

3. See, for example, California's website <http://www.courts.ca.gov/partners/juryinstructions.htm>, Washington state's <http://www.courts.wa.gov/index.cfm?fa=home.contentDisplay&location=PatternJuryInstructions>, Florida's http://www.florida.supremecourt.org/jury_instructions/instructions.shtml, or Massachusetts's <http://www.mass.gov/courts/court-info/trial-court/dc/dc-crim-model-jury-inst-gen.html>.
4. Confirming my sense of this statement's syntactic complexity, Word's grammar-check program highlighted it in my text and suggested changing from passive to active voice.
5. My analysis of the juror interviews comes from complete transcripts of all interviews with both jurors B29 and B37, listed in the References.

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8 DISCOURSE COALITIONS, SCIENCE BLOGS, AND THE PUBLIC DEBATE OVER GLOBAL CLIMATE CHANGE

Graham Smart

INTRODUCTION

The research presented in this chapter extends a long-term study of discourses and argumentation in the ongoing public debate over global climate change as this debate continues to unfold day by day in a multiplicity of texts circulated on the web. Within this intertextually intracommunicated field of recurrently patterned discourse, or genre system, my research has focused on argumentative texts—in this case, texts communicating a clear claim regarding the nature, causes, and implications of climate change—produced by social actors actively engaged in the climate-change controversy. In the present study I draw on three sources of theory to form a conceptual framework for further investigating discourses and argumentation in the climate-change debate: contemporary theorizing of the public sphere, particularly as this research relates to the public understanding of science; scholarship on collective argumentation in public spaces, with a focus on the notion of the "discourse coalition" (Hajer 1995), a cluster of social actors—individuals, organizations, institutions—who, within the context of a major social debate, are attracted to a common set of arguments, or "macro-argument" (Toulmin 1959); and theory in genre studies, specifically the concepts of genre set, genre system, and genre uptake.

In earlier research (Smart 2012, 2011), I described the formation and continuous reproduction of two opposing discourse coalitions extremely active within the climate-change debate, the "climate-change crisis discourse coalition" (hereafter the Advocates) and the "climate-change crisis skepticism coalition" (hereafter the Skeptics), each with its collectively held argumentative position on climate change. In the study presented here, I identify a third discourse coalition, the Eco-optimists.

I also investigate how discursive interaction between the three discourse coalitions—Advocates, Skeptics, and Eco-optimists—creates opportunities for communicating knowledge about climate science to their respective publics, albeit in ways that reflect entrenched adversarial positions and a limited view of audience rather than potentially contributing to a fuller public understanding of climate science and greater public engagement within the climate-change debate. The present study also explores the primary role that science blogs, with their affordance of immediate circulation on the web, play in facilitating discursive interaction among the three discourse coalitions. I then describe the blog of one climate scientist, a glaciologist, who has created a space for herself in public discussion of climate change outside the constraints of the hegemony-seeking discursive struggle among the Advocates, Skeptics, and Eco-optimists.

Exploring the ways knowledge about climate science is made available to different publics and examining the nature of this knowledge are high-stakes pursuits given that the views of these publics have the potential to influence the actions (or inaction) of policymakers at different levels of democratic governance. At the same time, combining genre theory with theories of publics and collective argumentation in the public sphere can create a conceptual synergy for such investigations. In addition, the concept of the discourse coalition adds usefully to a category of conceptual metaphors—including the “discourse community” (Swales 1990), the “rhetorical community” (Miller 1994), and the “activity system” (Cole and Engeström 1993)—that have been used by scholars in genre studies in theorizing and empirically investigating the contexts in which genres are situated and function. Adding the discourse coalition to this category of conceptual metaphors provides researchers with another distinctive way of thinking about the activity of social actors linked discursively through their joint use of a set of genres—in this case specifically within the agonistic context of major public debates. Polarizing disagreement over issues such as assisted dying, marriage equality, abortion, radical disparities of income in society, militaristic foreign policies, and the threat of climate change call for innovative methods of rhetorical inquiry. Further, in bringing the notions of the genre sets, genre systems, and genre uptakes associated with discourse coalitions into play, we can better understand the sociopolitical actions performed by these discourse coalitions as well as the effects of these actions on genre users. In what follows, I first provide some historical background on the science and politics of climate

change as well as research and theory relevant to the present study. Then I describe the study and findings before concluding with a brief discussion of their implications for public agency within the discursive dynamics of major public debates.

