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WSW Special Issue on Communication

Introductory Remarks by Jeffrey K. Lazo*

For almost seven years as director of the Societal Impacts Program (SIP) at the National Center for Atmospheric Research (NCAR), it has been my mission "to help society benefit from current and emerging weather forecasting capabilities by integrating social sciences knowledge and methods into the weather research and policy-making communities." With the training, toolbox, experience, and perspectives of an economist, it would make sense for me to advocate "integrating economics" as the answer to integrating the social sciences. Instead—with the goal "to help society benefit"—I am convinced that first "integrating communication" will have a much greater long-run payoff to society than more benefit-cost studies.

Thus I was thrilled to hear that the 2011 American Meteorological Society (AMS) annual meeting was being organized around the broad theme of "Communicating Weather and Climate." Over the years it has become our practice to publish a special, large edition of *Weather and Society Watch* in time for the annual AMS meeting. For the fifth year we are doing just this but this time we are taking advantage of the conference theme and dedicating this issue to communication. We asked several authors to contribute articles on their perspective, research, and interests on communication. We truly appreciate their generosity in contributing to this edition.

Authors In This Edition

Features In This Edition

Margaret "Peggy" LeMone, senior scientist emerita at NCAR and current president of the AMS chose communication as the theme for the 2011 AMS annual meeting. In her article she discusses the importance of good will and communication. "Good will," "trust," "credibility"—all different dimensions of the personal relation between the communicator and the recipient but, as research in risk communication has shown, all critical to communicating information such as weather forecasts or climate scenarios. Simply put, if you haven't shown and developed good will and if the listener doesn't trust you, he or she is less likely to hear you.

Betsy Bach, associate director with the National Communication Association (NCA) (http://www.natcom.org/), brings the perspective of the academic community of communication researchers. Starting from the premises of communication research, she discusses the creation of science as a communication process and how interdisciplinary teams face communication challenges. She demonstrates further how the dissemination of their science is an area where

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the climate and weather science community could benefit from the knowledge and tools of communication scholars. Between them, Peggy and Betsy represent the excellence of the disciplines of meteorology and communication and, recognizing the potential benefits of doing so, they have jointly committed to bridging the professional cultural divide starting with this year's AMS meeting.

Vankita Brown of the National Weather Service (NWS) presents a passionate discussion of the cultural dimensions of weather. Especially compelling to me is her statement "What scientists, academicians, and public officials have come to consider as logical behavior must not be the only barometer that is used to analyze what are often culturally-based ways of being, knowing, and acting in the world." After a severe weather event, I have often heard someone say "Why didn't people do the right thing when they hear the warning?" Vankita's article should help explain that people often are doing the right thing—it just may not be the thing that the "logical" forecaster or emergency manager thought was the right thing.

Karen Akerlof, a doctoral student studying environmental science and public policy at George Mason University discusses the relation of modeling in public debates on climate. She outlines some of the historical and political issues that have evolved in the development of climate science and policy and how these have been communicated and played out in the media. Many of the successes and failures in developing climate policy had related to the framing of these issues in the media rather than in the science involved—communication issues!

Renee Lertzman, a visiting fellow with the Portland Center for Public Humanities and Portland State University, discusses affect and psychic numbing and how these play into responses to communication about climate change. She states that "Attending to emotional and affective dimensions of climate change and how we communicate can profoundly complement existing innovative studies in the psychology and communications of climate change." From my own work on hurricane warnings where individuals in focus groups displayed serious emotional impacts from having gone through Hurricane Andrew, it is very obvious to me that emotion can play a huge role in responses to hurricanes as well. This likely extends to all sorts of weather impacts, from flash floods to droughts to tornadoes to snow storms (just think New York City, Christmas 2010!).

As you read these articles and attend the sessions at the 2011 Annual AMS meeting—or follow the presentations and outcomes of the meeting online—you will see a few of the many dimensions that communication can bring to the weather, water, and climate communities. If you find the area of communication interesting, I'll take the liberty of recommending some resources related to communication and weather I have found valuable (remember that I am an economist!).

- Betty Morrow, a sociologist by trade, has a nice review on risk communication written for the Coastal Services Center (Morrow 2009). This review is available online.
- I also recommend Ann Bostrom et al.'s book on mental models and risk communication (Morgan et al. 2001). Several of us in the SIP are working with Ann Bostrom on an NSF funded project looking at the communication of extreme weather warnings using the mental modeling approach – an approach I find incredibly useful for understanding different perspectives on hazards such as flash floods and hurricanes.
- I'll also point those interested to an article on communication of weather forecasts by Rebecca Morss, Julie Demuth, and myself based on a national survey of the US public (Morss et al. 2008) available on our website (http://www.sip.ucar.edu/publications.php).
- And of course there have been numerous articles on or related to communication and weather information in prior issues of *Weather and Society Watch* (all available at: http://www.sip.ucar.edu/news/previous.php), as well as in the AMS publication *Weather, Climate, and Society*.
- In addition to resources such as the National Communication Association (http://www.natcom.org/), I recommend people also become familiar with the Society for Risk Analysis (http://www.sra.org) and their journal *Risk Analysis*, a bountiful resource on risk communication.

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Good Will in Communicating

by Margaret “Peggy” LeMone*

When I selected “Communicating Weather and Climate” as the theme for the 2011 American Meteorological Society (AMS) annual meeting, I was compelled by a combination of life experiences and an awareness of the significance of communication not only in working with other scientists, but also the challenges that AMS members face with customers or the general public on a frequent, if not day-to-day basis. What is good communication? How can we do better?

