Counteracting the Politicization of Science*

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Abstract

Few trends in science have generated as much discussion as its politicization. This occurs when an actor emphasizes the inherent uncertainty of science by casting doubt on the existence of scientific consensus. In this paper, we offer a framework that generates predictions about when communications can be used to counteract politicization efforts aimed at novel energy technologies. We then present evidence from nationally representative survey experiments to demonstrate how warnings to dismiss future invalid politicization claims and corrections to ignore past claims can counteract the deleterious effects of politicization. The results provide novel insights about science communication in a politicized era and offer a blueprint on which future work can build.
Few trends in science have generated as much discussion as its politicization. Politicization occurs when an actor emphasizes the inherent uncertainty of science by casting doubt on the existence of a scientific consensus. This often causes citizens to ignore otherwise credible information and dismiss ostensibly credible scientific information. Dietz (2013) states, “politicization does not bode well for public decision making on issues with substantial scientific content” (p.14085). Yet politicized communications do not occur in a vacuum: scientists and other opinion leaders can and do work to counteract such efforts. Whether and when their attempts are successful, however, remain unanswered questions.

We address these questions by first offering a precise definition of the politicization of science. We then develop a framework that generates predictions about the conditions under which communications can counteract politicization efforts aimed at novel energy technologies (we specifically focus on hydraulic fracturing and carbon nanotubes or CNTs). We test these predictions with survey experiments conducted on nationally representative samples in the United States. The results demonstrate that communication efforts to counteract politicization can be effective under certain conditions. Specifically, warnings about future attempts to politicize science attenuate politicization’s effects, and lead to an increase in the impact of consensual scientific information on opinions. Corrections to dismiss communications that have already politicized science also counteract it, although, in the cases we explore, they are not as effective as warnings.

The Politicization of Science

Individuals base their opinions on a host of ingredients including values, identities, and factual information. Social scientists have developed a fairly thorough understanding of: how factual information affects opinions (e.g., Bauer, Allum, & Miller, 2007; Delli Carpini & Keeter, 1996; Miller, 1998); how individuals account for knowledge shortfalls (Lupia, 2006); how being uninformed or misinformed about politics influences views (e.g., Kuklinski et al., 2000); and, how individuals may biasedly interpret factual information (Druckman, 2012; Taber & Lodge, 2006). This work reveals a subjective element in the interpretation and usage of facts despite that facts, by themselves, are not inherently subjective information (Shapiro & Bloch-Elkon, 2008).

One of the most useful types of facts is “scientific evidence” that reports a verifiable and reproducible observation(s) stemming from the use of the scientific method. Dietz (2013) states, “A good decision must be factually competent [and] reflect our understanding of how the world works. Here, the role of science is obvious: Science is our best guide to developing factual understanding” (p. 14082, also see Kahneman, 2011). This is where the politicization of science enters the picture. While the term has been used in varying ways, close examination of the literature on the politicization of science makes its meaning clear (e.g., Jasanoff, 1987; Oreskes & Conway, 2010; Pielke, 2007).

Three defining features include:

• There exists a scientific finding or, in many cases, a body of scientific work that has been produced according to sound scientific procedures (i.e., through the use of the scientific method). While it is not required, in many cases, politicization occurs once there is a body of work that approaches what many would consider a “consensus position” among scientists on a given topic (Shwed & Bearman, 2010).
• Any scientific finding(s) contains some uncertainty. This is the case because scientists seek to find evidence that shows a conclusion is incorrect (i.e., falsify a conclusion) rather than confirm it with certainty: “After all, future observations may change.... [Moreover], falsification can never be... definitive” (Shadish, Cook, & Campbell, 2002, p. 15). Thus, “scientific information is always, to some degree, vulnerable to concerns about uncertainty because scientists are trained to focus on uncertainty” (Dietz, 2013, p. 15084; also see Popper, 1984, p. 5).

• An agent or agents accentuate this uncertainty by calling scientific consensus into question and suggesting alternative possibilities. This is typically done not in an effort for scientific accuracy but rather in pursuit of a particular agenda.

Thus, politicization occurs when an actor emphasizes the inherent uncertainty of science by casting doubt on the existence of a scientific consensus. This definition coheres with that put forth by one of the most noted books on politicization – Merchants of Doubt – which defines politicization as “exploiting the inevitable uncertainties about aspects of science to cast doubt on the science overall... thereby magnifying doubts in the public mind” (Steketee, 2010, p. 2; also see Oreskes & Conway, 2010; Pew, 2009). The consequence is that “even when virtually all relevant observers have ultimately concluded that the accumulated evidence could be taken as sufficient to issue a solid scientific conclusion... arguments [continue] that the findings [are] not definitive” (Freudenburg, Gramling, & Davidson, 2008, p. 28; italics in the original). Horgan (2005) notes that this undermines the scientific basis of decision-making because opinions diverge from the scientific consensus as groups conduct campaigns with the goal of altering public policy to advance a favored agenda (also see Lupia, 2013).

We believe our definition of politicization makes clear how this is a unique communicative tactic. As intimated, politicization differs from other communication strategies that influence opinion formation insofar as: (1) politicization is about emphasizing the inherent uncertainty of science by casting doubt about the existence of a scientific consensus – it is not competitive framing of an issue, which would involve emphasizing, for example, the environmental and economic consequences of energy-related policies; (2) it need not come from a political actor – the source of politicization could be an interest group, a fellow citizen, or any actor; and, (3) it is not misinformation per se but rather involves accentuating the inherent uncertainty of science, thereby creating doubt about the existence of scientific consensus. This latter point is important as the concepts are related but misinformation refers to “false, misleading, or unsubstantiated information” (Nyhan & Reifler, 2010, p. 304). Politicization involves questioning the existence of scientific consensus but not offering false information per se (this would be called pseudo-science; Hansson, 1996).

