Politics and Science: Untangling Values, Ideologies, and Reasons

By
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This commentary argues that we need a more nuanced account than we have now of the sources of disagreement among experts and the sources of distrust in scientific claims among the public. Such nuance requires an understanding of the nature of science (an empirical, uncertain, and yet reliable source of knowledge) and of how that differs from faith as a basis for knowledge claims. It also requires an understanding of how values can legitimately function in science, including in the shaping of research agendas and in the assessment of evidential sufficiency, and of the inherently political nature of science (e.g., when evidence shifts the boundary between public and private). While science is neither apolitical nor value-free, it can (and should) be pursued with integrity. Detecting science with integrity and defining the legitimate roles values play in such science opens the space for genuine deliberation and a way forward out of an ideological stalemate.

Keywords: expert disagreement; scientific literacy; values; trust; science; scientific integrity; risk assessment

The articles published here present a bleak picture. The public seems further divided than ever on scientific issues with important policy implications while also diverging from experts on those issues. To make matters worse, in some areas (e.g., genomic science), experts are themselves divided. The ideal of science helping the citizenry to make informed decisions seems ever more elusive, slipping further from our grasp.

In this commentary, I suggest that things are not as desperate as they might seem. There are ways forward out of our current morass, which,

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while neither easy nor obvious, have the possibility of putting both science and the public on a stronger footing. Doing so requires thinking more carefully about why people distrust science or disagree with experts. It requires changing the way we think about science in the public sphere, recognizing its inherently political aspects. Tackling these challenges can help us to refocus on the techniques that allow for genuine citizen engagement with science, which can bridge ideological divides while assisting science in aiding human progress.

One of the most important similarities across the articles is that, contra the traditional take on scientific literacy (Miller 1998), more knowledge of a topic does not automatically lead to more acceptance of the science or its implications. For example, Hochschild and Sen (this volume) survey the writings of experts across a range of disciplines who have written about genomic science. Despite all of the writings presumably demonstrating an expertise about the science (having published on the topic in peer-reviewed journals), the experts ranged widely in their levels of optimism about the science. More familiarity with the science did not automatically breed more optimism about it or ready acceptance of its possible implications. In Bolsen, Druckman, and Cook (this volume), deeper knowledge among members of the public about climate change science did not translate into deeper acceptance of the scientific consensus. Instead, it depended on the person's ideological commitments whether more knowledge led to more or less agreement with the vast majority of climate scientists. Deeper knowledge neither generated expert consensus nor moved nonexperts automatically into the expert camp.

Berkman and Plutzer's article on biology teachers and the evolution debate presents a different set of challenges. Their article details disturbing evidence that although biology teachers largely accept the standard account of evolution in biology, they do not sufficiently understand it or its evidential basis to feel confident about engaging in a debate about it in their classrooms with their students (or with the students' parents; Berkman and Plutzer, this volume). Instead, they lean on pedagogical techniques and classroom management skills to avoid the debate, in effect watering down their teaching of biology to avoid conflict. In contrast with the other two articles, this is a context in which we have evidence suggesting that increased knowledge of biology will improve the situation—teachers with greater familiarity with the science do better in teaching evolution in their classrooms. But, as I note below, there is more that could be done to improve the teaching and understanding of evolution.

Digging Deeper: Sources of Disagreement and Distrust

A closer consideration of the value issues embedded in the data reported in these articles reveals that perhaps we should not be surprised at the result that more knowledge does not equal more agreement. Since the 1960s, it has become increasingly clear that science brings with it a double-edged sword. Advances in science (and the technologies that both foster and derive from those advances) bring great benefits but also problems and challenges. The Internet and cell phones have brought massive increases in our ability to communicate but also problems of increased opportunities for governments to spy on citizens. New ways to extract fossil fuels create new fights over whether we should use those advances (such as hydraulic fracturing techniques), even if they might increase energy security. Biomedical advances bring new ways to save and prolong life but also new difficult choices regarding how to use these advances, often in emotionally fraught decision contexts. That we now all should have advanced medical directives and end-of-life discussions with our loved ones, even if the actual circumstances of our demise are not likely to be covered by such directives and discussions, speaks to the new challenges that we are confronting.