It is obvious that clear communication is important. Writing or speaking in clear, simple English increases the chance for the message to be received. But clarity is not enough. For the reader or listener to absorb and accept a message, additional barriers must be crossed. Some are gender-based. Some are cultural. Some relate to our life experiences. Some relate to the influence of unprecedented choices for information sources. These are barriers we deal with as individuals, in our workplace, and in the AMS. How do we deal with these barriers? Clearly, recognizing that there are barriers is the first step, and the next steps involve listening, sharing experiences, and developing trust. While I don’t think it solves all our problems, we can go a long way by trying to create and maintain feelings of good will.

How do we create good will? Working with one another and the public on weather issues over time provides an opportunity to develop trust: there’s nothing quite like being “through the wars” together. It is not hard to find examples. Local National Weather Service (NWS) Weather Forecast Offices (WFOs) work with community groups, schools, emergency managers, weather broadcasters, and other groups to improve response to severe weather events, an effort that not only involves education but considerable give-and-take. Local WFO staff and weather broadcasters talk at schools and public gatherings to educate, but also to listen. Private-sector meteorologists work with customers to get forecasts tailored to their needs. The AMS, with its professional membership equally divided among the government, academic, and private sectors, has historically provided a means for the three sectors to discuss problems of mutual interest, allowing not only a template but an atmosphere of mutual respect to tackle similar problems in the future. Operational meteorologists and broadcasters earn the respect of the public through introduction of new technology (like Doppler radar), new terms (like the Fujita Scale), and newly-elucidated phenomena, such as El Nino or the Arctic Oscillation. And today, such information is available not only in our homes, but through hand-held devices almost everywhere.

When speaking to a group or conducting a workshop for the first time, one doesn’t have the luxury of a long association to develop trust. However, there are ways to honor everyone in the audience. When Margaret Mead spoke to a group, she would include quieter members of the audience by requiring that questions be written down on 3 x 5 cards. [1] Another speaker, Rev. Sally Bingham, [2] whose presentations about climate change were being interrupted by hecklers who were highly skeptical about her message, came upon the idea of starting out her talks with a show of hands: What did people think about climate change? When the audience realized that the skeptics were in the minority (true for most of her talks), she was able to get through her presentation. I’ve found allowing workshop participants to share stories about the weather and climate not only provides relief from more technical discussions, but provides a point of reference, and perhaps most important, allows the audience to bond.

Good will and honoring our audience also entails some sympathy with those with whom we disagree. One needs to ask: why do they feel this way? It appears obvious from Oreskes and Conway’s book *Merchants of*

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Doubt, [3] that many actively deny anthropogenic origins of climate change because of a deeper fear about the potential responses. Addressing people with such motivations, it's sometimes possible to find common ground on related topics, like alternative energy; but sometimes, one has to "agree to disagree."

Sometimes simply turning down the volume can turn up the good will. While a contentious panel discussion might provide entertainment, does it make us question our opinion, or reinforce it? One of the most satisfying experiences I had in participating in a sometimes-contentious online climate discussion group was an accidental off-line discussion (by pushing the "reply" rather than the "reply all" button) with one woman who was a climate skeptic. The resulting open-ended discussion ended with mutual respect and a discussion far less encumbered by political baggage. And sometimes doing an absolutely outstanding job can change people's minds: in addition to his enormous talents, the critical trait that enabled Jackie Robinson to successfully integrate major league baseball was his ability to ignore the taunts and slurs and play good baseball. All the arguing in the world couldn't match his getting out on the field and earning the respect of his team and baseball fans everywhere. The parallel in our field is following high ethical and rigorous scientific standards, actively participating in the peer-review process, giving careful, well-documented talks at conferences, and writing excellent peer-reviewed papers, the gold standard for information on weather and climate.

Similarly, restraint, patience, and simple good manners are still important in this age of instant communication. Who hasn't started or escalated an argument through sending a hastily-written email? Add to that the potential for misunderstanding in length-limited "tweets" and "texts," or messages sent by a distracted sender, and the danger of misunderstanding becomes greater. And couldn't we all do without the mean-spirited "comments" that are posted at the end of news articles?

Given the importance of developing trust, one can see the importance of including "weather" as well as "climate" in our discussions. First, while I have stressed the successes, much still needs to be done regarding communicating uncertainty communicating with diverse populations, finding methods for feedback, and so on; which largely builds on our experience with weather events. Second, so much has been said about climate already: why not back off and think about lessoned learned from communicating about weather? And finally, and perhaps most importantly, the difficult conversations about climate might be more productive if we can build on the good will and mutual respect from our shared history

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Footnotes

[1] P. 240, *With a Daughter's Eye*, by Mary Catherine Bateson, HarperPerennial 1994, New York, ISBN 0-06-097573-3. She would keep the cards afterwards, to see how the audience reacted to her ideas.

[2] Bingham, S., Climate change: a moral issue. Chapter 9 in *Creating a Climate for Change*, Susanne C. Moser and Lisa Dilling, Eds., Cambridge University Press, 2007. ISBN 978-0-521-04992-4.

[3] Oreskes, N., and E. Conway, 2010: *Merchants of Doubt:* Bloomsbury Press, New York. ISBN 978-1-59691-4.

Working Together to Inform the Public about Weather: Collaboration Between Communication and Weather Related Disciplines

by Betsy Wackernagel Bach*

The discipline of communication and the weather and climate communities can learn much from each other, as we both engage in research that is related to public health and welfare. This relationship between our disciplines will certainly be highlighted during the 91st annual meeting of the American Meteorological Society (AMS), as the chosen convention theme is "Communicating Weather and Climate." Moreover, collaboration between our disciplines is essential if we are to better inform the public about weather related issues.

