**BOUNDARIES, BREACHES, AND BRIDGES:
THE CASE OF CLIMATEGATE***

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ABSTRACT

We examine the incident known as “Climategate” in which emails and other documents relating to climate scientists and their work were illegitimately accessed and posted to the Internet. The contents of the files prompted questions about the credibility of climate science and the legitimacy of some of the climate scientists’ practices. Multiple investigations unfolded to repair the boundary that had been breached. While exonerating the scientists of wrongdoing and endorsing the legitimacy of the consensus opinion, the investigating committees suggested revisions to some scientific practices. Despite this boundary repair work, the credibility and legitimacy of the scientific enterprise were not fully restored in the eyes of several stakeholders. We explore why this is the case, identify boundary bridging approaches to address these issues, and highlight policy implications.

1. Introduction

In late November 2009, a computer server at the University of East Anglia's (UEA) Climatic Research Unit (CRU) was hacked, and thousands of emails and other files were illegitimately obtained and then posted to the Internet via a "sophisticated and carefully orchestrated attack" (Norfolk Constabulary, 2012; see also House of Commons, 2010: 5-6). Dating from March 1996, the files offered a selective glimpse into the making of climate science (Revkin, 2009; Russell Report, 2010). Popularly referred to as "Climategate," the incident was initially considered a "mischievous" hacking attempt (Johnson, 2009), deliberately timed to sabotage the upcoming United Nation's Climate Change Conference (known as the Copenhagen Summit).

But once the contents of the files became public, concern with how they had been obtained was quickly overwhelmed by their contents. Signaling the potentially serious threat that this incident posed to the credibility of the scientists and legitimacy of climate science, numerous investigations were initiated.¹ By August 2011, nine separate investigations had been completed. Each investigation exonerated the implicated climate scientists of violating scientific norms and reaffirmed the scientific consensus regarding the anthropogenic global warming hypothesis.

One might conclude that there is not much to learn from Climategate: Some files were hacked by miscreants that embarrassed a few climate scientists who were eventually exonerated. Yet, this account leaves many questions unanswered. For instance, why did this incident occur in the first place? And, why is it that the credibility of the scientists and legitimacy of climate science continued to be called into question despite numerous investigations?

In this article, we consider the events leading up to Climategate and the processes that

¹ For analytical purposes, we distinguish between credibility and legitimacy (see also Kirkland, 2012). Credibility has to do with the trustworthiness ascribed to a source or finding. Legitimacy has to do with the acceptability of constitutive practices. A finding can be credible but based on practices that are considered to be illegitimate, such as conducting research without institutional review board approvals. It is also possible for legitimate practices to generate findings that audiences consider to lack credibility, such as the recommendation by the United States Preventive Services Task Force (USPSTF) that most women in their 40s no longer need mammograms, whereas starting age 50, they are advised to have one every 2 years (USPSTF, 2009). Of course, the two constructs can interact, as when the credibility of a finding is impacted by the legitimacy of the practices followed.

subsequently unfolded. Our analysis identified a paradox that we build up to in this paper. Specifically, scientists engage in boundary work (Gieryn, 1983) to distinguish themselves from non-scientists.² However, they must then bridge across the chasm they have created. This is always difficult, but particularly so when the science/non-science boundary is breached, as was the case with Climategate. In this instance, selected email exchanges purporting to represent the practices of the broader climate science community were made available to diverse stakeholders, thereby raising questions about the entire climate science infrastructure and its findings.

Though numerous investigations exonerated the implicated scientists, ongoing concerns about the credibility and legitimacy of the science remained, even after the climate scientists undertook boundary repair work to address the damage that Climategate had created. These observations generate additional questions. Specifically, how might stakeholders be convinced of the integrity of science after a breach such as Climategate? Going even further, what additional forms of organization and modes of governance might be required to reduce the possibility of incidents such as Climategate in the future?

Our analysis highlights the need for boundary bridging work. In particular, we propose a narrative approach to bridging the boundary between scientists and non-scientists. At one level, such an approach implies a shift to meaning making rather than information processing. Going even further, it also implies the creation of hybrid forums (e.g., Callon and Rabeharisoa, 2003) wherein matters of concern can be brought together alongside matters of fact (Latour, 2004). Given that new matters of concern are bound to emerge even as current ones are addressed (Callon, 1998), climate science is likely to continue unfolding and remain in-the-making. In this regard, Climategate can be seen as a crucial episode in making these issues explicit and visible, and in suggesting ways they might be addressed, or even avoided.

2. Background

Prior research has demonstrated that actors belonging to one epistemic community often find it difficult to coordinate let alone understand knowledge from other communities (Galison, 1999; Knorr Cetina, 1999),

² Similar work is undertaken by other professionals to create jurisdictional boundaries (e.g., see Abbott, 1988).

owing to processes of paradigmatic closure, inversion, and normalization (Kuhn, 1970; Latour and Woolgar, 1986; Vaughan, 1996). In this regard, boundary objects are said to facilitate coordination among epistemic communities without requiring explicit consensus (Bowker and Star, 1999; Star, 1989; Star and Griesemer, 1989; for a review, see Star, 2010). First, as with objects more generally, boundary objects entail interpretive flexibility (Pinch and Bijker, 1987). Second, and of direct relevance to climate science, boundary objects provide material-organizational arrangements that allow different groups to work together. Third, boundary objects reside in-between social worlds, requiring that actors tack back and forth between ill-structured and tailored uses of these objects.

In addition to this role as mediators (Latour, 2005), boundary objects are capable of scaling up as they become networked together to constitute larger boundary infrastructures (Bowker, 2000; Bowker and Star, 1999; Edwards, 2010; Star, 2010). Boundary infrastructures are constitutive of standards that allow different epistemic communities to communicate and coordinate with each other (Star and Ruhleder, 1996). The assembling of such infrastructures is neither *de novo* nor disruptive, but instead an incremental and accretive process (Star, 1999). As boundary infrastructures are linked with extant temporal rhythms, conventions and practices, they are able to promote coordination among different epistemic communities.

However, access to the boundary infrastructure and the opportunity to contribute to its development is not available to everyone. Pertinent here is the “boundary work” (Gieryn, 1983) that scientists undertake to distinguish themselves from non-scientists.³ Such boundary work is unproblematic in those cases where stakeholders accept the divide and grant the scientists who have access to the boundary infrastructure the authority to speak on behalf of nature (e.g., Callon, 1999; Pinch, 2000). Complications arise, though, when stakeholders with contrarian views consider themselves to be scientists, but are not given the same authority to speak on behalf of nature by core scientists. Such groups then become “monsters” (Bowker and Star, 1999; Haraway, 1992), and their inputs are not normalized through an ongoing and iterative process (Star, 2010).

³ Whereas Gieryn (1983) conceptualizes boundary work occurring “downstream,” in the case of Climategate, these boundary disputes are happening much closer to the production of science.

Indeed, as boundary infrastructures become more structured, the contrarian views of “deniers” (Washington and Cook, 2011) are not seamlessly accommodated, thereby generating tensions and controversies that remain unresolved and simmering under the surface (e.g., see Jasanoff, 1987). Similar dynamics are evident in a range of issues, from healthcare (e.g., mammograms and autism) to energy (e.g., hydraulic fracturing and nuclear power). Accordingly, it is important to gain a deeper appreciation of these controversies as they hold important policy implications for the governance of complex issues such as climate science. The Climategate incident offers us an opportunity to do so.

3. Methods

Our analytical strategy was to follow the controversies (Callon, 1986; Latour, 2005). We did so by examining data related to Climategate from multiple sources, including national news media, such as *The Times*, *The Guardian*, *The New York Times* and *The Wall Street Journal*; news sources local to those implicated, such as the *Eastern Daily Press* and *The Daily Collegian*; official press statements by the organizations involved; and numerous investigation reports – altogether more than 1,000 pages of text – that were issued in the aftermath of these events. We also followed the scientific community through publications such as *Nature* and *Science*; and the so-called skeptic community through websites such as *Climate Audit* and *Watts Up With That*. Finally, we reviewed numerous academic journal articles, governmental reports and other documents implicated by the released files. This corpus of data allowed us to examine the Climategate controversy in considerable depth using concepts from the literature on science and technology studies. Data analysis was iteratively performed by adhering to the steps laid down by Miles and Huberman (1994) in their primer on qualitative research. When themes began to emerge from the data, missing pieces of information became apparent, which led to further purposeful data collection and analysis (Lincoln and Guba, 1985).

4. Findings

Our analysis revealed a proliferation of social groups such as core scientists and deniers driving this controversy. It also showed the vulnerability of a seemingly robust boundary infrastructure around climate science. We also examined the investigations that unfolded to understand the incident, and the

boundary repair work undertaken in response to the breach. Results of these investigations and subsequent events suggest that climate science continues to be vulnerable despite these efforts. We theorize boundary bridging work as a pathway to dealing with this paradox.