Given this backdrop, it would be shocking if experts did not have the mixed view of genomic science noted by Hochschild and Sen (this volume). The authors note that in general, the majority of experts were neither blanket optimists nor pessimists about genomics. This is as it should be, as experts are precisely those who have sufficient familiarity with the field to be able to project out where further developments might lead and to envision both the possibly beneficial and the possibly problematic implications.

This mixed assessment is apparent in the quotes concerning the various genomic technologies. The genetically modified mosquito might indeed be the best tool to fight dengue fever, but the awareness of the risks of using such a tool both are recognized and require consideration. Genetic testing may in fact put some people at ease, while unnecessarily raising the alarm for others, especially as few diseases are genetically determined. (Instead, genetic influences tend to be joined by environmental influences, such as behavior, diet, and infectious agents.) Whether the costs of such tests are worth it, especially if the insight they actually provide is oversold, is clearly a debatable issue. All of these issues are better framed in mixed terms—whether the development and utilization of new techniques is worth the benefits or not. The question then becomes whose insight should be trusted and, perhaps more importantly, who should ultimately decide about how the new technologies are used.

The issue of trust also appears in the discussion of climate change. If more knowledge does not persuade the public to accept the expert consensus, why is this so? What drives the divergent views? Multiple factors come into play, including, as noted by Bolsen, Druckman, and Cook (this volume), local weather events, gender, ethnicity, party identification, and ideological frameworks (such as those articulated by cultural cognition theory). Trust in science and trust in government are also factors.

But with all these factors on the table, we need to look more closely at what we are talking about, particularly as trust in government and trust in science seem conceptually related to the "egalitarian communitarian" and "hierarchical individualist" worldviews. Someone who believes that it is better to leave individuals to their own devices in the free market (hierarchical individualist) is clearly going to be less trusting of communal institutions such as governments. They are probably also going to be less trusting of science, based as it is on an epistemic community that values recognizing that each scientist "stands on the shoulders of giants" (i.e., all the other scientists who came before) and for which community criticism is part of the assurance of reliable knowledge (see below).

Matters of gender and ethnicity also play a role in shaping whom we trust. It is well known, for example, that the gender and ethnic groups that are underrepresented in expert groups trust those experts less (Slovic 1999). Given the history of such groups' relations with expertise, this is not surprising (e.g., Skloot 2010). Each history provides different reasons for distrust for different scientific issues and thus offers different possible remedies in each case. Rather than multiplying possible factors, we need a more incisive analysis of the roots of and the reasons for distrust in particular cases.

Consider again the hierarchical individualists, with their general unease with communal institutions. To address distrust here, we should probably not point to a scientific consensus to bolster our scientific claims, as such a consensus is less a reason to trust science and more a reason to worry about how that consensus was formed and whether it was the result of groupthink (Solomon 2006). For hierarchical individualists, it may be more effective to present the evidential tests, reasons, and responses to criticism than to measure the extent of the scientific community consensus.

In addition to presumptive distrust, there are other reasons some groups, especially political conservatives, may be wary of science, particularly concerning topics such as climate change. Climate change science is among those sciences that detects deleterious effects of private actions on the public good (Douglas 2013). Such science includes the detection of harmful environmental effects of chemicals (such as CFCs' impact on the ozone layer, lead in children, health impacts of second-hand smoke, or environmental estrogens on fertility) that have been the center of so many public controversies. What ties these examples together is the ability of science to detect the public effects of private actions, thus providing reasons to expand the realm of the public. Such science has a clear political and ideological valence. This kind of science has the power to change our perceptions of what were once thought to be private actions (burning fossil fuels, smoking cigarettes, using CFCs) and making manifest public impacts of concern. Once public concern is registered, efforts begin to impose regulations or other government measures, which effectively move the public-private boundary. For those already suspicious of government intervention in our lives, such science is deeply unwelcome, as it provides an argument for the expansion of government efforts.