While there is already a good deal of research shared by the two disciplines (risk and crisis communication, the effects of climate change, and environmental communication, to name a few), there are other, less obvious ways in which our two disciplines can collaborate: during the *private creation* of science, and the *public dissemination* of science, where the results of creating science are both adapted and communicated to lay audiences. Communication scholars can team with weather related researchers to ensure that both the creation and dissemination of their scientific findings is an effective process.

What is Communication?

To understand how communication researchers can collaborate with those in weather related disciplines in both the creation and dissemination of science, I first provide a very brief overview of our discipline. Communication research includes inquiry by social scientists, humanists, and critical and cultural studies scholars. Its focus is on improving the content and methods of communication teaching/training, and on the cultivation of communication practices that constitute family, education, healthcare, community, workplace, and public life. The following premises are foundational to communication research:

- To understand (dis)valued institutional, societal, or personal outcomes, it is crucial to study the communication *process* through which outcomes are generated.
- The key features of a communication process will depend on whether the process is mediated or face-to face; personal or part of an intuitional frame, largely language-based or highly visual, addressing politically contested or consensually shared values.
- To understand communication problems requires recognition that they are usually the result of multiple, competing legitimate aims.
- Design of messages and campaigns, and interactional scenes and communicative practices related to them (e.g., an appeals process, a deliberation occasion), must take account of the likelihood of interpretive differences and resulting dissent between speakers/planners and the recipients/audience.
- Communication contexts evolve historically and socially and reflect beliefs about persons and meaningful actions that participants will hold.

Based on these premises, we have the expertise to guide scientists in both the private and public phases of communicating science in ways informed by the process and complexity of communication, coupled with a focus on messages and the context in which they are communicated and interpreted. Researchers in our field

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Collaboration (continued from page 5)

have spent decades studying communication dynamics in organizations and, as such, we are well equipped to offer the expertise needed to facilitate communication, collaboration, and complex problem solving in organizational contexts.

The Creation of Science

The creation of science is inherently a communication process, as the creation of science does not occur in a vacuum. Rather, science is shaped through the creation of shared meaning that occurs by way of communication between and among scientists (who can be trained in quite different methodologies and research traditions) working together. Weather related science teams are often interdisciplinary. It is not uncommon to have meteorologists, climatologists, and geographers working together on a single team. These teams must collaborate to frame research questions, carry out investigations, and discuss findings with each other, despite their different backgrounds. Scientists must be able to engage in discourse that allows them to work within different research philosophies, so that the research team reaches some degree of coherence and clarity. This is often referred to as *team science*.

To work collaboratively, scientists must demonstrate interpersonal communication competence, teamwork (which includes problem-solving and decision making), manage conflict, and often communicate across cultural and language differences. They must deal with the reality that *how* a message is communicated is as important as the message *content*. Being able to communicate effectively in a team is the foundation for successfully communicating results to the public.

Thompson's (2009) investigation of collective communication competence in interdisciplinary work teams reinforces the importance of what occurs in the private phase. As scientific problems become more complex, scientists have formed interdisciplinary teams comprised of people with different areas of scientific expertise. These interdisciplinary teams often make communication and collaboration more difficult. Thompson identifies four specific communication processes essential to building collective communication competence: spending time together, practicing trust, discussing language differences and engaging in team tasks. She also specifies communication processes that cause deterioration of collective communication competence such as sarcastic humor and jockeying for power.

However, the creation of science is not just about collaborative teamwork. It involves communication and collaboration with other constituencies, most importantly those people who are often the "face" of science created in weather related disciplines: the on camera weather forecaster who often translates scientific findings for the public.

The Dissemination of Science

The public phase is comprised of events that allow for scientists to engage in communication with public stakeholders and the media about their results. They must present research results clearly and understandably, leading discussion and managing public debate, each of which requires adapting messages to varied audiences. Communication researchers have examined public discussion and deliberation, risk and crisis communication, along with analyzing and adapting messages to various audiences and publics for decades. Communicating science to the public increasingly requires the ability to explain complex findings, translate research into lay language, overcome resistance from opinion leaders and manage organized opposition. It is here where communication scholars can collaborate with weather and climate researchers and on-camera forecasters to help determine the best way to craft messages for public dissemination.

The public and private phases of communicating science are not mutually exclusive. Rather, they are overlapping, ongoing, and continuously impact each other. That said, the implications for studying the

communication of science in the private and public phases are profound and far-reaching. Achievements realized during the public dissemination phase are largely dependent upon the successful creation of science in the private phase. Conversely, the clear communication and public understanding of scientific findings will also have an impact on the private creation phase. Positive or negative feedback from the public, and actions taken on the basis of the findings, will determine how (and indeed whether) the teams continue to work together in the private phases of science creation.

The public and private phases, as well as the mutual influences between them all warrant further, and collaborative, investigation by communication and weather and climate scholars. Such investigation can help to train weather and climate researchers to realize the impact of their private behavior in the creation of science. It will also shape the impact of weather related messages on the public.

If this is a topic of interest to you, please consider attending the special communication session scheduled on January 22-23 (just prior to the AMS general meeting) on "Integrating Communication, Weather and Climate: More than Just 'Talking about the Weather." At this workshop, scholars from both the communication discipline and the weather and climate community will share perspectives relevant to weather and climate, and discuss a series of questions on how our disciplines might collaborate on a number of different weather related issues. If you are unable to attend the communication workshop, please look for a summary after the completion of the AMS annual meeting.