4.1 Proliferating Social Groups

Even a cursory analysis of the Climategate files highlights the contentious nature of climate science in-the-making (Latour, 1987). At the heart of the controversy are climate scientists who distinguish themselves from non-scientists by subscribing to norms of science. These scientists, along with the help of policy makers, funding agencies, technologists, non-governmental organizations, international consortia, and others, assembled a boundary infrastructure to facilitate communication and coordination across a wide array of disciplines including paleoclimatology, dendrochronology, oceanography, glaciology, atmospheric physics, geophysics, and biochemistry. Opposing this consensus were “deniers,” a label that climate scientists and their allies used to describe those opposed to the consensus opinion because they “deny the truth” (Washington and Cook, 2011:1; see also Mann, 2012; Powell, 2011).

Many climate scientists feel an urgent need to publicize the anthropogenic causes of global warming so as to galvanize action among policymakers and the other stakeholders (e.g., Mann, 2012).⁴ Such passion is readily evident in the many texts that they have produced (e.g., Powell, 2011; Washington and Cook, 2011). Some of the deniers are equally passionate, using multiple tactics ranging from “conspiracy theories” to “logical fallacies” to deny climate science (see Washington and Cook, 2011 for more details).

But these are not the only two positions in the debate. Mainstream climate scientists reserve the term “skeptics” for those who take a contrarian position from within the practice of science (Mann, 2012; Powell, 2011; Washington and Cook, 2011), thereby complicating the situation. For instance, some contrarian scientists have offered alternative models and interpretations, an outcome that Sarewitz (2004:

⁴ Climate scientists are not unique in this regard. Some scientific fields, such as conservation biology, are explicitly political or “mission-driven” (e.g., see Meine, Soulé and Noss, 2006). We thank an anonymous reviewer for making this observation.

389) described as an “excess of objectivity.” And yet, speaking to the ambiguities involved with boundaries in-the-making, mainstream climate scientists typically have ignored some contrarian scientists such as Lindzen, a professor of meteorology from the Massachusetts Institute of Technology (see Pearce, 2011 for details).⁵ Consequently, contrarian scientists risk inhabiting a gray zone between mainstream climate scientists and climate science deniers, despite the merits of the models they have to offer and the concerns they may raise (see Powell, 2011 for more details). The same is the case with actors who, however gently, question whether scientific norms are being followed (see Pearce, 2011 for more details).

In a review of Powell’s (2011) book, *The Inquisition of Climate Science*, Pearce (2011: 237) underscored the tendency for skeptical scientists to be ignored or dismissed:

The central flaw of this book is that Powell fails to address the serious and coherent critiques of the climate change consensus. Where in this book are Judy Curry of Georgia Institute of Technology, the University of Colorado’s Roger Pielke, Jr., the University of Alabama’s John Christy and others? All three are renowned academics, yet they each have also been reasoned critics of the orthodox climate science canon, and of their fellow researchers, in specific areas.

Whereas Pearce is a journalist, similar criticisms have come from within climate science. Hulme amplified this point in his *Nature Climate Change* review of Mann’s (2012) book, *The Hockey Stick and the Climate Wars*. He noted, “But this binary [climate scientists vs. deniers] framing is wrong. There are plural and multiple positions, not just about the policy implications of climate change knowledge but also about the scientific assessment of climate risk itself” (Hulme, 2012: 224).⁶

Although it is possible to describe a considerable portion of the Climategate incident by focusing on climate scientists, deniers and “caught in the middle” contrarian scientists, it omits other important groups, such as policymakers and other public stakeholders. In this regard, an emerging stream of research has found that attitudes towards climate science differ based on political leanings, and these differences are most evident at opposite ends of the political spectrum (Gauchat, 2012; Maibach,

⁵ Lindzen’s cloud models generate outcomes that depart from the consensus opinion.

⁶ As of June 2013, Hulme was a professor of climate change in the School of Environmental Sciences at the UEA. He was formerly a researcher in the CRU for 12 years. Hulme is mentioned over 100 times in the Climategate emails (Russell Report, 2011: 147).

Leiserowitz, Cobb, Shank, Cobb, and Gullett, 2012).⁷ Understanding such attitudinal differences is all the more important when dealing with “reflexive historical sciences” (Collins and Evans, 2002: 268-269), in which the potential for uncertainty is amplified to the extent that human actions affect the outcomes. Accordingly, the analysis is incomplete unless the reactions of the people who may be contributing to the problem are taken into consideration.⁸

While following the protagonists, antagonists and other stakeholders at the heart of the controversy is one analytic strategy, another approach is to acknowledge the role played by larger institutions such as the U.S. Environmental Protection Agency (EPA) and the Intergovernmental Panel on Climate Change (IPCC). The IPCC in particular has been implicated by the controversy owing to its direct role in promoting climate science to policymakers. Between 1995 and 2012, the IPCC published four major assessment reports. Its 2001 and 2007 reports were implicated in the Climategate controversy, the former as it related to questions about the “hockey stick” graph (depicting a rise in global-scale temperatures), and the latter regarding questions about the peer review process.⁹

⁷ For instance, Leiserowitz and colleagues (2011) identified six global warming segments among Americans: *alarmed, concerned, cautious, disengaged, doubtful* and *dismissive*. Three of the segments (totaling ~65%) were concerned about global warming to varying degrees and supportive of policy responses. In addition to the heterogeneity of responses at a point in time, these differences are dynamic over time and across countries. For instance, these same researchers found a shifting mix of segments in America from 2008 to the present (Leiserowitz et al., 2011). Similar research in India also revealed six segments, dubbed: *informed, experienced, undecided, unconcerned, indifferent* and *disengaged* (Leiserowitz et al., 2013). But notably, only one segment was common between the United States and India, suggesting the need to accommodate heterogeneous concerns.

⁸ MacKenzie (1990) offered the notion of a “certainty trough” from his study of missile accuracy. Experiencing the lowest level of uncertainty were users of the technological program, “program loyalists” and others who simply “believe what the brochures tell them” (p. 371). Experiencing a higher level of uncertainty were those “alienated and those committed to an alternative weapon system,” as were “those closest to the heart of the production of knowledge of accuracy” (p. 371). Lahsen (2005a) re-examined this certainty trough in the context of general circulation models (GCMs). Drawing on participant observation and interviews, Lahsen observed that the situation is far more complex than portrayed by MacKenzie because of the difficulties in distinguishing knowledge producers and users, the presence of multiple production sites, and changes in the network of actors and GCMs over time. Even if one could distinguish between producers and users, Lahsen challenged the assumption that knowledge producers were able to critically assess the accuracy of their simulation models, noting that some users such as “atmospheric scientists” and “synoptically trained empirical meteorologists” were better able to identify model shortcomings. However, Lahsen observed that, in their interactions with external audiences, modelers at times downplayed inaccuracies in their model because they were interested in securing their authority (p. 917).

⁹ Please visit the IPCC Report webpage (<http://www.ipcc.ch/ipccreports/tar/wg1/005.htm>) for an example of the hockey stick graph.

As scientific representations such as the hockey stick graph were “translated” (Callon, 1986; Latour, 1987) from journal articles to non-scientific venues such as the IPCC report, some deniers struck back. Initially, deniers raised their concerns on blogs. But climate scientists ignored such critiques on the basis that they were not peer-reviewed (Mann, 2012). Indeed, papers published in high status peer-reviewed journals such as *Nature* are a part of a boundary infrastructure that enables communication and coordination among scientists on the one hand, while generating boundaries between scientists and non-scientists on the other (Gieryn, 1983; Merton, 1942, Washington and Cook, 2011).¹⁰ As the Russell Report (2010: 39) noted: “Access to publication in scientific journals is therefore a crucial issue.” It underscored this point by quoting evolutionary biologist Edward Wilson (1998): “A discovery does not exist until it is safely reviewed and in print.” In other words, what counts as a “fact” depends, at least in part, on what gets published (see also Latour, 1987).

Historically, access to academic journals has been restricted to “core” scientists (Collins and Evans, 2002). Recognizing the importance of scientific articles, some deniers attempted to publish in such journals, and in some cases, even succeeded. This feat did not escape notice. According to the Russell Report (2010: 29), prior to 2003, “those critical of MBH [referring to the original hockey stick paper by Mann, Bradley, and Hughes (1998)] had not had a paper published in a mainstream journal.” But, several papers published by critics between 2003 and 2005 were “significant not only because they challenged MBH, but also because they had been peer reviewed” (Russell Report, 2010: 29).¹¹

¹⁰ The term *boundary* has been used in different ways (see Lamont and Molnár, 2002). For Bowker and Star (1999), a *boundary infrastructure* promotes coordination and communication across scientific communities. For Gieryn (1983), *boundary work* involves the creation and maintenance of jurisdictional authority by scientists over non-scientists.

