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The Politics of Science: Political Values and the Production, Communication, and Reception of Scientific Knowledge

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In early May 2014 a team of 300 expert scientists issued a report titled *Climate Change Impacts in the United States*. The report came after seventy workshops and thousands of public and expert comments, including from agencies with representatives from oil companies (National Climate Assessment 2014). Among its many conclusions, the report states: "Global climate is changing and this is apparent across the United States in a wide range of observations. The global warming of the past 50 years is primarily due to human activities, predominantly the burning of fossil fuels. … Climate change threatens human health and well-being in many ways" (pp. 15–16).

The report reinforces a fairly long-standing scientific consensus and, by all accounts, reflects high-quality evidence and analysis from a heterogeneous group of scientists who took care to incorporate the views of various constituencies. Yet partisan rancor immediately followed. For example, Republican Florida Senator Marco Rubio stated, "I do not believe that human activity is causing these dramatic changes to our climate the way these scientists are portraying it."

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He further stated, "I think the scientific certainty that some claimed isn't necessarily there" (Reilly 2014). Rubio's view coheres with national public opinion polling. In October 2013 66 percent of Democrats believed there was solid evidence that human activity is a primary determinant of Earth's temperature getting warming while only 24 percent of Republicans believed so (Davenport 2014, A15). Partisan division also exists over the very existence of climate change, with 86 percent of Democrats believing it is occurring compared with 60 percent of Republicans.[1]

Politics often seems to dominate discussions surrounding scientific topics and associated technologies, at least in the contemporary United States. Politics is perhaps most salient in the case of climate change, but climate change is just one of many examples where politics and science intermingle. Other instances include debates over evolution, stem cell research, the use of various vaccines, fracking, and the use of nuclear power, among others.

Why so much controversy? We live in a time rich with scientific discovery and, as a public, we are keenly interested in what science portends for our collective future. Yet we also live in a time of great political polarization. These trends virtually guarantee considerable political debate over scientific discoveries and their application. There is much for us to learn about the interplay of politics and science—both how the process of scientific discovery can be politicized and how individuals' political views can influence the way they communicate and interpret scientific findings. In this volume, we bring together a group of accomplished scholars from across the social sciences who are tackling these themes in their research. Through a combination of innovative research articles and expert commentary, the authors not only shed light on how politics and science intertwine generally but also advance our understanding of salient contemporary scientific and technological debates.

The intersection of values and science

It was once commonplace to argue that "rational" science, as well as the public's understanding of science, advances over time unimpeded by human prejudices (Miller 1998; Popper 2001). However, scholars increasingly recognize that the scientific process does not play out in a moral vacuum. A range of human values, including political and religious ones, influence the process of scientific discovery as well as the dissemination and public reception of scientific findings (Douglas 2009; Kitcher 2011; Nisbet 2009). Scholars in the field of science and technology studies in particular have blazed trails in the study of political,

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religious, and other social influences on the scientific process (see Hackett et al. 2008 for an introduction to the field). For example, historians of science have chronicled past scientific controversies, from Copernicus to recent debates surrounding race and genetics (Barker and Kitcher 2014; see Mack 2006 for a recent collection). Philosophers of science have discussed the conditions under which values appropriately and inappropriately influence scientific discovery (Douglas 2009; Kitcher 2011), and political scientists have explored societal institutions—such as "boundary organizations"—that might allow for human values to affect scientific agendas in a sensible way (Guston 2000; also see Brown 2009).

That values influence scientific processes should not be surprising. Values represent emotionally charged beliefs regarding ideal states of the world or behaviors that guide our evaluation of behaviors and events (Rokeach 1973; Schwartz 1992). While science seeks to establish facts and not values, it does speak to values. In determining what is perceived to be "fact," it both enables and limits—and therefore directs—human endeavor. Scientific facts can tell us which human goals are within reach and how those goals can be achieved most efficiently (e.g., see Jasanoff 2012). Thus, individuals with strong convictions regarding which societal goals are most important and how those goals ought to be achieved (i.e., individuals with strong values) have an interest in what is accepted as "fact" and, thus, in the scientific enterprise. This interest can drive attempts to influence the scientific process as well as bias reactions to scientific findings. In sum, precisely because science has the potential to inform human values, those with strong convictions may try to influence the direction of scientific knowledge or respond in biased ways to such knowledge.

Individuals' value-based interests interact with the scientific process at several junctures. First, some individuals seek to influence the scientific agenda, i.e., the problems to which scientists devote scarce time and resources. There is considerable agreement among academics that taking the public's desires into account when setting a scientific agenda, i.e., deciding which scientific questions should be prioritized over others, is desirable (Brossard and Lewenstein 2009; Brown 2009; Douglas 2009; Guston 2000; Kitcher 2001; Pielke 2007). This said, it is usually problematic when values (whether held by the public, scientists, or others, such as funding agencies) influence the scientific method, i.e., the study design, data collection, and data analysis. If the desire to reach a specific outcome biases a scientist's methodology, most agree that the scientific process has been corrupted (e.g., see Douglas, this volume).

