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Climate Science as Culture War

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ABSTRACT: The public debate around climate change is no longer about carbon dioxide and climate models. It is about values, culture, worldviews, and ideology. And the greater the efforts to present sophisticated data on climate change—without attending to the values that climate change threatens—the greater resistance there will be to a social consensus on global warming.

In May 2009, a development officer at the University of Michigan asked me to meet with a potential donor—a former football player and now successful businessman who had an interest in environmental issues and business, my interdisciplinary area of expertise. The meeting began at 7 a.m., and while still nursing my first cup of coffee the potential donor began the conversation with "I think the scientific review process is corrupt." I asked what he thought of a university based on that system, and he said that he thought that the university was then corrupt, too. He went on to describe the science of climate change as a hoax, using all the familiar lines of attack—sun spots and solar flares, the unscientific and politically flawed consensus model, and the environmental benefits of carbon dioxide.

As we debated each point, he turned his attack on me, asking why I hated capitalism and why I wanted to destroy the economy by teaching environmental issues in a business school. Eventually, he asked if I knew why Earth Day was on April 22. I sighed, as he explained, "Because it is Karl Marx's birthday." (I suspect he meant to say Vladimir Lenin, whose birthday is April 22 and is also Earth Day. This linkage has long been a source of support for some on the far right who believe that Earth Day is a Communist plot, even though Lenin never promoted environmentalism and Communism does not have a strong environmental legacy.)

I turned to the development officer and asked, "What's our agenda here this morning?" The donor interrupted to say that he wanted to buy me a ticket to the Heartland Institute's Fourth Annual Conference on Climate Change, the leading climate skeptics conference. I checked my calendar and, citing prior commitments, politely declined. The meeting soon ended.

I spent the morning trying to make sense of the encounter. At first, all I could see was a bait and switch; the donor had no interest in funding research in business and the environment but instead wanted to criticize the effort. I dismissed him as an irrational zealot, but the meeting lingered in my mind. The more I thought about it, the more I began to see that he was speaking from a coherent and consistent worldview, one I did not agree with but which was a coherent viewpoint nonetheless. Plus, he had come to evangelize me. The more I thought about it, the more I became eager to learn about where he was coming from, where I was coming from, and why our two worldviews clashed so strongly in the present social debate over climate science. Ironically, in his desire to challenge my research, he stimulated a new research stream, one that fit perfectly with my broader research agenda on social, institutional, and cultural change.

Scientific vs. Social Consensus

Today, there is no doubt that a *scientific consensus* exists on the issue of climate change. Scientists have documented that anthropogenic sources of greenhouse gases are leading to a buildup in the atmosphere, which leads to a general warming of the global climate and an alteration in the statistical distribution of localized weather patterns over long periods of time. This assessment is endorsed by a large body of scientific agencies—including every one of the national scientific agencies of the G8 + 5 countries—and by the vast majority of climatologists. The majority of research articles published in refereed scientific journals also support this scientific assessment. Both the US National Academies of Science and the American Association for the Advancement of Science use the word "consensus" when describing the state of climate science.

And yet a *social consensus* on climate change does not exist. Surveys show that the American public's belief in the science of climate change has mostly declined over the past five years, with large percentages of the population remaining skeptical of the science. Belief declined from 71 percent to 57 percent between April 2008 and October 2009, according to an

October 2009 Pew Research Center poll; more recently, belief rose to 62 percent, according to a February 2012 report by the National Survey of American Public Opinion on Climate Change. Such a significant number of dissenters tells us that we do not have a set of socially accepted beliefs on climate change—beliefs that emerge, not from individual preferences, but from societal norms; beliefs that represent those on the political left, right, and center as well those whose cultural identifications are urban, rural, religious, agnostic, young, old, ethnic, or racial.

Why is this so? Why do such large numbers of the American public reject the consensus of the scientific community? With upwards of two thirds of Americans not clearly understanding science or the scientific process and fewer able to pass even a basic scientific literacy test, according to a 2009 California Academy of Sciences survey, we are left to wonder: How do people interpret and validate the opinions of the scientific community? The answers to this question can be found, not from the physical sciences, but from the social science disciplines of psychology, sociology, anthropology, and others.