¹¹ Pinch’s (1979) study of parapsychologists showed how difficult it can be to publish heterodox findings, even when they appear to be “more scientific” than the prevailing orthodoxy, leading him to conclude that “demarcation arguments are culturally dependent” (p. 344). Moreover, as with parapsychologists, even when climate science deniers succeeded in publishing in peer-reviewed journals, they were sometimes ignored. For instance, two climate science deniers succeeded in publishing a critique (see McIntyre and McKittrick, 2003) of the original hockey stick paper (Mann, Bradley, and Hughes, 1998), but Mann and colleagues never replied to their criticism. Why? “Because the journal that published the McIntyre and McKittrick article – *Energy and Environment* – was not a recognized scientific journal, we chose not to submit a comment to it” (Mann, 2012: 302). Instead, *Energy and Environment* was “a social science periodical... not recognized by the Institute for Scientific Information, the body responsible in

The climate change debate also is readily apparent in mass-market books, each offering its own version of events by invoking disparate concerns and justifications. In the 3 years following the release of the Climategate files, more than 20 books were published with evocative titles such as *The Hockey Stick Illusion: Climategate and the Corruption of Science* (Montford, 2010), *The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future* (Inhofe, 2012), *The Inquisition of Climate Science* (Powell, 2011), and *Climate Change Denial: Heads in the Sand* (Washington and Cook, 2011). Simply examining the titles of these books, their publishers, and publication dates provides another perspective on how this controversy continued over time.

Through their journalistic reports, the mass media were also a player – modulating the debate between climate scientists, deniers and other stakeholders. But some (e.g., Boykoff, 2008; Boykoff and Boykoff, 2007) have questioned the media’s practices of covering both consensus and contrarian views. Eilperin (2009), an environmental reporter for *The Washington Post*, explained the importance of such coverage: “Boykoff suggests that many mainstream reporters quote climate contrarians out of a misguided quest for journalistic balance... But this point misses the real reason that many journalists include comments from climate skeptics: They are trying to capture the political divide over global warming.”

The digital medium also became integral to the constitution and performance of the controversy. According to the Russell Report (2010: 42):

There continues to be a scientific debate about the reality, causes and uncertainties of climate change that is conducted through the conventional mechanisms of peer-reviewed publication of results, but this has been paralleled by a more vociferous, more polarized debate in the blogosphere and in popular books.

This latter “strand of debate” has been “more passionate, more rhetorical, highly political and one in which each side frequently doubts the motives and impugns the honesty of the other, a conflict that has

essence for the accreditation of scientific journals” (Mann, 2012: 115). Collins and Pinch (1979) have argued that such “implicit rejection” is powerful, precisely because it does not attract undue attention to dissenting ideas.

fuelled many of the views expressed in the released CRU emails, and one that has also been dramatically fuelled by them” (Russell Report, 2010: 42).

Not to be forgotten are social scientists. Grundmann (2012: 281) summarized the positions some of these scholars articulated regarding Climategate (e.g., Beck, 2010; Jasanoff, 2010b; Ravetz, 2011; van der Sluijs et al., 2010; Wynne, 2010), characterizing them as ranging from the “apologetic” to the “highly critical.” Lahsen (2012) noted that many of these social scientists had been reluctant to deploy their frameworks on climate science lest their analyses become fodder for the anti-environmental coalition (see also Pinch, 2000 for a summary of how social scientists can be misinterpreted as undermining the scientific enterprise). But, more recently, social scientists have explicated their critical stance so as to better inform the debate on global warming. For instance, they have offered distinctions between *matters of fact* and *matters of concern* (Latour, 2004), and between *contributory expertise* and *interactional expertise* (Collins and Evans, 2002). But even some of these distinctions are hotly debated within the social science community (e.g., see a response by Jasanoff, 2003 to Collins and Evans, 2002).

4.2. Vulnerability of Science

Research has shown how climate science is constituted and performed through a set of boundary objects that are simultaneously coherent and plastic (see Edwards, 2010 for details about the constitution of the climate science infrastructure). These boundary objects include data models, simulation tools, model parameterizations and intercomparison techniques (Lahsen, 2005a; Sundberg, 2007). Together with other artifacts such as satellites and telecommunication networks, and institutional arrangements such as the Group of Earth Observations (GEO) and the IPCC, these boundary objects were networked into an elaborate climate science boundary infrastructure. Along the way, climate science was transformed from a “fringe concern” (Schmidt, 2010) into a recognizable domain of inquiry (e.g., Fourier, 1824/1837; Hulburt, 1931; Plass, 1956; Tyndall, 1863).

However, despite its apparent stability, Climategate threatened the boundary infrastructure of climate science as doubts were raised about boundary objects, such as the hockey stick graph. By association, the entire infrastructure became implicated. The potential delegitimization of the climate

science infrastructure was all the more surprising, as it was accomplished through illegitimate acts.

Although hackers selectively released less than 0.3% of the data on the CRU server (Norfolk Constabulary, 2012; Russell, 2010: 26), the contents of the files quickly eclipsed any concerns regarding how they had been obtained. This in itself is revelatory.

How can science be so vulnerable despite its claims to self-evident authority? One explanation is related to the timing of the release. The Climategate files were released just before the Copenhagen Summit held in December 2009, and as a result, caught the attention of different stakeholders around the world. By virtue of their association with this event, the Climategate files had an immediate effect on the summit itself, as well as some enduring effects on subsequent processes and opinions.

But more than timing was involved. The released files also breached the conventional boundary between the representation and the practice of science (see Czarniawska, 2004 on the distinction between the logics of practice, representation and theory).¹² Whereas some stakeholders would like to see science as certain (Collins and Evans, 2002: 246-247), in this case, the consensus offered by climate scientists was purportedly undermined by the contents of the files, which selectively revealed processes of climate science in-the-making. Stakeholders “downstream” typically are not privy to seeing “upstream” processes (Gieryn, 1983), because of the boundary work that scientists undertake in an effort to delineate science from other kinds of activities, thereby gaining the authority to speak on behalf of nature (Shapin and Schaffer, 1985). The more successful this boundary work has been, the greater the potential loss of credibility and legitimacy when these boundaries are breached.

¹² We thank an anonymous reviewer for highlighting the presence of a “myth” about scientists aspiring to Mertonian norms (*communalism, universalism, disinterestedness, originality and skepticism*) while sometimes embracing practices that deviate from these norms, such as partially releasing or hiding data, or inaccurately reporting findings (e.g., see Niaz, 2005 for a review of the controversy surrounding Millikan’s oil drop experiments, including his published and withheld data). Similarly, Lahsen (2005a: 917) noted that climate science modelers sometimes downplayed or failed to recognize shortcomings in their models because their “careers and identities become intertwined with, and partly dependent on, the quality of their models.” Owing to their “professional and emotional investment,” scientists “are likely to give their models the benefit of doubt when confronted with some areas of uncertainty,” and when in public “at times downplay model inaccuracies because they are interested in securing their authority” (p. 917).

In this regard, several scholars have written about the vulnerability of science when scientific knowledge enters the public domain. For instance, when scientists participate in policymaking, the indeterminacies underlying science in-the-making are probed (Jasanoff, 1987: 197). At these moments, the basis for according cognitive authority to scientists by stakeholders rests on precarious ground.

The use of the digital medium also was important in shaping this episode, and this facet distinguishes Climategate from earlier scientific controversies. The hackers exploited the digital medium not only to gain access to private correspondence (as a digital trace had been left), but as a mechanism for rapidly disseminating selected files as well. As Maibach et al. (2012) recounted: “In the span of less than 24 [hours] an international scandal was born... based almost exclusively on a naming and framing of the event.”¹³

Through such framing efforts, the Climategate files established a certain context and subtext for interpreting climate science. Drawing on these narrative resources, disparate stakeholders made their own inferences about the practices being followed by some climate scientists, and through synecdoche, the whole enterprise. As Shapin (2010:19) noted: “Science, like finance, is a credit-economy: these are activities in which, if you subtract credibility, there is just no product left – neither a currency nor a body of scientific knowledge. Skepticism in science is like a run on the currency.”