THE SCIENCE AND POLITICS OF CLIMATE CHANGE

The climate-change controversy of the twenty-first century is rooted in nineteenth-century European science in the research of Joseph Fourier, John Tyndall, and Svante Arrhenius. The cumulative outcome of this research was the theory that certain atmospheric gases, including carbon dioxide (CO₂), combine to produce a *greenhouse effect* (a term conceived by Arrhenius) that could potentially raise the surface temperature of the earth. In the following years, a line of climate scientists, including Guy Callendar, Charles Keeling, and Stephen Schneider—the latter coining the term *global warming*—provided empirical evidence for three claims, respectively: that rising levels of atmospheric CO₂ were a consequence of the mounting use of fossil fuels, particularly coal; that growing levels of atmospheric CO₂ were leading to higher annual temperatures; and that higher concentrations of atmospheric CO₂ could eventually result in an extremely dangerous increase in the earth’s average surface temperature. Subsequently, the 1980s saw growing concern among climate scientists around the world that global warming could lead to climate change—severe disruptions in global weather patterns such as heat waves, droughts, severe storms, and widespread coastal flooding (Weart 2003).

An international political response to the scientific reports of human-caused climate change emerged in the late 1980s. A landmark event was the founding in 1988 of the United Nation’s Intergovernmental Panel on Climate Change. The IPCC was given responsibility for monitoring peer-reviewed scientific publications on various aspects of climate change, evaluating the risks for the biosphere and humankind, and reporting regularly on its work to policymakers from the 194 member countries of the IPCC. The IPCC released major assessment reports in 1990, 1995, 2001, and 2007. The IPCC’s *Fifth Assessment Report* was published in three installments from September 2013 to April 2014. Each of the assessment reports has evoked animated public debate over the reality, causes, impacts, and need for mitigation of climate change through worldwide reductions in CO₂ emissions from fossil fuels.

RELATED RESEARCH AND THEORY

The Public and Publics

To trace the origins of contemporary theorizing on the public sphere, we can do no better than to begin with John Dewey's (1929) *The Public and Its Problems*, a rejoinder to Walter Lippmann's (1925) assertion that there is no such thing as "the public." In the course of defending the idea of the public as a valid and useful concept, Dewey also pointed to the existence of multiple publics, to the permeable boundaries between public and private domains, and to the role of communication in the formation of publics. Here Dewey anticipated themes later taken up by scholars such as Jürgen Habermas (1989), G. Thomas Goodnight (1982), and Charles Taylor (1992). Much of this contemporary scholarship follows Dewey in linking conceptualizations of the public and publics to the ideal of enhancing deliberative discourse within democratic societies.

Narrowing our focus to an area of scholarship known as the *public understanding of science*, we will next consider three representations of the public and its relationship to science and scientific knowledge, discussed here in a sequence of increasingly complex and sophisticated perceptions of the public's ability to take an interest in, comprehend, and contribute to science: the deficit model, the knowledge coproduction model, and the concept of public reasoning. Both scientists themselves and scholars who study science have been criticized for holding a deficit model (Wynne 1995) of the public's relationship with science—that is, for assuming that nonexpert audiences are scientifically nonliterate, not only lacking knowledge about science but also limited by a cognitive inability to understand its complexities. This negative characterization of a scientifically nonliterate general public is often coupled with a naive view of science communication as the direct transfer of simplified knowledge from scientific expert to lay person, with the expert taking on the paternalistic role of lecturer (Bucchi 2008). Further, as Greg Myers (2003) points out, the transfer notion of science communication assumes that the public is a *tabula rasa*—a unitary collective mind without cultural schemas or individual competencies and motives for interpreting scientific knowledge.

In contrast to the deficit model of public audiences, the knowledge coproduction model assumes that certain members of the public, in possessing relevant lay knowledge and competencies in areas of science of particular interest to them, are capable of engaging with professional scientists in setting priorities for research, interpreting the significance of findings, and applying the resulting knowledge in the best interests

of society (Bucchi 2008). From this perspective on the relationship between the public and science, the social responsibility of the scientist shifts from attempting to educate a scientifically deficient public to engaging dialogically with interested and competent citizens in "hybrid forums" (Callon 1999) in which lay and expert knowledge can be productively combined.

A final conceptualization of the public and its relationship to science of relevance here is Sheila Jasanoff's (2012) notion of "public reasoning." Jasanoff argues that every modern democratic state, over time, coconstructs with its citizens a distinctive political culture and unique form of public reasoning—that is, the use of sanctioned forms of evidence and modes of argumentation in making and justifying decisions for which the government is accountable to its citizenry. According to Jasanoff (2012), public acceptance of government decisions in areas of public concern, often involving science and technology, depends both on the government's use of technocratic practices such as risk assessment, cost-benefit analysis, and reference to constitutional law and on the government's performance of its "rituals of rationality [in] . . . forums ranging from the high courts to the blogosphere" (9).