To understand the processes by which a social consensus can emerge on climate change, we must understand that people's opinions on this and other complex scientific issues are based on their prior ideological preferences, personal experience, and values—all of which are heavily influenced by their referent groups and their individual psychology. Physical scientists may set the parameters for understanding the technical aspects of the climate debate, but they do not have the final word on whether society accepts or even understands their conclusions. The constituency that is relevant in the social debate goes beyond scientific experts. And the processes by which this constituency understands and assesses the science of climate change go far beyond its technical merits. We must acknowledge that the debate over climate change, like almost all environmental issues, is a debate over culture, worldviews and ideology.

This fact can be seen most vividly in the growing partisan divide over the issue. Political affiliation is one of the strongest correlates with individual uncertainty about climate change, not scientific knowledge.[1] The percentage of conservatives and Republicans who believe that the effects of global warming have already begun declined from roughly 50 percent in 2001 to about 30 percent in 2010, while the corresponding percentage for liberals and Democrats increased from roughly 60 percent in 2001 to about 70 percent in 2010[2] (see Figure 1 on page TK).

Climate change has become enmeshed in the so-called "culture wars." Acceptance of the scientific consensus is now seen as an alignment with liberal views consistent with other "cultural" issues that divide the country (i.e., abortion, gun control, health care, and evolution). This partisan divide on climate change was not the case in the 1990s. It is a recent phenomenon, following in the wake of the 1997 Kyoto Treaty that threatened the material interests of powerful economic and political interests, particularly members of the fossil-fuel industry.[3] The great danger of a protracted partisan divide is that the debate will take the form of what I call a "logic schism," a breakdown in debate, in which opposing sides are talk about completely different cultural issues.[4]

This article seeks to delve into the climate change debate through the lens of the social sciences. I take this approach not because the physical sciences have become less relevant, but because we need to understand the social and psychological processes by which people receive and understand the science of global warming. I explain the cultural dimensions of the climate debate as it is presently configured, outline three possible paths by which the debate can progress, and describe specific techniques that can drive that debate toward broader consensus. This goal is imperative, for without a broader consensus on climate change in the United States,

Americans and citizens around the globe will be unable to formulate effective social, political, and economic solutions to the changing circumstances of our planet.

Cultural Processing of Climate Science

When analyzing complex scientific information, people are "boundedly rational," to use Herbert Simon's phrase; we are "cognitive misers," according to Susan Fiske and Shelley Taylor, with limited cognitive capacity to fully investigate every issue we face. People everywhere employ ideological filters that reflect their identity, worldview, and belief systems. These filters are strongly influenced by group values, and we generally endorse the position that most directly reinforces the connection we have with others in our referent group—what Dan Kahan refers to as "cultural cognition." In so doing, we cement our connection with our cultural groups and strengthen our definition of self. This tendency is driven by an innate desire to maintain a consistency in beliefs by giving greater weight to evidence and arguments that support pre-existing beliefs, and by expending disproportionate energy trying to refute views or arguments that are contrary to those beliefs. Instead of investigating a complex issue, we often simply learn what our referent group believes and seek to integrate those beliefs with our own views.

Over time, these ideological filters become increasingly stable and resistant to change through multiple reinforcing mechanisms. First, we'll consider evidence when it is accepted or, ideally, presented by a knowledgeable source from our cultural community; and we'll dismiss information that is advocated by sources that represent groups whose values we reject. Second, we will selectively choose information sources that support our ideological position. For example, frequent viewers of Fox News are more likely to say that the Earth's temperature has not been rising, that any temperature increase is not due to human activities, and that addressing climate change would have deleterious effects on the economy.[5] One might expect the converse to be true of National Public Radio listeners. The result of this cultural processing and group cohesion dynamics lead to two overriding conclusions about the climate change debate