Only one study, to the best of our knowledge, isolates the causal effects of politicized science on support for an emergent energy technology. Bolsen, Druckman, and Cook (2014a) show that messages that emphasize politicization not only stunt the impact of otherwise persuasive information from a credible source (e.g., the National Academy of Sciences), but also directly increase anxiety and perceptions of threat, and decrease support for emergent technologies. Thus, as many worry, politicization undermines the impact of consensual scientific information. Interestingly, Bolsen et al. (2014a) also report that politicization does not influence the processing of scientific information opposed to the use of an emergent technology, likely reflecting the disproportionate weight of negative information (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). We thus focus on situations where there is consensual scientific information regarding an emergent technology’s benefits and where counter efforts are necessary to combat the effects that result from exposure to politicized science.
While these findings and other commentaries on politicization are telling, they also are limited when one considers the reality of science communication as an ongoing competitive process (Chong & Druckman, 2010). Scientists and other actors can and do attempt to counteract politicization by asserting scientific consensus, when it seems to exist, and challenging the intent of those who try to politicize science. It is these types of communication efforts to which Uhlenbrock, Landau, and Hankin (2014) refer when emphasizing that “[s]cientific societies and organizations can play a central role in science policy discourse in addition to an individual scientist’s voice” (p. 98, also see Newport et al., 2013). We next present a framework that generates predictions about when communications attempting to counteract politicization are likely to be effective.

**Politicization and Opinion Formation**

We focus here on opinion formation about two relatively novel energy technologies – carbon nanotubes and hydraulic fracturing. We also focus on situations where consensual scientific information exists. We recognize that defining a scientific consensus is not straightforward; yet, this strikes us as a critical starting point for an empirical investigation since, as mentioned, prior work suggests politicization undermines positive consensual scientific information. We explore on how varying types of counteractive communication efforts influence opinions relative to the possession of no (communicated) information on a given technology (see Druckman (2001) on using this as a baseline). We present Table 1, which offers definitions of key concepts, to facilitate presentation of the theoretical framework motivating the hypotheses we state below.

[Insert Table 1 About Here]

We begin by considering the impact of scientific consensus: information on which there is general agreement within a field about existing knowledge (see Table 1) (Shwed & Bearman, 2010). Such information matters because forming opinions about emergent technologies inevitably involves assessing uncertain future risks and benefits (National Research Council, 1994; Polasky, Carpenter, Folke, & Keeler, 2011). Moreover, psychological work on attitude change shows that “consensus implies correctness” (Kruglanski & Stroebe, 2005, p. 358); this is particularly the case when a communication includes the “citation of ... evidence [which] appears to enhance [persuasiveness]” (O’Keefe, 2002, p. 186; also see, e.g., Eagly & Chaiken, 1993; Miller, 1998). In this case, positive consensual scientific information reduces anxiety and perceived threat about the future impact of emergent technologies (National Research Council, 1994;Constans, 2001; Maner & Schmidt, 2006; Polasky, Carpenter, Folke, & Keeler, 2011; Weisenfeld & Ott, 2011). Reductions in anxiety and perceived threat, in turn, lead individuals to become more supportive of the technology (this connection between anxiety, threat, and support for emergent technologies coheres with Bolsen et al.’s 2014a findings; also see Arceneaux, 2012, p. 272-272; Druckman & McDermott, 2008; Hirsh, Mar, & Peterson, 2012, p. 313). We hypothesize that individuals will become less threatened and anxious, and more supportive of an emergent technology’s usage, when they receive positive consensual scientific information, relative to those who receive no information (hypothesis 1). ii

When science is politicized – which, as presented and defined in Table 1, occurs when the inherent uncertainty of science is emphasized to cast doubt about the existence of a scientific consensus – the confidence instilled by consensual scientific information is undermined. In fact, politicization likely even goes further than merely eliminating the impact of consensual scientific information by creating, at least among some, distrust in science generally (e.g., Gauchat, 2012; Gollust, Niederdeppe, & Barry, 2013). Psychological work suggests that anxiety – such as that stemming from politicization – generates a preference for risk aversion (i.e., favoring the status quo), and thus, decreases support for novel innovations (Arceneaux, 2012; Caplin and Leahy, 2001;
Kahneman, Knetch, and Thaler, 1991). Consequently, when individuals are exposed to politicized messages accompanied by positive scientific information, they become uncertain about whether to trust the information in this context and more anxious due to greater perceived uncertainty and risk. Increased anticipated risk, in turn, heightens anxiety (Constans, 2001; Maner & Schmidt, 2006). This will render any positive impact of the scientific information on individuals' opinions impotent. We thus predict that individuals will become more threatened and anxious, and less supportive of an emergent technology in the presence of politicization, relative to those who receive no information (hypothesis 2).

The existing literature stops here, leaving the impression that politicized communications dominate; yet, attempts to counteract politicization do occur. For instance, the mission of the National Academy of Sciences is to engage in such counter-efforts by documenting consensus about contemporary scientific issues when it exists and providing “independent, objective advice to the nation on matters related to science and technology” (http://www.nationalacademies.org/about/whatwedo/index.html). Nonetheless, even though scholars have called for research on ways to counteract politicization (Dietz, 2013; Nature, 2010), empirical work has remained silent on the matter.

There are two competitive ways to potentially counteract politicization (Chong & Druckman, 2007, 2010). Counteractive communications can take the form of a warning that a scientific consensus exists and that efforts to politicize science should be dismissed, or a correction with similar content that follows politicized science. As shown in Table 1, a warning is a message that alerts individuals to the content of an upcoming message (Eagly & Chaiken, 1993, p. 347); in this case, it would be a communication that warns individuals to ignore / not believe a later message that claims consensual scientific information about an emergent technology is politicized. This may occur when scientific organizations, or individuals, anticipate politicization attempts in the future, which happens on many scientific issues (e.g., see Lupia, 2013). On the flip side, a correction is a communication that provides information to individuals about a belief they may hold, stemming from exposure to a prior communication (e.g., Cobb, Nyhan, & Reifler, 2013; Nyhan & Reifler, 2010): in this case, it would be a message that tells individuals to ignore / not believe a prior message that politicizes scientific information about an emergent energy technology.

**Warnings, Corrections, Motivated Reasoning, and Counteracting Politicization**

We turn to the theory of motivated reasoning to understand the process by which warnings and corrections may counteract politicized communications. We follow Taber and Lodge (2006) and focus on two primary motivations, or goals, in the opinion formation process: directional and accuracy goals. A directional goal refers to when a "person is motivated to arrive at a particular conclusion" (Kunda, 1999, p. 236). As defined in Table 1, directional motivated reasoning causes people to view evidence as stronger when it is consistent with prior opinions, and dismiss information inconsistent with prior beliefs regardless of its objective accuracy (e.g., see Druckman, Peterson, & Slothuus, 2013; Kunda, 1990, 1999; Lodge & Taber, 2000; Slothuus & de Vreese, 2010; Taber & Lodge, 2006).