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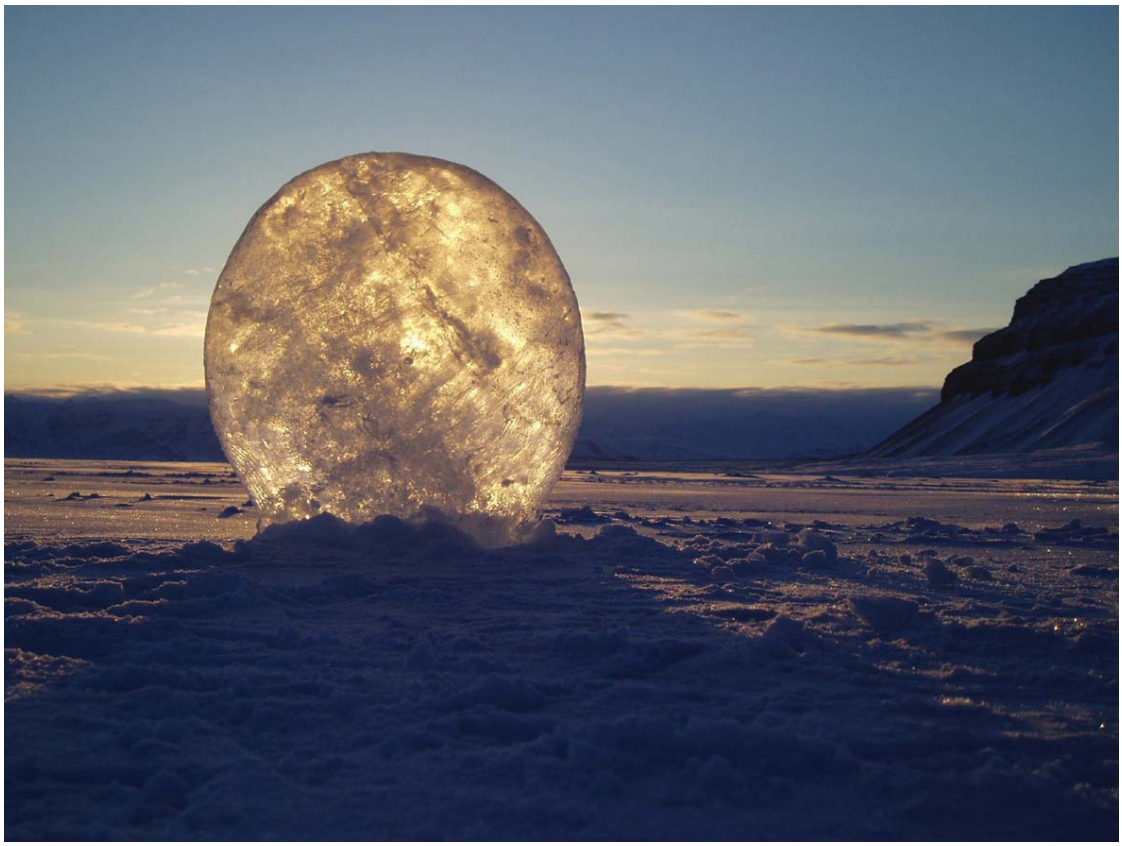

An ice lens carved from glacial ice
Photo credit: Heather and Dan Ackroyd, 2005 Cape Farewell expedition

Does the Weather Make Us Anxious? Reflections on Anxiety, Emotions and Weather

by Renee Lertzman*

Two decades ago when I was in college, I came across the writings of Robert Jay Lifton. Lifton, a psychiatric researcher, had conducted a groundbreaking study on survivors of the bombing in Hiroshima. For the first time, a researcher had unlimited access to people who had experienced, and lived through, the experience of a nuclear bomb. Lifton coined the term "psychic numbing" to describe the stunning capacity for coping with events and circumstances that were arguably beyond imagination. Further, he elaborated dimensions contributing to social trauma, constituting what he called "the broken connection."[1] Through his interviews in Hiroshima, he began to discover the human need for continuity; to imagine life as ongoing beyond our own, and its constancy. Symbols of immortality included works of art, children—and nature. When there was a rupture or a "break" in these symbols, trauma and psychic numbing tended to take place.
The events in Hiroshima presented a radical alteration of nature, of the rhythms and cycles that had become taken for granted. Whereas nature had been a symbol of constancy and immortality through elements such as the mountains, the oceans and the seasons, it was now less certain and more mutable. With the bomb, we could see how, in fact, human intervention can alter things such as mountains, weather patterns, and air quality—things that had been previously taken for granted.

I was studying psychology and environmental studies at the time and was sensitive to the phenomena of environmental change, whether through climate change or more tangible forms of impact, such as deforestation or contamination of the seas. I began to wonder not only about the physical aspects of climate change and anthropogenic alterations of natural systems, but the psychological and social ones as well. With Lifton's work, I began to wonder if the awareness of radical changes in nature, including weather and climate, somehow constituted a form of "psychic numbing" that would enable us to continue on with our day-to-day lives, in the face of growing evidence of radical changes ahead.