First, climate change IS NOT a "pollution" issue. While the US Supreme Court decided in 2007 that greenhouse gases were legally an air pollutant, in a cultural sense, they are something far different. The reduction of greenhouse gases is not the same as the reduction of sulfur oxides, nitrogen oxides, carbon monoxide, or particulates. These forms of pollution are manmade, they are harmful, and they are the unintended waste products of industrial production. Ideally, we would like to eliminate their production through the mobilization of economic and technical resources. But the chief greenhouse gas, carbon dioxide, is both manmade and natural. It is not inherently harmful; it is natural part of the natural systems; and we do not desire to eliminate its production. It is not a toxic waste or a strictly technical problem to be solved. Rather, it is an endemic part of our society and who we are. To a large degree, it is a highly desirable output as it correlates with our standard of living. Greenhouse gas emissions rise with a rise in a nation's wealth, something all people want. To reduce carbon dioxide requires an alteration in nearly every facet of the economy, and therefore, nearly every facet of our culture. To recognize greenhouse gases as a problem requires us to change a great deal about how we view the world and ourselves within it. And that leads to the second distinction.

Climate change IS an existential challenge to our contemporary worldviews. The cultural challenge of climate change is enormous and threefold, each facet leading to the next. The *first facet* is that we have to think of a formerly benign, even beneficial, material in a new way—as a relative, not absolute, hazard. Only in an imbalanced concentration does it become

problematic. But to understand and accept this, we need to conceive of the global ecosystem in a new way.

This challenge leads us to the *second facet:* Not only do we have to change our view of the ecosystem, but we also have to change our view of our place within it. Have we as a species grown to such numbers, and has our technology grown to such power, that we can alter and manage the ecosystem on a planetary scale? This is an enormous cultural question that alters our worldviews. As a result, some see the question and subsequent answer as intellectual and spiritual hubris, while others see it as self-evident.

But if we answer this question in the affirmative, the *third facet* challenges us to consider new and perhaps unprecedented forms of global ethics and governance to address it. Climate change is the ultimate "commons problem," as Garrett Hardin defined it, where every individual has an incentive to emit greenhouse gases to improve their standard of living, while the costs of this activity are borne by all. Unfortunately, the distribution of costs in this global issue is asymmetrical with vulnerable populations in poor countries bearing the larger burden. So we need to rethink our ethics to keep pace with our technological abilities. Does mowing the lawn or driving a fuel inefficient car in Ann Arbor, Mich. have ethical implications for the people in low-lying areas of Bangladesh? If you accept anthropogenic climate change, then the answer to this question is yes, and we must develop global institutions to reflect that recognition. But this is an issue of global ethics and governance on a scale that we have never seen, affecting virtually every economic activity on the globe and requiring the most complicated and intrusive global agreement ever negotiated.

Taken together, these three facets of our existential challenge illustrate the magnitude of the cultural debate that climate change provokes. Climate change challenges us to examine previously unexamined beliefs and worldviews. It acts as a flashpoint (albeit a massive one) for deeper cultural and ideological conflicts that lie at the root of many of our environmental problems, and includes differing conceptions of science, economics, religion, psychology, media, development, and governance. It is a proxy for "deeper conflicts over alternative visions of the future and competing centers of authority in society," as Mike Hulme underscores in *Why We Disagree About Climate Change*. And, as such, it provokes a violent debate among cultural communities on one side who perceive their values to be threatened by change, and cultural communities on the other side who perceive their values to be threatened by the status quo.

Three Ways Forward

If the public debate over climate change is no longer about greenhouse gases and climate models, but about values, worldviews, and ideology, what form will this clash of ideologies take? I see three possible forms.

The Optimistic Form is where people do not have to change their values at all. In other words, the easiest way to eliminate the commons problem of climate change is to develop technological solutions that do not require major alterations to our values, worldviews, or behavior: carbon-free renewable energy, carbon capture and sequestration technologies, geo-engineering, or others. Some see this as an unrealistic future. Others see it as the only way forward since people become attached to their level of prosperity, feel entitled to keep it, and will not accept restraints or support government efforts to impose restraints.[6] Government-led investment in alternative energy sources, therefore, becomes more viable than the enactment of regulations and taxes to reduce fossil fuel use.

