodder for further commentary or meta-debate should be no surprise. Auditors playing “spot the hockey stick” recognize the importance of criticism of scientific products. In spite of the difficulties and tensions produced by the explicit activity of demarcation through moderation, these situations produce anxiety and interest over rhetorical strategy.

***Ethos* and Alienation – Collective Moderation**

The connections commenters draw between the hockey stick controversy and other scientific controversies point to the limitations of moderated *ethos*. Either moderators implicitly share the political values of their commenters and knowingly apply filters unequally, or moderators do not view the substance of these comments as political because of the strength of

shared ties. If RealClimate's contributors were to filter such comments as political, they would likely alienate a major portion of RealClimate's readership. However, failure to filter such comments undermines claims of strict demarcation between the science of climate change and its potential political, policy, and cultural consequences and contexts. Commenters' response to this dilemma indicates some recognition of these limitations. Several responses point to rhetorical or communicative failures as a significant problem. These comments may be a sign of a reflexive consideration of *ethos* on the part of its readership. Immediate feedback from the audience regarding the appropriateness of comments or the rhetorical strategies climate scientists ought to pursue produce a set of interactions and relationships likely impossible in the conventional space of peer-review.

While moderators on RealClimate control the appearance of comments, the collective response of the audience strongly influences the tone of comment threads. Some commenters adopt a pseudo-moderating function by labeling others as skeptics or deniers and may be chastised by others seeking a more civil tone or more open dialogue. For example, a comment from a self-identified skeptic, "Kroganchor," explains, "I am a skeptic. Not being sufficiently educated to understand the science, I must form an opinion from the conclusions of others. And present company excepted, there are lots of skeptics" (2007a). An antagonist responds, "That makes you a denier. A skeptic must present evidence to back up their claim of skepticism" (Elifritz, 2007). Several commenters respond that flippant characterizations and insensitivity to opposing perspectives are rhetorically counter-productive. One refers to "Kroganchor's" initial series of questions regarding climate science and explains RealClimate must reach out to skeptics:

I think that's not helpful, Mr. Elifritz. Kroganchor has asked some good questions; we can't guess his age or education or background from them but so far they've been quite

basic ones (like why is the ocean so cold since the core of the planet is hot and so is the air — a question that takes a bit of physics to decide or believe). The Contributors here are good at figuring out where to start, with someone, after a while, and set a good example for visitors like you and me who. Take some time to try to get to know people when they arrive declaring themselves, see who's willing to learn how to learn. Curiosity furthers (Roberts, 2007).

Such an approach remains premised on the informative model of the interested public.

Nevertheless, it recognizes the importance that RealClimate, as a community (instead of merely a collection of contributor posts), must embody an *ethos* of respectful learning. “Kroganchor’s” reply indicates the potential of a more rhetorically aware strategy, “I appreciate the other comments responsive to my post. In the last year I have gone from being AGW [anthropogenic global warming] 20/80 [level of skepticism] to AGW 80/20% as a result of reading RC and other sites” (Kroganchor, 2007b). The same thread includes a detailed post analyzing the makeup of potential audiences and methods for approaching others. I quote this comment in great length to illustrate with reasonable degree of detail the complexity of the discussion:

We continue to have problems with definitions, and we should be gentler. I follow Stephen Schneider’s kind lead here, who had no problem with me being somewhat skeptical years ago, given that I was clearly willing to listen and study a wide range of sources. We have the following problem: a) A few people are paidup members of the denialist industry, and some of them know enough about the science to be able to generate masses of plausible-sounding controversy, using well-honed PR and lobbyist tactics... These are clearly “denialists” or “deniers”, not skeptics. b) Some people happen to encounter enough of this early, and get anchored on these beliefs, and it does take serious effort to wade through it, and watch these sources long enough to understand how the end result never changes. This often happened when somebody got turned off by some of the early extreme alarmist doom-saying & press pieces [I certainly got turned off once or twice that way], or gets irked at movies like “The Day After Tomorrow”, or thinks that Crichton is credible on this. People are often susceptible to this for economic, political, philosophical, or ideological reasons... But this one has two groups with strong beliefs, plus a third group using science. People turned off by one extreme can rebound over into the other, thinking they are being normally skeptical, whereas they are now adopting a 100% certainty in the other direction. Confusion is always easier to create than clarity. b1) Some seem to make a career of digging up every contrarian cherry-pick, repeating every old argument, post such everywhere, etc, and I think “denier” fits them also. b2) But some admit to not knowing or understanding much about it, and it is not completely irrational to think that human modification of climate seems an “Extraordinary claim that requires extraordinary proof”. Of course, the proof by now is very solid, but I

don't think that's instantly obvious to the casual observer, and the real deniers are good at stirring up confusion, and tarring lots of people as alarmists., and playing to non-science motivations. Anyway, I'd suggest being gentler with somebody in b2) than in b1) or a), because b2) might be willing to learn if they don't get turned off. I don't know of an accepted term for b2), and it is sometimes hard to distinguish b1) from b2) at first. I think "Start Here" is a good resource, but I'm not yet sure there is a solid educational strategy for people who are willing to learn, but with different levels of background and misinformation (Mashey, 2007a)

Though this comment stands out in its length and depth, the arguments included are not unusual, even if they often appear in more fragmentary form. The commenter recognizes the limitations of a purely "educational" approach, the potential pitfalls of fear appeals, and the wide variety of sources and background beliefs that influence an audience. By speaking from experience as an unconvinced audience member rather than already convinced supporter, this commenter acknowledges the role context plays in understanding and responding to scientific evidence.

Another commenter makes it clear RealClimate participants must ask skeptics which arguments they find weak or unconvincing:

If they appear to be unclear about what principles are involved, we could explain those principles to them, preferably in our own words, or for that matter, the evidence, the trends and the support – but more or less at a schematic level – so that they get the lay of the land. Then we could ask them what specifically doesn't seem strong enough to support the claims which have such widespread support within the scientific community and have a great deal of evidence in their favor, then go on from there (Chase, 2007c).

Such an approach differs strongly from the detailed list of "Myth versus Fact," by investigating sources of skepticism rather than presuming to start with the technical language of scientific expertise. The same commenter also recognizes that skepticism about climate science does not demonstrate the adequacy of a scientific response:

A few thoughts about convincing skeptics... When people come in here and seem especially skeptical of the science, I suspect that a large part of it has to do with how they are worried about the effects of doing something about climate change on the economy – although I have noticed other concerns. Another has to do with their worrying about creating some sort of world government. I can understand a bit of both concerns, maybe even more than a little bit. I know that I am worried about the world economy. In fact it

is a big concern for me as the state of the economy will determine how many resources we have for dealing with the enormous problems that climate change will create for humanity. A great deal is riding on it being in good shape. But if we don't do something about climate change, there is every reason for thinking that the world economy will be wrecked by it... Maybe if we learn to address some of these concerns earlier rather than later in a discussion, and if we point out that given their concerns, they should also be concerned with climate change, then we will actually stand a better chance of getting them onside. Sometimes I get the feeling that we oftentimes do a better job of convincing ourselves than convincing those who actually need the convincing (Chase, 2007d).

A strongly moderated *ethos* would exclude these discussions altogether. RealClimate's contributors pursue a rhetorical strategy that labels economic arguments as off-topic or best addressed by other expert communities. If some skepticism originates in the fear of dramatic change, emphasizing the certainty of scientific evidence may produce further resistance by adding fear. A moderated *ethos* that only addresses the relative validity and certainty of risk levels instead of alleviating or productively directing risk perceptions may speak powerfully to existing allies, but does little to reach those outside the circle of consensus. The next section explores the significance of leaving these shared value and risk assessments largely implicit in contributor formulations of moderated *ethos*.

Risk, Moderated *Ethos*, and Implicit Values

The decision by RealClimate's contributing scientists to separate the discussion of climate science from its potential effects in public policy does not match the choice of many commenters. The questions of risk and potential impact raised by RealClimate commenters provide an important background for the differing narrative structure and interpretive frames in the Hockey Stick dispute. If, in fact, our society will soon produce temperatures that are a significant historical aberration, to potentially devastating effect, it is of little wonder why these commenters interpret the meticulous auditing of statistical choices and proxy data as delusion, conspiracy, or protection of privileged interests. RealClimate commenters consistently frame the

issue of climate change in terms of risk and consequences. This section compares the frame and context provided by these comments with a more rigidly demarcated posts by contributors to suggest that commenters make explicit judgments about risk and policy choice that remain implicit for contributors.

Comments on RealClimate that discuss the risks of climate change demonstrate the difficulty of rigorously distinguishing between science, politics, and economics. Many reading RealClimate seek or compare information regarding relative risk assessment. Commenters desire prudence in addition to validity:

I'm not as comfortable as Peter that there will be timely breakthroughs in technological fixes, public understanding, and policy. So my question again is, how long can we afford to wait to reduce GHG emissions? I'm not asking this rhetorically. Can those of you who model climate shed any light, for us laypeople, on what happens if we wait 10, 20, 50, or 100 years to reduce emissions? Putting the effects of higher atmospheric concentrations aside, if we double, triple, quadruple CO₂ concentrations, how long does it take to reduce those emissions? I'm assuming that if technological fixes come along, that society will still have to deal with decades or centuries of climate change impacts before we return to "normal" levels of GHGs in the atmosphere. Thanks (Bolduc, 2005).

This commenter points out that his question is not rhetorical because the issue of response to climate change or levels of impact is often suppressed. In the environment of moderated *ethos*, such questions most often remain unanswered. Assessing the relative effectiveness of policy response versus likely consequences remains unaddressed by contributors.

Explicit contributor content on issues of risk and response violates the premise of discussing purely scientific issues. However, moderated *ethos* relies on a shared value premise of precautionary action in the face of climate change. In a post entitled, "What If ... the "Hockey Stick" Were Wrong?" Stefan Rahmstorf explains that even if Mann and other paleo-climatologists committed fundamental errors, "The famous conclusion of the IPCC, 'The balance of evidence suggests that there is a discernible human influence on global climate', does not

depend on any reconstruction for the past millennium” (Rahmstorf, 2005). Arguing for the strength of consensus absent paleo-climate data, Rahmstorf reaches a conclusion that in a literal reading of RealClimate’s mission and rules should not appear:

In the spirit of this article, let’s assume these [detection and attribution] studies were also wrong, in addition to all of the above. Let’s assume these studies somehow greatly underestimated natural variability in the climate system, so that the “signal” of anthropogenic climate change has not yet emerged from the “noise” of natural variations... Surely, then we wouldn’t need to worry about global warming, and the world could hold off with the Kyoto protocol? Unfortunately, that also doesn’t follow. The only thing that would follow in that case is that our data are not yet good enough to prove that anthropogenic climate change is already happening. That would not be so surprising ... most of the anthropogenic warming is still to come (the point of conducting science is to give an early warning, rather than just wait until the facts are obvious to everyone) (Rahmstorf, 2005).