Throughout my work as a communications professional and academic researcher, I have explored how we experience and respond to news about our changing world. This doesn't mean what our attitude, beliefs or values are, but the actual gut-level response to news about a changing climate. Attending to *affect* in particular acknowledges the profound role our visceral, often unconscious and energetic responses have in shaping our perceptions of environmental changes (and our subsequent practices and behaviors). We can think of emotion as being the tip of the iceberg—what we are most aware and conscious of (i.e. sad, fearful, angry)—and affect as the feeling tone and energy that informs responses, below the surface. Affect can include anxiety, loss, desire—subtle qualities perhaps linked with particular memories or associations, filtered through our subjective experience. Affect is a particularly useful concept because it acknowledges the highly complex nature of how we experience certain phenomena, mediated often through identity, relationships, social and cultural meanings and an instinctive craving for safety and security (whatever form that may be). While our attitudes, beliefs and values are key components of cognitive processing, research is increasingly reflecting the importance of affect in environmental communications and messaging. [2]

The focus on emotional dimensions and affect is particularly strong in psychotherapeutic and mental health sectors, where people are working on the front lines with individuals and groups, shifting destructive habits or behaviors, managing mental health problems, and working through loss, bereavement, or trauma. The focus is particularly salient in light of how humans process difficult or challenging information, whether about themselves or the world around them.

To say that the prospect of climatic change, and indeed its increasing incidence, can cause anxiety seems to be stating the obvious. And yet, this simple feature of communicating about climate change is rarely acknowledged in either practice or theory. We discuss framing the issues, and how we can translate abstract, systemic and highly uncertain content into terms different audiences can grasp, but rarely is the attention on the emotional tenor of such information, or the affective dimensions such as anxiety, anticipatory loss, or the experience of a threat to one's way of life and identity.

If we accept—just for the moment—that information about climate change can arouse anxiety, possibly acute anxiety, then it seems worthwhile to acknowledge common strategies humans use for coping with anxieties. If we look to the field of psychotherapeutic practice and psychodynamic fieldwork, we find established strategies, or 'mechanisms' to 'defend' against anxiety, usually referred to as "defense mechanisms." The phrase "you're being so defensive!" is one we may

often say in our personal relationships. But defense mechanisms are pervasive and salient to the topic of communicating about climate change. They may include denial (it's not happening), projection (it's all their fault), or disavowal (I know it's happening but I am going to act as if it's not). We are all familiar with this, because we engage in these strategies at various times, under various circumstances. The trouble with defense mechanisms is that while they are designed to protect us from the distress of psychic conflict and dilemmas (i.e. should I fly to see my grandchildren? Can I enjoy pineapple in winter? What would I do if the river rises?), they are largely unconscious and don't usually lead to adaptive behavior. One doesn't decide to deny the existence of a serious problem or bad news, it 'just happens'—and it's also done socially, as well as individually.[3] Socially and culturally we collude in one another's attempts to manage anxiety and keep it at bay.

What does this have to do with communicating about climate change, you may be wondering? There are a number of implications. First is the basic recognition that how people respond to such news may not correlate with the level of concern, care or anxiety. To shut down, deny, or turn away may be a normal response to information that appears to be overwhelming and threatening. Returning to Lifton's concept of psychic numbing, the idea of extreme weather changes can be too much to consider and can lead to a turning away or 'numbing.' This presents a formidable challenge for communications.

Second is recognition that we cannot separate out emotional responses to these issues, as much as we'd like. This means assuming from the get-go that people may become upset, anxious or depressed about the topic of climate change and the weather, and it can lead to a sense of melancholy—what Glenn Albrecht has termed "solastasia," experiencing profound loss of places altered through environmental change.

How this translates into practice is another matter, and indeed there is a tremendous need for further research in this area, drawing from multiple disciplines and engaging in productive dialogs amongst psychologists, communications professionals, scientists, social scientists and humanities.[4] One possible take-away, if we look to the practice of psychotherapy with groups and individuals, is the necessity for people to feel safe and secure in confronting difficult or painful truths. This can take a number of forms, for example, encouraging social forms of engaging with these issues, so people are coming together and sharing socially what this means for us as communities.[5] It can inform the ways we communicate about these issues across multiple audiences, with sensitivity toward providing both information and guidance in terms of actions. Or, it can be as simple as acknowledging that these are potentially frightening issues, but that we are all in this together, and working collectively for creative and informed responses.

Attending to emotional and affective dimensions of climate change and how we communicate can profoundly complement existing innovative studies in the psychology and communications of climate change. The more readily we can incorporate such dimensions into our work and practice, I suspect, the more effective we may be at getting our messages across, and having them 'land.'

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Footnotes

[1] See Lifton, R.J. (1979) The Broken Connection. New York: Simon & Schuster.

[2] For example, see Leiserowitz, A. (2006) "Climate change risk perception and policy preferences: The role of affect, imagery, and values." *Climatic Change* (77), 45-72; Lorenzoni, I., Nicholson-Cole, S. and L. Whitmarsh, (2007) "Barriers perceived to engaging with climate change among the UK public and their policy implications." *Global Environmental Change* (17), 445–459; Stoll-Kleemann, O'Riordan, T. and Jaeger, C.C. (2001) "The psychology of denial concerning climate mitigation measures: evidence from Swiss focus groups." *Global Environmental Change* (11), 107-117; and Randall, R. (2009) "Loss and Climate Change: The Cost of Parallel Narratives." *Ecopsychology*, 1(3), 118-129.

[3] For example, Kari Norgaard's work on the social production of climate denial in a community in Norway; see Norgaard, K. (2011) *Living with Denial*: Climate change, emotions and everyday life. Cambridge: MIT Press (forthcoming).

[4] The role of the arts in climate communication is one of the more exciting areas in the field at the moment. For example, see the international project, Cape Farewell (www.capefarewell.com), a climate arts project with internationally renowned artists, working alongside scientists on voyages to the Arctic. See also my interview with Cape Farewell founder, David Buckland in Environmental Communication: A Journal of Nature and Culture, 2008.

[5] The work of Cambridge Carbon Footprint, UK is particularly notable: the organization runs "Carbon Conversations," discussion groups that meet over several weeks, and incorporates non-threatening and low-key activities such discussing lifestyle changes and a game designed to address carbon emissions mitigation. See http://cambridgecarbonfootprint.org/ for more information.