To understand the consequences of directional motivated reasoning, consider Druckman and Bolshen’s (2011) two-wave study on the dynamics of opinion formation toward two emergent scientific technologies. At wave 1, respondents reported their support for genetically modified (GM) foods or carbon nanotubes (CNTs) following exposure to pro or con frames on each issue. Then, about ten days later, respondents received three types of information about GM foods or CNTs in a follow-up survey: in the case of GM foods, positive information about how GM foods combat diseases, negative information about the unknown and potentially harmful long-term health consequences of GM foods,
and neutral information about the economic consequences of GM foods. Druckman and Bolsen (2011) report that opinions formed at wave 1 in response to exposure to positive or negative frames related to GM foods strongly conditioned evaluations toward the new information presented in wave 2. Individuals exposed to positive or negative information about an emergent technology at wave 1 evaluated directionally consistent evidence at wave 2 as more effective, directionally inconsistent evidence at wave 2 as less effective, and neutral evidence as consistent with the direction of the opinion formed at wave 1. The authors found virtually identical dynamics with the same design but on the topic of CNTs (also see Kahan et al., 2009).\textsuperscript{vi}

Directional motivated reasoning seems to be pervasive on political and scientific issues where individuals have little incentive to exert great effort in processing competing arguments and technical information (see Taber & Lodge, 2006, p. 767).\textsuperscript{vii} Nyhan and Reifler (2010) state, “humans are goal-directed information processors who tend to evaluate information with a directional bias toward reinforcing their pre-existing views…” (p. 307). Dietz (2013) adds, “this process of biased assimilation of information can lead to a set of beliefs that are strongly held, elaborate, and quite divergent from scientific consensus” (p. 14083, italics added). If people come to believe a technology is politicized, they may view any counter-communications as ineffective and continue to dismiss consensual scientific information.

However, directional motivated reasoning also suggests that one can counteract politicized communications by persuading people – prior to encountering politicization – that a scientific consensus indeed does exist and that attempts to politicize consensual scientific information should be dismissed. This establishes an initial attitude that people later use to evaluate subsequent information a la directional motivated reasoning– i.e., that a technology is not politicized and that consensual scientific information is credible. Put another way, when individuals receive a warning to dismiss future claims about politicization with regard to an emergent energy technology, directional motivated reasoning will lead people to discount politicization and trust consensual scientific information. We thus predict that individuals who receive a warning that a scientific consensus exists (and should not be politicized) will become less threatened and anxious, and more supportive of an emergent energy technology, relative to those who receive no information (hypothesis 3).\textsuperscript{viii}

In contrast, directional motivated reasoning implies that corrections to dismiss prior claims about politicization are likely to fail. In this case, individuals form an initial opinion that scientific information related to an emergent technology is politicized, and thus, due to directional motivated reasoning, view later corrective messages to dismiss the initial information about politicization as less credible (i.e., they defend their prior belief of politicization). Consequently, the impact of politicized communication prevails leading to depressed support a la hypothesis 2: individuals who are exposed to a correction to dismiss prior politicization will thus become more threatened and anxious, and less supportive of an emergent energy technology, relative to those who receive no information (hypothesis 4).\textsuperscript{ix}

Directional motivated reasoning may be the default mode of processing information in some contexts; however, in other contexts, individuals instead pursue an accuracy goal in processing information and forming an opinion (Druckman, 2012). As described in Table 1, accuracy motivated reasoning involves evaluating new information/evidence with the goal of holding a “correct,” or accurate, belief by attempting to engage in an “objective,” or evenhanded, assessment of relevant information (Druckman, 2012; Kunda, 1999; Taber & Lodge, 2006, p. 756). Instead of defending a prior belief, identity, or worldview, the goal is to assess available information objectively, even if it runs counter to one’s existing beliefs or identities (Lavine, Johnston, & Steenbergen, 2012). For example, Bolsen, Druckman, and Cook (2014b) find that, in forming an opinion about aspects included in the
2007 Energy Independence Act, when respondents were prompted to process information with an accuracy motivation – that is, they were told they would have to later justify their opinions – the bias stemming from directional motivated reasoning disappeared. Respondents’ opinions were not driven by the Act’s perceived sponsor but rather reflected an assessment of the policy content with which they were provided (also see Nir, 2011; Prior, Sood, & Khanna, 2013).

The implication, for us, is that individuals will not dismiss a correction a la directional motivated reasoning when motivated to form an accurate belief; rather, individuals will consider all relevant information and give weight to consensual scientific information previously encountered in forming their overall opinion toward an emergent energy technology. Consequently, when individuals who are induced to form accurate opinions receive a correction to dismiss prior claims about politicization, it will counteract prior politicized communications and elevate the impact of consensual scientific information. Individuals will thus become less threatened and anxious, and more supportive of an emergent technology, relative to those who receive no information (hypothesis 5).

For reasons we will later discuss, this prediction – while perhaps not capturing the information processing of the bulk of people when it comes to emergent energy technologies – may become increasingly relevant in the future as debates about energy evolve and come to have a more direct impact on an individual’s everyday life (e.g., as energy debates become more localized) (Sinatra, Kienhaues, & Hofer, 2014; also see Bolsen & Cook, 2008). We summarize our hypotheses in Table 2.

Experimental Design and Measures

We tested our hypotheses with experiments embedded in a nationally representative survey in the United States (implemented over the Internet) with a total of 2,484 participants across both studies. We focus, as mentioned, on two emergent energy technologies. One experiment focused on carbon nanotubes (CNTs), which are tiny graphite tubes that efficiently convert sunlight into electricity and thus offer a novel method to obtain energy from an alternative source. National surveys suggest that nearly half the population knows virtually nothing about CNTs (e.g., the 2010 General Social Survey, see also Druckman & Bolsen, 2011). The other experiment focused on a novel way to obtain energy from a conventional energy source: hydraulic fracturing – a method to obtain energy that “involves drilling horizontally through a rock layer and injecting a pressurized mixture of water, sand, and other chemicals that fractures the rock and facilitates the flow of oil and gas” (Boudet et al., 2014, p. 58). Hydraulic fracturing – which is commonly called “fracking” – fundamentally differs from conventional drilling (http://www.cleanwateraction.org/feature/fracking-explained). While this method receives greater media coverage than CNTs, the public is “largely unaware and undecided about this issue” (Boudet et al., 2014, p. 63). Data from our survey confirm this as respondents reported, on average, not closely following news about CNTs or fracking (see Table A1 in the Supplementary Appendix). We opted to use the term “fracking” in the experiment, as opposed to hydraulic fracturing, because of its familiar use in news coverage and in academic work (e.g., see Boudet et al., 2014).