If the purpose of science is to give early warning, prudence rather than certainty orients moderated *ethos*. We must be careful to avoid reducing *ethos* to explicit normative commitments. Rahmstorf not only implies logical policy consequences from climate science data, he also embeds scientific pursuits in assisting prudential choices. However, the tension between the implicit precautionary values and explicit demarcation found in moderated *ethos* means prudential assessment only proceeds, in this passage, as far as “worry.” How much readers ought to worry or whether there are effective means for addressing their concerns remains outside the purview of climate scientists. One commenter sharing this precautionary orientation supports Rahmstorf’s conclusion that arguments over precision miss the point of general consensus:

If there’s a CO₂ elephant running around my living room, I don’t really need cosmic rays, or random gremlins, or cycles-conjured-out-of-cherry-picked-data, or weird solar effects ... to explain why the floor is shaking. This is like: You are hot. A bunch of world-class doctors come in with various thermometers, and they get 100 +/- 1.0, so they argue a lot about the measurements differences. They keep improving thermometers, and a while later, they get 101 +/- .5. They still argue about the differences. The next batch of thermometers arrives, and they get 102 +/- .1. They still argue about the +/- .1, but they agree that the science is settled that you have a nasty heat stroke, getting worse, and it

would be really good to get you in an ice bath SOON. Meanwhile, random scientists (not doctors) and others (not even scientists) visit you. Some just look at you, taking no measurements, and say you look fine, so no action needed. Some say you're getting warmer, but it's just the natural day/night cycle. Some say it's better for you to be warmer than colder. Some say that it's an exceptionally warm July. Some say the doctors are still arguing, and therefore more study is needed, so take no action before that. At 102, you're still OK, and you probably shouldn't leap into a freezer, but if you don't do something, you will not be in good shape, pretty soon (Mashey, 2007b).

Doctors prescribe courses of action and remedies while scientists observe. This commenter perceives RealClimate contributors playing the role of (world class) "doctor" even though those same contributors try to demarcate doctors' prescriptive functions from scientists' purely observational role. If moderators implicitly assume prescriptive roles and responsibilities, they are likely to face charges of hypocrisy or conspiracy. More importantly, if the "doctors" believe they restrict themselves to observations, they are more likely to interpret skeptical charges of hidden agendas or implicit interests as unjustified character attacks. Tension between the first person (scientist or doctor) and second persona (interested citizen or "patient") generates objections from skeptical commenters regarding moderating policy. Discussions of relative risk and precaution appear generally permitted as long as their conclusions follow from consensus rather than skeptical scientific claims. In one example, a commenter who analogizes the broad findings of consensus climate science to economics argues they each produce similar parameters for action, detailed analysis of consequences and effects may be unknown, but broad outlines for policy remain clear:

In economics, there are some few things it's known to be really stupid to do...Print lots and lots of paper money — undermine an economy. In climate science, there are some few things it's looking very likely would be really stupid to do, too. In economics, "in the long run we are all dead."...In climate science, "we" is the biosphere. So far, it hasn't quite died even in the worst events. We can hope that remains true (H. Roberts, 2005).

The potential impacts of climate change give urgency to scientific investigation and lower the degree of certainty required for action. Another commenter shares this precautionary assessment and suggests that claims about economic costs prioritize present gain over future losses:

Physical scientists are used to theories which apply well at certain scales and not at others...Economists seem to think that a dollar is a dollar, and come up with a “discount rate” that automatically and with a dubious claim on cold objectivity trivializes our moral obligation to subsequent generations. The discount rate, a meaningful and useful measure on short time scales, is abused. The resulting decision process, though brilliantly effective on short time scales, is stunningly perverse and arrogant on longer ones...in climate modeling, our prediction becomes fuzzier as we go deeper into time, but the validity of the theory on which the models are based remains constant. In economic modeling, the validity of the theory itself degrades over time because economics is a mathematical theory of a social and historical artifact, one whose nature changes gradually over time. This is a very fundamental difference between physical and economic models, and one which has practical implications for thinking rationally about global change policy. Does this mean we should forego economic thinking entirely? I think not. On the other hand, the longer out in time we look, the less guidance conventional economic thinking offers (Tobis, 2005).

The relative weight assigned to different disciplines over different scales establishes a predictive and policy-relevant role for climate science. Discussing not only scientific findings but the purpose and social function of those findings technically falls outside the boundaries of RealClimate. A skeptical poster follows this comment with the objection, “Whatever happened to the board’s stated policy: ‘...The discussion here is restricted to scientific topics and will not get involved in any political or economic implications of the science.’?” (MacMurray, 2005). Objections based on explicit norms draw attention to implicit value choices on the part of moderators. Many commenters on RealClimate debating risk take the immediate policy relevance of climate science as a given. Their desire for a discussion beyond disputes over statistical implementation and methods suggests shared interests and allegiances extend beyond matters of fact into the realm of precautionary values and policy choice. Moderated *ethos* distributes credibility and authority through implicit values as much as explicit norms.

CHAPTER 4

MASS MEDIA, ORTHODOXY, AND SCIENTIFIC *ETHOS*

This chapter turns to more conventional mass media outlets, newspapers, new magazines, and popular science publications. Though letters to the editor provide reader feedback, a stronger division between producers and consumers of discourse exists in these media. Mass media outlets do not provide an extensive written record of audience feedback but we may still productively analyze the characterizations and narratives chosen in the hockey stick dispute. Although we also must consider multiple pieces and outlets with different readerships, individual pieces in this media are more likely to present a complete narrative account of events as opposed to the consistent updates that are presented on blogs. This analysis rests on an interpretation of approximately fifty newspaper and magazine articles and letters to the editor found in U.S. and Canadian sources. Canadian media took a greater early interest in the controversy, likely because both McIntyre and McKittrick are Canadian. Searching Lexis-Nexis for mass media coverage of the controversy produced a sample that was nearly half pro-skeptic editorials, with the remaining half split nearly evenly between reportage and consensus editorials or lengthy opinion letters. McIntyre, Mann, and other scientists directly involved in the controversy wrote opinion pieces for mass audiences. These media introduce journalistic and policy-advocate positions not present in the analysis thus far. Initial arguments and presentations on Climate Audit and Real Climate influence the narrative frames and characterizations used in these pieces. Affiliates or allies often present the controversy in shared terms. However, the “moderation” of consensus, while under the immediate control of RealClimate’s contributors online, passes into the hands of journalists or interested policy advocates and ideological sympathizers. The effects

of this shift appear dramatically in coverage of the controversy after McIntyre and McKittrick's publication in *Geophysical Research Letters* in 2005. The *ethos* of moderated consensus, strongly invested in an expert moderated division between the scientific and non-scientific, faces added challenges in mass media presentation of competing expertise. Consensus defenders agree that Mann's hockey stick graph is not a core element of their position. Competing expertise and conflict over Mann's techniques and credibility add difficulties for appealing to his credibility as an honest broker. Though some consensus advocates may abandon their defense of Mann's hockey stick, mass media forums challenge the separation of this content and the credibility of climate scientists.

Consensus, Skepticism, and Orthodoxy

After the release of McIntyre and McKittrick's 2003 paper in *Energy & Environment* a number of mass-media outlets carried opinion pieces detailing their criticisms of the hockey stick graph. The following section analyzes early editorials and opinion pieces that positively assess McIntyre and McKittrick's work and use the critique to question policies to limit greenhouse gas emissions. The writers of the pieces considered in this section all represent conservative or libertarian think tanks in Canada and the United States. These pieces consistently frame the challenges to the hockey-stick graph in line with the audit narrative. However, this audit frame expands and takes on more explicitly political and policy connotations. Writing for a mass audience, many of whom are spectators, rather than participating auditors, these writers offer their readers a more dramatic and conclusive heroic narrative. Their narratives position McIntyre and McKittrick as heroes willing to confront dominant scientific orthodoxy and political interests. Thomas Lessl argues that the theme of heroism in the face of persecution by an established orthodoxy holds a powerful place in the mythology of North American scientific

education and institutions (1999). Appropriation of this narrative frame and mythology remaps the places of authority and interest in our society.

Spectators, Believers, and Skeptics

Skeptical editorialists shaping the political judgment of a mass audience rely on an *ethos* of spectatorship over participation. The participatory relationships of Climate Audit's skeptical collective favor first person and first person plural identifiers. Though initial skeptical editorialists offer a subjective assessment, the distance of the third-person permits a relationship closer to objective reportage. Rather than the creators or auditors of science, the public consumes the end results of scientific investigation. From such a position, the audience may enjoy the fruits of the auditor's labor even if they are not direct participants. Third person characterization permits more florid depictions of heterodox individuals. Their credibility depends in part on what distinguishes them from the audience as well as competing scientists. They are colorfully characterized as "math nuts" or, in McIntyre's case, "a talented amateur" (Wojick, 2003). Though readers may share in or be persuaded to adopt skeptical scientific and political conclusions, they are unlikely to share their characteristics. Thus, readers encounter descriptions of McIntyre and McKittrick's work as, "remarkable," "shocking," and a "blockbuster," that "pulls no punches" (Schulz, 2003; Wojick, 2003). With the knowing acknowledgement that, "Like all good statistical work, this blockbuster...has a boring title Corrections To The Mann et. al. (1998) Proxy Data Base and Northern Hemispheric Average Temperature Series," David Wojick suggests nevertheless this is a fight worth tuning into. So much so that, "the editors of the pricey British journal Energy & Environment that ran it have signaled its value by making it freely [available] in order to stimulate debate" (Wojick, 2003). The drama of narrative derives in large part from the confrontation between scientific orthodoxy

and heterodoxy. Readers act as collective and cautionary witnesses to a story of complacent orthodoxy confronted by novel challenges.

Characterization in the orthodox versus heterodox narrative suggests a confrontation between the typical and the unique. Orthodox characters present the negative qualities of self-interest and stubbornness, but function primarily as symbols for the failings of a powerful, abstract, and omnipresent system. Though character and narrative cannot be separated, in this case character is almost entirely reducible to the role an individual plays in a larger value conflict. The orthodoxy Michael Mann represents is not scientific, but instead political. He stands in for powerful and vested interests that appear scientific, but, in fact, share none of science's essentially skeptical and heterodox qualities. Orthodoxy corrupts due to the strong incentives to preserve dominant interests. Michael Campbell, a business columnist, writes in the *Vancouver Sun*, "When you question a multi-billion-dollar windfall you'd better look out and, make no mistake about it, the Kyoto Protocol translates into monster money for many researchers, bureaucrats and public institutions" (2003). Lorne Gunter, columnist and President of Civitas, a Canadian society for libertarian academics, claims, "Too many scientists have based their research, their reputations and their incomes on the greenhouse theory to let it go now" (2003). Mann appears as an important figure only because his research supports the interests of the IPCC, Kyoto protocol supporters, and orthodox scientific consensus. Mann's importance is singular, even if his character is not. Nick Schulz, an American Enterprise Institute Fellow, tells *USA Today's* American audience that Mann's original findings are "startling," but only to emphasize their importance for consolidating climate change orthodoxy:

The U.N. used Mann's research to declare the 1990s "the warmest decade and 1998 the warmest year of the millennium." Countless news stories picked up on this idea that the past few years have been unusually warm. Efforts to limit the emission of the greenhouse gases blamed for this warming were bolstered by Mann's research. In fact, this week the

Senate plans to consider legislation co-sponsored by Sens. John McCain, R-Ariz., and Joe Lieberman, D-Conn., to reduce the emission of greenhouse gases. McCain's Web site says, "Global warming is a growing problem... The 10 warmest years (on record) have all occurred since 1987." The statement is based on Mann's research [ellipsis original] (2003).