Collective Argumentation in the Public Sphere

Much contemporary scholarship on argumentation has focused on interactions between individuals (Fahnestock 2009). For a discussion of scholarship looking at argumentation on a broader social plane—and there is little of this—we can begin with Stephen Toulmin's (1959) concept of the "argument field," which assumes that some features of arguments are field specific while other features are common across all fields. G. Thomas Goodnight (1982) elaborated on this idea with his notion of "argument spheres"—Goodnight identifies three: personal, technical, and public—with each sphere marked by certain topics and particular standards for legitimate evidence and valid argument. For Goodnight, the public sphere should ideally be a site for deliberative discourse among members of a society where issues involving conflicting interests, uncertainty, provisional knowledge, and concern for the future are taken up and resolved.

Maarten Hajer's (1995) concept of the "discourse coalition," part of his "argumentative discourse analysis" approach, provides another way of theorizing occurrences of collective argumentation in the public sphere. A discourse coalition is a cluster of social actors—individuals, organizations, institutions—who, within the context of a major social debate,

are attracted to a common set of arguments, or “macro-argument” (Toulmin 1959). A defining feature of the discourse coalition is that it necessarily exists in opposition to other discourse coalitions in a struggle for “discursive hegemony,” defined as success in influencing the public and policymakers regarding the issue in question—and performed publicly through genre sets, systems, and uptakes.

Genre Sets, Systems, and Uptake

Researchers guided by a social theory of genre have recognized that genres found in academic, workplace, and public settings often perform in sets, with each genre set operating as an integrated rhetorical/epistemic site within a particular field of activity (Bazerman 1988; Devitt 1991). While providing users with a certain discursive stability and continuity, genre sets also typically display flexibility and continual evolution in their forms and functions. Moving beyond the scale of a single intragroup genre set, Charles Bazerman (1994) identifies a broader intergroup pattern of discourse—the “genre system,” which encompasses genre sets used by two or more social groups as these groups interact in pursuing mutually intelligible purposes.

Within the context of this dialogical interaction between genres, Anne Freedman introduced the concept of uptake, occurring when a text in one genre elicits a responding text in another genre. Freedman (2002; 2012) later extended this notion of uptake to include not only one text responding to another but also a situation in which the use of a genre may prompt subsequent, though not necessarily immediate, semiotic events and related human actions. Anis Bawarshi and Kimberley Emmons have further expanded the concept of uptake in empirical studies of genres. Bawarshi (2006) points to how conventionalized relationships between genres can serve to organize different recurrent social actions within a field of human activity. Emmons (2009) has guided our attention beyond the value of uptake as a “necessary heuristic for understanding the ways texts and genres cohere within systems of social activity” (140) to recognize how uptake can also contribute to our understanding of human agency and the formation of individual subjectivities. According to Emmons, “If we are to account for the power . . . of uptake, we must redefine uptake not as the relation between two (or more) genres, but as the disposition of subjects that results from that relation” (140).

Genre Studies and Blogs

In their studies of the interaction between public actions and individual dispositions within the genre of the weblog, Carolyn Miller and Dawn Shepherd note the “astonishing uptake of blogs” (Miller and Shepherd 2009, 263) and the rapid pace of the blog’s differentiation into different types. Miller and Shepherd (2004) describe the emergence of personal blogs as a response to “a recurrent rhetorical exigence [arising in] a particular cultural moment . . . a *kairos* of mediated voyeurism, widely dispersed by relentless celebrity, unsettled boundaries between public and private, and new technology” (1, 11). They observe that the blog, seen as an online diary, serves two fundamental purposes, one individual (personal self-expression) and the other social (cultivating relationships within an online community of bloggers), with both purposes related to discursive identity formation. In concluding their study, however, Miller and Shepherd signal their awareness of the rapid differentiation in the types and purposes of blogs, made possible by continuous technological advances afforded by new blogging software, and they raise the question of whether it is still reasonable to see the blog as a single unitary genre. Later, they point to striking changes in the blogging landscape: “Blogs [have begun] to change and adapt, to speciate, as it were. . . . The forms and features of the blog that had initially fused around the unfolding display of personal identity were rapidly put to use for . . . political advocacy, corporate tech support, classroom interaction, and public deliberation” (Miller and Shepherd 2009, 263), and I would add, given their centrality here, for discussion of science.

The Science Blogosphere

John Wilkins (2008) characterizes science blogs as “blogs whose main focus or intent is disseminating or commenting upon science” (411). With respect to the social importance of science blogs, Wilkins asserts that “blogs are highly idiosyncratic, personal and ephemeral means of public expression, and yet they contribute to the current practice and reputation of science as much as, if not more than, any popular scientific work or visual presentation” (411). According to Bora Zivkovic (cited in Bonetta 2007, 443, 444), science blogs emerged in the late 1990s and early 2000s. In 2007, Zivkovic reported that the number of blogs with the word *science* as one of their hashtags was 19,881. As he pointed out, however, many of these blogs were “pseudoscience blogs, new age blogs, creationist blogs, or computer technology blogs,” concluding that the number of “actual science blogs”—blogs authored by

“graduate students, postdocs, and young faculty [in the sciences]”—was 1,000 to 1,200. (Later in the chapter, I employ the term *science blog* to refer to a broader category of bloggers than Zivkovic does here.)