We used an identical experimental design to test our hypotheses for both CNTs and fracking. We randomly assigned half of the participants in our sample to an experiment about CNTs (N = 1,256) and the other half to an analogous experiment about fracking (N = 1,228). For each technology, we randomly assigned participants to one of six conditions, as captured in Table 2, that we next discuss.
Individuals randomly assigned to Condition 1, which served as a baseline for assessing the hypotheses, received no information about either technology and were simply asked to respond to the key dependent measures. This included questions that gauged: (1) the extent of support for the use of either CNTs or fracking (on a 7-point scale with higher scores associated with greater support), (2) the extent to which the government should decrease or increase investments into research that advances this approach for obtaining energy (on a 7-point scale with higher scores associated with increases in investments), and (3) the extent to which the technology would help ensure long-term energy sustainability (on a 7-point scale with higher scores associated with greater sustainability). We also included measures to test our hypotheses about the impact of the experimental interventions on respondents’ perceived levels of threat and anxiety. We measured perceived anxiety by asking respondents, “As you think about [fracking / CNTs] as an approach to obtain energy, how much anxiety do you feel?” (on a 5-point scale with higher scores indicating greater anxiety). We measured perceived threat by asking respondents, “Indicate how dangerous or safe you think it us to use [fracking / CNTs] as an approach to obtain energy” (on a 7-point scale with higher scores indicating greater perceived threat). These central dependent variables followed all of the experimental conditions.

As Table 2 illustrates, Condition 2 allows us to test hypothesis 1 by providing respondents with positive scientific information from a study published in the Proceedings of the National Academy of Sciences (NAS) about either CNTs or fracking and later assessing support for the respective technology. For example, in the case of CNTs, we provided respondents with a definition of CNTs and informed them that CNTs “offer a novel method to obtain energy that is fundamentally different from conventional approaches and allows for the production of a substantial amount of energy. A recent study published in the Proceedings of the National Academy of Sciences shows that CNTs can be safely produced on a large scale (and do not pollute the environment). A professor of chemistry at Stanford referred to recent developments as “good and needed.” The fracking study offered analogous information.

We confirmed via a pre-test (with participants not in the main experiment) that individuals viewed the source as highly credible. Again, we anticipate (see hypothesis 1, Table 2) decreases in threat and anxiety and an increase in overall support for each technology in this condition, relative to respondents who receive no information.

Condition 3 added a statement that has been employed in exactly the same way in prior related work (see Bolsen et al., 2014a) that accentuates science’s politicization, “…Yet, importantly, politics nearly always color scientific work, with advocates selectively using evidence. This leads many to say it is unclear whether to believe scientific evidence related to debates over CNTs. Some argue the process leads to pollution that harms the environment, while others disagree pointing to evidence that there are minimal or no negative environmental consequences…..” We reference contrary arguments because it is more realistic insofar as it raises uncertainty without offering specific factual evidence to counter the scientific consensus – e.g., by citing a competing scientific study or conclusion. We anticipate that politicization will increase threat perceptions and anxiety, and stunt overall support for each technology by rendering consensual scientific information impotent (see hypothesis 2, Table 2).

Condition 4 added a warning that preceded the politicized scientific information stating, “Some say that it is difficult to assess the benefits of this process because people only point to evidence that supports their position. However, the assessment of CNTs should not be politicized; a consensus of scientists believes CNTs are better for the environment than other energy production methods.” Thus, the warning explicitly provides respondents with a message that a consensus of scientists believes CNTs are positive relative to alternative energy production methods and that their assessment of the
technology should not be colored by politicization. We later debriefed these participants and informed them whether “a consensus of scientists” actually believes this is debatable. We expect the warning will cause respondents to reject future politicized messages due to a directional motivation to uphold the initial opinion and be open to consensual scientific information encountered in the presence of politicization – thereby decreasing individuals’ perceptions of threat and anxiety, and increasing overall support for an emergent technology (see hypothesis 3, Table 2).

Condition 5 included a correction nearly identical to the just described warning, but it was presented to participants after they had already been exposed to politicized scientific information. Therefore, due to directional motivated reasoning and the initial opinion toward the technology formed in the presence of politicization, we expect that a correction will not be effective at counteracting politicization, resulting in increases in threat and anxiety, and decreases in overall support for an emergent technology (see hypothesis 4, Table 2).

Condition 6 coupled the correction with a widely used method for inducing a motivation for accuracy. Participants were informed at the start of the survey, “At some point in this survey, we are going to ask your opinion about an approach related to energy production in the United States. When thinking about your opinion, try to view the approach in an evenhanded way. We will later ask that you justify the reasons for your judgment – that is, why the technology is more or less appealing” (see Lerner & Tetlock, 1999; Lord, Lepper, & Preston, 1984; Tetlock, 1983). We later asked participants to justify their opinions. Prior work demonstrates that inducing accuracy motivated reasoning causes individuals to consider information in a more evenhanded fashion with the goal of arriving at an opinion that is correct, rather than one that upholds existing beliefs or protects existing identities (e.g., Bolsen et al., 2014b; Kunda, 1990). We thus expect that corrections to dismiss politicized scientific information coupled with an accuracy motivational inducement will decrease threat and anxiety, and increase overall support for each technology, relative to those who receive no information (see hypothesis 5, Table 2). As mentioned, the dependent measures followed exposure to the experimental stimuli in all conditions. We provide the full wording of each stimulus, the debriefing statement, and all measures in a Supplementary Appendix.

Results

As noted, we measured support for each technology with the three aforementioned items (support, investment, sustainability); we created scaled measures, using these three items for each technology, to gauge support for CNTs and for fracking. The items scaled together for each technology, coincidentally, with alphas of .94. We evaluate the impact of the experimental conditions on overall support, anxiety, and threat by regressing each dependent variable on the experimental conditions, omitting the pure control condition as the baseline (condition 1, Table 2). We present the results for fracking and CNTs, respectively, in Table 3 and Table 4. (In Tables A4 - A6 in the Supplementary Appendix, we report the means, standard deviations, and Ns for each condition for overall support, perceived threat, and level of anxiety for both technologies.)