The potential for political, religious, or other values to influence the scientific process does not end with research studies themselves. Kitcher (2011) argues that the "context of certification"—the phase of inquiry in which new findings are accepted or rejected as part of public knowledge—is critically important. When values drive the interpretation of evidence, the result can be skewed interpretation of largely "objective" factual information (Lodge and Taber 2013; also see Blank, Lodge, and Taber, this volume). A large body of literature suggests that values often play a significant role in shaping how individuals interpret information: the perceived credibility of the information depends on whether it coheres with a particular person's prior beliefs or values. For example, a conservative who rejects anthropogenic climate change is more likely than others to dismiss

evidence of human-driven climate effects as flawed, whereas a liberal with contrary prior beliefs is more likely than others to view evidence that minimizes human-induced effects as flawed. When citizens accept or reject scientific evidence based on political predispositions, political polarization over scientific beliefs and related political opinions results (Lodge and Taber 2013; Druckman, Peterson, and Slothuus 2013). Furthermore, widespread rejection of well-founded scientific claims due to political bias can endanger the practical application of scientific discoveries given the public's ability to punish political actors through elections and boycott associated products in the marketplace.

The final stage of the scientific process involves the practical application of scientific knowledge, i.e., technology. Here, values also play a role, often a legitimate one. Even if technological know-how exists, there may be risks or moral considerations involved in implementing a technology; weighing these things involves values (see Douglas, this volume; Hochschild and Sen, this volume). To take a classic example, even given scientists' probable ability to clone a human being, thus far we have collectively chosen not to. While value considerations are not inappropriate in deciding whether a technology should be employed, certainly value differences between citizens, or between citizens and experts or policy-makers, can drive sharp disagreements over technology policy, as in recent debates over mandatory vaccinations (see Fowler and Gollust, this volume).

In an era of great emphasis on scientific and technological know-how and great political polarization, there is much to study at the intersection of politics and science. Perhaps for this reason, interest in the subject is rapidly growing across academia, including among scholars not traditionally associated with science and technology studies. Most noticeable to us is a burgeoning body of mainly quantitative empirical research conducted by researchers from across the social sciences. Much of this research has coalesced around the topic of "public understanding of science." Researchers have focused on two main topics: (1) citizens' beliefs and attitudes related to science and science-relevant public policy and (2) the communication processes through which scientific findings are disseminated, interpreted, and accepted or rejected by members of the public. A prominent theme of this research is the idea that laypeople evaluate the veracity and relevance of scientific information in part based on whether it bolsters, or undermines, their extant policy preferences and politically relevant values and identities (e.g., Kahan, Jenkins-Smith, and Braman 2011). Media framing and selective attention to media congenial to one's political ideology tend to exacerbate this process (e.g., Hart and Nisbet 2012). The upshot is that Kitcher's "context of certification" is rife with political interference and controversy. This theme is not entirely new of course; however, social scientists are giving increasing attention to it and—using survey, experimental, and content analyses—seeking to identify patterns across scientific topics, types of communication, and individual values and identities.

This volume's contribution

We bring together scholars working in the social scientific tradition whose work relates to the way in which politically relevant values and identities

influence the communication of scientific knowledge and its reception by the public.[2] In addition, recognizing that scientists and other knowledge elites themselves are not without value commitments, this volume also examines the interplay of political values and scientific beliefs (and behaviors) among this community of individuals. These articles are organized into three sections: public beliefs, communication, and knowledge elites. Each section includes a commentary written by one or more area experts that seeks to provide an overview of the general topic, to reflect on the section's contributions and integrate them into the existing research literature, and to convey some practical advice for how the rest of us might grapple with normative challenges that the research articles raise.

Each article and commentary contributes an array of interesting observations, and we wish to point out several especially novel and important themes that emerge from the various contributions (beyond the obvious idea that politics matters to science and technology). First, the conventional wisdom seems to suggest that, where science is political, it is partisan: that is, important differences in scientific beliefs arise from the public's allegiance to the Democratic or Republican Party. However, if we look closely at correlated phenomena, oftentimes other factors—such as liberal-conservative ideology, political or economic values, or religion—matter as much as, if not more than, partisanship per se (see especially Blank and Shaw, this volume). Second, "motivated reasoning" about scientific findings is not the province of any one partisan or ideological group. While conservatives and Republicans may be especially resistant to scientific claims related to climate change, liberals and Democrats also tend to be skeptical of scientific claims that undermine their policy preferences or value commitments (e.g., see Nisbet, Cooper, and Garrett, this volume). Third, increased education or knowledge is not always a panacea. Among members of the general public, the most aware are the most likely to allow their values to color their scientific understanding (e.g., Bolsen, Druckman, and Cook, this volume). Fourth, although the articles raise concerns regarding the politics that surround science, we do not see reason to panic across the board. Despite the findings in this volume, there is evidence that most members of the public trust scientists more than they distrust them (Blank and Shaw, this volume). There is evidence that, among some important groups (teachers, scientists), more knowledge does in fact lead to less political bias (Berkman and Plutzer, this volume; Bolsen, Druckman, and Cook, this volume). And there is some optimism that new types of science communication may more successfully convey knowledge to the public (Nisbet and Fahy, this volume). Of course, it is worth noting that not all evidence for a "political take" on scientific communication or understanding is evidence that something has gone wrong; as we mention above, values can play an important role in some aspects of the scientific process (Douglas, this volume).