As the upstream practice of science spilled over downstream, emphasis shifted to three major concerns suggested by the files: (a) that the data on which the inferences were drawn had not been made available freely to all, and that some data or files may even have been destroyed; (b) that the peer review process had been subverted; and (c) that scientific representations such as the hockey stick graph were misleading because of the way they had been spliced together and depicted (see National Science

¹³ Adut’s (2005) work on scandals is relevant here. The anticipation of scandal discourages institutional actors from sanctioning offenders of a norm, even if known by many, as long as its transgression does not involve immediate and identifiable victims, and its transgression is committed in, or remains, private. However, when there is a “disruptive publicity of transgression,” the negative externalities “may prod polluted or provoked third parties into showing extraordinary zeal vis-à-vis the offender, to signal rectitude or resolve” (p. 216).

Foundation, 2011; Oxburgh Report, 2010; Pennsylvania State University, 2010a; Russell Report, 2010).¹⁴ Scientific credibility partly rests on the use of “authorized” and “conversational objects” (Shapin, 2010: 26; or what Latour, 1987 called “immutable mobiles”), such as the hockey stick graph, which had come to represent global warming in an unquestionable way. When the basis for such a metonymy was called into question by the Climategate files, the entire climate science consensus became suspect.

These concerns about the inputs, processes and outputs of climate science were all the more damaging because they were based on the scientists’ own emails, purportedly suggesting that they may have violated their own espoused scientific norms. If true, these practices would have been problematic in their own right. But such practices would be all the more problematic given the demand for openness and transparency fostered by the use of technologies such as the Internet and the blogosphere. As the Russell Report noted, the growing popularity of the blogosphere as a platform for discussion and debate transformed “the degree of openness now required of scientists whose work directly affects policymaking. Without such openness, the credibility of their work will suffer because it will always be at risk of allegations of concealment and hence malpractice” (Russell Report, 2010: 42).

The use of digital technologies, while increasing the possibility of exposure, also fosters informality. For one thing, private language is liable to contain colloquialisms and informal talk (e.g., “Mann’s *Nature* trick”). In this regard, the Russell report (2010: 34) noted that terms such as “prat,” “dishonest,” “appalling,” “rubbish,” and “crap,” which were used by some CRU members to refer to critics (i.e., *ad hominem* attacks) and their work, could be embarrassing if made public. However, the possibility of informal talk is greater when using digital media such as emails to communicate with one another. The Russell Report (2010: 32) pointed to research showing that “email communication is less inhibited than other written and spoken forms” (see also Sproull and Kiesler, 1986). The report went on to conclude: “Since the communication was assumed to be private, it was generally informal, using slang,

¹⁴ There is much written about these allegations in books (Powell, 2011), blogs (e.g., *Watts Up With That*), and journal articles (e.g., Grundmann, 2012), representing varying points of view about the released files.

jargon and acronyms. Now that the emails have become public, some are doubtless regretted by their authors” (Russell Report, 2010: 32).

In sum, the incident underscores how credibility and legitimacy were compromised despite the “preponderance of evidence” (Washington and Cook, 2011: 8) on which the climate science consensus rested. Following the breach, some stakeholders – aided by deniers, the media, and blogs – questioned the legitimacy of the practices constituting climate science (see Powell, 2011: 1-5). For instance, had the climate scientists been open? And, was the scientific community as self-correcting as it claimed (Mann, 2012: 147)?¹⁵ In turn, these questions took a toll on the credibility of the scientists and the legitimacy of the scientific consensus that was being communicated to the public. As Mann (2012: 232) reflected, “We’d seen the public polling data that suggested our credibility as a community had taken a hit” (see also Powell, 2011).

4.3. Investigations

Another way to understand and learn from a controversy is by examining the investigations that unfold. The number and timing of the investigations, the composition of the committees, the allegations investigated, the evaluative criteria invoked, what is said and what is left unsaid, and most importantly, the overall findings, are all revelatory. Additionally, investigations and their ensuing recommendations have potentially “performative” effects (Callon, 2010; MacKenzie, Muniesa, and Siu, 2007). For instance, the very fact that an investigation occurs shapes future behavior irrespective of what is found. For all these reasons, investigations are important, if under-theorized, research settings.

The investigations that unfolded in the aftermath of the Climategate incident examined concerns over misconduct covering issues such as suppression and falsification of data, destruction of emails, misuse of privileged information and deviation from scientific norms. The number of investigations that were carried out is noteworthy in and of itself (see Table 1 for an overview of some of the issues).¹⁶ This

¹⁵ However, such public concern was heterogeneously distributed (Maibach et al., 2012; Gauchat, 2012)

¹⁶ Again, we connect with Adut’s (2005) insight that, once a scandal erupts, the externalities that are generated may prod affected parties to show “extraordinary zeal vis-à-vis the [alleged] offender” (p. 216).

reflects not only the global ramifications of the controversy, but also its local embeddedness. Each institution and community that was implicated or impacted carried out an investigation, and understandably so.¹⁷ And while each investigation was ostensibly independent, there were clear links between them as evidenced by the inter-textuality of the reports, underscoring the connectedness of the issues involved and how credibility and legitimacy can be lost or gained through a network of associations (Callon, 1986; Latour, 2005).

-- Table 1 here --

Numerous eminent scientists from different disciplines were appointed to the different investigating committees. Most focused not on the scientific conclusions per se, but on the practices that lay at the center of the controversy as revealed by the released files. All of the investigations that we reviewed exonerated the climate scientists of any meaningful wrongdoing. For instance, for each of the first three allegations against Mann, the investigation panel convened by the Pennsylvania State University (2010a: 5) concluded: “As there is no substance to this allegation, there is no basis for further examination of this allegation in the context of an investigation in the second phase of RA-10 [Penn State’s research conduct policy].” As to the fourth allegation of whether Mann seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities, a subsequent panel concluded that “there is no substance to the allegation” (Pennsylvania State University, 2010b: 19).¹⁸

¹⁷ This is consistent with research on *values work* (Gehman, Treviño and Garud, 2013). When values practices are breached, often there are investigations, which can become self-referential, thereby further provoking concern from stakeholders with alternative values practices.

¹⁸ Mann made a distinction between “actual data” and “intermediate data,” noting: “It is not standard practice to publish or make generally available this intermediate data” (Pennsylvania State University, 2010b: 7) He also noted that “in his field of study in contrast with other fields such as economics, publishing the source code was never standard practice until his work and that of his colleagues came under public scrutiny, resulting in public pressure to do so” (Pennsylvania State University, 2010b: 8). This suggests that different scientific communities have different norms of science, and that even agreement on ostensive rules cannot prevent performative differences (Czarniawska, 1991; Latour, 1986). Moreover, Mann noted that he was initially “reluctant to publish his source codes because the National Science Foundation had determined that source codes were the intellectual property of the investigator.” He had built his source codes “using a programming language (FORTRAN 77) that was not likely to produce identical results when run on a computer system different from the one on which it was developed (e.g., different processor makes/models, different operating systems, different compilers, different compiler optimizations).” Of

Other reports reached similar conclusions. In its review, the Oxburgh Report (2010: 5) concluded that there was “no evidence of any deliberate scientific malpractice in any of the work of the Climatic Research Unit.” The CRU’s work on tree rings had been “carried out with integrity” (p. 3) using “fair and satisfactory” methods (p. 4). Moreover, the CRU was found to be “objective and dispassionate in their view of the data and their results, and there was no hint of tailoring results to a particular agenda” (p. 4). In a similar vein, the Russell Report dismissed allegations that climate scientists at the CRU had manipulated data, concluding that the rigor and honesty of the CRU scientists are “not in doubt” (Russell Report, 2010: 11). For its part, the National Science Foundation (2011) panel focused on the statistical procedures that Mann had used, and concluded that such scientific debate “is ongoing but does not, in itself, constitute evidence of research misconduct” (p. 3). These are just a few examples of the many ways in which the investigations exonerated the scientists who were implicated by the released emails (see also Powell, 2011, especially Chapter 14).

The investigating committees also examined whether the climate scientists had violated the norms of their specific communities. For instance, PSU investigators asked: “Did you engage in, or participate in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?” The Muir Russell panel examined, among other allegations, the “honesty, rigor and openness with which the CRU scientists [had] acted.” Several other forms of norm violations were scrutinized by various investigative committees (See Table 1 for more details). We call this process *boundary repair work*. By this, we mean efforts from inside the practice of science to reestablish the credibility of scientists and the legitimacy of their practices, thus, reasserting the authority of scientists to speak on behalf of nature (see also Sims and Henke, 2012 on repairing credibility through mechanisms other than investigations).

relevance here are observations offered by Baumann (1992: 71) on scientific authority: “Being the sole owners of the experience which provides the raw material for their study, the scientists are in full control of the way the material is constructed, processed, analyzed, interpreted, narrated.” Mann added that starting around 2000, he adopted a “more accessible programming style (MATLAB),” and since then he has made “all source codes available to the research community” (Pennsylvania State University, 2010b: 8).