Defining Mann's character according to the political role played by his findings implies that readers should interpret his activities as political rather than scientific. Mann does not receive the label "scientist," but instead, "global warming guru...author of the famous hockey stick" (Wojick, 2003). Campbell's label, "Kyoto linchpin Michael Mann," completes the transformation from individual to symbol (2003).

Skeptical opinion writers grant the hockey stick both substantive and symbolic importance in the production of consensus. By building up the importance of the hockey stick for the scientific claim for anthropogenic climate change and the political argument for greenhouse gases, these pieces suggest that the orthodox consensus is both overwhelming and surprisingly vulnerable. The hockey stick becomes a "key global warming study," the "famous hockey stick" and "the seminal 1998 study" (Ball, 2004; Schulz, 2003; Wojick, 2003). Tim Ball, a retired climatologist and member of a skeptical Canadian think-tank, goes so far as to claim that, "the single research article that was the panel's [IPCC's] support of the human-induced climate change theory is now known to be wrong" (2004). According to Ball, debate over this symbol is the most important site for the confrontation between orthodox "believers" and skeptical scientists:

Despite criticism that this study contradicted a large array of data from many sources, Kyoto enthusiasts quickly adopted it as the "smoking gun" they desperately needed to support the human-induced warming theory. Critics were dismissed as a fringe minority, or, in Anderson's words, "outlier scientists" operating "on the margin of the issue." To question the validity of the hockey stick became a sacrilege deemed unworthy of public discourse (Ball, 2004).

Ball stages the hockey stick controversy as a conflict over a symbol that has taken on religious importance. “Need” accounts for the presence of the hockey stick in the face of contradictory factual evidence. Iain Murray’s commentary similarly juxtaposes consensus-supporting believers and the “careful scientists” who had doubts but were afraid to publicly voice their concerns:

Careful scientists were suspicious of this graph, because it contradicted the historical evidence of a Medieval Warm Period, when the Vikings colonized Greenland, and a Little Ice Age, when the River Thames in London regularly froze over. Yet the alarmist lobby jettisoned the historical evidence in favor of the hockey stick, which was based on "proxy data" such as the width of tree rings and the thickness of ice layers (2003).

True believers and careful scientists give credence to different evidence. Gunter’s title suggests, “Proof exists, but believers would rather denounce than debate” (2003). In their desire to produce results that conform to a belief system, consensus scientists produce scare-quoted “proxy data” that stands apart from commonsense historical data. While the contradictory evidence was there for all to see, this staging cries out for individuals of exceptional character willing to bear withering criticism.

Building on their shared skeptical *ethos*, editorialists adopt McIntyre and McKittrick’s auditing narrative frame. Without replication and transparency, science becomes dogmatic. Novel and challenging findings demonstrate both the incorruptibility of truly scientific procedures and the corrupting power of consensus. After providing historical background for the significance of Mann’s claims, Schulz asks his audience the tantalizing skeptical question, “But what if it’s not true?” (2003). The willingness to ask this question produces authentic breakthroughs:

When McIntyre and McKittrick audited Mann's data to see whether its conclusions could be replicated, they discovered significant problems. Once they corrected the errors, the two researchers made a remarkable conclusion: The late 20th century was not unusually warm by historical standards (Schulz, 2003).

These accounts stress political context and desire as forces driving Mann to produce the hockey stick paper. According to Ball, McIntyre and McKittrick's audit operates as a normal and crucial scientific procedure:

In most science, it is standard procedure to have the validity of important research results checked by other scientists who use the same data and methods to see if they get the same outcome. Despite the enormous stakes involved, a proper assessment of this study was not published until last October when Canadian analyst Steve McIntyre and University of Guelph environmental economics Professor Ross McKittrick published the results of such an audit study. They found that the temperature curves of the study could not be reproduced using the methods employed by Mann et al. (Ball, 2004).

From this perspective, normal science proceeds coolly and efficiently by exhaustively testing results. Only consistent audits and replication produce the degree of certainty scientific findings demand. Kenneth Green, director of the Risk and Environment Centre at the Fraser Institute, argues their audit corrects results and procedures:

The two Canadians obtained the very same data sets and methods ostensibly used by Mann in constructing the hockey stick and ran an audit on the data and calculations. Their findings were shocking. The Mann dataset, they found, contained numerous errors in data handling. Critical data sets were truncated or extrapolated unreasonably; some of the data was obsolete, there were errors where temperature records were erroneously linked to the wrong geographical location, and there were errors in various calculation methods. McKittrick and McIntyre fixed the errors, re-ran the calculations using Mann's own methods and, lo and behold, no more hockey stick (2003).

According to Green, the audit reveals that the consensus lacks rigor, shielding Mann and his data from real debate. Evidence for the believer remains opaque to the non-believer. Persecuted and heroic individuals willing to stand up for truth do not need to fear the scrutiny of others, indeed, they ask for it knowing history will vindicate their conclusions:

Mann never made his data available online -- nor did many of the earlier researchers whose data Mann relied upon for his research. That by itself raises questions about the U.N. climate-change panel's scientific process. It remains to be seen whether the McKittrick and McIntyre study will withstand the "outside scrutiny" they have asked for and will no doubt receive. But given the implications of the errors and problems they apparently have unearthed within the Mann study, the two researchers have done a

tremendous service to science and the public, which should rely on facts to make informed public policy decisions (Schulz, 2003).

McIntyre and McKittrick personify the best qualities of genuinely scientific research. They enjoy moral authority not only because of their error-free work, but also their willingness to accept a level of scrutiny that mere dogma could not survive. These skeptical claims accord immense importance to the individual integrity of scientists. Though they label Mann's actions as "mistakes" or "errors," Mann has lost credibility to debate the issue. Scientific improvement becomes a matter of finding better scientists even more than finding better data or methods. That "skeptical scientists have doubted this representation of past climate for decades," or "careful scientists were suspicious" implies that the problem lies in the scientists rather than in science itself. Skeptical characterizations imply a need to replace the "believers" in consensus orthodoxy with appropriately anti-dogmatic scientists.

Unlike those who occupy the position of asserting risk claims, and are therefore to be judged by the correctness or incorrectness of their data and analysis, the anti-change editorialists provide a shield to those who are skeptical of scientific claims. They dismiss attacks on skeptics as politically motivated. As McIntyre and McKittrick do not make their own claims about risk levels, but merely debunk those of others, political or personal motives feature prominently in such arguments. Skeptical editorialists characterize McIntyre and McKittrick as likely to suffer persecution for their unorthodox conclusions. Campbell argues that the pair, "better be battering down the hatches," given that they, "can expect an avalanche of personal attacks from the politically motivated. In Canada far too much money is at stake to derail the Kyoto juggernaut" (2003). Comparing their plight to earlier skeptical victims, Gunter claims:

This is a threat to the greenhouse religion. Therefore the pair [Willie Soon and Saul Baliunas] must be burned at the stake. The same fate is likely to befall Canadian researchers Steve McIntyre and Ross McKittrick, who have just destroyed the "hockey

stick" theory on recent global warming for the British journal *Energy & Environment*. (Questioned the theory, or called it into doubt might be less-charged wording, but I'll stick with destroyed.) The "hockey stick" has been among the holiest of holies in the greenhouse priests' liturgy (2003).

This portrait of climate change advocates as comparable to religious advocates effectively draws on older narratives that portrayed science as opposed to religion. In narratives that oppose science and religion, genuine science always appears embattled because the scientist's true calling remains the destruction of dogmatic opinion or belief. Using the example of Galileo, Lessl argues confrontations between science and Church helps demarcate interested belief from disinterested science:

Galileo comes into view as the defender of reason and unflinching devotion to fact, who is put down by a religious institution that stubbornly clings to faith and emotion. These contrasts...dramatize the scientific norm of disinterestedness, the belief that scientists perform their labors in a spirit of emotional neutrality or attitudinal detachment that holds at bay the potentially prejudicing elements of personal ambition and ideological prejudice (1999, p. 157).

Heroic and individualistic narratives of scientific achievement mark modernist distinctions between faith and science. The use of this narrative suggests consensus climate scientists no longer possess the qualities that distinguish their activities as scientific. Lessl argues, "Modernity looks to the scientific culture as a kind of moral exemplar which upholds in some ideal fashion its values of rationalism, liberalism, and individualism" (1999, p. 164). A rationalist and individualist *ethos* privileges control and mastery as the identifying characteristic of scientific expertise.

Perhaps the real sin of consensus science is that it undermines modern narratives of rationality and individual progress. Skeptical editorialists characterize consensus scientists as emotionally invested in their reading of results and as emotionally manipulative in their presentation of results. According to this narrative, the "climate alarmists" threaten the

progressive increase of rational control and mastery (Murray, 2003). The hockey stick served as, “perhaps the most potent weapon in the arsenal of those who oppose western capitalism and push instead for massive intervention” (Campbell, 2003). Instead of giving in to their alarmist claims, skeptical uncertainty requires careful assessment of all possible courses of action:

This is just one example of scientific uncertainty. There are many others demonstrating that the science of climate change is far from settled. Neither I nor anyone else knows whether climate over the course of this century will be a scientific curiosity or a serious ecological threat... What's needed? A planning process that ties action to knowledge, invests in new knowledge and adjusts actions as we learn. New knowledge is needed to better understand the true nature of the climate risk and to identify and develop the most promising technologies for addressing it...[M]ajor corporations have put a quarter-billion dollars into Stanford University's Global Climate and Energy Project, in hopes of pinpointing truly promising energy technologies that will lower greenhouse gas emissions. The current climate change debate isn't about action or inaction. It is about whether proposed actions are consistent with our state of knowledge and other important societal priorities. Our nation should not be frightened into adopting unknown and unproven technologies until they can contribute to healthy economic growth and until we better understand the impact of human activities on our climate system (O'Keefe, 2003).

Skeptics offer their readers a vision of careful and detached rationality that ensures everything is under control. The power of presumption aligns scientific activity with an *ethos* that is highly skeptical of large-scale, irrational, and radical change. However, this is not the satisfied complacency or ideological desperation of orthodoxy as the novel and “shocking” results of McIntyre and McKittrick’s work ensures this narrative retains the progressive and innovative qualities of modern life. Skeptical narrative structure allies two apparently contradictory elements, a powerful presumption against change and a claim to persecuted and marginal status. Both components rely on characterizations common to modernist narratives of the conflict between science and religious belief.