The Pessimistic Form is where people will fight to protect their values. This most dire

outcome results in a logic schism, where opposing sides debate different issues, seek only information that supports their position and disconfirms the others', and even go so far as to demonize the other. Roger Pielke in *The Honest Broker: Making Sense of Science in Policy and Politics* describes the extreme of such schisms as "abortion politics," where the two sides are debating completely different issues and "no amount of scientific information … can reconcile the different values." Consider, for example, the recent decision by the Heartland Institute to post a billboard in Chicago comparing those who believe in climate change with the Unabomber. In reply, climate activist groups posted billboards attacking Heartland and its financial supporters. This attack-counter attack strategy is symptomatic of a broken public discourse over climate change.

The Consensus-based Form involves a reasoned societal debate, focused on the full scope of technical and social dimensions of the problem and the feasibility and desirability of multiple solutions. It is this form to which scientists have the most to offer, playing the role of what Peilke calls the "honest broker"—a person who can "integrate scientific knowledge with stakeholder concerns to explore alternative possible courses of action." In this form of social debate, resolution is found through a focus on its underlying elements, moving away from positions (e.g., climate change is or is not happening), and toward the underlying interests and values at play. How do we get there? Research in negotiation and dispute resolution can offer techniques for moving forward.

Techniques for a Consensus-based Discussion

In seeking a social consensus on climate change, discussion must move beyond a strict focus on the technical aspects of the science to include its cultural underpinnings. Below are eight techniques for exploring the ideological filters that people use in the social debate.

1. Know your audience. Any message on climate change must be framed in a way that fits with the cultural norms of the target audience. The 2011 study *Climate Change in the American Mind* offers a segmentation of the American public into six groups when it comes to views on climate change science (see sidebar on page TK). On the two extremes are the climate change "believers" and "disbelievers." Consensus-based discussion is not open to these groups, as they are already employing logic schism tactics that are closed to debate or engagement. The polarity of these groups is well known: on the one side, climate change is a hoax, humans have no impact on the climate, and nothing is happening; on the other side, climate change is an imminent crisis that will devastate the Earth and human activity explains all climate changes.

The challenge is to move the debate away from the loud minorities at the extremes and to engage the majority in the middle—the "convinced," the "skeptical," and the "disengaged." People in these groups are more open to consensus-based debate, and through direct engagement can be separated from the ideological extremes of their cultural community.

2. Ask the right scientific questions. For a consensus-based discussion, climate change science should be presented not as a binary yes or no question,[7] but as a series of six questions. Some are scientific in nature, with associated levels of uncertainty and probability; others are matters of scientific judgment.

1. *Are greenhouse gas concentrations increasing in the atmosphere?* Yes. This is a scientific question, based on rigorous data and measurements of atmospheric chemistry and science. In fact, as William Nordhaus wrote in the *New York Times* inMarch 2012, "The finding that global temperatures are rising over the last century-plus is one of the most robust findings in climate science and statistics."

Commented [HA1]: It was March 22 if you want the exact date

2. *Does this increase lead to a general warming of the planet?* Yes. This is also a scientific question; the chemical mechanics of the greenhouse effect and "negative radiative forcing" are well established.
3. *Has climate changed over the past century?* Yes. Global temperature increases have been rigorously measured through multiple techniques and strongly supported by multiple scientific analyses.
4. *Are humans partially responsible for this increase?* The answer to this question is a matter of scientific judgment. Increases in global mean temperatures have a very strong correlation with increases in man-made greenhouse gases since the industrial revolution. While science cannot confirm causation, fingerprint analysis of multiple possible causes has been examined, and the only plausible explanation is that of human-induced temperature changes. Until a plausible alternative hypothesis is presented, this explanation prevails for the scientific community.
5. *Will the climate continue to change over the next century?* Again, this question is a matter of scientific judgment. But given the answers to the previous four questions, it is reasonable to believe that continued increases in greenhouse gases will lead to continued changes in the climate.
6. *What will be the environmental and social impact of such change?* This is the scientific question with the greatest uncertainty. The answer comprises a bell curve of possible outcomes and varying associated probabilities, from low to extreme impact. Uncertainty in this variation is due to limited current data on the Earth's climate system, imperfect modeling of these physical processes, and the unpredictability of human actions that can both exasperate or moderate the climate shifts. These uncertainties make predictions difficult and are an area upon which much debate can take place. And yet, the physical impacts of climate change are already becoming visible in ways that are consistent with scientific modeling, particularly in Greenland, the Arctic, the Antarctic, and low-lying islands.