Contested Predictions: The Significance of Modeling to Public Climate Debates

by Karen Akerlof*

"As a result of our inaction, we have three options: mitigation, adaptation, and suffering," glaciologist Lonnie Thompson recently wrote (2010). In the United States over the past two decades, political response to climate change has been stymied, in part, by arguments that uncertainties in the projections of computer models do not support costly policy prescriptions for reducing greenhouse gas emissions. The ability of computer models to produce accurate information about complex climate processes has been questioned by skeptics (Idso & Singer, 2009). Meanwhile, policymakers have used the controversy and uncertainties to avoid difficult policy decisions, preferring to fund additional research (Lemos & Rood, 2010).

Yet as increasingly variable climates pose challenges to decision makers at all governmental levels, they will likely rely upon climate projections in making policies on decadal and multi-decadal time scales. A National Research Council (NRC) study on advancing climate modeling stated, "Climate models are the foundation for understanding and projecting climate and climate-related changes and are thus critical tools for supporting climate-related decision making" (2010). In this article, I argue for significance of climate modeling and prediction to an understanding of the context of past and present climate debates, and why they will be even more important to future discourses on adaptation policy.

Half a year after James Hansen's testimony before Congress in which he declared that "with 99 percent confidence" he believed Earth's temperature was rising (Weart, 2003), President George H. W. Bush took office, pledging to counter the greenhouse effect with the "White House effect" (Weisskopf, 1992). His Chief of Staff John Sununu convinced him otherwise. As Sununu later described, "Our response to their call for policy change in 1989 was to point out that their models should be supported by good science, and that in order to get good science, we would provide a very substantial increase in funding for global climate research" (Sununu, 2009). Twenty years later, the MIT engineer still claims that the "Global Climate Models' predictions of doom" are used to back up facts that have been "cherry picked" by alarmists. "Since basic hard science is more difficult to bias, they … resort … to modeling."

Climate models have become "a lightning rod in the climate debate" (Revkin, 2004). In a chapter on "Global Climate Models and Their Limitations," critics of the Intergovernmental Panel on Climate Change (IPCC) wrote that "scientists working in fields characterized by complexity and uncertainty are apt to confuse the output of models—which are nothing more than a statement of how the modeler believes a part of the world works—with real-world trends and forecasts. Computer climate modelers certainly fall into this trap, and they have been severely criticized for failing to notice that their models fail to replicate real-world phenomena by many scientists … " (Idso & Singer, 2009, p. 10).

"The epistemology of modeling is a central focus of climate politics," Edwards wrote (1999, p. 460). The rhetoric relies on a philosophical argument about the value of theory as opposed to observation. Those who prioritize theory—termed "frontier scientists"—see models as useful tools, while "high-proof" scientists who place a higher value on observation emphasize model inadequacies such as parameterization. These debates over the use of models presuppose a clear distinction between the three realms of climate science—modeling, theory and observation—that in fact do not exist (Edwards 1999, 2010). Model parameterizations merge theory with observations, and diverse data sets require models to assimilate them due to differences in sources and calibration.

The eruption of "Climategate" just prior to the December 2009 United Nations climate summit in Copenhagen illustrates the importance of the science of climate modeling to the oratory of climate policy debates and public involvement in the discourse. The Internet distribution of more than a 1,000 hacked e-mails and documents from

servers of the Climatic Research Unit (CRU) at the University of East Anglia spurred controversy over perceived lack of public access to the observational data sources used by the models and the politicization of the scientific review and publication process in the field of climatology (Schiermeier, 2009). Polls found that public concern about climate change dropped substantially in the United States after the controversy (Leiserowitz, Maibach, Roser-Renouf, Smith & Dawson, 2010). Britain and Germany underwent similar declines (Rosenthal, 2010).

Complicating matters, the uncertainties both in climate predictions for the next few decades and in longer range projections may widen with the use of new modeling techniques and as additional climate processes and feedbacks are incorporated to produce more realistic simulations (Trenberth, 2010). When only about one-third of the public in the United States currently believes that there is scientific consensus even on whether global warming is occurring (Leiserowitz, Maibach, Roser-Renouf & Smith, 2010), the introduction of additional uncertainties into science reports such as the fifth IPCC assessment, expected in 2013, may further confound the public's understanding of the issue (Trenberth, 2010). Trenberth notes that the notion that uncertainty in climate model projections could increase even as the science improves may be extremely counterintuitive for lay audiences.

Lemos and Rood have pointed to a conflict between the perceived usefulness of climate predictions, and their usability (2010). Human beings have long been driven to divine the future, only the techniques we use have changed. As computers began to be commercially available in the 1950s, computer models became a primary tool for forecasting, including in both climate science and meteorology (Edwards, 2010). Increases in computing power and understanding of Earth's climatic processes have led to models with higher resolution and fuller realization of atmospheric, land and ocean systems.

Modelers (Shukla et al, 2009) and decision makers (Morello, 2010) have suggested that further improvements in modeling—indeed a revolution in the science—will be needed to meet the societal challenges of adapting to climate change. Researchers who have studied the use of seasonal climate forecasts by policymakers have countered that the relationship between improvements in scientific technology and better decision making is not always linear, and reducing uncertainties does not always contribute to improved policy development (Lemos & Dilling, 2007; Lemos & Rood, 2010). "Effective and robust adaptation strategies are not significantly limited by the absence of accurate and precise regional climate predictions. They are limited more by a multitude of technological, institutional, cultural, economic and psychological factors that lie beyond the reach of climate models—and always will," wrote Hulme and Dessai (2008).