Consensus and the *Ethos* of Expertise

Consensus supporters writing for large audiences compete over the historical legacy of modern scientific *ethos*. Scientists defending Mann’s work and responding to skeptical

criticisms in the mass media retain modernist demarcations between scientific and political spheres. Scientists writing responses to hockey stick opinion pieces and editorials characterize their opponents as politically motivated, ignorant, and manipulative. Positioning themselves and Michael Mann as representatives of a broad expert consensus, their narratives frame skeptical writers as interested actors interfering with disinterested scientific inquiry. While they provide a political context for interpreting credibility attacks on Mann and the hockey stick, they refuse to align his findings, or the broader consensus as represented by the IPCC process, with any political conclusion. Strongly demarcated scientific ground rests on a distinct scientific *ethos* uncontaminated, that is portrayed as uncontaminated by political distortion.

This section analyzes three editorials responding to Tim Ball's editorial, "Theories about climate change were based on junk science," examined earlier in this chapter. We may speculate that this editorial drew forceful responses because of Tim Ball's self-presentation as a climate scientist instead of a policy advocate. That a fellow climate scientist would accuse others of leaving the scientific realm for the "religion" of global warming necessitated clarification of the boundary between real and apparent science. Their responses prove the desire to fight over ownership of their "home ground" of rational detachment.

Like the skeptics, consensus scientists emphasize the controversy as a contest over accuracy versus error. Andrew Weaver, a lead author of the IPCC's second, third, and fourth assessment reports, opens his piece by observing, "[Tim Ball's] commentary is hopelessly inaccurate on many fronts" (2004). Patrick Walden, a scientist working at TRIUMF, a Canadian particle physics laboratory, argues that Ball's citation of McIntyre, McKittrick, Soon, and Baliunas ignores that, "these two articles are mired in controversy and are much more suspect than the work they attack" (2004). Ray Bradley, one of the co-authors for the hockey stick

study, opens by contesting Ball's facts, "Tim Ball rightly criticizes the Environment Canada website for claiming that the 20th century was the warmest for the past 600 years. It was the warmest for at least 1,000 years" (2004).

Though science may be defined by inquiry, these authors characterize scientific consensus according to the certainty of results. Their approach suggests their foremost concern lies in protecting public perception of consensus as a source of certainty. Constructing a bulwark against the intrusion of skepticism, they minimize the significance of the hockey stick for the IPCC's conclusions about climate change. Bradley minimizes the contribution of his own paper in favor of the integrity of consensus:

The IPCC reviewed thousands of studies, not just the "hockey stick" graph, and came to the unequivocal conclusion that human activities have an effect on climate. It's flattering to think that one figure out of a report of several thousand pages somehow overwhelmed all the other compelling evidence, but this is not the case. The IPCC based its conclusion on a massive and unprecedented international scientific assessment (2004).

The importance of consensus may be magnified for climate scientists given the importance of their findings for pressing policy choices. Credibility of any one study depends on the relative certainty provided by the weight of evidence. Weaver accuses the skeptics of deceiving the public by suggesting the IPCC relied exclusively on the hockey stick, or even reconstructions of past temperature:

First, the Intergovernmental Panel on Climate Change's statement that "most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations" was not based on the so-called "hockey stick" of Michael Mann. It was based on numerous climate change detection and attribution studies that have nothing to do with the tree ring record over the last 1,000 years. Second, there are a number of independent 1,000-year tree ring reconstructions that show essentially the same thing -- rapid 20th and 21st century warming that dwarfs any change over the last 1,000 years (2004).

Building layers of evidence helps characterize skeptics as either manipulative or willfully ignorant. In contrast to skeptical narratives that use the hockey stick's public significance to

prove its scientific importance, scientists minimize their public and personal significance by referencing the breadth of results. They hope that any doubts their audience might feel about personal credibility may be removed by de-personalizing their own results and activities.

Consensus advocates' de-personalization of scientific work helps contrast their activities with skeptics. By personalizing skeptical tactics and choices, consensus defenders wish to deprive skeptics of a disinterested and impersonal *ethos*. According to Bradley, the controversy is of skeptics own making because they are interested characters, committed to a particular political perspective. Bradley groups Ball into a group of deceitful characters misinforming the easily confused inexpert public:

Ball and his colleagues try to promote the idea that scientists disagree about global warming in the desperate hope that by spreading confusion among the public, legislation to control greenhouse gases will be derailed. We need fair and honest political discourse on what we should do about global warming, but trying to deny the basic facts verges on fantasy (2004).

The theme of “fair and honest” debate mirrors skeptical arguments in form, but differs substantially in content. Only political debate constrained by adherence to facts already established by scientific consensus satisfies these criteria. Each of these consensus editorialists carefully avoids explicitly committing to a particular political position, as doing so would forfeit their claim to disinterested independence.

On the other hand, the editorials do not engage in detailed scientific analysis. Although the authors in question do assert the correctness of Mann's conclusions, only Gavin Schmidt's 2005 letter responds to the specific methodological (statistical or data choice) criticisms made by McIntyre and McKittrick. We could interpret this as either lack of familiarity with the specifics of the dispute or defensiveness on behalf of a mistaken colleague. However, the authors in question do assert the correctness of Mann's conclusions. Perhaps they lack confidence in their

ability to resolve questions of principal components analysis for a general audience in 250 words. Constraints on specific resolution of the controversy increase their rhetorical reliance on the power of consensus. Appeals to the authority of the IPCC magnify the difficulty of conforming to norms of disinterest. While the IPCC assesses scientific data rather than makes policy, skeptical editorials clearly indicate its political resonance. In order to adhere to expectations of disinterested science within a politicized context, the *ethos* of scientific consensus appeals to expert authority. Consensus defenders contend that scientific experts filtering the evidence used to debate climate change ensures that subsequent arguments open to all will meet standards of fairness.

Consensus scientists establish a hierarchical *ethos* organized by the superiority of expert authority and knowledge. Narrow specialization ought to provide credibility because specialists possess superior skills and information. The characterization of skeptics as poorly informed and consensus science as a massive informational edifice supports specialist authority. Bradley assures his audience that his long experience in climate science brings accuracy:

Climatologists (such as me) who have spent decades studying this problem are quite aware of how climate has varied over time. That's why we can see that the recent changes are far beyond the normal range (2004).

We cannot trust the judgment of his skeptical opponents because they are non-experts operating on unfamiliar terrain, “the critique of the "hockey stick" study by a Canadian businessman and an economist (not known for their credentials in climatology), they neither audited our study, nor corrected it” (Bradley, 2004). Weaver responds to Ball’s claim that IPCC lead authors are well connected rather than experts by appealing to their esteemed and experience character:

[T]o suggest that Sir John Houghton and Professor Bert Bolin have never been major contributors to basic climate research is nothing short of bizarre. For example, Sir John was elected a Fellow of the prestigious Royal Society in 1972 for his pioneering work in

atmospheric science and he was knighted in 1991 in recognition of his outstanding services to science and meteorology (2004).

While the general audience likely lacks familiarity with complex statistical procedures, marks of distinction and the imprimatur of professional associations deserve a reader's trust. Expert appeals must distinguish between authentic experience and the appearance of knowledge. Official recognition contrasts sharply with the suspect associations or forums that produce skepticism. Walden argues that the forums that support skepticism appear scientific, but fall outside the realm of relevant expertise:

The Willie Soon and Sallie Baliunas article was published in the journal *Climate Research* against the recommendation of several devastating peer reviews of the paper. As a result, *Climate Research* has lost much of its credibility with the scientific community, and five of its editors have resigned. This debacle was the subject of a story in *The Wall Street Journal*. The other article by Steve McIntyre and Ross McKittrick, a statistician and economist respectively, not climatologists, was printed in the social science (rather than climate) journal *Energy and Environment*. Their analysis (albeit an incorrect one) was a rehash of the Mann data freely available online. The journal in question did not allow Mann et al. to publish a rebuttal as is usually the case with credible scientific journals (2004).

An appeal to conventional demarcation norms, this formulation of expert authority rests on the suspect individual credibility of particular skeptics and the institutional procedures that inappropriately grant them a (social science) foothold. On these accounts, expert authority derives from thorough demarcation between authoritative scientific spaces and the larger public sphere. Narratives responding to skeptical claims contrast their limited skills of skeptical authors and the resulting inaccuracy of their position with the overwhelming and properly adjudicated evidence of consensus. Relying on broadly defined institutional mechanisms and distinctions, particularly "hard science" peer review, the *ethos* of consensus responds to isolated contradictory evidence. However, the limitations of this *ethos* and dynamics of authority change if controversy migrates across the border between scientific experts and skeptics. The next section will

examine changes in mass media presentation of the controversy after McIntyre and McKittrick published a 2005 paper in *Geophysical Research Letters*.

Journalistic Investigation, Skepticism, and Boundary Breakdown

In 2005 McIntyre and McKittrick published a further critique of the statistical methods and significance of Mann et al's 1998 paper. In this section we will examine changes in mass media representation and narratives of skepticism and expertise generated by the inclusion of skeptical work in a prominent climate science journal. Skeptics, editorialists, and reporters, narrated their move from outside the boundary of legitimate science into the position of legitimate challenger as proof of the fragility of scientific consensus. The narration of their vindication emphasized their tenacious and thorough character, in contrast to the desperation of their mainstream opponents. Faced with publication in a prominent scientific journal, consensus defenders were forced to narrow the basis for demarcating science from non-science. Emphasizing Mann's status as an embattled victim, they attempted to portray their opponents as vindictive. Maintaining expert status required defending the integrity of Mann's work

After the publication of McIntyre and McKittrick's work in 2005, reporters in addition to editorial and opinion writers framed the hockey stick controversy as an investigatory audit. The tone of muck-raking journalism in these pieces shares many skeptical characterizations and an increasing distrust of scientific procedures designed to demarcate consensus. Unsurprisingly, reporters make the case for the significance of the controversy. Though reporters may note that the hockey stick dispute is not crucial for determining the cause of climate change, its role in public policy debates more closely matches the auditors playing "Spot the Hockey Stick." Journalistic presentations include assessments of the hockey stick's rhetorical role and media

prominence. The hockey stick controversy appears worthy of reporting because of its role in politics and policy:

The eye-catching image has had a big impact. Since it was published four years ago in a United Nations report, hundreds of environmentalists, scientists and policy makers have used the hockey stick in presentations and brochures to make the case that human activity in the industrial era is causing dangerous global warming (Regalado, 2005).

Front page reporting by Canada's *National Post* references a "pivotal global warming study central to the Kyoto Protocol," while its special investigative section frames its content as a, "major two-part investigation that delves deeper into the foundations for what may well be the most important economic, scientific and business graphic in world history" (Corcoran, 2005; Cowan, 2005). The *Wall Street Journal* leads its story with the claim that the hockey stick graph is, "One of the pillars of the case for man-made global warming" (Regalado, 2005). Another story observes the graph was "featured in the 2001 Intergovernmental Panel on Climate Change report" (Whipple, 2005a).

Characterizations of McIntyre and McKittrick mark their transition from outsiders to figures whose prominence finally matches that of their targets (both Mann and the hockey stick).