In asking each of these questions, a central consideration is whether people recognize the level of scientific consensus associated with each one. In fact, studies have shown that people's support for climate policies and action are linked to their perceptions about scientific agreement on the issue. But the reality is that the belief that "most scientists think global warming is happening" declined from 47 percent to 39 percent among Americans between 2008 and 2011.[8]

3. Move beyond data and models. Climate skepticism is not a knowledge deficit issue. Aaron McCright and Riley Dunlap have observed that increased education and self-reported understanding of climate science has been shown to correlate with lower concern among conservatives and Republicans and greater concern among liberals and Democrats. Research also has found that once people have made up their minds on the science of the climate issue, providing continued scientific evidence actually makes them more resolute in resisting conclusions that are at variance with their cultural beliefs.[9] One needs to recognize that reasoning is suffused with emotion and people often use reasoning to reach a predetermined end that fits their cultural worldviews. When people hear about climate change, they may, for example, hear an implicit criticism that their lifestyle is the cause of the issue or that they are morally deficient for not recognizing it. But emotion can be a useful ally; it can create the abiding commitments needed to sustain action on the difficult issue of climate change. To do this, people must be convinced that something can be done to address it; that the challenge is not too great nor are its impacts preordained. The key to engaging people in a consensus-driven debate about climate

change is to confront the emotionality of the issue and then address the deeper ideological values that may be threatened to create this emotionality.

4. Focus on broker frames. People interpret information by fitting it to pre-existing narratives or issue categories that mesh with their worldview. Thus information must be presented in a form that fits with those templates, using carefully researched metaphors, allusions, and examples that trigger a new way of thinking about the personal relevance of climate change. To be effective communicators, climate communicators must use the language of the cultural community they are engaging. When addressing a business audience, for example, one must use business terminology, such as net present value, return on investment, increased consumer demand, rising raw material costs, etc.

More generally, one can seek possible broker frames that move away from a pessimistic appeal to fear and instead focus on optimistic appeals that trigger the emotionality of a desired future. In addressing climate change, we are asking who we strive to be as a people, and what kind of world we want to leave our children. To gain buy-in, one can stress American know-how and our capacity to innovate, focusing on activities already underway by cities, citizens, and businesses.[10]

This approach frames climate change mitigation as a gain rather than a loss to specific cultural groups. Research has shown that climate skepticism can be caused by a motivational tendency to defend the status quo based on the prior assumption that any change will be painful. But by encouraging people to regard pro-environmental change as patriotic and consistent with protecting the status quo, it can be framed as a continuation rather than a departure from the past.

Specific broker frames can be used that engage the interests of both sides of the debate. For example, when Energy Secretary Steven Chu referred in November 2010 to advances in renewable energy technology in China as the United States' "Sputnik moment," he was framing climate change as a common threat to US scientific and economic competitiveness. When Pope Benedict XVI linked the threat of climate change with threats to life and dignity on New Year's Day 2010, he was painting it as an issue of religious morality. When CNA's Military Advisory Board, a group of elite retired US military officers, called climate change a "threat multiplier" in its 2006 report, it was using a national security frame. When the Lancet Commission pronounced climate change as the biggest global health threat of the 21st century in a 2009 article, the organization was using a quality of life frame. And when the Center of American Progress, a Washington, D.C. think tank aligned with the Democratic Party, connected climate change to the conservation ideals of Presidents Theodore Roosevelt and Richard Nixon, they were framing the issue as consistent with Republican ideals.

One broker frame that deserves particular attention is the need to replace the uncertainty or probability of climate change with the risk of climate change.[11] People understand low probability, high consequence events and the need to address them. For example, they buy fire insurance for their homes even though the probability of a fire is low, because they understand that the financial consequence is too great. In the same way, climate change for some may be perceived as a low risk, high consequence event, so the prudent course of action is to obtain insurance in the form of both behavioral and technological change.