THE STUDY

This study addresses two sets of research questions. The first set of questions relates to the discursive formation of collective argumentation in the debate over global climate change: (1) What discourse coalitions can we identify within the web-based discourse of the climate-change controversy? and (2) What can an investigation of discursive interactions between discourse coalitions reveal about how climate-science knowledge is presented to different publics and about the nature of this knowledge? The second set of research questions focuses on the subgenre of the science blog and is taken in part from Miller and Shepherd’s 2004 study: “What rhetorical work do blogs perform—and for whom? And how do blogs perform this work?” (1). To these questions, I will add others: What role do science blogs play in the formation of the discourse coalitions examined here? And to what extent do these blogs offer their publics a balanced view of climate science?

I have reanalyzed a corpus of some fourteen thousand texts used in my 2011 and 2012 studies, in addition to analyzing approximately four hundred posts to science blogs gathered since 2012. The corpus used for the two earlier studies includes a range of genres, including blogs, news stories from newspaper and magazine websites, as well as online reports, press releases, and other texts from environmental NGOs, think tanks, research institutes, and government agencies—with each text presenting a clear position on one or more aspects of human-caused climate change. The majority of these texts were collected using Google Alerts, with a smaller number of texts collected through subscriptions to organizations’ websites or through other electronic texts received via e-mail.

In analyzing this body of texts, I employed Maarten Hajer’s (1995) “argumentative discourse analysis” approach, founded on a neo-Foucauldian notion of discourse—one that is quite apposite for examining the discourses of environmental debates: “[A discourse is] an ensemble of ideas, concepts and categorizations through which meaning is given to social and physical phenomena, and which is produced, reproduced, and transformed in a particular set of practices” (447). Hajer offers the discourse analyst a conceptual schema for recognizing broad discursive patterns across multiple texts within a corpus with the aim of identifying macroarguments shared by groups of social actors—or

“discourse coalitions”—as they fight for “discursive hegemony” in the context of a major social debate.

As a research method, I have appropriated Miller and Shepherd’s (2004) approach in scrutinizing two sources of data: my own corpus of texts, which I examined using content analysis, and published commentaries by professional scientists (Schmidt 2008; Varner 2014). I have also included in my data published work by academics who study the field of science, such as scholars in sociology, communication, organizational studies, and science education (Bonetta 2007; Kouper 2010; Trench 2012; Wilkins 2008).

THREE DISCOURSE COALITIONS AND THEIR ADVERSARIAL INTERACTION

In previous research (Smart 2011, 2012) identifying discourse coalitions in the climate-change debate, I labeled one of these clusters of actors the *Advocates* and another the *Skeptics*. Further, I was able to infer from the corpus of texts a set of logically ordered claims comprising the respective argumentative positions of these two discourse coalitions (Smart 2011, 371–78). These positions can be compressed into the following statements:

Advocates: Human-caused climate change threatens us with an impending global catastrophe, and policymakers around the world must act without delay to counteract this danger.

Skeptics: The theory of human-caused climate change is at best uncertain, and we must resist misguided remedial government policies that would undermine our economies and way of life.

My 2011 study also pointed to the intense interactivity in the relationship between the *Advocates* and the *Skeptics*: “While these two clusters of [social actors] are diametrically opposed in their positions on climate change and clearly not attempting to establish mutual understanding through an authentic deliberative dialogue, they are nevertheless highly engaged with one another discursively . . . in that each of the coalitions appears very aware of the other’s evolving position, or macro-argument, regarding climate change, and highly alert to any emerging claims” (376). In what follows, I use the concepts of genre set, genre system, and uptake to explore this paradox of the intense mutual engagement and yet unremitting contestation characterizing the discursive relationship between *Advocates* and *Skeptics*. First, though, who are the social actors comprising these two adversarial discourse coalitions? Examples

on the Advocates side are the authors of climate-science blogging sites (RealClimate), environmental NGOs (Sierra Club), international political organizations (United Nations Environment Programme), organized groups of scientists (Union of Concerned Scientists), media organizations (*Guardian*), policy think tanks (Pembina Institute), and religious organizations (Evangelical Climate Initiative). On the Skeptics side, there are the authors of climate-science blogging sites (What's Up With That?), business corporations (Peabody Energy), industry associations (Canadian Association of Petroleum Producers), organized groups of scientists (Friends of Science), media organizations (*Financial Post*), policy think tanks (Competitive Enterprise Institute), and religious organizations (Cornwall Alliance).