A *National Post* opinion column argues:

Until now, criticisms of the hockey stick have been dismissed as fringe reports from marginal global warming skeptics. Today, however, the critical work of two Canadian researchers, Ross McKittrick, an economics professor at Guelph University, and Toronto consultant Stephen McIntyre, will be published by *Geophysical Research Letters*, the prestigious journal that published one of the early versions of Michael Mann's 1,000-year tracking of Northern Hemisphere temperatures, [punctuation sic] Publication in *Geophysical Research* sets McIntyre and McKittrick's analysis and conclusions in direct opposition to the Mann research. Their criticism can no longer be dismissed as if it were untested research posted on obscure Web sites by crank outsiders. Their work is now a full challenge to the dominant theme of the entire climate and global warming movement (Corcoran, 2005).

The *Post's* front page reporting mirrors this treatment of *Geophysical Research Letters*, labeling it as, "one of two prominent journals that in 1998 published the research they [McIntyre and

McKittrick] are now challenging” (Cowan, 2005). Marcel Crok, a writer for the Dutch journal, *Natuurwetenschap & Techniek*, publishing a special comment in the *National Post* also notes the transformation from skeptical “crank” to legitimate opposition. Crok’s account adds credibility by noting his own transformation from disdain to appreciation for McIntyre and McKittrick’s work:

These skeptics are generally outsiders, reviled by "true" climate researchers. On the one hand, Michael Mann...is the unofficial king of climate research. In 2002, *Scientific American* included him as one of the top 50 visionaries in science. On the other hand, the two Canadian skeptics are outsiders...Climate skeptics are most prolific on the Internet, a platform for novices, the scatterbrained and the experienced alike...We at *Natuurwetenschap & Techniek* were initially skeptical about these skeptics as well. However, McIntyre and McKittrick have recently had an article accepted by *Geophysical Research Letters* -- the same journal that published Mann's 1999 article. This, together with the positive responses of the referees to that article, quickly brought us around. Even *Geophysical Research Letters*, an eminent scientific journal, now acknowledges a serious problem with the prevailing climate reconstruction (Crok, 2005).

McIntyre’s location and non-scientific character, initially a credibility barrier, become a mark of distinction. Working in the arena previously reserved for scientific “royalty,” McIntyre deserves the credibility accorded to the scientific elite. His tenacity is proof of his credibility now that his work appears within the peer-reviewed circle of climate science. Amateur status assists

McIntyre’s claim to disinterested and genuine skepticism. Margaret Wentz, a *Globe and Mail* columnist explains:

Mr. McIntyre is not a scientist. He's just a curious citizen with a first-rate mathematical mind who was intrigued by the biggest public policy issue...Unlike almost everyone else in the highly charged climate-change debate, Mr. McIntyre has nothing personal at stake. He doesn't need to advance his career or get research grants. He's never taken money from any company or industry group. And he is astonished that climate science isn't subject to the same audits and due diligence that are carried out in any ordinary business (2005).

These characterizations suggest that only non-experts can appear truly disinterested. Wentz’s narrative borrows McIntyre’s narrative and characterization whole cloth. Amateurism helps

deflect charges of interest or industry affiliation because of the homespun qualities of McIntyre's enterprise. Crok describes McIntyre's efforts as an, "unusual hobby" that "has since grown to become almost a full-time occupation" (2005). The institutional support for mainstream scientists merely confirms either their incompetence or the special insight of the interested amateur: "Despite billions of dollars spent on climate research, academic and institutional researchers had never bothered to replicate Mann's work" (Crok, 2005). In Regalado's *Wall Street Journal* article, disparity in resources merely confirms the drama of this amateur's rise to respectability:

But is the hockey stick true? According to a semiretired Toronto minerals consultant, it's not. After spending two years and about \$5,000 of his own money trying to double-check the influential graphic, Stephen McIntyre says he has found significant oversights and errors (Regalado, 2005).

That this presentation does not raise questions about the relative social position of someone who can afford to take two years and \$5,000 to pursue a hobby suggests that the allure of amateur-made-expert crowds out other character issues. McIntyre's business associations largely follow his self-presentation as a businessman familiar with the dangers of "promotion,": "McIntyre has scrutinized promotional graphics and large data sets for years" (Crok, 2005). McIntyre's enigmatic quality also sidelines consideration of McKitrick. While his previous opposition to the Kyoto protocol is noted, his qualifications and background receive considerably less attention and scrutiny. While McIntyre's credibility on issues of methodology depends on his success in reaching science's inner-sanctum, his believability derives from the characteristics that distinguish him from the mainstream scientist.

The valence of Michael Mann's professional prominence acquires negative connotations when contrasted with the talented amateur. The "unofficial king" of climate research appears rather pompous when deprived of arguments based on expertise and skill. Modern scientific

ethos rests on the correspondence of quality of scientific results to quality of character. Mann's nearly complete identification with the hockey stick, his signature work, means few resources exist for describing his character. His career follows the trajectory of his work:

Mr. McIntyre e-mailed Dr. Mann requesting the raw data used to build the hockey stick. After initially providing some information, Dr. Mann cut him off. Dr. Mann says his busy schedule didn't permit him to respond to "every frivolous note" from nonscientists. The climate-statistics expert, now 39, gained a big career boost from initial publication of the graph in 1998 and 1999. Although others had sought clues to past temperatures, his team was among the first to stitch many disparate records together to span hundreds of years across the entire Northern Hemisphere (Regalado, 2005).

Prior to their publication in *Geophysical Research Letters*, Mann's definition of his own character against the amateurism and insignificance of his opponents might have confirmed his expertise and genius. Fighting on more even ground, Mann's quote diminishing the significance of McIntyre's work instead reinforces perceptions of his elitism. McIntyre's character forms part of an interesting story, while Mann's appears reduced to his work.

These characterizations assist in, and are also produced by, the auditing narrative frame. Journalists and editorialists writing about the controversy hope to provide a definitive answer. McIntyre's accusation that Mann's refusal to provide his source code prevents a final determination encourages readers to wonder what could explain Mann's recalcitrance. Readers encountering this dispute likely have little or context for evaluating the reasonability of McIntyre's claims or norms regarding disclosure. The use of business standards and quotations from McIntyre shape Crok's chronology and description of data requests:

McIntyre sent an e-mail to Michael Mann in spring 2003, asking him for the location of the data used in his study. "Mann replied that he had forgotten the location," he said. "However, he said that he would ask his colleague Scott Rutherford to locate the data. Rutherford then said that the information did not exist in any one location, but that he would assemble it for me. I thought this was bizarre. This study had been featured in the main IPCC policy document. I assumed that they would have some type of due-diligence package for the IPCC on hand, as you would have in a major business transaction. If there was no such package, perhaps there had never been any due diligence on the data,

as I understood the term. In the end, this turned out to be the case. The IPCC had never bothered to verify Mann, Bradley and Hughes' study (2005).

By positioning readers as outside witnesses, like McIntyre, Crok encourages readers to interpret Mann's intransigence as proof of factual inaccuracy. Assessments of guilt or innocence are familiar in the journalistic context. Readers gain insight into the controversy primarily through the activities and qualities of the characters in place of the validity of their conclusions.

Summaries of the statistical issues raised by McIntyre and McKittrick appear in these pieces, however, frequently the quotes of other experts stands in for a detailed comparison between non-centered versus centered data conventions in Principal Components Analysis:

Statistician Francis Zwiers of Environment Canada, a government agency, says he now agrees that Dr. Mann's statistical method "preferentially produces hockey sticks when there are none in the data." Dr. Zwiers, chief of the Canadian agency's Center for Climate Modeling and Analysis, says he hasn't had time to study Dr. Mann's rebuttals in detail and can't say who is right. Dr. Mann, while agreeing that his mathematical method tends to find hockey-stick shapes, says this doesn't mean its results in this case are wrong. Indeed, Dr. Mann says he can create the same shape from the climate data using completely different math techniques. The dispute turns on esoteric math concepts like principal components analysis, detrended standard deviations and autoregressions. "It's a very difficult technical question, one that not even most people in climate research would understand," says Eduardo Zorita, a climate scientist at the GKSS Research Centre in Germany. He, too, now agrees that Mr. McIntyre has identified a statistical snafu in the hockey-stick math. What he says isn't yet clear is whether it could invalidate Dr. Mann's final result (Regalado, 2005).

That the scientific and statistical questions may escape definitive resolution amplifies the importance of character. Even if audiences feel incapable of rigorously determining the validity of the hockey stick, the investigative and skeptical frame encourages credibility judgments on the basis of guilt or innocence. That a statistical case *could* be made on behalf of the hockey stick may not excuse Mann's apparent unwillingness to engage his opponents and provide them with the data and code required for accuracy. Indeed, the failure to do so suggests that he is acting to

protect himself or his interests instead of living up to the demands of scientific rigor. Allegations of misconduct undermine the basis for trusting consensus conclusions.

In addition to presenting a competing *ethos*, skeptical critics undermine audience perceptions of a unified expert consensus. As James Cowan writes in the *National Post*:

[T]he allegations raised by Prof. McKittrick and Mr. McIntyre have caused some to reconsider their reliance on the hockey stick graph. Rob Van Dorland, who works with the Intergovernmental Panel on Climate Change, told a European science magazine: "It is strange that the climate reconstruction of Mann has passed both peer review rounds of the IPCC without anyone ever really having checked it" (2005).

The size or scope of fractures in scientific consensus may matter less than that consensus is not absolute. As one reader's letter to the editor exclaims, "these scientists' are deeply divided on the feasibility of such findings. The mumbo-jumbo even confuses their own!" (T. Roberts, 2005). If even expert scientists dissent from the climate consensus non-experts are under less pressure to overhaul their perceptions. Narratives of evolving and escalating crisis also provide an impression of momentum:

The two Canadians are no longer just one voice crying in the wilderness. On Oct. 22, 2004, in *Science*, Dr. Zorita and his colleague Dr. Hans von Storch, a specialist in climate statistics at the same institute, published a critique of a completely different aspect of the 1998 hockey-stick article (Crok, 2005).

Skeptical *ethos* rewards holding out as "one voice crying in the wilderness" in hope of future redemption. In part, appeals to the solidity of existing consensus may de-emphasize the arduous history of debate and arguments that produce it. The title of Corcoran's opinion piece that introduces this feature, "Let science debate begin," suggests that skepticism associates "debate" not with degrees of difference or gradual formation of consensus, but only dramatic and polemical confrontation. However, the prominence accorded to dissent by scientific experts suggests that modern demarcation influences the presentation of skeptical *ethos*. Individual skepticism becomes easier to maintain with evidence that experts share that skepticism. Letters

to the editor from skeptical members of the *National Post* readership suggest they share feelings of vindication in the face of pressure to conform. One reader notes his long attention to the issue and the refreshing sense of receiving support for his convictions:

I have been faithfully following the news and, particularly, your various columns on such matters for some time now. I have been bugging our elected representatives about the hopelessness of doing anything about "global warming" by controlling CO2 emissions, thus wasting our money and, not incidentally, deceiving the public about the truth of the matter. Your two articles on the climate "hockey stick" fiasco, as revealed by McIntyre, is a welcome breath of fresh air in a hopelessly one-sided but tainted debate. Assuming the conclusions of the revised analysis sticks, this fellow deserves the Nobel prize for something (Coulter, 2005).