To date there appears to be no systematic evaluation of the treatment of prediction and climate models in public climate debates, even though their use for decision making has been contentious. Similarly, resources developed for journalists and other communicators on climate change may fail to specifically address this topic (McFarling, 2006; Moser & Dilling, 2007; Ward, 2008). "Climate controversies constantly lead into the guts of the infrastructure, inverting it and reviving, over and over again, debates about the origins of numbers" wrote Edwards in his book on climate modeling and global politics (Edwards, 2010, p. 432). The structure of these debates is derived from the nature of the science, its continual "re-interrogation" of past records to enhance the accuracy with which we understand climate processes, and our abilities to forecast the future.

The framing of conflicts over climate policy has been shaped by its origins as a scientific problem and early decisions by politicians to keep it within that sphere, increasing research into its causes and impacts and reducing uncertainties before committing to greenhouse gas reductions (Sarewitz & Pielke, 2000). Thus delving into the "guts" of climate science may further elucidate what it is that we are arguing over, and whether it is material to the decisions that society will need to make.

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Conferences & Opportunities

Weather and Society * Integrated Studies 2011 Summer Workshop

Host: National Center for Atmospheric Research (NCAR) Societal Impacts Program (SIP)
Date: August 4-12, 2011
Location: Boulder, Colorado
For More Information: Please visit www.sip.ucar.edu/wasis

The National Center for Atmospheric Research (NCAR) Societal Impacts Program (SIP) is happy to announce that it will hold the 2011 Summer WAS*IS workshop August 4-12, 2011, in Boulder, Colorado. Workshop information, including how to apply, will be posted on the WAS*IS webpage by early February 2011. Applications for the WAS*IS workshop are due by March 25, 2011.

If you have questions about the 2011 Summer WAS*IS workshop, please visit www.sip.ucar.edu/wasis or contact Emily Laidlaw at laidlaw@ucar.edu.

Summer Institute on Climate Change

Host: Cooperative Institute for Climate and Satellites—North Carolina, in collaboration with NC State and NOAA's National Climatic Data Center
Date: June 15 - July 1, 2011
Location: Asheville, North Carolina
For More Information: Please visit http://si.cicsnc.org/

The Cooperative Institute for Climate and Satellites—North Carolina (CICS-NC) is pleased to announce the Summer Institute on Climate Change (SIC2). In collaboration with NC State and NOAA's National Climatic Data Center, the Summer Institute is created to provide science and services to establish an informed society capable of anticipating and responding to climate change and its impacts. The theme of the 2011 Summer Institute is "Turning adaptation into action: Define your strategic Advantage.

This two and a half week course offers professionals, researchers, policy makers and practitioners the opportunity to learn practical methods for integrating climate knowledge and adaptation mechanisms into their decision-making processes. The training course is a combination of expert lectures, special seminars, focused discussions and practical exercises. For more information or to apply, please visit http://si.cicsnc.org/. Application deadline is March 11, 2011.

8th International Conference on Information Systems for Crisis Response and Management (ISCRAM)

Host: National Civil Engineering Laboratory
Date: May 8 - 11, 2011
Location: Libson, Portugal
For More Information: Please visit http://www.iscram.org/iscram2011/

Each year, ISCRAM brings together top researchers and practitioners working in the area of information systems and crisis management. The conference provides an excellent opportunity to exchange information and knowledge on new research and best practices with a diverse group of colleagues. The theme of the 2011 meeting will be "From early-warning systems to preparedness and training." For more information, please visit http://www.iscram.org/iscram2011/.

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Weathering the Cultural Storm: Recasting the Natural World of Perceived Disaster

by Vankita Brown*

For most of the history of our species we were helpless to understand how nature works. We took every storm, drought, illness and comet personally. We created myths and spirits in an attempt to explain the patterns of nature.
Ann Druyan

God moves in a mysterious way, His wonders to perform. He plants his footsteps in the sea, and rides upon the storm.
William Cowper

To those who are outside of the study of meteorology, weather can be a mysterious and awe-inspiring phenomenon, to which many people often ascribe an array of personal and culturally specific meanings, beliefs, and social practices. These weather-related dynamics are not casual and fleeting moments in life's challenging journey but, rather, function as a way of reconciling and resigning the self to the ways that mystical and transcendental forces are seen to operate in a world outside of human understanding and human control. God speaks and seeks to impact human life through naturally occurring events, such as earthquakes, volcano eruptions, tornadoes, and destructive hurricanes; all are seen as the majesty and providence of almighty God at work. Universally, those natural events in which water, in particular, is the destructive force hold special significance, for water is believed to bring a cleansing power that washes away all the humanly created and lived impurities so that a new beginning might emerge. World religions such as Islam, Christianity, Judaism, and Hinduism, in addition to many other faiths, have a sustained reverence for water, which is also associated with apocalyptic concepts of life and death, and is often the main component of birth and death rituals. The Judeo-Christian Bible is replete with multiple reminders of water as a primordial spiritual cleansing agent, from the Great Flood to the baptism of the proclaimed savior of the world, Jesus Christ.

This symbolism is also played out in more contemporary events, such as with the Indonesian tsunami, the flood in Pakistan, and, of course, Hurricane Katrina. For those who are devotees of religious lore, seemingly destructive acts of nature are better understood and appreciated as evidence of God's power, will, and direct and needed intervention in human affairs. Because this symbolism is grounded in deeply held religious and spiritual beliefs and practices, it serves as a cultural signifier that impacts and directs one's view of the world and one's relationship to that world. Whereas non-believers often dismiss such beliefs and practices as no more than folkloric fancy, it is critical to recognize that how people often "weather the storm" may have more to do with perceptions of what's coming, and it may be more than just water, but what's in the water, and what's coming through the water, and why it's coming for me.