At the same time, some of the reports did evoke other concerns, suggesting that adherence to scientific norms alone may not be sufficient to repair breached boundaries. For instance, the Government Response to the House of Commons Report recognized that stakeholders may distinguish between the credibility of the science and the legitimacy of the practices, noting:

Reputation does not, however rest solely on the quality of work as it should. It also depends on perception. It is self-evident that the disclosure of the CRU emails has damaged the reputation of UK climate science and, as views on global warming have become polarized, any deviation from the highest scientific standards will be pounced on. (Government Response to House of Commons, 2010: 6)¹⁹

Similarly, the Russell Report found that the CRU was “unhelpful in dealing with requests for information to enable detailed replication of the CRUTEM analysis” (Russell Report, 2010: 53). On this point, the panel that drafted the Russell Report concluded that the CRU had “helped create the conditions for this campaign by being unhelpful in its earlier responses to individual requests for station identifiers and the locations from which specific, detailed station raw data could be downloaded” (Russell Report, 2010: 95). Emphasizing the possibility of a backlash emerging from the very actions of the climate scientists at the CRU, the report noted:

[W]e do find that there has been a consistent pattern of failing to display the proper degree of openness, both on the part of the CRU scientists and on the part of the UEA, who failed to recognize not only the significance of statutory requirements but also the risk to the reputation of the University [of East Anglia] and, indeed, to the credibility of UK climate science. (Russell Report, 2010:11-12)

Implied here is that the climate science boundary infrastructure was not easily accessible to deniers and some skeptics. Some of these actors struck back, thereby destabilizing the boundary infrastructure that had emerged. The report concluded: “A fundamental lack of engagement by the CRU team with their obligations under FOIA/EIR [Freedom of Information Act/Environmental Information Regulations], both prior to 2005 and subsequently, led to an overly defensive approach that set the stage for the subsequent mass of FOIA/EIR requests in July and August 2009” (Russell Report, 2010: 95).

¹⁹ The use of the expression “as it should” suggests that those on the committee would have liked to claim unquestioned authority for science (with the proviso that it followed its own norms), but recognized that there was an audience perception to be dealt with to establish credibility and legitimacy.

It also noted that “the requirements of the legislation for release of information are clear and early action would likely have prevented much subsequent grief” (Russell Report, 2010: 95). It is noteworthy that these words of caution from the Russell Report were couched from a legal dimension of worth and not from a scientific one (see Boltanski and Thévenot, 2006 on justification from different logics).

Most investigations stopped short of recommending any new practices. Suggestions, to the extent there were any, were offered by the investigative committees that had been critical in places. For instance, speaking to the norm of communalism articulated by Merton (1942), the Russell Report (2010: 93-94) noted: “Public trust in science depends on an inherent culture of honesty, rigor and transparency. The requirements of FOIA and EIR must not be seen as impositions. They are a necessary part of the implicit contract between the scientist and broader society. Such an open culture will also lead to the best science.”

The Government Response to the House of Commons Science and Technology Committee (2010: 5) noted that even though “It is not standard practice in climate science and many other fields to publish the raw data and the computer code in academic papers,” this is “problematic because climate science is a matter of global importance and of public interest, and therefore the quality and transparency of the science should be irreproachable.” Later, they added: “We have suggested that the [climate science] community consider becoming more transparent by publishing raw data and detailed methodologies” (Government Response to House of Commons, 2010: 11).

In assessing these evaluations, some social scientists were not as quick to overlook what is implied in the released emails. Grundmann (2012: 282)²⁰ for instance, hinting at boundary repair work potentially gone awry, noted:

In my view it was misleading and counterproductive to engage in such rhetoric to defend

²⁰ See also Ravetz (2011: 151) who noted: “And the ‘hockey stick’ picture of the past, so crucial for the strict version of the climate change story, has run into increasingly severe problems. As an example, it relied totally on a small set of deeply uncertain tree-ring data for the Medieval period, to refute the historical evidence of a warming then; but it needed to discard that sort of data for recent decades, as they showed a sudden cooling from the 1960s onwards! In the publication, the recent data from other sources were skillfully blended in so that the change was not obvious; that was the notorious ‘*Nature* trick’ of the CRU emails.”

the hockey stick and it does not make it better when commentators later defended it by saying the quote was out of context and a “misunderstanding” of the word “trick.” The trick of omitting inconvenient data from the time series in the hockey stick is highly problematic... The emails show attempts at influencing the peer review process in order to prevent uncomfortable papers from publication... When critical outsiders made requests for CRU temperature data under the Freedom of Information Act these were foiled using dubious pretenses. At least in one case, the refusal has violated FOI legislation, as Pearce (2010: 147) documents. Furthermore, some of the climate scientists may have had a possible conflict of interest when selecting research for inclusion in the IPCC assessment reports. They may even be guilty of covering up their mistakes by deleting emails. Various inquiries have come to the conclusion that their rejection of FOI requests shows signs of a bunker mentality, the opposite of the free critical spirit that is expected from scientific research.

Even as these investigations were unfolding, the IPCC and its chairman, Rajendra Pachauri, were questioned for allegedly misrepresenting some scientific studies, and for including other studies that were not peer-reviewed (Rosenthal, 2010). After initially demurring in the face of these criticisms, in March 2010, United Nations (UN) Secretary General Ban Ki-moon and IPCC Chairman Pachauri announced that they had invited an independent review of the IPCC’s processes and procedures (IPCC, 2010). In an interview after the announcement, Pachauri explained that he and the hundreds of scientists who had contributed to the IPCC reports were taken aback by the volume and intensity of criticism: “We’ve learned, we’ve listened and we’ve decided to do something about it” (Broder, 2010).

However, despite so many exonerations and despite the actions promised by IPCC and other institutions in the wake of this incident, a significant number of stakeholders and policymakers continued doubting the consensus being promoted by the climate scientists. For instance, a Gallup poll in 2011 found that 47% of the public still did not believe in climate science (Gallup, 2011). Other research by Leiserowitz et al. (2013: 2) found that “Climategate had a significant effect on public beliefs in global warming and trust in scientists.” In a similar vein, Maibach et al. (2012) found that “the CRU email controversy appears to have contributed to the widening divide in America between those who are convinced that climate change is real, human-caused and serious and those who remain unconvinced.”

4.4. Boundary Bridging

After being exonerated by the investigations, Mann (2012: 248) observed: “The forces of climate change denial have, I believe, awakened a ‘sleeping bear.’ My fellow scientists will be fighting back, and I look

forward to joining them in this battle.” But, as Wynne (2010: 290) noted: “The central issue for the new scientists championing the environmental risks from business-as-usual modern development would not be the technical ones of ‘getting the science right’ ...but the quintessentially unfamiliar social ones, of credibility.” Mann (2012: 254) himself appeared to have grasped this difference:

Scientists understand the processes that lead to scientific consensus because these processes are intrinsic to the culture of science... The processes that lead to a public consensus, however, are different, and by contrast are generally foreign to most scientists. Scientific truth alone is not enough to carry the day in the court of public opinion.

But if “scientific truth” alone is not enough, what is required? Here we offer the notion of *boundary bridging work* to highlight efforts required by scientists to connect with downstream stakeholders, especially when the science/non-science boundary has been breached. We distinguish boundary bridging work from: (a) boundary work by scientists that establishes their credibility and legitimacy by drawing distinctions from downstream stakeholders, and (b) boundary repair work by scientists in attempts to regain lost credibility and legitimacy within the scientific community through internal investigations so as to reestablish their authoritative position to speak on behalf of nature. Indeed, the Russell Report (2010: 42) “urge[d] all scientists to learn to communicate their work in ways that the public can access and understand; and to be open in providing the information that will enable the debate, wherever it occurs, to be conducted objectively.”²¹

Some changes already have been made in the case of climate science. In their report on the positive impact of Climategate, Maibach et al. (2012) listed a number of initiatives aimed at improving communication between scientists and the public. For instance, the *Climate Science Rapid Response Team* (CSSRT) was created to provide policymakers and the media with access to experts on climate

²¹ Gieryn and Figert (1990: 75) have shown how this is possible in their example of the O-ring with the Challenger space shuttle. Confronting Congress, and the need to communicate a probable cause of the Challenger accident to the public, renowned physicist Richard Feynman resorted to a dramaturgical presentation. He carried out an “experiment in real time,” although he had already conducted the experiment beforehand and knew the outcome. The real time experiment was carried out to suspend the audience’s disbelief and to generate certainty about the probable cause of the accident (see Lampel, 2001; MacKenzie, 1989; Sims and Henke, 2012 for more details on dramaturgical presentations). Feynman later noted: “Although I knew it would be more dramatic and honest to do the experiment for the first time in the public meeting, I did something that I’m a little bit ashamed of. I cheated. I couldn’t resist. I tried it.... I discovered it worked before I did it in the open meeting” (Feynman, 1988: 148-149).

science; the American Geophysical Union hosted the *Leadership Summit on Climate Science Communication* in 2011; and *ClimateCommunication.org* was established to provide climate scientists with resources on effective communication.