While this volume contributes these and many other insights into the academic literature, it also contributes to the public interest. As science advances toward a greater degree of explanatory credibility and as associated technological know-how accumulates, the ability of the public and private sectors to intervene in citizens' lives in sophisticated ways also increases. At the same time, we are living through a moment when the political sphere is incredibly polarized

(Abramowitz 2011; McCarty, Rosenthal, and Poole 2006). When these two phenomena intermingle, the result can be intense political controversy as well as important opportunities lost. For example, President Obama stated immediately after the 2010 midterm elections: "So I think when it comes to something like energy … here are some areas where there's just too much disagreement between Democrats and Republicans, we can't get this done right now" (Obama 2010). Furthermore, as the politicization of science increases, a spill-over effect is produced, whereby citizens lose faith in science generally. According to the journal *Nature*, "there is a growing anti-science streak … that could have tangible societal and political impacts" (*Nature* 2010, 133). At risk is not just the helpful application of science through technology but the funding of basic scientific research itself (Lupia 2014). In short, value-based assessments of science and related technologies—while often understandable and in some cases even reasonable—nevertheless can, if not tempered, drive political gridlock and stall scientific advancement toward greater understanding of ourselves and the world around us.

A critical first step to solving problems where they exist is often simply shining a bright light on those problems, which is primarily what this volume's authors do. In some cases, particularly in the commentaries that close each section, authors also offer cautious prescriptions. In the end, we hope this special issue of *The ANNALS* will help scholars, citizens, scientists, politicians, and pundits to better understand and begin to grapple with the many political biases that color Americans' perceptions of the empirical world and their opinions on science-relevant public policy.

Overview of the Articles

The contributors to this volume are an impressive group of scholars who have already made important contributions within their varied disciplines, which include Political Science, Communication, Psychology, Law, Public Health, and Philosophy. Together, the articles in this volume address a wide array of scientific topics relevant to public policy and the public interest—including climate change, energy policy, nanotechnology, health policy, genomics, and neuroscience—and do so using multiple methodologies, including surveys, experiments, interviews, focus groups, and content analyses. Below we briefly summarize these articles' contents.

Section I: Political values and public beliefs about science

This section focuses on the relationship between Americans' political predispositions and their beliefs about science broadly construed. Blank and Shaw analyze data from perhaps the most comprehensive public opinion survey, examining the link between Americans' political predispositions and their willingness to trust scientific expertise on a range of topics. Among other things, they conclude

that political ideology and religion play more of a role than partisanship in shaping scientific trust. In their contribution, Nisbet, Cooper, and Garrett draw on experimental data to argue that trust in science among both conservatives and liberals decreases when they are exposed to science messages that undermine their political values. Schuldt, Roh, and Schwarz demonstrate that we must be careful in drawing conclusions from surveys about partisan divides over science; question wording and order can influence responses in surprising ways. Shen and Gromet describe a first-of-its-kind experimental study of Americans' view on "neurolaw." They find that, when neuroscience used in the courtroom is seen as reducing offender culpability, Republicans are less likely to approve of neurolaw. Stoutenborough, Vedlitz, and Liu remind us that politics is not everything. Citizens often have clearly identifiable concerns about energy technologies, and these risk perceptions appear to be more important in shaping attitudes toward those technologies than political predispositions per se. Finally, in their commentary, Kraft, Lodge, and Taber describe the influential theory of "motivated reasoning," and use this framework to unify the articles in this section.