One response to this kind of science has deepened ideological divides. Some have used debates over these issues as a training ground for manufacturing doubt about the evidential record so as to delay regulation. As Oreskes and Conway (2010) and McGarity and Wagner (2008) have shown, a new public relations technique has arisen that seeks to cast doubt on science, particularly science that provides evidence for an expansion of the realm of public concern. And such manufactured doubt clearly politicizes science in an unhelpful way. But being more cautious before accepting the science because of concerns over the expansion of government is a sound reason to demand more evidence, as long as uncertainties and doubt are accurately characterized.

Applying this line of thought, we should not be surprised that Hochschild and Sen (this volume) find that ideologically Right-leaning experts are less concerned about negative effects of genomic science, whereas Bolson, Druckman, and Cook (this volume) found that ideologically Left-leaning citizens are more accepting of climate science. Genomic science is less likely to expand the realm of the public but rather to make more effective (potentially problematically) the power of the state in its well-established domains (e.g., criminal justice). Additional uses seem voluntary and thus up to individual choice; e.g., whether to find out more about one's own genetic code and one's own ancestry. Of course, privacy will need to be protected, but what counts as private is not brought into question.

Contrast this with the case of climate science. Here, the production of carbon dioxide through the burning of fossil fuels and dumping that carbon dioxide into the atmosphere was once thought to be an act with no public implications. We did care about other pollutants (some of which could be scrubbed out at smoke stacks or tail pipes) but carbon dioxide was thought to be innocuous (and it is so unreactive chemically that scrubbing techniques are not available). Now, climate science suggests this is of public concern too. The scope and scale of the problem calls for massive government intervention in the market (although some of the best solutions are market-based solutions such as carbon taxes). In addition, these government interventions must be coordinated globally if they are to have their desired impact. For those concerned about the scale of government, skeptical of communal organizations, and unhappy with changing the public-private boundary, such science is deeply worrisome. More knowledge about it only deepens the underlying political worries.

Science is not politically neutral; different areas of science have different political valences. But even if we recognize the range of issues at stake and how they are politically fraught, that in itself is unlikely to break the stalemates we currently face. We can expect those on the Right to be unlikely to trust the scientific community when the research produced offers reasons to expand government mandates, but to trust science when it appears to enable better protection of personal freedoms and enforcement of existing laws. We can expect those on the Left to be likely to trust science when it finds reasons for public concern over private action but to distrust science when it bolsters traditional inequalities and to be worried about the directions some sciences and technologies might take once released into the market. But merely having such expectations is not enough. We need to find ways to have a productive debate across these ideological divides about the full range of issues that developments in science and technology present to us.

Toward Productive Debate

To have that debate, we need a public that has a better understanding not just of scientific facts but, more importantly, of the nature of science. With such an understanding, more productive debates on science and technology can occur.

Miller's (1998) conception of civic scientific literacy includes an understanding of the nature of science; it is both the part of the literacy the public does the worst on and the part largely neglected in discussions of literacy, which instead tend to focus on factual bits of information. However, understanding the nature of science is crucial both for being able to properly process science in the news and, more importantly, for engaging with scientific and technological controversies.

Indeed, across the board in the studies discussed here, one is struck by how the studies' subjects lack an understanding of what science is. It seems to be viewed as a final, fixed source about the state of things, to be believed or accepted on trust in the overall institution alone. Yet reflection on the nature of science reveals how incorrect such an understanding is.