However, Lahsen (2012) argued that more than communication (in the vernacular sense of the word) is required. Resorting to communication that simply affirms the consensus opinion based on results of scientific modeling (an approach that may have served as the basis for boundary demarcation before the scandal erupted) may no longer be adequate, in part because the boundary between scientists and non-scientists has been breached, and with it the authority of scientists to speak on behalf of nature has been called into question (see also Lahsen, 2005b). Moreover, stakeholders have now been exposed to the uncertainties of science, but do not necessarily have the means to understand and appreciate the struggles that scientists confront to arrive at a consensus. As Eilperin (2009) noted: “The average American doesn’t study principal component analysis and doesn’t need to. But when that’s what scientific experts—and lawmakers who have been briefed by their staffers—are talking about, it leaves most of the public in the dark.”

That there are uncertainties and vigorous debates even among climate scientists is not surprising, as they are engaged in a science where “models cannot be verified in the sense of having their truth status confirmed with certainty” (Lahsen, 2005a: 901). Exact reproduction of a given climate model outcome is impossible due to the internal model variability that results from chaotic dynamic perturbations (Edwards, 2010; Lahsen, 2005a). Funtowicz and Ravetz (1993: 744) call this *post-normal science*, where “facts are uncertain, values in dispute, stakes high, and decisions urgent” (see also Ravetz, 2004, 2011).

But some fear that if action is postponed until the causes for climate change are fully determined, the damage may be irreversible. For this reason, some have advocated for the “precautionary principle” (see United Nations, 1992 for one definition), as a way of leaving the world a better place for future generations.²² For such action to succeed, everyone—scientists and stakeholders—must be involved, as

²² The precautionary principle itself has been challenged by critics (see Washington and Cook, 2011).

humans are integral elements of the calculus, affecting both inputs and outcomes (what Collins and Evans, 2002 call “reflexive historic sciences”). Accordingly, any journey to a more sustainable future must consider not only the conditions of a variety of social groups in the future, but also the historically contingent situated experiences of different social groups whose behaviors and choices must change in real-time if any meaningful transition is to occur (Garud and Gehman, 2012).

What might be an effective bridging strategy under these circumstances? Bruner (1986) offered a narrative approach. A narrative approach recognizes that “facts” must be categorically embedded within the cultural symbols in currency (Douglas, 1996; Swidler, 1986) and rendered relevant by contextualizing them into stakeholders’ lived experiences (Bruner, 1986). Consequently, the implications of scientific work, especially about a future that has not yet unfolded, have to be presented as narratives that generate meaning for stakeholders (Brown, Rappert, and Webster, 2000), not as an esoteric set of facts and procedures that are comprehensible only to those who are steeped in science.

In addition, temporal construal mechanisms (Trope and Liberman, 2003) affect how actors respond to future events. Information about distant-future events is generally construed in more abstract and decontextualized terms than information about near-future events. Consequently, a strategy of offering more and more data about the future is likely to backfire. By comparison, narratives convince by ringing true (or what Bruner, 1986 calls “verisimilitude”). In this way, a narrative approach shifts the conversation from issues of uncertainty to plausibility, without succumbing to the problem of “overselling certainty” (van der Sluijs et al., 2010).

In this regard, Judith Curry pointed to the emergence of a new literary genre, dubbed “climate fiction” or cli-fi for short, as “an untapped way” of communicating various aspects of the climate change issues (Evancie, 2013).²³ In one recent example, *Odds against Tomorrow*, the protagonist is a “futurist” who earns his living by selling doomsday weather scenarios to corporations (Rich, 2013). One of these

²³ As of June 2013, Judith Curry was professor and chair of the School of Earth and Atmospheric Sciences at the Georgia Institute of Technology.

scenarios comes to life when New York City is flooded by a catastrophic hurricane.²⁴ This is one way in which cli-fi novels are able to overcome temporal construal problems, by vividly depicting an imminent dystopian future. Glass (2013) noted: “Finely constructed, intricate narratives help us broaden our understanding and explore imagined futures, encouraging us to think about the kind of world we want to live in.” In doing so, the future’s distance is collapsed (Murdoch, 1998; Serres and Latour, 1995).

At the same time, surprisingly, there is no mention of “climate change” in *Odds against Tomorrow*. According to the author, Nathaniel Rich, this was intentional:

I think the language around climate change is horribly bankrupt and, for the most part, are examples of bad writing, really. And cliché—“climate change,” as a phrase, is cliché. “Global warming” is a cliché... I think we need a new type of novel to address a new type of reality, which is that we’re headed toward something terrifying and large and transformative. And it’s the novelist’s job to try to understand, what is that doing to us? (Evancie, 2013)

While some scientists may balk at considering a narrative approach, Cozzens and Gieryn (1990) remind us that scientists already engage in rhetoric. They noted: “Those who see rhetoric as ‘mere’ rhetoric will be surprised to find, in more than a few places in this collection, that science and rhetoric do not occupy opposite poles on the continuum of truth” (Cozzens and Gieryn, 1990: 5). Indeed, scientists have used rhetoric to emphasize “selected characteristics to the institution of science (i.e., to its practitioners, methods, stock of knowledge, values and work organization) for purposes of constructing a social boundary that distinguishes some intellectual activities as ‘non-science’” (Gieryn, 1983: 782).

Underlying the demarcation of such boundaries is a semiotic mechanism (see Akrich and Latour, 1992; Greimas, 1987; Taylor and van Every, 1999) that drives a narrative approach. Indeed, the very authoritative position that scientists command emerges from boundary work that they engage in based on rhetoric to establish contrasts between science and non-science. Within the scientific community itself, peer-reviewed papers establish the contexts and the subtexts for scientific claims to be made. Through inter-textuality (i.e., cross-referencing), these peer-reviewed articles allow scientists to generate a

²⁴ *Odds against Tomorrow* was already written when Hurricane Sandy hit New York City in October 2012 (see NHC, 2013).

consensus opinion despite the lack of conclusive data about a future that has yet to unfold, and one that they would like to prevent from unfolding. The relationality and inter-temporality involved in the generation of such a consensus are narrative mechanisms.

In sum, a narrative approach allows for the demarcation of science from non-science, and, at the same time, allows scientists to bridge with diverse stakeholders and other social groups who are implicated. Moreover, it allows scientists to project a future scenario that they would like to prevent from happening without the availability of conclusive data. But, to embrace such a narrative approach, climate scientists will have to go beyond their own espoused scientific norms.

However, to the extent that a narrative approach is used primarily as a mechanism to convey meaning from the upstream of science to the downstream of its use, it will still frame the situation as “us” vs. “them,” potentially leading to dysfunctional conflict.²⁵ If one were to consider a “post-Mertonian” (Cozzens and Gieryn, 1990: 2) route, the solutions may need to be far more radical than the use of mere rhetorical skills to demarcate science from other audiences and then bridge the divides. After all, different stakeholders may have situated expertise that scientists lack and, as a consequence, will have “radically ‘other’ ways of understanding the world” that can shape the debate on transitions to a sustainable future (Jasanoff, 2003: 392; see also Wynne, 1989). As Wynne (2006: 219) noted:

The institutional changes yet to be explored would reflect a more avowedly open and indeterminate future, thus more recognition of contingency within scientific knowledge, and less claims on power and control by science. This would naturally entail changes in forms of governance involving science.

The Russell Report (2010: 15) also hinted at the need for alternative governance when it noted: “A key issue is how scientists should be supported to explain their position, and how a *public space* can be created where these debates can be conducted on appropriate terms, where what is and is not uncertain can be recognized” (emphasis ours). The idea of a “public space” for fostering discussion and debate

²⁵ For instance, almost exactly 2 years after the initial Climategate incident, a second set of more than 5,000 emails, working papers and documents was released in November 2011, roughly a week before the United Nations Durban Climate Change Conference. The contention has also spilled over to the legal domain as contending parties have threatened, and in some cases filed, lawsuits.

among interested social groups resonates with the notion of hybrid forums proposed by Callon and colleagues (e.g., Callon, Lascoumes, and Barthe, 2009; Callon and Rabearisoa, 2003) as a solution to the problem of technical democracy. Forums, “because they are open spaces where groups can come together to discuss technical options involving the collective,” and hybrid, “because the groups involved and the spokespersons claiming to represent them are heterogeneous, including experts, politicians, technicians and laypersons who consider themselves involved. They are also hybrid because the questions and problems taken up are addressed at different levels in a variety of domains, from ethics to economic” (Callon et al., 2009: 18).