[Insert Table 3 and Table 4 About Here]

The first column in Table 3 and in Table 4 illustrates the impact of the experimental conditions on overall support for the technology. All reported p-values are from one-tailed hypothesis tests given our predictions are directional (Blalock, 1979). First, in support of hypothesis 1, support for fracking and CNTs increases significantly when positive scientific information is presented relative to the baseline. Also in support of hypothesis 1, the second and third columns in Table 3 and Table 4 show...
that anxiety and threat perceptions toward the use of the technologies significantly decrease as a result of exposure to positive consensus scientific information. This shows that, sans politicization, positive scientific information is impactful in shaping opinions toward emergent energy technologies.

Of course, the impetus for the study is to explore what often occurs in political contexts: science is politicized. We find, in support of hypothesis 2, that anxiety and threat perceptions significantly increase in the presence of politicization and overall support significantly decreases for each technology (see Table 3 and Table 4). While these results accentuate that politicization undermines consensual scientific information, the remaining conditions demonstrate ways to counteract it.

We find strong support for hypothesis 3 – that is, that a warning in advance of a politicized communication, stating that a scientific consensus does in fact exist, vitiates politicization’s effects and opens individuals to scientific information. Indeed, Table 3 and Table 4 show that the warning generated significantly higher levels of overall support for each technology. A warning, as Table 3 and Table 4 illustrate, also reduces anxiety and perceptions of threat that result from politicized science for both fracking and CNTs. This is the first empirical evidence that we know of that demonstrates a way to counteract politicization. A warning causes individuals to dismiss later attempts to politicize scientific information and attend to consensual scientific information. In sum, warnings can be an effective approach for overcoming politicization provided that one can anticipate its occurrence.

Recognizing that one cannot always anticipate politicization, hypothesis 4 focused on corrections. It posited, however, that corrections to discount politicization after an opinion has already been formed in the presence of politicized science would not be successful at counteracting it, leading to increased anxiety and threat perceptions, and decreased support. We find mixed support for this hypothesis. Table 3 shows that, in the case of fracking, the correction that followed politicized scientific information did not lead to decreased support; instead, it neutralized politicization’s effects leading a non-effect relative to the baseline. This neutralizing effect is also apparent, in the case of fracking, with a non-effect relative to the baseline for measures of anxiety and threat perception. Thus, the correction appears to have some effect at offsetting politicization in the case of fracking, although it did not lead to a positive effect of the consensus scientific information. Table 4 shows that the correction, again counter to hypothesis 4, actually significantly increases overall support for CNTs. In support of hypothesis 4, however, the correction did not counteract the increased anxiety and threat that stems from politicized science, despite the increased overall support. We suspect these mixed findings with regard to the effect of corrections across technologies (sans an accuracy motivation) reflect the inclusion of strong consensual information on a topic where citizens lack much prior information. In fact, this may explain why we found a larger counteractive effect resulting from the correction on CNTs relative to fracking, as citizens know even less about CNTs than fracking. One intriguing question is whether under certain conditions citizens are willing to support emergent energy technologies – that offer alternative sources of energy – even if they feel some threat and anxiety simply because the counterfactual is a continued reliance on traditional energy sources (e.g., citizens become risk-seeking).

To evaluate hypothesis 5, we assess the impact of a correction in the context of an inducement to form an accurate opinion. We find that an accuracy inducement coupled with a correction counteracts politicization and increases support for both CNTs and fracking (see column 1, Table 3 and Table 4). We also find, in support of hypothesis 5, that a correction in the context of an accuracy motivation reduces anxiety and threat perceptions toward each technology (see columns 3 and 4, Table 3 and Table 4), thereby stimulating individuals to weigh consensual scientific information more
heavily in forming an overall evaluation. This result demonstrates that a correction coupled with an accuracy motivation can play a powerful role in counteracting politicized science and opening people to consensual scientific information.

We illustrate the substantive impact of the experimental conditions on overall support for each technology in Table 5 by reporting the percentage of respondents in each condition who express support above the neutral point (i.e., greater than 4) on the 7-point scaled measure. The percentage of respondents expressing support for each technology is significantly higher in the presence of positive scientific information relative to the pure control baseline (as previously demonstrated in Table 3 and Table 4) – an increase in support from 17% to 95% for fracking and from 22% to 94% for CNTs. Politicized scientific information increases anxiety and perceived threat associated with the use of the technology, and this undermines the positive impact of consensual scientific information on opinions. In line with previous work (Bolsen et al., 2014a), politicization significantly decreases overall support for each technology relative to the pure control baseline. In the case of fracking, as Table 5 shows, only 4% of respondents support its use in the presence of politicized scientific information as compared to 17% in the baseline. In the case of CNTs, the decrease is a bit smaller (5% decline) but remains significant. The decline in support generated by the presence of politicized communications is remarkable relative to the support generated by the scientific information in condition 2 (a decline from 95% support to 4% support for fracking and from 94% to 17% support for CNTs, see Table 5).

Perhaps equally remarkable is the impact of the warning that a scientific consensus indeed does exist and that future claims about politicization should be dismissed. In this case, as shown in Table 5, 95% of respondents in this condition express support for both fracking and CNTs.

A correction that follows politicized scientific information, counter to hypothesis 4, does have a significant effect in increasing support for CNTs relative to the baseline of no information (an increase from 22% to 32%); however, the increase in support for fracking relative to the pure control baseline (an increase from 17% to 20%) is not statistically significant. Nonetheless, in both cases, the correction has some effect at overcoming or neutralizing the negative effects stemming from science’s politicization. Finally, as Table 5 shows, an accuracy inducement coupled with the correction has a sizeable impact on support for the use of each technology. For fracking, the motivation for accuracy increases the impact of the corrective information by 65% (from 20% support in the corrective condition alone to 85% support when the same information is coupled with an accuracy motivation, see Table 5). The sizeable impact of the accuracy motivational inducement is also apparent in the results from the CNT study. The accuracy motivational inducement coupled with the correction increases support for CNTs by 44% above the correction without the accuracy motivation (from 32% support in the corrective condition to 76% when the same information is coupled with an accuracy inducement).