5. Recognize the power of language and terminology. Words have multiple meanings in different communities, and terms can trigger unintended reactions in a target audience. For example, one study has shown that Republicans were less likely to endorse that the phenomenon is real when it is referred to as "global warming" (44 percent) rather than "climate change" (60 percent), while Democrats were unaffected by the term (87 percent vs. 86 percent). So language

matters: the partisan divide dropped from 43 percent under a “global warming” frame to 26 percent under a “climate change” frame.[12]

Other terms with multiple meanings include: “climate denier,” which some use to refer to those who are not open to discussion on the issue, and others see as a thinly veiled and highly insulting reference to “Holocaust denier”; “uncertainty” is a scientific concept to convey variance or deviation from a specific value, but is interpreted by a lay audience to mean that scientists do not know the answer; “consensus” is the process by which the IPCC forms its position, but leads some in the public to believe that climate science is a matter of “opinion” rather than data and modeling.

Overall, the challenge becomes one of framing complex scientific issues in a language that a lay and highly politicized audience can hear. This becomes increasingly challenging when addressing some inherently non-intuitive and complex aspects of climate modeling that are hard to explain, such as the importance of feedback loops, time delays, accumulations, and nonlinearities in dynamic systems.[13] Unless scientists can accurately convey the nature of climate modeling, others in the social debate will alter their claims to satisfy their political interests.

6. Employ climate brokers. People are more likely to feel open to consider evidence when a recognized member of their cultural community presents it.[14] Certainly, statements by former Vice President Al Gore and Senator James Inhofe evoke visceral responses from individuals on either side of the partisan divide. But individuals with credibility on both sides of the debate can act as what I call climate brokers. Since a majority of Republicans do not believe the science of climate change, compared to a majority of Democrats who do, the most effective broker would come from the political right. Climate brokers can include representatives from business, the religious community, the entertainment industry, the military, talk show hosts, and politicians that can frame climate change in language that will engage the audience to whom they most directly connect. When people hear about the need to address climate change from their church, synagogue, mosque, or temple, for example, they will connect the issue to their moral values. When they hear it from their business leaders and investment managers, they will connect it to their economic interests. And when they hear it from their military leaders, they will connect it to their interests for a safe and secure nation.

7. Recognize multiple referent groups. The presentation of information can be designed in a fashion that recognizes that individuals are members of multiple referent groups. The underlying frames employed in one cultural community may be at variance with the values dominant within the communities engaged in climate change debate. For example, while some may reject the science of climate change by perceiving the scientific review process to be corrupt as part of one cultural community, they also may recognize the legitimacy of the scientific process as members of other cultural communities (such as users of the modern health care system). While someone may see the costs of fossil fuel reductions as too great and potentially damaging to the economy as members of one community, they also may see the value in reducing dependence on foreign oil as members of another community who value strong national defense. This frame incongruence emerged in the 2011 US Republican primary as candidate Jon Huntsman warned that Republicans risk becoming the “anti-science party,” if they continue to reject the science on climate change. What Huntsman alluded to is that most Americans actually do trust the scientific process, even if they don’t fully understand it.

8. Employ events as leverage for change. Studies have found that most Americans believe that climate change will affect geographically and temporally distant people and places.

But studies also have shown that people are more likely to believe in the science when they have a vivid experience with extreme weather phenomena. This has lead climate communicators to link climate change to major events, such as Hurricane Katrina in 2005 and Hurricane Ike in 2008, or to more recent floods in the American Midwest and Asia, as well as to droughts in Texas and Africa, to hurricanes along the East Coast and Gulf of Mexico, and to snow storms in Western states and New England. The cumulative body of weather evidence, reported by media outlets and linked to climate change, will increase the number of people who are concerned about the issue, see it as less uncertain, and feel more confident that we must take actions to mitigate its effects. For example, in explaining the recent increase in belief in climate change among Americans, the 2012 National Survey of American Public Opinion on Climate Change noted, "about half of Americans now point to observations of temperature changes and weather as the main reasons they believe global warming is taking place."[15]

Ending the Climate Science Wars

Will we see a social consensus on climate change? If beliefs about the existence of global warming are becoming more ideologically entrenched and gaps between conservatives and liberals are widening, the solution space for resolving the issue will collapse and the debate will be based on power and coercion. In such a scenario, domination by the science-based forces in the policy arena looks less likely than domination by the forces of skepticism, since the former has to "prove" its case while the latter merely needs to cast doubt. But such a polarized outcome is not a predetermined outcome. And if it were to form, it can be reversed.