For each cluster of actors, the Advocates and the Skeptics, a set of frequently employed web-circulated genres serves as a vehicle for both the engagement and the contestation between discourse coalitions. Genres used by both sides—which form part of their respective genre sets—include blog posts, press releases, reports, newsletters, documentaries, opinion pieces in newspapers, and books, with the blog appearing to be the most frequently used genre on the part of both discourse coalitions. We can further conceptualize the continuous discursive interplay between the discourse coalitions, performed in the public sphere through their respective web-circulated genre sets, by viewing these two genre sets as comprising a larger genre system, an intertextually intra-connected field of discourse. Ironically, while the two discourse coalitions are diametrically opposed to one another on a range of issues related to climate change, the tension between the two coalitions serves to animate and motivate both of them.

Another useful way of conceptualizing the intense mutual engagement/contestation between the Advocates and the Skeptics is to think of this engagement/contestation as a continuous series of genre uptakes performed by the two sides. One side publishes an instance of a genre on the web, and the other side responds with a countering text, often within days, or even hours in the case of blogs. In Freadman's (1994) terms, we might see this interaction, metaphorically, as a relentless sequence of tennis shots and returns, a rapid-fire exchange primarily performed through the genre of the blog. Within the genre sets employed by the social actors comprising the two discourse coalitions, blogs are the most commonly used, and by a considerable margin—presumably because of the immediacy of web circulation that blogs afford their authors. Unfortunately, I think, the Advocates and the Skeptics use their blogs almost exclusively to pursue discursive hegemony in the

climate-change debate, declining any meaningful dialogue with their counterparts in the other discourse coalition. One consequence of this situation is that the climate-science knowledge offered to their respective publics, as a form of genre uptake, is consistently slanted toward the fixed argumentative position of the discourse coalition.

A further concern is that contestation between the Advocates and the Skeptics, each wielding its own version of climate science, could potentially impair the quality of what Jasanoff (2012) terms “public reasoning”—the distinctive form of rationality and evidence-based argumentation sanctioned as acceptable for making and justifying decisions for which a government is accountable to its citizenry. A related danger here is that such contestation could undermine the potential for deliberative discourse among members of a society with respect to a major social issue such as climate change. For each of the three discourse coalitions, an examination of the comments posted by readers in response to blog authors' original posts certainly supports this view in that readers' comments almost always reflect, rather than probe, the blog author's version of climate science.

Below is an example of the regrettable (I would argue) epistemic bias seen in exchanges between Advocates and Skeptics concerning climate science. On March 10, 2008, physicists Knud Jahnke and Rasmus Benestad authored a post on an Advocate blog site called *RealClimate*. As we see below, Jahnke and Benestad's blog post is intended, as an uptake, to undermine the credibility of a Skeptic documentary on climate change by challenging an academic publication by physicist Nir Shaviv that was cited in the documentary.

A Galactic glitch

10 March 2008

[By] Knud Jahnke and Rasmus Benestad

After having watched a new [Skeptic] documentary called the “Cloud Mystery” . . . we realized that a very interesting point has been missed [regarding] climate: galactic cosmic rays and the evolution of the Milky Way galaxy. It is claimed in “The Cloud Mystery” . . . and related articles that our solar system takes about 250 million years to circle the Milky Way galaxy and that our solar system crosses one of the spiral arms [of the galaxy] about every ~150 million years (Shaviv 2003).

But is this true? Most likely not. . . . This claim is seriously at odds with astrophysical data. . . . So it seems that Shaviv's ‘periodicity’ estimate for crossing of spiral arms by the sun does not hold up under scrutiny when using current astronomical results as the work by Kranz et al. . . . [This undermines] Shaviv's remarkable press-release claims that “the operative

significance of our research is that a significant reduction of the release of greenhouse gases will not significantly lower the global temperature.”

Remarkably, the poor scientific basis of the galactic cosmic ray hypothesis seems to be inversely related to the amount of media backing it is getting. At least 3 documentaries (“The Climate Conflict”, the “Global Warming Swindle”, and now “The Cloud Mystery”) have been shown on television—all with a strong thrust of wanting to cast doubt on the human causes of global warming.

Two days later, a countering post by Nir Shaviv (see below) appeared on his blog in which Shaviv defends his work from Jahnke and Benestad’s attack. In an interesting rhetorical move, Shaviv rewrites the final paragraph from Jahnke and Benestad’s earlier blog post, completely reversing its meaning, an unusual instance of uptake.