Science's greatest strength is its commitment to evidence and to criticism based on evidence. Scientists are both expected to be continually seeking new evidence, even in relation to widely accepted views, and when the evidence does not match expectations, to challenge themselves to alter their views. Because there is always new evidence to be had (as phenomena recur or shift in new contexts) and because we are always developing new methods for gathering evidence (in hopes of strengthening the precision or scope or depth of the evidence), no scientific claim is safe from evidential challenge. This means that no scientific claim or theory is ever proven 100 percent. It cannot be. People can always raise doubts about any scientific claim—it is never completely certain.

Although this might seem obvious for newer theories such as climate change, it goes for evolutionary theory, too. We cannot know "for sure" whether evolutionary theory is accurate (Berkman and Plutzer, this volume). It is possible (although unlikely) that some evidence will overthrow our current biological theories of how life developed. We can know that there is a huge amount of very good evidence for evolutionary theory and no good theoretical competitors, and thus that it is not the least bit controversial. Asking for certainty in science is simply asking for the wrong thing.

But, and this is the really important part, the lack of absolute certainty in science is actually its source of strength and reliability. Scientific claims can always be challenged, and they usually have been, by lots of different people—people who attempt to find out what is wrong with the theories and improve them. Because science is always open to challenge, it gets challenged over and over, and, as such, it is our most reliable source of knowledge.

That some students think that evolutionary theory is unusual in their biology training because they wonder whether "there is enough scientific evidence to say for sure" (quoted in Berkman and Plutzer, this volume) shows how deep the confusion is about the nature of not just evolution, but of all science. Instead of focusing so much on pedagogical methods, more attention needs to be paid in teacher training to scientific methods, to the process of evidence gathering, of questioning, of challenging, in core science classes, at all levels of instruction. More in-depth instruction in the history of science would also help—not just who discovered what, but how they did it, the doubts they faced, the evidence they gathered, and how theories developed. More fundamentally, science needs to be taught less as a collection of important facts and more as process of always open-ended querying. One needs to understand the theories that we have and how we got them to see where one can begin to engage with them; but these theories should not be taught as timeless, unassailable edifices. They are instead nothing more or less than the best empirical knowledge we have at the moment—and they should be treated as such.

This understanding of science will also help to elucidate the tension between science and religion. Problems arise when both science and religion speak to the same question and deliver different answers, such as, what is the origin of life? Or of humans? For those religious groups that take the Bible as a literal authority on these questions, there can be an irresolvable tension on what to believe. We should not downplay that. However, it is crucial to inform students that the basis of belief for science is very different than that for religion. It might seem at first that people must simply decide which authority to accept—religion or science. But for those who believe on the basis of faith, the very strength of faith is to believe in the absence of evidence, or even in the presence of evidence to the contrary. If I have faith that humanity can tackle the challenges of the twenty-first century without self-destructing, that is surely not based on evidence—indeed much of the evidence seems to be pointing in the opposite direction. But to have this faith is precisely to draw on the strength of belief despite such contrary evidence.

Science provides a very different basis for belief. Scientists have to have evidence for their claims, and, as they so often point out, if you would listen to them long enough, they could tell you all the evidence they have. Even more important, scientists, when working properly, cultivate a culture of criticism, of pointing out where other scientists have overstepped, or missed important things, and of developing alternative theories. As proponents of evolution have noted, Darwin's theory of evolution has been substantially modified and developed since 1859, as new evidence has arisen. This is precisely what is supposed to happen in science. Thus, belief in science should be based on evidence—evidence for theories and evidence that the scientific community is functioning properly.

If students had a clearer sense of these different bases for belief—one being faith and one being a critical stance based on evidence—perhaps the tensions between them could be reduced. Students could learn what the evidence indicates and still be free (as they are) to believe or accept a view contrary to the evidence. Science teachers could emphasize this when teaching evolution. Faith is belief without evidence or in the face of contrary evidence. No presentation of evidence need challenge articles of faith.