The circulation of narratives on climate concerns at these forums creates a narrative repository (Deuten and Rip, 2000; Garud, 2008) that can serve as “recipes for structuring experience itself, for laying down routes into memory, for not only guiding the life narrative up to the present but directing it into the future” (Bruner 2004: 708). Fiction, cli-fi or otherwise, is not derivative of these narrative forms and modes of existence; narrative “comes first from imagination rather than experience” (Bruner 1995: 176). Indeed, a new novel may be precisely what the world needs. Or as Gregory Norminton (2013: viii) wrote in an anthology on the subject, *Beacons: Stories for Our Not-So-Distant Future*: “Global warming is a predicament, not a story.”

An example of such a forum in-the-making is the United States National Climate Assessment’s (NCA) NCAnet. Constructed as a “network of networks,” NCAnet is an attempt in “establishing and facilitating ongoing dialogue between the NCA, producers of information used in assessments, and users of assessments” across the United States, thereby extending “the NCA process and products to a broader audience” (NCA, 2012: 1). As the charter reads: “the NCA is also seeking to build long-term capacity to conduct and use assessments by cultivating partnerships with organizations that will participate in the sustained assessment process” (p.1).

Scientists who claim undisputed authority to speak on behalf of nature may view the creation of such hybrid spaces with alarm, as this offers concerned stakeholders the opportunity to co-author the

emerging narrative on the climate agenda alongside the scientists.²⁶ However, if science is indeed robust, it will have its own voice, even in forums where critique is prevalent. The key is in understanding the meaning of critique, given such assemblies. As Latour (2004: 246) clarified: “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 naïve believers, but the one who offers the participants arenas in which to gather.” In other words, such hybrid assemblages allow the proliferation and enrollment of concerns.

A more vexing problem is that hybrid forums, to the extent that they are adopted, may appear to provide deniers with a platform from which to spread their propaganda. From a post-Mertonian perspective, however, “denying the deniers” would threaten the legitimacy of the forum and the credibility of its conclusions. To be legitimate, a forum needs to accommodate diverse stakeholders – even those who inhabit “borderlands” (Bowker and Star, 1999). For instance, forums such as the United Nations provide a right of participation, but participation does not automatically generate credibility and legitimacy for the positions advocated by those participants. Having a voice is not the same as having one’s way. At the same time, the credibility and legitimacy of scientists, deniers, critics and other stakeholders is not a given in advance, but an outcome of the processes that unfold (Kirkland, 2012).²⁷

5. Implications and Conclusion

Lahsen (2012) invited two sets of authors (Grundman, 2012; Maibach et al., 2012) to reflect on Climategate to explore what we can learn. Summarizing their articles, Lahsen (2012) concluded:

Whether or not one agrees with the perspectives put forth, the two articles are, in effect, examples of the scientific community scrutinizing itself, a scrutiny that can serve to improve the community and the knowledge it produces. Ultimately, both articles suggested that Climategate had negative dimensions but that it served to identify

²⁶ This is the problem of extension (or dilution) of authority that Collins and Evans (2002) wrote about in their quest to involve the public even while maintaining the legitimacy of the scientific enterprise. Their solution is to identify what they labeled as “non-certified” experts to address the problem of extension while preserving legitimacy. Jasanoff (2003:392) critiqued this position noting, “Most important, not one of these authors [Shapin and Schaffer, Ezrahi, or Latour] essentializes the nature of expertise, showing it instead to be always contingent, historically situated, and grounded in practice.”

²⁷ Kirkland (2012) showed how a vaccine court had to decide who was credible and what was legitimate. These issues were not determined *a priori*. Instead, the court served as the very basis for the determining credibility and legitimacy. Until the court’s performance, there were no deniers.

problematic behavior within scientific practice, behavior that needs attention and repair.

In a similar vein, our exploration of some of the issues associated with Climategate adds to our understanding of the antecedents, processes and consequences of controversies in general, and climate science in particular. We found many different kinds of actors whose identities were driven by differences they saw as salient when they compared themselves with others. These social groups included climate scientists, deniers, policymakers, the media, and other public stakeholders, to name a few. However, any classification, whether driven from the outside or from the inside, will be contested. This is because classifications have moral and practical implications (Bowker and Star, 1999), determining who has a right to speak and on what kinds of topics (Gieryn, 1983). Even the determination of who is an expert and who is not is itself an issue for sociological inquiry rather than a fact that is given *a priori* (Jasanoff, 2003; Kirkland, 2012).

The Climategate incident shows that the facets of science that give scientists the authority to speak on behalf of nature are also the very source of its vulnerabilities. Scientists engage in boundary work to distinguish themselves from non-scientists. As long as the boundaries are accepted and hold, such demarcation is the source of credibility for scientists and the source of legitimacy for the science that they produce. However, some stakeholders may feel disenfranchised and so breach the boundary in more or less (il)legitimate ways. As the upstream practice of science spills over into the public sphere, other stakeholders are confronted with the problem of making sense of the science. However, they do not have the context or the subtext of how science works because they were not part of the boundary infrastructure and because of the boundary work that went into distinguishing science from non-science. When this happens, even those stakeholders who had accepted the boundary as given may start questioning the credibility of the scientists to speak on behalf of nature and the legitimacy of the science being produced, especially if they are allowed to see selected portions of science in-the-making.

The Climategate incident also illustrates how a scientific community, when threatened, attempts to reestablish credibility and legitimacy through investigations. For the most part, these investigations unfold by evaluating the scientists and their practices against the norms espoused by the scientific

community. To the extent that the scientists are exonerated, as was the case with Climategate, the investigations may reestablish credibility and legitimacy within that specific scientific community. However, the outcomes of such investigations may be insufficient to restore credibility and legitimacy in the eyes of other downstream stakeholders. In addition, stakeholders who embrace alternative logics may now evaluate the scientific enterprise using different dimensions of worth (Boltanski and Thévenot, 2006), especially if the boundaries between science and non-science have been breached to reveal practices that do not conform to a myth of science that they promoted.

We have proposed a narrative approach for boundary bridging to address this tension. A narrative approach suggests that it is possible for scientists to continue generating credibility and legitimacy, not only within their own communities, but also with members of other communities. However, adopting such an approach will require that scientists be willing to vary their ontologies (Callon, 1998: 253). This is a paradox that scientists will have to grapple with.

Some science and technology studies scholars have gone even further to offer alternative governance approaches (e.g., Callon, 1999; Jasanoff, 2010a, 2010b; Latour, 2004; Wynne, 2010). While there are differences in their positions, they all suggest the need to re-conceptualize the issue in such a way that different stakeholders and their dimensions of worth (Boltanski and Thévenot, 2006; Stark, 2009) are accorded symmetric treatment in hybrid forums (Callon and Rabeharisoa, 2003). For some scientists, the creation of hybrid forums can appear more threatening than the controversies that can emerge because of the demarcations and boundaries that they make to retain the authority to speak on behalf of nature. This is the deeper paradox that the Climategate incident illuminates.