More slurs from realclimate.org
By Nir Shaviv, Wed, 2008-03-12 11:36

Realclimate.org continues with its same line of attack. Wishfulclimate.org writers try again and again to concoct what appears to be deep critiques against skeptic arguments, but end up doing a very shallow job. . . . According to realclimate.org, everything my ‘skeptic’ friends and I say about the effect of cosmic rays and climate is wrong. In particular, all [our] evidence is, well, a figment in the wild imagination of my colleagues and I. The truth is that the many arguments trying to discredit this evidence simply don’t hold water. The main motivation of these attacks is simply to oppose the theory which would remove the gist out of the arguments of the greenhouse gas global warming protagonists. . . .

To summarize, using the final paragraph of Jahnke and Benestad, we can say that

Remarkably, the poor scientific basis of the attacks against the galactic cosmic ray hypothesis seems to be inversely related to the tenacity of the devout global warming protagonists—all with a strong thrust of wanting to cast doubt on the possibility that natural climate drivers may have been important to 20th century temperature change. (Italics in the original)

The two blog posts reproduced above illustrate Emmons’s (2009) description of genre uptake as “a necessary heuristic for understanding the ways texts and genres cohere within systems of social activity” (140). We can see how the ongoing interaction realized in pairs of blog posts such as the two above serves to organize the discourse in a way readers can recognize as meaningfully connected. Further, if we were to assume the two blog posts were intended not only for a public comprising social actors in the authors’ own discourse coalition but also as a performance intended for a nonpartisan public as well, we could—prompted by Emmons (and recalling Bakhtin’s [1986] notion of “addressivity”)—see

uptake occurring here in the form of the authors’ intended effects on the thinking and possible future actions of the individuals reading the blog posts. Unfortunately, however, from my observations of readers’ comments posted in response to blog authors’ initial posts, the Advocates and the Skeptics each appear to elicit their own discrete public, with little or no evidence of readers seeking out different views from a range of science blogs.

The exchange of blog posts reproduced above reveals how both the Advocates and the Skeptics, exploiting the immediacy afforded by blogs, maintain entrenched hegemony-seeking positions on climate change. And while the Advocates and Skeptics each offer their particular public instances of climate-science knowledge, the knowledges offered are incommensurate (Kuhn 1962) with one another, thereby limiting the possibilities for fuller understanding on the part of a broader public. Further, implicit in the pair of blog posts above are deficit-model assumptions regarding a general public’s relationship with science, assumptions that are a far cry from an invitation to participate in the coproduction of scientific knowledge and to engage productively in the climate-change debate.

In reanalyzing the corpus used in my 2011 and 2012 studies as well as approximately four hundred blog posts gathered since 2012, I identified a third discourse coalition in addition to the Advocates and the Skeptics—an Eco-optimist discourse coalition (hereafter the Eco-optimists). The position of the Eco-optimists can be abridged as follows: while the human use of fossil-fuel emissions and the consequent rise in atmospheric CO₂ have almost certainly been the primary cause of climate change, warnings of a looming ecological catastrophe are misguided since human societies will use their increasing wealth and proven ingenuity to develop new technologies for bringing the earth’s climate back into balance. Space does not permit a fuller examination of Eco-optimists’ discursive interactions with both the Advocates and the Skeptics. However, the same kind of agonistic relationship between the Advocates and the Skeptics also characterizes the relationship between the Eco-optimists and each of the other two discourse coalitions. An exchange of blogs between Andrew Revkin, an Eco-optimist who authors a blog for the *New York Times*, and Clive Hamilton, an Advocate author of *Requiem for a Species: Why We Resist the Truth About Climate Change*, represents this agonistic relationship.

The exchange began in mid-June 2014 with Revkin’s reference on his blog to using the phrase “paths to a ‘good’ anthropocene” during a conference talk he gave earlier that month (*Dot Earth*, February 8, 2016).

The term *anthropocene* is employed, typically by Advocates and in a negative sense, to denote the twelve thousand-year period since the last ice age, when human activities are seen to have significantly damaged the earth's ecosystems. Revkin's main theme in his conference talk had been that, while it is certainly conceivable that climate change could cause catastrophic disruptions to the global climate, humankind has the collective intelligence, systems of governance, and technologies needed to change paths very quickly and avoid the worst consequences of climate change. Revkin further argued that the best way to encourage the global public to embrace this course of action is to accentuate the possibilities for progress in dealing with climate change rather than presenting the public with scare tactics and apocalyptic visions of future devastation.

Hamilton responded to Revkin's notion of a possible path to "the 'good' anthropocene" with a forceful riposte in his own blog on June 17, 2014. The excerpts from Hamilton's blog post that follow convey the sense and spirit of his response

Thanks for sending the link to your talk on "Charting Paths to a 'Good' Anthropocene." Since you ask for responses let me express my view bluntly. In short, I think those who argue for the "good Anthropocene" are unscientific and live in a fantasy world of their own construction. . . .