Is there a reason to be hopeful? When looking for reasons to be hopeful about a social consensus on climate change, I look to public opinion changes around cigarette smoking and cancer. For years, the scientific community recognized that the preponderance of epidemiological and mechanistic data pointed to a link between the habit and the disease. And for years, the public rejected that conclusion. But through a process of political, economic, social, and legal debate over values and beliefs, a social consensus emerged. The general public now accepts that cigarettes cause cancer and governments have set policy to address this fact. Interestingly, two powerful forces that many see as obstacles to a comparable social consensus on climate change were overcome in the cigarette debate.

The first obstacle is the powerful lobby of industrial forces that can resist a social and political consensus. In the case of the cigarette debate, powerful economic interests mounted a campaign to obfuscate the scientific evidence and to block a social and political consensus. Tobacco companies created their own pro-tobacco science, but eventually the public health community overcame pro-tobacco scientists.

The second obstacle to convincing a skeptical public is the lack of a definitive statement by the scientific community about the future implications of climate change. The 2007 IPCC report states, "Human activities…are modifying the concentration of atmospheric constituents…that absorb or scatter radiant energy…[M]ost of the observed warming over the last 50 years is very likely to have been due to the increase in greenhouse gas emissions." Some point to the conditioned word "likely" to argue that scientists still don't know and action in unwarranted. But science is not designed to provide a definitive smoking gun. In fact, it is important to remember that the landmark 1964 Surgeon General's report about the dangers of smoking was equally conditional. And even today, we cannot state with scientific certainty that smoking causes lung cancer. Like the global climate, the human body is too complex a system for absolute certainty. We can explain epidemiologically why a person could get cancer from

cigarette smoking and statistically how that person will likely get cancer, but, as the 1964 Surgeon General reports explains, "statistical methods cannot establish proof of a causal relationship in an association [between cigarette smoking and lung cancer]. The causal significance of an association is a matter of judgment, which goes beyond any statement of statistical probability." Yet the general public now accepts this causal linkage, and the growing number of smoking bans is predicated on a prudent assessment of the scientific evidence, not on scientifically proved causality.

What will get us there? While climate brokers are needed from all areas of society—business, religion, military, politics, etc.—I would like to direct attention to one field in particular that needs to become more engaged: the academic scientist and particularly the social scientist. Too much of the debate is dominated by the physical sciences in defining the problem and by economics in defining the solutions. Both fields focus heavily on the rational and quantitative treatments of the issue and fail to capture the behavioral and cultural aspects that explain why people accept or reject scientific evidence, analysis, and conclusions. But science is never socially or politically inert, and scientists have a duty to recognize its effect on society and to communicate that effect to those who must live with the consequences. Social scientists can help in this endeavor.

But the relative absence of the social sciences in the climate debate is driven by specific structural and institutional controls that channel research work away from empirical relevance. Social scientists limit involvement in such "outside" activities, because the underlying norms of what is considered legitimate and valuable research as well as the overt incentives and reward structures within the academy lead away from such endeavors. Tenure and promotion is based primarily on the publication of top-tier academic journal articles. This is the signal of merit and success. Any effort on any other endeavor is decidedly discouraged.

The role of the "public intellectual" has become an arcane and elusive option in today's social sciences. Moreover, it is a difficult role to play. The academic rules are not clear and the public backlash can be uncomfortable; many of my colleagues and I are regular recipients of hostile email messages and web-based attacks. But the lack of academic scientists in the public debate harms society by leaving out critical voices for informing and resolving the climate debate. There are signs, however, that this model of scholarly isolation is changing. Some leaders within the field have begun to call for more engagement within the public arena as a way to invigorate the discipline and underscore its investment in the defense of civil society. As members of society, all scientists have a responsibility to bring their expertise to the decision-making process. It is time for social scientists to accept this responsibility.