In this narrative, debate requires two strongly held positions. Appealing to adversarial norms for public debate suggests that the conduct of consensus scientists violates the expectation of vigorous public debate. Skeptics depict consensus appeals as an effort to end legitimate opposition via *fait accompli*. These narratives present the pressure to conform to an already-decided expert opinion as evidence of the elitist presumption on the part of consensus advocates. An individual climate auditor's participation and mass audience skeptic's weary consumption of dominant opinion share a common sense of conviction. Hold out long enough and the truth will out. Controversies focused on the guilt or innocence of members of mainstream consensus point towards corruption at the origin of consensus. Only letting "debate begin" provides a check against dominant interests carrying the day.

Consensus, Personalization, and Embattled Scientists

Consensus advocates attempt to re-frame calls for "debate" as quibbles over statistical minutiae. Suggesting that Mann's work faced unreasonable scrutiny and was singled out not for its scientific importance but for its media prominence, published articles in traditional media outlets by consensus scientists shift the blame onto members of the media. Objecting to the overly personalized nature of the controversy, consensus scientists emphasize that proper

appreciation for the workings of science renders McIntyre's objections irrelevant. McIntyre's demands for Mann's source code represent an unwarranted intrusion on a research community more interested in making improvements than adjudicating the past.

Consensus scientists given the chance to describe the controversy highlight the personalization of the debate. An *ethos* of consensus distributes both proof and responsibility. Different climate scientists producing similar results confirms the validity of methodological choices even if disagreements or discrepancies exist:

It is quite possible there are errors in the Mann reconstruction, but at least seven other independent reconstructions have generated approximately the same results. "They attack the Mann thing and it stands for everything else," Keller said. "You'd think that Mann was the only guy who did this." Respected paleo reconstructions also have been compiled by Duke University's Thomas Crowley, the University of Arizona's Jonathan Overpeck, and P.D. Jones of the Climatic Research Unit of the University of East Anglia (Whipple, 2005b)

The consensus narrative identifies Mann primarily through his victimized status. Other than the career success that explains his prominence and a few remarks regarding his combative personality, few other climate scientists defend or define Mann based on his personal qualities. A profile of Mann in *Scientific American* entitled "Behind the hockey stick," introduces him as embattled, "Seven years ago Michael Mann introduced a graph that became an iconic symbol of humanity's contribution to global warming. He has been defending his science ever since" (Appell, 2005). According to Appell, devotion to defending the work secures Mann's credibility as a scientist dedicated to his data:

That led to "unjustified attack after unjustified attack," complains climatologist Gavin A. Schmidt of the NASA Goddard Institute for Space Studies. Although questions in the field abound about how, for example, tree-ring data are compiled, many of those attacking Mann's work, Schmidt claims, have had a priori opinions that the work must be wrong. "Most scientists would have left the field long ago, but Mike is fighting back with a tenacity I find admirable" (2005).

Mann's victimization demonstrates misunderstanding or manipulation on the part of scientific opponents. A consensus scientist quoted in Regalado's *Wall Street Journal* article makes it clear the troubling implications even as he explains the irrelevance of Mann's work for the consensus as a whole:

‘The main punch line still appears in many other studies,’ says Jonathan Overpeck, a climate specialist at the University of Arizona. He shares some other scientists' concern that critics have unfairly singled out Dr. Mann's work. A variety of critics appear to be ‘on some kind of witch hunt,’ Dr. Overpeck says (Regalado, 2005).

Overpeck contends that opponents organizing a witch-hunt must either be ignorant, politically motivated, or both. Consensus dictates rules of engagement that respect the collective output of scientific research communities. The obvious personal animosity between consensus scientists and McIntyre derives, in part, from his inversion of this relationship. He infers sweeping problems from particular observations and personal character judgments. Gavin Schmidt, co-founder of RealClimate, in an opinion piece for the *Calgary Herald* observes, “Debates about statistical minutiae rarely make it into the popular press -- except when they concern climatology. This testifies to the regrettable politicization of global warming science” (2005c). Only an insatiable opposition produced by an immediately political context would make these exorbitant demands. In “normal” circumstances, disagreements or problems at this level of detail would never receive public exposure, but scientists could be trusted to accurately deliberate about them. Schmidt asks his readers to interpret the hockey in the context of normal scientific progress and accuracy:

If all statistically significant data are included, the results end up being the same. If the data reduction step is skipped and all the raw tree-ring records are included, the answer is still the same. If a completely different method is used that avoids the whole issue, again, the answer is the same. This is because the raw data from which the method produces a hockey stick, themselves have a hockey stick shape. This is not a claim of inerrancy. Past-climate reconstruction is dependent on raw data and, prior to 1600, the amount of suitable data drops off quite quickly. New good quality data for this period are

continually being published, and will be incorporated in the next set of reconstructions. New statistical methods have been developed making the reconstructions less sensitive to missing data; the original 1998 results will likely be superseded. This is how science works. Incidentally, even if McIntyre and McKittrick's results were valid, there would be no implications for the Kyoto protocol, which was agreed upon in 1997 before Mann's work was published (Schmidt, 2005c).

Public expectations of perfection are unreasonable. Scientists face significant difficulties producing their results. Though we may hope for better results in the future, the results we have are robust enough to deserve respect. What produces this public expectation of “inerrancy?” Schmidt’s narrative suggests mass media channels distort public understanding of climate science because they imbue specific results with symbolic qualities:

The media often give the impression scientific progress consists of a series of revolutions where scientists discard their past thinking with each new result. This is often because only a handful of high-profile studies, like the hockey stick, are recognized by the media, and unrealistic weight attached to them. New results may be overemphasized to make them sound important enough to have news value. Claims any new paper will rock the foundations of climate science should be treated with skepticism (2005c).

Reclaiming “normal” skepticism, Schmidt argues for the presumptive credibility of expert research communities. Disorderly and inaccurate presentation produces a form of skepticism unbound by respect for the explanatory powers of scientific consensus. Climate skeptics do not submit their own results and beliefs to the level of scrutiny that they expect of mainstream science. The subsequent foundation of RealClimate reflects Schmidt’s noisy channel diagnosis. Mass media act as poor moderators by making the presentation of science selective and iconic.

Ironically, the move to RealClimate to reduce the distortion of mass media channels places their content outside of the system of peer-review and strong demarcation so crucial to the early case against McIntyre and McKittrick. Their own interpretation of their presence on the Internet suggests that scientific institutions need to develop additional outlets. As a supplementary tactic it aids in the consumption of information already filtered through

professional affiliation and demarcation. However, an MSNBC report on the founding of RealClimate suggests the move to different media may have more profound changes for scientific *ethos*:

The developments of the past year show that the "accepted wisdom" on science isn't as quickly or as widely accepted as perhaps it once was partly because of a skeptical political climate, and partly because the Internet provides wider access for dissenting views. Those societal challenges are sparking the rise of a new breed of scientists: media-savvy folk who aren't afraid to join the fray themselves. One of those folk is Gavin Schmidt co-founder of the RealClimate Web log. In its year-end roundup, ... Seed magazine selected Schmidt as one of 15 "icons" who has shaped the global conversation about science over the past year (Boyle, 2005).

This “new breed” of scientist may be more prepared for institutional arrangements and levels of trust that do not match the model of expert consensus. However, Schmidt’s own desire for respect for normal scientific consensus suggest that, perhaps again, mass media reporting may be making too much of single scientific result by making transforming it into an icon. If scientists “join the fray,” this suggests their position is only recently embattled. In this narrative, consensus advocates began their work in an apolitical and demarcated environment unpolluted by outside concerns until unscrupulous opponents politicized the issue of climate change. A modernist narrative of embattled scientists poorly fits the policy relevant contours of climate science.

CHAPTER 5

CONCLUSIONS

As members of the public, our primary interest in scientific controversies lies in choosing how to move forward in the context of significant disagreement. Public response to controversy entails more than rendering judgment of true or false. Social relationships that distribute credibility and influence all decision-making in the relevant arenas also undergo modification in any resolution. Understanding the rhetorical patterns, techniques, and frames that are an important part of the hockey stick controversy does not, on its own, resolve the factual dispute between McIntyre and McKittrick and Michael Mann. Like both Mann and McIntyre, my *ethos* oriented perspective holds that the hockey stick controversy speaks to broader issues in our society's relationship to scientific information and authority. Like (I suspect) a fair portion of both Climate Audit and Real Climate's readership, (and certainly their "lurkers" who make no comments) if pressed to replicate or even explicate the complexities of Principal Component Analysis I would be found wanting. This itself is a significant feature of all contemporary complex scientific controversies: at some point they require making decisions about trust, credibility, and allegiance. Judgments about character, the storylines we use to explain conflicts, and reflexive attention to both will likely prove crucial to resolving controversies. It may be that collectively we are nearly as poorly trained in making these judgments as are most people at performing PCA. Fortunately, our deficits in this area are more likely a product of our (often uninvestigated) familiarity with character, narrative and credibility, and, as a result, may be reflexively considered and re-trained. In this spirit, I offer these concluding sections as an

assessment of the rhetorical difficulties faced by scientific rhetors and the possibilities *ethos* offers rhetorical scholars for building the capacity for fair judgment.

Findings—*Ethos* and the Hockey Stick Debate

Ethos plays an important rhetorical role in the hockey stick controversy. An *ethos*-oriented lens draws out important connections between character, narrative, and place that generate and undermine credibility in competing accounts of the controversy. The opposing frames presented in this study construct different social maps for identifying places capable of producing trustworthy scientific evidence and scientific actors. For all those directly involved, the hockey stick dispute raises important questions about who to trust and the institutional procedures and norms designed to secure trust.

Modern scientific *ethos*, grounded in the organized and disinterested pursuit of universal truths, strongly influences the use of skepticism and consensus as rhetorical resources in the hockey stick controversy. McIntyre's auditing narrative and RealClimate's defense of scientific consensus each lay claim to portions of the institutional legacy of modern science for coping with the novel challenges presented by climate science. Both auditors and consensus advocates construct an *ethos* premised on disinterestedness as a source of scientific credibility. The importance of disinterestedness for making knowledge "effective" prompts opponents to seek out sources of interest. McIntyre positions himself with great care as free from financial interest in the outcome of the dispute. Consensus scientists build a barrier between pure research and the interested advocacy groups who use scientific findings. Comments on Climate Audit and RealClimate testify to the difficulties either McIntyre or Mann face in presenting themselves as disinterested characters. For many opposing commenters, McIntyre and Mann's efforts merely prove that nefarious interests are at work at some level. Scientific rhetors face increasing

challenges in fitting their position within a Mertonian institutional framework, even as the quality of disinterest associated with that framework remains important. Neither skeptics nor consensus defenders perceive their opponents as collaborators in the pursuit of scientific truth. Instead, they widen their interpretive frame to include the context they hope will exclude their opponents from achieving scientific status.