Many cultures are taught to cultivate powerful affective sentiments in forging a relationship with nature that is grounded in love, respect, and adoration, and consuming awe. With the understanding that nature is God's handiwork and responds to celestial command, nature in all its forms is to be appreciated as a venue in which the creator manifests her magnificence. Given such a foundation, it is no mystery that some people would rather trust nature over frail humanity's feebleness and inability to outwit it or outrun it. Likewise, to turn one's back on the awesomeness of God's work would, indeed, be nothing short of blasphemy.

"God is love;
he is merciful and kind;
he moves in mysterious ways;
his wonders to perform;
he plants his footsteps on the sea, and rides on every storm."
Such a God has the power and foresight to act in ways that puny humanity is powerless to comprehend. What on

the surface may seem like destructiveness of disaster where human life and property are concerned, at another level is appreciated as operating for the betterment of humankind, even if that means loss or destruction of some kind.

A recent and poignant illustration of "weathering the storm" was encountered while conducting field research in New Orleans in 2009. I interviewed the Director of Homeland Security and Office of Emergency Preparedness for Plaquemines Parish, Jesse St. Amant, who was one of the first to call for evacuation in the area. He told me a story of a senior couple that was adamant about not "evacuating" (his term), but rather not "abandoning" (their term) their home in anticipation of the imminent arrival of Hurricane Katrina. St. Amant explained to the couple that there would be no emergency services available, and pleaded with them to leave as soon as possible. They explained to him that they had survived other hurricanes that preceded Katrina, and if God was willing, they would also survive Katrina. St. Amant said that he reluctantly left the couple in their home, since he had no choice other than to acquiesce to their decision to stay. "I tried to get them to leave, but this is America, and you have the right to live and die where you want," he told me. When he and his team re-entered Plaquemines Parish after the storm, he found the same couple two doors down from their house, deceased.

Although the sentiments of the couple may sound irrational to some, many people contemplate the possibility that a natural event could be their God reaching out to them, calling them home. And for them, given their belief in a post-death celestial home, there is no other place they would rather be than their earthly home in serene preparation for the final journey to their home in paradise. The decision to accept God's call transcends fear or the petty thought of impending disaster! Indeed, what Hurricane Katrina did and other natural "calamities" do is invite persons to ponder the meaning of life and the pivotal question of a community's relationship with its creator. Psychologically and spiritually, people make conscious choices to ready themselves during such occurrences for the possibility of a renewal or re-birth of life in physical death.

This is what social scientists mean when they say that risk and disaster are socially constructed concepts. Perceptions of risk and disaster are relative to a specific population, at a particular time and place, and under certain conditions. The interpretation of "risk" must be recast as relative to who is threatened, and what is considered to be the source of the threat. Neither the God of love and mercy, nor her mystical and wondrous work, is ever devalued and blasphemed as a threat, but rather acts of love, mercy, and sacrifice. Therefore, when viewing the world through this cultural lens, it is critical to recognize and process the significance for the way others interpret the universe around them and, subsequently, how they view their location and relationship to and in that universe.

This is not a discussion primarily about religion or spirituality, but more about a community's understanding and interpretation of the world that they inhabit, their relationship to that world, and how their cultural beliefs—folkloric or otherwise—inform a significant part of their behavior. When community and cultural traditions are relegated to the periphery while trying to assess behavior with regard to perceived natural disasters, all the components necessary to conduct a comprehensive analysis are not being considered. What scientists, academicians, and public officials have come to consider as logical behavior must not be the only barometer that is used to analyze what are often culturally-based ways of being, knowing, and acting in the world.

Additionally, the scholarly community, in particular, must re-assess and, perhaps, challenge its established academic leanings. Scholars are trained to subscribe to a set of epistemological protocols that guide their investigations of and approaches to knowledge, which, ultimately, colors what counts as knowledge, and what is dismissed as fancy. Yet, in order to make real progress in understanding the complex world in which we live, it is critical that a people's ontology (way of understanding what is) be recognized and appreciated for its role in shaping their minds, spirits, and actions.

If we are dedicated to understanding the world and, more specifically, the potential implications and social consequences of weather, we must be about the business of entrenching ourselves into the diverse cultural worlds of the many communities that enrich this nation.

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The purpose of *Weather and Society Watch* is to provide a forum for those interested in the societal impacts of weather and weather forecasting to discuss and debate relevant issues, ask questions, and stimulate perspective. The newsletter is intended to serve as a vehicle for building a stronger, more informed societal impacts community.

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of NSF or other sponsors. Contributions to *Weather and Society Watch* are subject to technical editing at the discretion of SIP staff.

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About SIP

All aspects of the U.S. public sector, along with the nation's economy, are directly and indirectly affected by weather. Although the economic impacts of weather and weather information on U.S. economic agents have been loosely documented over the years, no definitive assessments have been performed, and information generated from the previous studies is difficult to locate and synthesize.

SIP, initiated in 2004 and funded by NOAA's U.S. Weather Research Program (USWRP) and NCAR, aims to improve the societal gains from weather forecasting. SIP researchers work to infuse social science and economic research, methods and capabilities into the planning, execution and analysis of weather information, applications, and research directions. SIP serves as a focal point for developing and supporting a closer relationship between researchers, operational forecasters, relevant end users, and social scientists concerned with the impacts of weather and weather information on society. Program activities include primary research, outreach and education, and development and support for the weather impacts community.

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