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"Six Americas" and Their Views on Climate Change

The Alarmed (2009: 18%, 2011: 12%) are most convinced that climate change is happening, see it is a threat to them personally, and are very worried about it. This group tends to be moderate to liberal Democrats who are active in their communities. They are more likely to be women, older middle-aged (55-64 years old), college educated and upper income, and hold relatively strong

egalitarian values, favoring government intervention to assure the basic needs of all people. They believe that it is more important to protect the environment than privilege economic growth, and are least likely to be evangelical Christians among the six groups.

The Concerned (2009: 33%, 2011: 27%) are also convinced that climate change is happening, although they are less certain and see it less as a personal threat than the alarmed. This group is very representative of the full diversity of the United States in terms of gender, age, income, education, and ethnicity—and tends to comprise moderate Democrats with an average rate of involvement in civic activities.

The Cautious (2009: 19%, 2011: 25%) are somewhat convinced that climate change is happening, but the belief is relatively weak, and many say that they could change their minds. This group is evenly divided between moderate Democrats and Republicans, with relative low levels of civic engagement and traditional religious beliefs.

The Disengaged (2009: 12%, 2011: 10%) are not at all sure that climate change is happening and are the group most likely to say they could easily change their minds. They have hardly thought about climate change and do not consider it personally important. This group tends to be moderate Democrat but is politically inactive. They prefer economic growth over environmental protection and are more likely to be minority women with less education and lower incomes.

The Doubtful (2009: 11%, 2011: 15%) say that they don't know whether climate change is happening or not and do not see it as a personal threat. This group is more likely to be male, older, better educated, high income, white, and Republican, with an average rate of involvement in civic activities. They hold strongly individualistic values and are more likely to say that they are "born again."

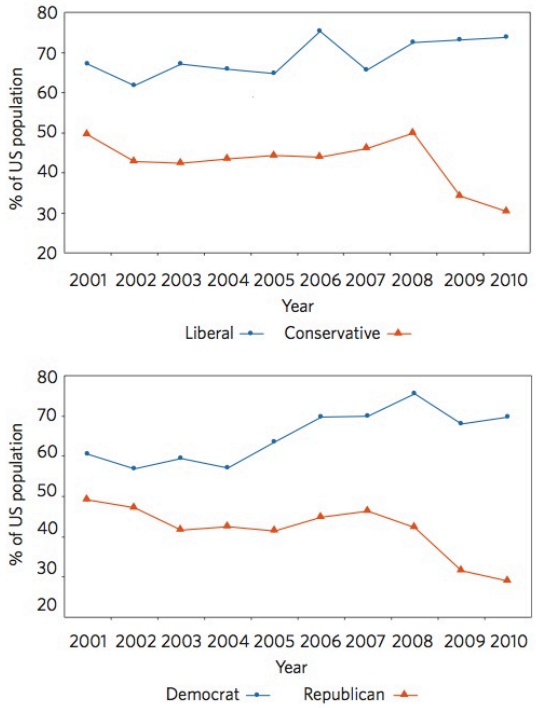
The Dismissive (2009: 7%, 2011: 10%) are sure that climate change is not happening and are they are not worried about the issue at all because they think it doesn't exist. This group is more likely to be high-income, well-educated, white men. They are also more likely to be very conservative Republicans who are civically active, hold strong religious beliefs, and are the segment most likely to be evangelical Christian. They strongly endorse individualistic values and oppose most forms of government intervention.

Source: Anthony Leiserowitz et al, "Global Warming's Six Americas," Yale Project on Climate Change/George Mason University Center for Climate Change Communication, May 2011.

FIGURE 1
The Growing Partisan Divide over Climate Change

Commented [TS2]: Since these charts are basically showing the same thing, would it be possible to give me just one? Again, this will save space.

AH: Yes, let's use the bottom one, it is more to the point and more dramatic.



Source: Aaron McCright and Riley Dunlap, "The Politicization of Climate Change and Polarization in the American Public's Views of Global Warming, 2001-2010," *The Sociological Quarterly*, 52, 2011.

The charts show the percentage of Americans who believe that global warming has already begun according to political ideology (upper panel) and the party they identify themselves with (lower panel).

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