For the rhetors surveyed here, scientific status remains privileged, most often in contrast to naïve “beliefs” characteristic of non-scientific attitudes to evidence. Auditors compare consensus to orthodoxy, and its adherents to religious believers reliant on the expert authority of priests. Consensus characterizations share in condemning belief as easily manipulated. However, for skeptical auditors, naïve belief is a product of the growing insularity of scientific institutions, while consensus defenders argue belief is a cyclical impediment to informed public judgment. The conflation of belief and ideological distortion found in both of these narratives illustrates the high threshold contemporary scientific rhetors face when attempting to cultivate trust.

For climate auditors, though scientific evidence continues to occupy a unique and privileged place in public discourse, climate science and scientists stray too far from norms that govern everyday conduct, in particular in the world of business. McIntyre’s auditing narrative challenges the premise that the unique epistemic privilege accorded to science demands a unique and insulated institutional location. By re-characterizing the climate scientists as beneficiaries of undeserved credibility, McIntyre separates the characteristics of modern scientific *ethos* from its traditional location. According to McIntyre, it is because scientists remain cloistered together that they develop undue interest in protecting their own institutional location. When speaking with a “priestly voice,” climate scientists face significant opposition for presuming their findings

and values deserve public deference. Auditors contend that the rhetoricity of the hockey stick demonstrates that consensus is a political rather than scientific product. Characterizing Mann as a deceptive “promoter,” auditors use the public and symbolic importance of the hockey stick as proof that climate scientists are driven by interests in grant money and continued attention rather than truth.

The auditing narrative provides a new institutional map well served by introducing novel media into scientific controversy. By blogging his audit, McIntyre provides an ongoing account of his dispute that generates the appearance of transparency and attention to feedback. While in his traditional academic publications McIntyre largely follows traditional norms of scientific self-presentation, his blog opens new opportunities for directly challenging those norms. Auditors’ criticize consensus as priestly exclusion. Re-characterizing expertise as elite presumption, the auditing narrative expands participation in the scientific enterprise to far broader collective. Auditors validate popular distrust of expert consensus by portraying the heart of scientific *ethos* as skepticism towards authority. The relationship between scientists and their audiences changes when audience members are position as outside auditors interested in scientific guilt and innocence rather than collective witnesses to gradual improvement in scientific understanding.

Mann and his fellow climate scientists’ translate expert demarcation into the blogging environment by thoroughly moderating the exchanges on RealClimate. Their efforts to cultivate impressions of accessibility and honesty only extend as far as dialogue occurs within the boundaries of expert consensus. Moderated *ethos* validates the pursuit of information on the part of an interested public. Scientists’ anxiety over the disinterest or ignorance of the larger public focuses their negative characterizations on purveyors of disinformation. They hope their expert

scientific presence on the Internet will change the contours of credible discussion, rather than forcing scientists to alter their claim to a privileged epistemic position.

ClimateAudit and RealClimate provide frames that influence mass media coverage of the hockey stick dispute. McIntyre's editorial allies follow his auditing narrative closely, borrowing his key characterizations of consensus scientists as intransigent and arrogant. Mann's defenders minimize the significance of the hockey stick in order to preserve the impression of expert unanimity. Consensus defenders depersonalized their own position, while depicting their opponents' motives as personal. In this narrative, Mann's identifying characteristic is his embattled status as an institutional representative. His opponents appear vindictive and unscrupulous in their creation of false controversy. The characterization of embattled scientist suffers from the difficulty of journalistic assessments of the depth and quality of expert consensus. Even those journalists careful to identify core elements of consensus science unaffected by the hockey stick dispute were liable to portray the controversy as important for public policy assessments of expert information. While their assumption that public consideration of scientific character would play an important role in policy decision-making may be accurate, it inhibited efforts to demarcate scientific findings from individual and personal credibility.

The alternative narratives and characterizations found in the discourses considered by this study illustrate that even though modern scientific *ethos* exercises continuing rhetorical force, climate science controversies generate important modifications to that *ethos*. Auditors' prioritization of skepticism and replication alters the institutional relationship between scientific experts and their audiences. Consensus scientists acknowledge in their creation of RealClimate that they face a different communicative landscape and media environment from their

predecessors. Tracing the narrative frames and patterns of the hockey stick debate raises further questions about the sources of changes in scientific *ethos* and appropriate critical and rhetorical responses. The subsequent sections of this chapter draw on the findings presented above to consider these issues.

Skepticism, Ideology, and *Ethos*

Approaching climate skepticism, and its particular manifestation in McIntyre's "audit," as an *ethos* prevents us from reducing it to either a mere factual misunderstanding or an ideological illusion. By and large, scientists and political figures trying to resolve climate science controversies resort to educating (lecturing) skeptics about scientific fact or declaring skepticism nothing more than a product of powerful (fossil fuel) interests. Though a thorough review of such documents is outside the scope of this paper, a brief turn to the most popular and prominent example of this technique, Al Gore's documentary *An Inconvenient Truth*, illustrates the difficulties generated by a failure to consider *ethos*. The film opens with a montage of Gore's difficult and long trek around the world to educate audiences about the dangers of climate change. While I might sympathize with Gore's embattled character, this episode was immediately used to leverage charges of hypocrisy. Skeptics cataloged the carbon emissions generated by Gore's travel, ridiculing him as someone incapable of living up to the standards he demanded of others. An inconvenient truth of this situation is that character remains extremely relevant for making judgments connected with lifestyle changes.

Ethos adds to ideological analysis by focusing our attentions on the way in which people present themselves and narrate their surroundings. What ideological analysis might hope to expose as a contradiction, *ethos* helps explain by examining rhetorics used by participants. An ideological interpretation of skepticism seeks out the *real* value content that makes up the

skeptical worldview. Peter Jacques argues, “Environmental skepticism doubts the importance and reality of environmental problems, but it is not about science. It is about politics” (2006, p. 76). Jacques rightly criticizes scholars who have limited their attention to the factual correctness of skeptical claims. However, this turns into an excuse to read climate skepticism as only marginally concerned with science:

[S]imply creating significant levels of conflict within epistemic communities may be just as effective in stalling protective environmental policy as settling a debate between claims. Therefore, the contrarian knowledge claims made by skeptics are of secondary importance to the political conflict they generate and the meaning this has for global societies. Skepticism’s doubt of environmental knowledge is thus superficial, tangential even, to its more important arguments for limiting who and what citizens are responsible to and for. More importantly, the struggle over the state of the planet is a struggle over society’s dominant core social values that institutionalize obligation and power (Jacques, 2006, p. 77).

The comments on Climate Audit suggest that value choices about responsibility certainly shape skeptical scientific interpretations. However, without genuine concern over scientific accuracy and certainty it seems unlikely that intense engagement on these issues would be sustainable. Not only does scientific information provides substance for dispute, modernist scientific *ethos* shapes the rhetorical efficacy of skeptical re-characterizations of scientific consensus as dogmatic. Skeptics are not unaware of the importance they accord individual liberty. They rhetorically stage their individual freedom of opinion in contesting what they perceive as the imperious tone of scientific consensus. We should consider the possibility that these narratives of responsibility may reshape relations between scientific communities and the public in general, not only among skeptics. Part of the effectiveness of the “audit” as a narrative of scientific activity is that appeals to aspects of scientific characters and institutions have long been powerful themes and touchstones for the public communication of science in North America.

Treating skeptical scientific characterizations and narratives as secondary also leaves us poorly equipped to understand possible shifts in scientific *ethos*. The analysis presented here suggests that the resolution of scientific controversies is likely to include a change in relationships to scientific authority and changes in institutional demarcation, not only judgments about particular scientific data. Skeptical *auditing* alters the meaning of Merton's "organized skepticism" by treating highly compact scientific organizations as inherently suspect. Opponent might deride auditors as insufficiently organized and overly skeptical. Yet, within the auditors' expansive definition of scientific activity, their efforts enact a novel form of scientific organization and institutionalization. Within a skeptical *ethos*, adding the organized power of public auditing and review ensures superior replication and confidence in the certainty of robust results. Historical associations between scientific *ethos*, free debate, and individualism enable this re-appropriation. Merton's norms, while perhaps not accurate sociologically, describe important rhetorical tropes for scientific authority. Merton regarded modern scientific *ethos* as a product of individualistic societies that were threatened by the rise of totalitarianism. Though we might doubt the threat of world government, we must acknowledge that the consensus position implies that all members of industrial society must make significant lifestyle changes. Rhetoric that appeals to individual liberty, freedom of conscience and ongoing debate utilizes themes with stronger historical ties to scientific *ethos* than collective sacrifice or necessity. The terms of participation offered by scientific narratives in the hockey stick debate affect an audience's ratification of those narratives as scientific. Skeptics participating in an audit of dominant institutions are given the chance to participate individually in the process of discovery.

Skepticism, Moderation, Participation, and the Public Sphere

The foregoing study of RealClimate and Climate Audit demonstrates that a change in media may magnify difficulties for producing scientific consensus. Several characterizations and narratives from the skeptical side appear to fit the more general *ethos* of contemporary Internet participation. At the very least, consensus advocates should not presume that the introduction of a new, highly participatory forum assists their efforts.

A blogging environment dedicated to argumentative content changes self-presentation and characterization by removing personal context. Visual rhetorical elements and personalized features that might influence our judgment of character do not appear on RealClimate and Climate Audit in the interaction between commenters. Comment threads produce an archive and identity attached to screen-names, but presentations are limited to the textual rendering of argument. My presentation of the comment threads on RealClimate and Climate Audit easily assigns allegiances to commenters. In part, this is a result of my need to simplify and narrate the significance of thousands of comments. However, there are few circumstances reading these blog comments that the affiliation of the commenter is not readily apparent. Though elements of this apparent transparency may be illusory, other participants likely share the impression that their friends and opponents may be easily identified. An auditing *ethos* dedicated to assigning precise responsibility and promoting extreme transparency draws strength from the meticulous and linear presentation characteristic of comment threads.

Recalling the association between *ethos* and place, the spatial relationships created by science blogging likely change the range and effectiveness of particular styles. Rhetorical theorist Richard Weaver characterized the transformation from grand style of 19th century rhetoric to modern rhetoric as a transformation from “spaciousness” and “distance” to the

“intrusive detail” of realism (1985, pp. 169, 178). Though science bloggers are separated by great distance physically, the blogging environment maximizes the “intrusive detail” of arguments. Weaver describes “spacious” rhetoric as a style that privileges phrases that:

[H]ave resonances, both historical and literary, and that this resonance is what we have been calling spaciousness. Instead of the single note (prized for purposes of analysis) they are widths of sound and meaning; they tend to echo over broad areas and call up generalized associations...In this way then the generality of the phrase may be definitely linked with an effect (1985, p. 169).