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TABLE 1: OVERVIEW OF ‘CLIMATEGATE’ INVESTIGATIONS

Investigation	Conclusions
<p>RA-10 Inquiry Report Commissioned by Pennsylvania State University. <i>Released in February 2010; see Pennsylvania State University, 2010a.</i></p> <p>Considered four synthesized allegations. “Did you engage in, or participate in, directly or indirectly... [1] ... any actions with the intent to suppress or falsify data? [2] ... any actions with the intent to delete, conceal or otherwise destroy emails, information and/or data, related to the 2007 IPCC report, as suggested by Phil Jones? [3] ... any misuse of privileged or confidential information available to you in your capacity as an academic scholar? [4] ... any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities?”</p>	<p>Decision for Allegations 1-3: “After careful consideration of all the evidence and relevant materials, the inquiry committee finding is that there exists no credible evidence that Dr. Mann had or has ever engaged in, or participated in, directly or indirectly, any actions...” related to allegations (1), (2) and (3).</p> <p>Decision for Allegation 4: “Given that information emerged in the form of the emails purloined from CRU in November 2009, which have raised questions in the public’s mind about Dr. Mann’s conduct of his research activity, given that this may be undermining confidence in his findings as a scientist, and given that it may be undermining public trust in science in general and climate science specifically, the inquiry committee believes an investigatory committee of faculty peers from diverse fields should be constituted under RA-10 to further consider this allegation.”</p>
<p>The disclosure of climate data by the Climatic Research Unit ordered by the House of Commons Science and Technology Committee. <i>Released in March 2010; see House of Commons, 2010.</i></p> <p>Committee set out to examine: “a) what had taken place; b) the steps that had been taken to investigate the allegations and to test the integrity of the data held and used by CRU; c) how CRU justified its commitment to academic transparency; and d) how the Vice-Chancellor proposed to restore confidence in CRU and its handling of data.”</p> <p>“It was not our purpose to examine, nor did we seek evidence on, the science produced by CRU. It will be for the Scientific Appraisal Panel to look in detail into all the evidence to determine whether or not the consensus view remains valid.”</p>	<p>Conclusion 1: “... relating to Professor Jones’s refusal to share raw data and computer codes, we consider that his actions were in line with common practice in the climate science community. We have suggested that the community consider becoming more transparent by publishing raw data and detailed methodologies. On accusations relating to Freedom of Information, we consider that much of the responsibility should lie with UEA, not CRU.”</p> <p>Conclusion 2: “In addition, insofar as we have been able to consider accusations of dishonesty—for example, Professor Jones’s alleged attempt to ‘hide the decline’—we consider that there is no case to answer. Within our limited inquiry and the evidence we took, the scientific reputation of Professor Jones and CRU remains intact. We have found no reason in this unfortunate episode to challenge the scientific consensus...”</p> <p>Conclusion 3: “A great responsibility rests on the shoulders of climate science: to provide the planet’s decision makers with the knowledge they need to secure our future. The challenge that this poses is extensive and some of these decisions risk our standard of living. When the prices to pay are so large, the knowledge on which these kinds of decisions are taken had better be right. The science must be irreproachable.”</p>
<p>Report of the International Panel set up by the University of East Anglia to examine the research of the CRU. <i>Released in April 2010; see Oxburgh Report, 2010.</i></p> <p>The panel examined whether “climatic data (produced and/or used by the CRU) had been dishonestly selected, manipulated and/or presented to arrive at pre-determined conclusions that were not compatible with a fair interpretation of the original data.”</p>	<p>Panel concluded that there was “no evidence of any deliberate scientific malpractice in any of the work of the Climatic Research Unit.” In addition, the panel also noted that CRU’s work had been “carried out with integrity,” using “fair and satisfactory” methods. Moreover, CRU was found to be “objective and dispassionate in their view of the data and their results, and there was no hint of tailoring results to a particular agenda.”</p>

Panel also suggested that their job is not about verifying whether “the published research were correct.” Rather, “the panel was asked to come to a view on the integrity of the Unit’s research and whether as far as could be determined the conclusions represented an honest and scientifically justified interpretation of the data.”	However, the panel also noted that they found it “very surprising that research in an area that depends so heavily on statistical methods has not been carried out in close collaboration with professional statisticians.”
<p>RA-10 Final Investigation Report Involving Dr. Michael E. Mann Pennsylvania State University. <i>Released in July 2010; see Pennsylvania State University, 2010b.</i></p> <p>“The Investigatory Committee’s charge is to determine whether or not Dr. Michael Mann engaged in, or participated in, directly or indirectly, any actions that seriously deviated from accepted practices within the academic community for proposing, conducting, or reporting research or other scholarly activities.”</p>	<p>“The Investigatory Committee, after careful review of all available evidence, determined that there is no substance to the allegation against Dr. Michael E. Mann...”</p> <p>In addition, the committee also concluded that “the manner in which Dr. Mann used and shared source codes has been well within the range of accepted practices in his field.”</p>
<p>Muir Russell Report University of East Anglia: Muir Russell Panel (U.K.) <i>Released in July 2010; see Russell Report, 2010.</i></p> <p>Allegations related to: behavior of the CRU scientists, such as their handling and release of data, their approach to peer review, and their role in the public presentation of results; assertion that “actions were taken to promote a particular view of climate change by, improperly influencing the process of advising policy makers;” honesty, rigor and openness with which the CRU scientists have acted.</p>	Panel exonerated the scientists dismissing allegations that they manipulated their data noting “rigor and honesty” of scientists at CRU were found not to be in doubt; expressed concerns “not with science, whether data has been validated or whether the hypotheses have survived testing, but with behavior;” noted that CRU “helped create the conditions for this campaign by being unhelpful in its earlier responses to individual requests for station identifiers and the locations from which specific, detailed station raw data could be downloaded;” and commented that “a fundamental lack of engagement by the CRU team with their obligations under FOIA/EIR, both prior to 2005 and subsequently, led to an overly defensive approach that set the stage for the subsequent mass of FOIA/EIR requests in July and August 2009.”
<p>U.S. Environmental Protection Agency (EPA) Report. <i>Released in August 2010; see United States Environmental Protection Agency (EPA), 2011.</i></p> <p>In 2009, EPA issued an endangerment finding to facilitate regulations on greenhouse gases. Petitions were raised by several parties to reconsider those findings in lieu of the CRU emails. Charges included climate science data issues, processes used to develop scientific support for the endangerment findings, ignoring public concerns about the implications of the emails involving scientists at CRU, and more.</p>	EPA examined every email and concluded that the released emails were “simply a candid discussion of scientists working through issues that arise in compiling and presenting large complex data sets” (EPA News Release, 2010). Their reports were released in three volumes: Volume 1: “The petitioners’ arguments rely on innuendo and speculation with little scientific support or argumentation.” Volume 2: “The petitioners’ interpretation of both the alleged error (or alleged unsupported statement) and its implications is not supported by the evidence provided.” Volume 3: “Petitioners’ claims regarding the implications of the CRU e-mails are wrong.”
<p>Government Response to the House of Commons Science and Technology Committee 8th Report of Session 2009-10: The disclosure of climate data from the Climatic Research Unit at the University of East Anglia. <i>Released in September 2010, see Government Response to House of Commons, 2010.</i></p> <p>Committee examined: “What had taken place (in the CRU email release incident); The steps that had been taken to investigate the allegations and to test the integrity</p>	<p>“Scientific reputation of Professor Jones and CRU remains intact.” However, committee critiqued the “culture of withholding information” from “those perceived by CRU to be hostile to global warming” and the failure to generally make available the data and code used in temperature reconstructions.</p> <p>“We cannot reach a firm conclusion on the basis of the evidence we took but we must put on record our concern about the manner in which UEA allowed CRU to</p>

<p>of the data held and used by CRU; how the work of CRU has been replicated by other academics; and CRU's practices of data sharing and transparency." In addition, considered how the events reflect more broadly on the "scientific community's practices of generating and sharing data."</p>	<p>handle FOIA requests. Further, we found prima facie evidence to suggest that the UEA found ways to support the culture at CRU of resisting disclosure of information to climate change sceptics."</p>
<p>U.S. Department of Commerce Inspector General Report Inspector General of the U.S. Department of Commerce. <i>Released in February 2011; see Inspector General of United States Department of Commerce, 2011.</i></p> <p>Considered: "Whether the National Oceanic and Atmospheric Administration (NOAA) carried out an internal review of the CRU emails posted on the internet; the basis for Dr. Lubchenco's above testimony statement before the House Select Committee on December 2, 2009; whether NOAA has conducted a review of its global temperature data comprising the Global Historical Climatology Network-Monthly dataset); whether any CRU emails indicated that NOAA: (a) inappropriately manipulated data comprising the GHCN-M temperature dataset; (b) failed to adhere to appropriate peer review procedures; or (c) did not comply with federal laws pertaining to information/data sharing..."</p>	<p>"NOAA scientists had not done anything inappropriate involving their scientific work." Also stated that the scientists followed legal advice with respect to FOIA requests. Inquiry did not assess the "validity and reliability of NOAA's or any other entity's climate science work."</p> <p>Regarding a May 2008 emailing requesting "an individual, who is now a NOAA scientist, to delete certain emails related to his participation in the IPCC AR4. This scientist explained to us that he believes he deleted the referenced emails at that time. We determined that he did not become a NOAA employee until after the incident, in August 2008, and therefore did not violate any agency record retention policies. Further, this individual informed us that in December 2009, he received a letter from Senator Inhofe requesting that he retain all of his records, which he told us he has done."</p>
<p>National Science Foundation (NSF) Office of Inspector General (OIG), Closeout memorandum, Case Number: A09120086. <i>Released in August 2011; see National Science Foundation, 2011.</i></p> <p>The NSF reviewed allegations forwarded by Penn State related to: "Falsifying research data; concealing, deleting or otherwise destroying emails, information or data; misusing privileged information; seriously deviating from accepted practices for proposing, conducting or reporting research and other scholarly activities."</p>	<p>"Lacking any direct evidence of research misconduct, as defined under the NSF Research Misconduct Regulation, we are closing this investigation with no further action."</p> <p>NSF OIG was satisfied that Penn State "adequately addressed Allegations 3 and 4 (i.e., misusing privileged information and serious deviation from accepted practices) identified in the Inquiry report." They also remarked that these allegations were "not issues covered under our Research Misconduct Regulation."</p>