To summarize, our central findings are:

- The politicization of science undermines the impact of positive consensual scientific information and significantly decreases support for emergent technologies. Thus, as many have worried, politicization appears to have significant negative implications for new technologies in the absence of counteractive efforts – e.g., by individuals and scientific organizations.
- The impact of politicization can, however, be overcome or at least counteracted by warnings or corrections, which often increase the impact of consensual scientific information. As we
predicted, warnings are more effective than corrections at counteracting politicization and ensuring positive consensual scientific information is impactful.

- Corrections to dismiss politicization can be effective at combating politicization, especially in the presence of an accuracy motivation; however, the correction by itself, without an accuracy motivation, does not eliminate the threat and anxiety generated by politicization toward CNTs or fracking.

- Overall, warnings appear to be the most effective method to counteract politicization; however, should that not be possible, a correction can counteract politicization, particularly in cases where there is a scientific consensus and individuals pursue accuracy motivational goals in processing scientific information.

Conclusion

We offer a conceptual framework and empirical evidence on how the politicization of science operates in a competitive rhetorical environment. In so doing, we also put forth a research agenda with at least four pressing issues. First, scientists are an obvious potential source of counteractive communications. Yet, to date, scientists generally have not been active in policy debates. Uhlenbrock et al. (2014) explain, “scientists shy away from being part of this dialogue because some science policy issues have become polarized… [yet] however ominous it may seem for scientists to venture into the communication world, there is a great need not only for dissemination of the information but also for science to have a regular voice in the conversation” (p. 95) (also see Lupia, 2014). Scientists cannot do this alone, however, and thus some of the responsibility falls on scientific organizations: “Scientific societies and organizations can play a central role in science policy discourse in addition to an individual scientist’s voice” (Uhlenbrock et al., 2014, p. 98; also see Newport et al., 2013). This is critical if scientific disciplines hope to present consensus or near consensus statements about varying scientific issues. As mentioned, the National Academy of Sciences (NAS) serves this role as part of their mission, but, given the challenge of the current and changing media landscape, other disciplinary organizations need to complement the NAS both in identifying areas of consensus and making a concerted effort to communicate findings to broader segments of the population. Promoting such communication not only is important to ensure adequate public understanding but also scientific funding. As Lupia (2014) makes clear, “Congress is not obligated to spend a single cent on scientific research” (p. 5) (italics in the original). He continues, “Honest, empirically informed and technically precise analyses of the past provide the strongest foundation for knowledge and can significantly clarify the future implications of current actions (p. 5).”

A second central issue involves citizen motivation. Given that, in many circumstances, communications to counteract politicization efforts come after politicization has occurred (i.e., a correction), our results highlight the importance of developing methods to motivate citizens to process information in an evenhanded fashion with the goal of forming and holding an accurate belief. While the bulk of Americans may not currently be particularly motivated to process information on science-related issues in an effortful and open-minded manner, this could change as issues about sustainability and energy sources become more localized (i.e., personally relevant to individuals) (Druckman, 2013). For example, the use of novel approaches to obtain energy (e.g., fracking) becomes the subject of debate as they are implemented in local communities. Localization stimulates individuals to process information with an accuracy motivation (Dietz, 2013; Leeper, 2012; Lupia, 2013). Sinatra, Kienhues, and Hofer (2014, p.131) suggest that with sustainability issues individuals who have a vested interest in understanding the best local outcome are less likely to engage in directional motivated reasoning (i.e., processing information with the goal being to protect one’s...
existing beliefs) (also see Leeper, 2012). In addition to localizing issues, motivation can be induced when information comes from varying sources with ostensibly different agendas (e.g., a mix of Democrats and Republicans) (Bolsen et al., 2014b) and/or when individuals anticipate having to explain their opinions to others (akin to our experimental manipulation). This latter method can be pursued by increased usage of participatory engagement/deliberations where people have to justify their opinions and beliefs publicly (Dietz, 2013; Druckman, 2012, 2014; Klar, 2014; Sinclair, 2012).

Third, our results accentuate the importance of the quality rather than the quantity of political information. Social scientists often focus on “how much” individuals know (for a detailed discussion of the normative criteria scholars have used to judge the quality of citizens’ opinions, see Druckman, 2014) – this is captured in the scientific literacy framework of opinion formation (e.g., Miller, 1998). More information per se, though, does not generate opinions that cohere with extant scientific consensus (Kahan et al., 2011; Kahan 2012; 2015). What is more important is the type of information that is conveyed, with the key being communicating the existence of a consensus when it exists. This of course raises another perplexing issue, however. That is, whether scientists in this day and age can in fact arrive at a consensus and successfully communicate this in a way that informs public dialogue.

As mentioned, we focus on situations in which positive consensual scientific information exists and the communications are in support of a technology’s usage, but we acknowledge that arriving at this consensus in the first place can itself be difficult. Here the obstacle is not communication per se but the need for scientists and scientific organizations to work towards arriving at consensual viewpoints, and then, when not possible, highlighting points of consensus and areas of uncertainty (Dietz, 2013). A fourth question for future work, in terms of studying communication effects, concerns what occurs when there is not a clear scientific consensus. It is critical to explore ways to credibly communicate alternative perspectives and the accompanying inherent uncertainty that always comes with science. Identifying effective communication tactics and understanding how citizens process various forms of scientific information is of the utmost importance to ensure science works to enhance human well-being.
<table>
<thead>
<tr>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific consensus</td>
<td>General agreement within a field about existing knowledge (e.g., Shwed &amp; Bearman, 2010)</td>
</tr>
<tr>
<td>Politicization</td>
<td>When an actor emphasizes the inherent uncertainty of science by casting doubt about the existence of a scientific consensus (e.g., Stekette, 2010, p. 2; Oreskes &amp; Conway, 2010)</td>
</tr>
<tr>
<td>Warning</td>
<td>A message that alerts individuals about the content of an upcoming message (Eagly &amp; Chaiken, 1993, p. 347).</td>
</tr>
<tr>
<td>Correction</td>
<td>A message that provides information to individuals about a misperception they may hold, stemming from exposure to a prior communication (e.g., Nyhan &amp; Reifler, 2010; Cobb et al., 2013).</td>
</tr>
<tr>
<td>Directional motivated</td>
<td>Tendency to view evidence as more effective when it is consistent with prior opinions (e.g., often dismissing information inconsistent with prior beliefs regardless of objective accuracy) (Taber &amp; Lodge, 2006)</td>
</tr>
<tr>
<td>reasoning</td>
<td></td>
</tr>
<tr>
<td>Accuracy motivated reasoning</td>
<td>Tendency to evaluate information/evidence with the goal of forming an accurate (or “correct”) belief by attempting to engage in an “objective”, or evenhanded, assessment of new information (Druckman, 2012).</td>
</tr>
</tbody>
</table>
Table 2. Experimental Conditions, and Hypotheses