Weaver asks “how was the orator able to use them with full public consent when he [sic] cannot do so today?” He answers that orators once possessed a “privilege” of “presumption” (1985, p. 169). Lessl’s description of the priestly voice suggests that successful popular scientific communication grows out of “spacious” or “extensive” ethos of presumption (1989). Both the content and places of the hockey stick dispute militate against the success of an extensive and spacious scientific *ethos*.

Stylistically, RealClimate’s moderated *ethos* constrains the spaciousness of its rhetoric in favor of significant “intrusive detail.” When moderation becomes explicit and publicly available instead of filtering largely outside of public purview, spacious rhetoric that presumes shared values faces new challenges. Spacious rhetorics build on the extensive capacity or coverage of an *ethos*. A recent development in the moderated *ethos* of RealClimate exemplifies the problem of an explicit filter. In response to complaints about too strict moderation of comment threads, this year (2011) RealClimate has introduced the “Borehole,” a page dedicated to the display of rejected comments. The heavy-handedness of orthodoxy would be difficult to display in more intrusive detail. Collecting both groups of the like-minded and separating them makes any crossover between the two less likely and is easily narrated as elite presumption. Skeptics frequent analogies between consensus and religious dogma re-appropriates modern narratives of

scientific authority for anti-elitist and anti-expert rhetorical posture. The very success of climate scientists in making their conclusions public generates the perception that their interests and activities serve elite interests. The spacious symbolic function of the hockey stick in mass media, even if not the intent of its authors, makes a conspicuous target for the narrative of elitist presumption.

Mann, Schmidt, and other consensus scientists hope that RealClimate might offer an alternative to the more conventional spectator relationship found in mass media presentations of the hockey stick. Offering direct access to real climate scientists speaking in the vernacular rather than the priestly voice aims at reducing the distance between scientists and their audience. Lisa Keranen's recent scholarship aims at re-characterization of scientific *ethos* along the lines of citizen-scientist and scientist-citizen to reduce the "chasm between scientists and their stakeholders" (2010, p. 164). Her vision suggests that adherence to the tenets of strict demarcation prevents elements of the re-characterization that RealClimate hopes to produce:

While the categories of citizen and scientists are not mutually exclusive, they nevertheless index an ethic of mutual engagement. The scientist-citizen/citizen-scientist and the knowledge partner therefore represent but several figures that can disrupt the cold war separation between science and its stakeholders. This first figure represents the politically engaged scientist who refuses to be seduced by the insular model of science. Instead, the scientist-citizen would actively solicit stakeholder input, approaching his or her task with a mind for public values (Keränen, 2010, p. 164).

In the hockey stick controversy, claims of researcher disinterest remains a central component of consensus science. The desire to avoid affiliation with environmentalists or other potential allies generates pressure to avoid pursuit of "public values." McIntyre's auditing narrative and the participation of the skeptical collective in explicit discussion of values more closely approximates this collapsing of distance between expert and lay audience. This is not to suggest that participation is incompatible with the consensus science position or is not a useful pursuit.

Rhetorical and science studies scholars should be careful not to equate participation and citizenship with a guarantee that participants will produce the values or results they desire. It is not only climate scientists who project the model of pedagogical relationships into the public sphere. Ideological and deliberative rhetorical critics' hopes for the public sphere may share the premise of the "interested public," that if only citizens became active and informed they would surely reach the same conclusion as experts. The terms and values associated with active participation in the scientific process may be narrated according to extremely different value premises. Particularly in the case of climate science, the introduction of implicitly precautionary values challenges the linear progressive narrative of the modernist scientific *ethos*.

Risk, Narrative and Scientific *Ethos*

The prominence of risk in the hockey stick controversy illustrates that scientific *ethos* may undergo important modifications as the end of scientific narratives shifts from the positive potential of discovery to, as Stefan Rahmstorf says on RealClimate, being able to "give an early warning" (2005). Climate science rhetoric exhibits strong ties to risk and danger. The "iconic" status of the hockey stick, while frustrating for many scientists, is not a coincidence. The rhetoric of a sub-discipline of climate science focused on reconstructing the past is most strongly identified by its data that helps forecast the future. Rhetoricians have long analyzed the effectiveness of fear appeals. The intersection of fear, risk, and scientific discovery presents a combination that is likely to grow in importance as we live out the consequences of modern scientific and technical capacity (and error).

The rhetorical association between climate science and a precautionary *ethos* possesses great potential for generating common concern or provoking backlash. Ulrich Beck, theorist of the risk society, argues that the modern institutional configuration of science as a separate,

sacred, and trusted sphere breaks down in the face of the uncertainties and risks manufactured by the application of modern technology. In the case of climate change, becoming victims of our own modern capabilities undermines relationships of trust in the scientific and technological institutions that produced those capabilities. However, Beck also acknowledged the tremendous rhetorical potential of environmental risk. He wrote:

Al Gore did not discover the environmental issue. What he did discover and began to exploit was its power to create meaning, politics and structure. The post-traditional world...possesses a fountain of youth for re-moralization [and] motivation in the challenges of self-inflicted imperilment (Beck, 1997, p. 91).

Commenters on RealClimate certainly testify to the meaning making power of rhetorics of self-inflicted peril. Yet, if Al Gore “discovered” the power of this type of issue to create meaning or cultivate a common *ethos*, Michael Mann is one of the early victims of its power to undercut credibility. Mann’s rhetoric of a strongly demarcated science independent of politics and policy ignores the strong ties between his area of expertise, risk, and immediate policy relevance. He may have been strongly prepared as a scientific expert, but he was poorly prepared as a scientific communicator.

The mass media coverage examined here grants symbolic importance to the hockey stick debate due to its extremely clear illustration of the significant risks created by climate change. Mass media audiences encounter the hockey stick controversy most often in the context of its political significance. Given the risks associated with making the wrong choice about climate change, editorialists and journalists present the hockey stick controversy in a political context. Commenters on Climate Audit and RealClimate consistently argue over risk assessments and value priorities. In the different levels of willingness to discuss risk found in the comments on RealClimate and RealClimate contributor posts we find evidence for the rhetorical force of a

shared *ethos* and the difficulty of articulating a “pure” scientific position when science comes into contact with risk.

Matters of Fact, Matters of Concern, and the *Ethos* of Criticism

The tone of this conclusion makes my frustration with the rhetorical choices of hockey stick defenders clear. As a result, it also makes my sympathy for their position on climate change evident. Focus on *ethos* raises questions about the position, authority, and orientation of the rhetorical critic. Separating credibility and critique risks making the *ethos* of criticism self-satisfying but rhetorically limited. Developing critical distance may permit one to speak beyond or about the confines of a particular value system and social hierarchy. However, this same distance may leave a critic unable to write or speak in terms that resonate with an audience that does not share their reading. I have tried to fairly and credibly map the characterizations, narratives and contours of authority found in different attempts to re-articulate scientific *ethos* in the hockey stick controversy. I cannot feign disinterest. In illustrating the effects and effectiveness of different rhetorics I have provided tools for both sides. In part, this is because the *ethos* of critique found in this work aims at the production of common matters of concern rather than decisions regarding matters of fact. Here I am borrowing the terminology of Bruno Latour to discuss the problem of critique in science studies. Latour, one of the founding figures of science studies, expresses unease over the relationship between the critical project of science studies and the production of uncertainty regarding climate science. To use the terminology of a RealClimate comment, Latour worries that science studies aids the “hard-core denialist” category of specialists paid to foment controversy (Latour, 2004). Latour suggests that the position of authoritative critique offers an intoxicating sense of power:

You are always right! When naïve believers are clinging forcefully to their objects, claiming that they are made to do things because of their gods, their poetry, their

cherished objects, you can turn all of those attachments into so many fetishes and humiliate all the believers by showing that it is nothing but their own projection, that you, yes you alone, can see. But as soon as naïve believers are thus inflated by some belief in their own importance, in their own projective capacity, you strike them by a second uppercut and humiliate them again, this time by showing that, whatever they think, their behavior is entirely determined by the action of powerful causalities coming from objective reality they don't see, but that you, yes you, the never sleeping critic, alone can see. Isn't this fabulous? (Latour, 2004, p. 239)

If we share any *ethos* across the lines of skepticism and consensus it may be our collective commitment to avoid being characterized as an ideological dupe or naïve believer. Skeptical and consensus rhetorics each scorn the believer. As corollary, both skeptics and consensus advocates present themselves as embattled by the armies of foolish believers from the other side. They share the desire to de-bunk opponents iconic attachments or foolish beliefs. Both are fighting over the legacy of the scientific *ethos* of the Enlightenment, which uses matters of fact to demolish opposing idols:

[W]hile the Enlightenment profited largely from the disposition of a very powerful descriptive tool, that of matters of fact, which were excellent for debunking quite a lot of beliefs, powers, and illusions, it found itself totally disarmed once matters of fact, in turn, were eaten up by the same debunking impetus....My question is thus: Can we devise another powerful descriptive tool that deals this time with matters of concern and whose import then will no longer be to debunk but to protect and to care, as Donna Haraway would put it? Is it really possible to transform the critical urge in the ethos of someone who adds reality to matters of fact and not subtract reality? (Latour, 2004, p. 232)

The *ethos* of adding to reality suggests that our first duty lies in trying to chart that reality as thoroughly and fairly as possible. Rhetoric enjoys a long history in the production of matters of concern and has long felt a chip on its shoulder for its distance from matters of fact.

Rhetoricians are eminently capable of taking revenge upon those who deal in facts by demonstrating that they are nothing more than the products of concern: that rhetoric operates constitutively. Latour's call for a renewed *ethos* of critique encourages us to formulate alliances

over shared matters of concern rather than come to blows over the relative priority of fact and concern:

The critic is not the one who debunks, but the one who assembles. The critic is not the one who lifts the rugs from under the feet of the naive believers, but the one who offers the participants arenas in which to gather (Latour, 2004, p. 246)

I cannot offer the magic bullet of the perfect “matter of concern” that can bridge the gap between opposing positions on climate change. Yet, charting the objections of skeptics to moderated *ethos* and tracing the rhetorical engagements of RealClimate posters suggests that adapting scientific *ethos* to an arena inhospitable to disinterest may first and foremost require reflection on elements of that *ethos* most often left implicit.

In a “crowded” world, there are fewer opportunities for cultivating a spacious *ethos* that appears disinterested because it is so broadly shared. Some lament the passing of a commonsense of objectivity, but a fracturing of a scientific *ethos* based on a shared narratives and experiences may be as much a consequence of the expansion of objectivity as of its passing. Readers of Aristotle’s initial formulation of *ethos* might be surprised at its relative paucity or simplicity. Though *ethos* was an object of study, the set of relations Aristotle was capable of, or would have thought to make, into objects of analysis instead of experiencing them as an intrinsic element or “background” of his subjective experience appears somewhat small. The consistent use of diverse characterizations and analogies between different social positions found throughout this study suggests that character, background value choice, and social position are constant objects of analysis and argument. This presents a fruitful arena for rhetorical scholarship even as it creates new challenges for those cultivating a scientific *ethos*. There are many matters that should concern us. Hopefully this work is one part of the long work of collective assembly.

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