For topics such as evolution, faith-based belief and how to distinguish it from science-based belief in a clear and respectful way will be central topics. For other topics, such as genomics and climate change, issues of faith are less central. Although there are some who will hold it as an article of faith that "God won't let us change the climate" or that "we shouldn't alter species because only God should do that," the substance of public debate is less about the potential conflict between faith and science and more about whom to trust and which risks to accept. These topics require a different analysis.

For topics where faith is not an issue, a proper understanding of science is still essential. Because science is never certain, we need scientists who are actively engaged in the ongoing critical assessment of evidence and theory to help us understand where things stand at any given moment. In our modern era, we have neither the time nor the expertise to unpack all the evidential claims of scientists ourselves. So how should we decide on whom to rely for input into a decision? Given the nature of science, we need to rely on experts who are actually experts in the field—who have the proper educational background (usually a PhD in the field) and who are publishing in the peer-reviewed literature of the field (in journals with other experts in the field on their advisory boards). These requirements minimally ensure that the experts are aware of the current evidence, theories, and debates in their science. Such requirements are frequently touted as important, but two other aspects are just as important in deciding on whom to rely: (1) that an expert acts with integrity and (2) that an expert weighs the risks and benefits in an acceptable way.

The first issue, whether experts act with integrity, is about whether they are properly responsive to evidence and criticism. If new evidence relevant to their views arises, do they change their mind, or at least explain why they do not (perhaps pointing to a flaw in the evidence)? Experts who do not do this are not engaged in acceptable intellectual practices and hold to their views more for ideological reasons than for evidential reasons (Douglas 2006).

One might think that asking members of the public to track whether experts respond to evidence or change their views as new evidence arises is too burdensome. However, if one is following an issue over a period of time, it can be readily assessable whether an expert meets this criterion. More importantly, though, if the public were to understand that such changes of view constitute responsible expertise, they may be less dismayed by experts whose views change. And, most importantly, this criterion can be used to move public debate forward in general. Let me explain how.

When a person (expert or not) proclaims that they do not accept the currently available evidence (on climate change, on evolutionary theory, and so on), particularly when there is a strong scientific consensus on the issue at hand, the productive response should be: Tell me what evidence would change your mind. Have the person imagine and describe what evidence would be persuasive. If they cannot say, they have more work to do. If they say no evidence would change their mind, they have effectively admitted their view is not scientific at all—they believe in something for purely ideological (or purely faith-based) reasons. And if so, this should be acknowledged as part of public debate. And if they have an answer for what evidence would be convincing, an attempt to gather such evidence can be made.

The force of this exercise can be seen in recent debates on climate change. Concerns have been raised that the climate data were being overly massaged by climate scientists to produce alarming trends. If this is a worry, then an independent analysis of such climate data could be helpful. Skeptics should be asked to say whether, if an independent analysis were produced, and it matched current projections, would they accept such projections as reliable? In 2011 climate skeptic

Richard Muller put together a team to reanalyze climate data. By 2012, Muller found that previous climate projections were largely reliable, and he found trends that matched the general climate science consensus (Borenstein 2011; Muller 2012). Whether other skeptics were convinced by the new analysis is unclear. But the example does seem to show that this kind of response narrows the grounds for legitimate criticism (Borenstein 2011).

This example is important not only as an example of properly functioning science (when concerns are raised, scientists track them down), but also of the burden of intellectual integrity in our culture. Skeptics who said they would trust such an independent analysis before the results were released should then be held accountable to their earlier statements about what would constitute persuasive evidence. When any of us are skeptical about a scientific issue, having to say what evidence would be persuasive is an important exercise, one that can keep our discussion from devolving into purely ideological disagreement. Holding both experts and ourselves to standards of intellectual integrity in this way can help to improve our debates.