[Individuals like you] do not attempt to repudiate the mass of scientific evidence; instead they choose to reframe it. As you declare so disarmingly, "You can look at it and go 'Oh my God', or you can look at it and go 'Wow, what an amazing time to be alive!' . . . You believe that "with work . . . we can have a successful journey this century. . . . We are going to do OK." Personally, when I think about those toiling, vulnerable masses who are going to suffer the worst consequences of a warming world, I find it offensive to hear a comfortable, white American say "We are going to do OK." (*Clive Hamilton*, June 17, 2014)

In Hamilton's blog post, we have another illustration of how the three discourse coalitions employ blogs, with their affordance of immediacy of circulation on the web, to maintain entrenched hegemony-seeking argumentative positions. Again, we see all three sides, in striving for discursive dominance, offer their public biased instances of climate-science knowledge, which if compared would be seen as incommensurate (Kuhn 2000). Each side's offerings of climate-science knowledge are rooted in particular theoretical assumptions and reflect a particular ideology, with the result that, as Randy Harris (2005) points out, "the lack of a common standard for taking the measure of two systems [of knowledge] with respect to each other . . . disabl[es] progress. If one can't measure sure theories with respect to each other, how can one choose which is best?" (3, 4).

One dimension of the incommensurability among the different climate-science knowledges proffered by the Advocates, Skeptics, and Eco-optimists is linguistic. Even terms used in common by the Advocates, Skeptics, and Eco-optimists, such as *uncertainty*, *scientific skepticism*, and *climate modeling* are infused with different meanings by each group. Howard Margolis (1996; cited in Harris 2005) describes a scenario that matches up well with the agonistic interaction of the three discourse coalitions: "Arguments [based on climate science] that seem powerful to one side seem unimportant to the other. What looks like striking insight to one side looks like perverse illusion to the other" (20). A key consequence of this incommensurability of climate-science knowledges is that blog readers are left without the opportunity they might otherwise have to make comparative judgements regarding the climate-science-supported claims advanced by the Advocates, Skeptics, and Eco-optimists, even when these claims involve empirical evidence—a situation that obstructs the possibilities for fuller public understanding and for informed political engagement on the part of the blogs' readers. To be fair to Andrew Revkin, his response in his blog to Hamilton's attack was to propose that the two men look at views they hold in common rather than at their differences of opinion and go forward from there. Here Revkin, in the interests of prompting new thinking about climate change, was clearly opting to step outside the constraints of the discourse coalition in which I have placed him.

THE SCIENCE BLOGOSPHERE: BLOGGERS AND THEIR PURPOSES

In this section I take up two of Miller and Shepherd's (2004) research questions—"What rhetorical work do blogs perform—and for whom?" (1)—and apply these questions in examining the genre of the science blog. When we turn to professional scientists who author blogs—and these include scientists in universities and industry as well as graduate students and postdocs in the sciences—I have identified a number of the purposes pursued in these blogs by scrutinizing the three sources of data mentioned earlier: approximately four hundred blog posts I have collected since 2012, commentaries posted by professional scientists themselves on their use of science blogs, and published work by scholars who study science.

One set of purposes is enacted by scientist bloggers, with fellow scientists as the intended audience. Here we see purposes such as sharing one's prepublication findings with other scientists; attracting collaborators for research projects from among specialists in one's own field

or in adjacent fields; expanding on one's own published work for fellow experts; and training graduate students in one's field of scientific expertise and preparing them for job searches by creating a forum for discussion and networking. A second set of purposes can be ascribed to scientist bloggers intending to communicate with public audiences. Given their salience to the study presented here, these purposes are listed below:

- engaging with the public regarding topics in one's scientific discipline, particularly topics that are complex and/or contested;
- striving to influence opinion leaders such as journalists, educators, and public intellectuals;
- satisfying the obligation for public outreach that comes with many institutional grants;
- providing a window onto the backstage science-in-the-making activities of one's field;
- writing autobiographically about one's life as a scientist;
- conveying views on science-informed government policies, in the role of a civic scientist.

What is particularly noteworthy about the second set of purposes involving scientists and public audiences is that they appear to hold at least the promise of realizing the "knowledge co-production model" of communication in a way that could allow for Goodnight's (1982) ideal of a public sphere with deliberative discourse among citizens on issues of import. In the next section we will see an example of full-fledged knowledge coproduction involving a climate scientist and her public as mediated through the climate scientist's blog.