<table>
<thead>
<tr>
<th>Condition</th>
<th>Scenario/Stimuli</th>
<th>Hypothesis(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No information</td>
<td>Baseline Condition</td>
</tr>
<tr>
<td>2</td>
<td>Consensus Scientific Information</td>
<td>Consensus scientific information in support of a technology leads people to become less threatened and anxious, and more supportive of its use. (<em>hypothesis 1</em>)</td>
</tr>
<tr>
<td>3</td>
<td>Politicized Scientific Information</td>
<td>Politicized messages render the impact of positive consensus scientific information impotent by generating doubt about its credibility. There is an increase in threat and anxiety, and decrease in overall support. (<em>hypothesis 2</em>)</td>
</tr>
<tr>
<td>4</td>
<td>Warning to Dismiss Politicized Scientific Information à→ Politicized Scientific Information</td>
<td>The warning that a scientific consensus exists and that politicized information should be dismissed leads people to reject future politicized messages and become open to consensual scientific information, leading to a decrease in threat and anxiety, and an increase in overall support. (<em>hypothesis 3</em>)</td>
</tr>
<tr>
<td>5</td>
<td>Politicized Scientific Information à→ Correction</td>
<td>Politicization renders the impact of consensual scientific information impotent. The correction has no counteractive effect, due to directional motivated reasoning, leading to increased threat and anxiety, and decreased overall support. (<em>hypothesis 4</em>)</td>
</tr>
<tr>
<td>6</td>
<td>Accuracy Motivation à→ Politicized Scientific Information à→ Correction</td>
<td>Inducing a motivation to form an accurate opinion will cause the correction to have an effect in counteracting politicization. It will thus overcome directional motivated reasoning and elevate the impact of consensual scientific information, leading to decreased threat and anxiety, and increased support. (<em>hypothesis 5</em>)</td>
</tr>
</tbody>
</table>

\(^1\)Predictions are relative the baseline.
Table 3. Determinants of Support, Anxiety, and Threat Perceptions toward Fracking

<table>
<thead>
<tr>
<th></th>
<th>Support</th>
<th>Anxiety</th>
<th>Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific information</td>
<td>2.14***</td>
<td>-1.44***</td>
<td>-1.98***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.10)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Politicized Scientific Information</td>
<td>-1.75***</td>
<td>0.66***</td>
<td>0.79***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.10)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Warning + Politicized Scientific</td>
<td>1.79***</td>
<td>-1.31***</td>
<td>-1.11***</td>
</tr>
<tr>
<td>Information</td>
<td>(0.08)</td>
<td>(0.11)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Politicized Scientific Information +</td>
<td>-0.05</td>
<td>-0.07</td>
<td>0.17</td>
</tr>
<tr>
<td>Correction</td>
<td>(0.08)</td>
<td>(0.10)</td>
<td>(0.14)</td>
</tr>
<tr>
<td>Accuracy Motivation + Politicized</td>
<td>0.95***</td>
<td>-0.72***</td>
<td>-0.21*</td>
</tr>
<tr>
<td>Scientific Information + Correction</td>
<td>(0.08)</td>
<td>(0.11)</td>
<td>(0.14)</td>
</tr>
</tbody>
</table>

\[ R^2 \]

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations</td>
<td>1,164</td>
<td>1,154</td>
<td>1,148</td>
</tr>
</tbody>
</table>

Note: Entries are OLS regression coefficients with standard errors in parentheses. *** p ≤ .01; ** p ≤ .05; * p ≤ .10 (one-tailed tests).
Table 4. Determinants of Support, Anxiety and Threat Perception toward CNTs

<table>
<thead>
<tr>
<th></th>
<th>Support</th>
<th>Anxiety</th>
<th>Threat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scientific information</td>
<td>2.26***</td>
<td>-1.48***</td>
<td>-2.40***</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Politicized Scientific Information</td>
<td>-1.40***</td>
<td>1.16***</td>
<td>0.72***</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Warning + Politicized Scientific Information</td>
<td>1.59***</td>
<td>-1.18***</td>
<td>-1.08***</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Politicized Scientific Information + Correction</td>
<td>0.20**</td>
<td>0.23***</td>
<td>0.20**</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Accuracy Motivation + Politicized Scientific Information + Correction</td>
<td>0.80***</td>
<td>-0.53***</td>
<td>-0.36***</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.10)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.64</td>
<td>0.46</td>
<td>0.46</td>
</tr>
<tr>
<td>Number of observations</td>
<td>1,203</td>
<td>1,176</td>
<td>1,168</td>
</tr>
</tbody>
</table>

Note: Entries are OLS regression coefficients with standard errors in parentheses. *** $p \leq .01$; ** $p \leq .05$; * $p \leq .10$ (one-tailed tests).
Table 5. Percent Expressing Support for Each Technology

<table>
<thead>
<tr>
<th></th>
<th>Fracking</th>
<th>CNTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Control</td>
<td>17%</td>
<td>22%</td>
</tr>
<tr>
<td>Scientific Information</td>
<td>95%</td>
<td>94%</td>
</tr>
<tr>
<td>Politicized Scientific Information</td>
<td>4%</td>
<td>17%</td>
</tr>
<tr>
<td>Warning + Politicized Scientific Information</td>
<td>95%</td>
<td>95%</td>
</tr>
<tr>
<td>Politicized Scientific Information + Correction</td>
<td>20%</td>
<td>32%</td>
</tr>
<tr>
<td>Accuracy Motivation + Politicized Scientific Information + Correction</td>
<td>85%</td>
<td>76%</td>
</tr>
</tbody>
</table>

The data above report the percentage of respondents in each experimental condition who express support greater than the mid-point on the 7-point scale (i.e., > 4) for each technology.
References


judgment. Chicago, IL: University of Chicago Press.