Section II: Politics and science communication

Section II focuses on the intersection of politics and scientific communication processes from a variety of perspectives. Nisbet and Markowitz examine the communication behaviors of scientists shortly after the end of the George W. Bush administration. The authors find that, contrary to what some might expect, though political predispositions were strongly predictive of attention to the debate over the Bush administration's science-related policies, such predispositions were not predictive of scientists' public or media outreach. Instead, career advancement was the key explanatory variable. Fowler and Gollust examine the evolution of news coverage of two health policy controversies—mammography screening guidelines and the HPV vaccine—and find that news media politicization had spillover effects, decreasing public trust in medical professionals in particular. Drawing on an experimental dataset representative of the U.S. population, Yeo, Xenos, Brossard, and Scheufele find that selective exposure to media outlets with politically congenial views is not inevitable; when people have political cues clarifying the political stakes of a new issue, they are willing to explore uncongenial media outlets. In the absence of such cues, however, Americans stick to attitude-consistent media sources. Kahan, Jenkins-Smith, Tarantola, Silva, and Braman analyze data from an experimental study—conducted in both the United States and England—regarding whether a "two-channel" science communication strategy can help to overcome cultural biases that impede science acceptance. They find that adding cultural meanings to information content can promote open-minded assessments of scientific information. Finally, in their commentary, Nisbet and Fahy analyze trends related to explanatory journalism, arguing that in contentious policy debates such as those over climate change or obesity, journalists should critically evaluate expert knowledge, broker cross-cutting discussion, and call attention to a broader set of policy options and technologies.

Section III: Values, knowledge elites, and the public

In this final section, the authors ask to what extent values influence the beliefs and activities of knowledge elites, including American teachers, scientists, and policy advisors. Hochschild and Sen assess variation in experts' views on genomics via interviews and content analyses of academic articles. They find clear disciplinary trends in scholars' optimism or pessimism regarding the societal use of genomics that are likely tied to political and other norms associated with academic disciplines. Berkman and Plutzer analyze survey and focus group data on public school and preservice teachers. They come to the conclusion that many American public school teachers' inability to effectively teach students evolution has its roots in the preservice years. Teacher training programs would likely make considerable headway by improving instruction in evolution (as well as other science fundamentals) and also by giving students ample opportunity to reflect on how their personal religious values and their scientific beliefs can coexist. Bolsen, Druckman, and Cook examine data collected from simultaneous surveys of the U.S. public, U.S. scientists conducting influential research related to energy technologies, and congressional policy advisors. The authors find interesting parallels and divergences: most notably, whereas policy advisors are more likely than the public to accept the anthropogenic nature of global warming, they are also nearly as polarized as the public along partisan and ideological lines on the subject. This highlights the need to find ways to overcome partisan motivated reasoning rooted in the politicization of science in the United States if meaningful policy action is to be taken to address the problem of global warming. In the final piece in this section and the volume, philosopher Heather Douglas considers the sources of contestation over science and how to overcome them. Doing so requires recognizing that although science can be clearly distinguished from matters of faith (such as religion), it is not value-free. We must acknowledge those areas where values legitimately intersect with the scientific enterprise while staunchly defending other areas from value bias.

Future Research

While our contributors cover a lot of ground, we admit to leaving several important topics to the side. We do so in large part because robust social scientific literatures have not developed in these areas. We very much hope that this volume serves as an impetus for more work on "the politics of science," particularly in the following research areas.

First, this volume focuses largely on the physical sciences, putting the social sciences themselves (somewhat ironically) aside. Yet political values also intersect with the social sciences, perhaps even more so given the often obvious societal implications of social science research. Witness recent political controversies over whether to continue to fund social science research (particularly political science) through the National Science Foundation (Lupia 2014) or the ideological divide over Thomas Piketty's *Capital* (e.g., see Vinik 2014).

Second, our contributors primarily focus on the intersection of politics and

science in the United States. Of course, similar phenomena likely arise in every country throughout the world. And yet important differences will depend, among other things, on the level of ideological polarization in a nation, what types of media the public consumes, and the nation's scientific and political cultures and institutions. Future comparative work on this subject is sorely needed, as is work on how international organizations and treaties enable or impede scientific and technological advancement throughout the world.

Third, the authors in this volume say little about science-relevant decision-making among political elites. Like members of the public, political elites are susceptible to letting values shape their interpretation of scientific information. Bolsen, Druckman, and Cook (this volume) are among the first to study the impact of ideology on scientific beliefs among political elites in a contemporary setting, but more work is needed. Another important subject is the impact lobbyists and interest groups have over members of Congress and other politicians responsible for science- and technology-relevant decision-making; this topic strikes us as vastly understudied, particularly during our current era of increased, and largely unregulated, election spending. Finally, we also require a better general understanding of legislative processes as they relate to both the collection and analysis of scientific evidence that informs public policy as well as the policies that govern scientific research (e.g., funding, research ethics). Our colleagues in political science have been surprisingly uninterested in these topics, and we look to them in particular to move "the politics of science" among political elites forward in the coming years.

Notes

1. The partisan divide is even greater when partisans are asked about the existence of "global warming" (as opposed to "climate change"). See Schuldt, Roh, and Schwarz (this volume).

2. While the topic of "the politics of science" (and the issue of climate change specifically) is relevant to people around the world, this volume focuses on the American context.

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