A CLIMATE-SCIENTIST BLOGGER ENGAGING WITH HER PUBLIC

I conclude these findings with a detailed look at a blog, *Antarctic Glaciers*, authored by glaciologist Bethan Davies. A journal article coauthored by Davies and a glaciologist colleague, in which the two scientists evaluate Davies's experience with her blog (Davies and Glasser 2014), provide insights into her blogging practices. (While Davies refers to characteristics common to both her blog and the website in which the blog is embedded, I focus here primarily on the blog.)

Davies's website describes her as "a glaciologist specializing in reconstructing glacier dynamics over multiple timescales, from both field and remotely sensed data, particularly in the Antarctic Peninsula, Britain and Patagonia. . . . [who] wrote and developed the Antarctic Glaciers

website as part of an ongoing commitment to outreach, education and research impact" (*Antarctic Glaciers*, June 26, 2015). And here is Davies describing the rhetorical work accomplished through her blog as it functions within the larger context of the website: "It delivers peer-reviewed science to the public, [senior high-school] and undergraduate students [and it] underpins and supports my university teaching, increases the visibility and impact of my research, and broadens my professional network" (*Antarctic Glaciers*, June 26, 2015).

As reflected in the design of her website, with its embedded blog and Twitter feed, Davies's rhetorical sophistication is impressive. As one example of her rhetorical savvy, as a guest contributor on a blog called *Bogology*, Davies includes an explicit description of the deficit model of science communication.

The belief that the simple conveyance of information from scientists to [an ill-informed] public is known as the "Knowledge Deficit Model." . . . The idea [is] that, once citizens [are] up to speed, they [will] judge the issue as the scientists did. [This] decades-old Knowledge Deficit Model [involves] the transmission of information, where the facts . . . speak for themselves and everyone . . . interpret[s] them in the same way. Why doesn't it work? . . . We know that knowledge is only one factor that shapes how individuals make judgements on scientific issues. Ideology, politics, trust, social identity, religion can all have equally strong impacts. (*Bogology*, March 10, 2014)

Davies contrasts the knowledge-deficit model with what she calls the "public engagement model," which has clear parallels to the knowledge coproduction model discussed earlier in the chapter:

In order to be more successful at science communication, scientists need to have a better understanding of what factors might shape an individual's beliefs and [perspectives]. They must research and understand their audience . . . and listen to and connect with their audience on their terms. [Scientists] need to understand what their audience needs, and to be able to evaluate and evolve in response to these needs. . . . The "Public Engagement" model therefore has deliberative contexts and dialogue at its core. Any [message] should be as interactive as possible. [Public audiences] are encouraged to participate in a dialogue, informing research . . . priorities with an emphasis on participation and feedback. (*Bogology*, March 10, 2014)

To "challenge the deficit knowledge model, with interactive features and a good understanding of the audience" and thereby engage with her public, Davies uses a number of strategies, among which are (1) including a continuing survey of readers on the website and using

information from respondents to make ongoing design adjustments to the blog and website; (2) identifying different types of individuals in her intended public and carefully considering how best to engage with each type of person; and (3) creating a synergy within a genre set comprising the blog, the website in which the blog is embedded, Twitter, YouTube and an Ask the Scientist feature by employing each genre according to its particular communicative affordances.

We might take the fact that Davies's website, begun in 2012, has recently been receiving up to five thousand visits a month as evidence that Davies has been successful in engaging with her public. Indeed, we might credit her with having created, together with this public, a "hybrid forum" (Callon 1999) combining lay and expert insights to produce new knowledge in the field of glaciology. And I argue that it is Davies's approach to communicating with her public, positioning herself outside the closed discursive world of adversarial uptakes created by the Advocates, Skeptics, and Eco-optimists, that enables her to join her readers in the coproduction of climate-science knowledge.

CONCLUSION

This chapter has investigated interaction among three discourse coalitions—Advocates, Skeptics, and Eco-optimists—as they compete for discursive hegemony in the debate over global climate change. The study shows that although each of the three discourse coalitions offers its public a version of climate-science knowledge, these versions are incommensurate, with the consequence that individuals are denied the possibility of developing, through dialogue, greater scientific understanding, a gain that could in turn lead to more informed public engagement in the climate-change debate. Further, recognizing the central role that science blogs play in this debate, the study identifies people, audiences, and purposes associated with science blogs, with particular attention given to blogs authored by climate scientists. A significant finding of the research is that climate scientists and other social actors possess sufficient agency to create a space for themselves in public discussions of climate change outside the narrow adversarial exchanges of the Advocates, Skeptics, and Eco-optimists.

In bringing together genre theory, scholarship on the public sphere, and the idea of the discourse coalition, the study offers a heuristic to researchers wishing to explore the discursive dynamics of major public debates. In addition, beyond academia, I hope the study might enhance our ability to approach environmental controversies

with additional insight, enabling us to play a more effective part in environmental debates.

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