But even if everyone is acting with integrity and all the available evidence is on the table, not everyone will agree. As noted above, no scientific statement is ever proven with complete certainty. So one can always ask, Is the available evidence sufficient for a claim? Answering this question involves considering the risks of accepting a claim when it might be false (a false positive) and the risks of rejecting a claim when it might be true (a false negative). Such risks are always present when we accept or reject scientific claims for the purpose of making decisions (Douglas 2009). And, depending on the social and ethical values that people have, people will find those risks more or less acceptable.

Consider the example of genetically modified mosquitoes to fight dengue fever. Is the use of such a tool safe? We can have studies of what happens when we modify insects and release them, but such studies will never be definitive. In the face of uncertainty, we must ask: What if we think the insects are safe and they have some problematic effect? What if, on the other hand, we do not use this tool and dengue fever becomes more widespread? These are not easy questions, and even if we agree on the available evidence, we might disagree about how to weigh the risks involved. It is not just members of the public who will disagree about the acceptable risks—experts often disagree too, for the same reasons.

So, the second characteristic to look for in experts (in addition to integrity) is whether they weigh risks the way you do. This is important not because the scientist should make the final decision on what to do, but because weighing the risks of false positives and false negatives is central to deciding whether evidence is sufficient, and to the assessment of the strength of evidence and uncertainty. If experts do not share your values in what counts as an acceptable risk, they may be experts who should be listened to, but not experts on whose assessment of the evidence you would want to rely in making a decision.

Here is the controversial conclusion to this discussion: the social and ethical values of the expert matter. Such values should not drive the expert's view (to do so would violate the standards of integrity), but they are not eliminable. And such values can include concern over expanding government. To get past our current stalemates, we need to ask skeptics (1) what evidence might convince them of an opposing viewpoint in a particular case and (2) to explore whether there are policy options to deal with such emerging public problems that might be less ideologically threatening.

In sum, understanding the nature of science (its endemic uncertainty, its emphasis on evidence, its open-ended character, and its resulting robustness) is necessary for understanding what we are relying on when we rely on science and what questions we can legitimately ask of experts. Such questions include: Why do you think what you think? How do you respond to the evidence that goes against what you think? How strong is the available evidence? Is there evidence not yet gathered that would help clarify what we should think (e.g., what possible tests would convince a skeptic)? How do you weigh the risks of false positives and false negatives in this case?

Putting It Together

Now one might think I am simply asking too much. Educate the public on the nature of science (so that they expect experts to change their minds sometimes and do not expect fixed certainties in science). Demand intellectual integrity from everyone—experts, politicians, the public, even ourselves. Think through which evidence one might find convincing when one is skeptical. Pay attention to the ethical values involved with weighing risks. How are we to do all this?

One approach would be to attempt to construct better social forums for our debates on these issues. It has become clear that open town hall–style meetings and open public hearings tend to attract those with predetermined agendas and who are not amenable to evidence and argument. We get grandstanding rather than genuine discussion.

We instead need social mechanisms that allow for genuine exchange, both from experts to the public and from the public to experts. Social scientists have been working on such mechanisms and the forums that instantiate them, and we are getting better at constructing them (Stern and Dietz 2008; Stilgoe, Lock, and Wilsdon 2014). Techniques being developed are called by a range of names, including collaborative analysis, analytic-deliberative processes, participatory research, public deliberation methods. They help members of the public to genuinely engage with both experts and the issues raised by scientific and technical developments in a deliberative manner. Questions to address in these forums include: What does the available evidence indicate? Where are there still data gaps? What values are at stake? What are the worries the public has? Given the available evidence, can those worries be addressed? Is further study needed, and of what sort? What weighing of the risks does the public find reasonable? Can the experts reflect those value judgments in their own weighing?

Our current standard modes of expert-public engagement do not seem to promote these kinds of interchanges. Indeed, our standard conceptions of scientific literacy and of public responses to science either presume a value-free, apolitical, and fixed science or an irrational public (or both). Neither of these conceptions will help us to grapple with science in democracies. Better conceptual structures and better social mechanisms can.

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