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i Frames are distinct from facts insofar as they prioritize a consideration that may – but need not – include factual content. While frames sometimes include factual content, in practice, most frames are “fact free” (i.e., do not report a verifiable and reproducible observation) (e.g., Berinsky & Kinder, 2006; Nelson, Oxley, & Clawson, 1997).

ii This prediction is orthogonal to work on scientific literacy, which focuses on how accumulated knowledge about basic science influences opinions. Recent work suggests that those with more basic knowledge about science hold more polarized attitudes (e.g., Scheufele & Lewenstein, 2005, p. 660; Kahan, 2012, p. 735; Kahan, 2015). The critical distinction between our research and research on scientific literacy is that we focus not on the *quantity* of basic scientific information, as in prior work, but rather on the impact of high *quality* and specific information (i.e., positive consensual scientific information toward an emergent technology) on opinion formation. This focus coheres with the aforementioned concerns regarding politicization’s impact on positive information.

iii A National Research Council (2009, p. 4) report implicitly recognizes how politicization can undermine the impact of scientific information: “Decision-making based on risk assessment is also bogged down. Uncertainty, an inherent property of scientific data, continues to lead to multiple interpretations and contribute to decision-making gridlock.”

iv Motivated reasoning encompasses a range of distinct goals, including defending prior opinions, and behavioral impression motivation (see Kunda, 1999, Ch. 6); however, we follow political communication work to date focusing on directional and accuracy goals.

v The theory also suggests people seek out information that confirms prior beliefs (i.e., a confirmation bias), but that is not relevant to our focus (see Druckman, Fein, & Leeper, 2012). Also, Lodge and
Taber (2013) explain, “The fundamental assumption driving our model is that both affective and cognitive reactions to external and internal events are triggered unconsciously, followed spontaneously by the spreading of activation through associative pathways which link thoughts to feelings, so that events that occur very early, even those that remain invisible to conscious awareness, set the direction for all subsequent processing…. A stimulus event triggers the stream of processing, proceeding through affective and then cognitive mediators, and perhaps leading to the construction of evaluations of political objects and conscious deliberation” (p.18). Lodge and Taber then depict the psychological process such that the emotional aspects are largely contained in the unconscious part of the processing that precedes the formation of stated attitudes. Along these lines they point out that “absent from [our Figure] is any mention of emotions” (2013, p. 21). In short, emotions play an important role in motivated reasoning, but – because this occurs unconsciously and we do not explore unconscious processes – our focus is on the cognitive aspects of opinion formation.

Druckman and Bolsen’s (2011) study is distinct from our focus since they explore the impact of a single piece of evidence (not consensual information) that contains factual information (i.e., citing the results of a study) compared to a similar frame that lacks factual content (see endnote 1); they also do not study the impact of politicization or the impact of efforts to counteract it.

Lodge and Taber (2013, pp. 35-36) explain that motivated reasoning, such as this, entails “systematic biasing of judgments in favor of one’s immediately accessible beliefs and feelings… [It is] built into the basic architecture of information processing mechanisms of the brain.”

Most past work on motivated reasoning focuses on how initial opinions with regard to a certain attitude object (e.g., an emergent technology, a political issue) shape subsequent attitudes and information-seeking behavior. Yet, the basic psychological processes apply straightforwardly to beliefs about scientific politicization. Our hypothesis also coheres, to some extent, with inoculation theory, which suggests that warnings can shape the impact of subsequent attempts at persuasion. The difference is that the focus in inoculation theory is on how to prevent future persuasion, while our focus – based in motivated reasoning theory – is on how communications can allow individuals to ignore politicized messages and be persuaded by scientific information (Compton & Pfau, 2005; Ivanov et al., 2012; McGuire, 1964; Pfau, 1997).

The expectation that warnings will have a greater impact than corrections is consistent with research in different domains that shows warnings exhibit stronger effects than corrections (Compton & Pfau, 2005, p.117; Einwiller & Johar, 2013, p.119; Pfau & Burgoon, 1988; also see Cobb et al., 2013, p. 308). We hired the firm ResearchNow to conduct the survey. They collected the data from a non-probability-based but representative (on all key census demographics) sample of the United States. When it comes to experimental research, such a sample is sufficient to ensure generalizable causal inferences (Druckman & Kam, 2011). See Table A1 in the Supplemental Appendix for the demographics of the sample.

We used quotes from actual articles reporting the findings from studies on CNTs and fracking (Strehlow, 2005; Wines, 2013) that focused on evidence in favor of each technology’s usage. As explained, this is a fruitful starting point given prior work suggests politicization renders positive information about the usage of an emergent energy technology impotent (Bolsen et al., 2014a). Other than identifying the source of the information as credible, we opted not to vary the source given that we believe this offers an important initial test, sans introducing interactions between the counteractive communication efforts and source of the information being politicized. Future work should explore source dynamics but doing so would have at least doubled the number of experimental conditions in our large studies. See Table A2 and Table A3 in the Supplementary Appendix for the complete wording of the stimuli for all experimental conditions we discuss in the main text.
We ran a pre-test to ensure that the politicization stimuli generated uncertainty; we found those exposed to politicization did express significantly greater uncertainty about whether the technology has sound science behind it relative to a control group. In short, they believed political considerations affected information on the given technology. We also opted, in this initial study, not to present an explicit political agenda as motivated by the politicized communication so as to avoid confounds of political leanings. Clearly future work is needed to isolate the impact of the political sources that use such communications.

Our experiment included two additional conditions that we do not discuss in the main text. The first condition included the accuracy prompt along with politicized information. The second included the accuracy prompt along with the politicized information preceded by a warning. We included these for exploratory purposes; we do not present them here since we had no clear expectations. Details reporting the exact wording of the stimuli for those conditions and all results are reported Tables A9–A15 in the Supplementary Appendix.

We confirmed the success of random assignment, and thus, the results we report to assess the effects of the experimental treatments on our dependent measures are robust to the inclusion of a host of demographic variables. (Details are available from the authors.) Additionally, we asked respondents, as a manipulation check, the extent to which political considerations affect the nature of the information that the public receives about the technology. As expected, individuals in the conditions with politicized information viewed political considerations as significantly more salient than those in other conditions; details are in Table A7 in the Supplementary Appendix.

The Ns in the tables drop a bit due to non-response on specific items. Note that although it is implicit that anxiety and threat mediate the impact of the communications on overall support, the design of our experiment precludes testing for mediation (see Bullock & Ha, 2011).

Two other findings are of note that we do not address in the main text. First, we asked respondents if they would like to be re-contacted with more information about either fracking or CNTs. We display the results in Table A7 in the Supplementary Appendix, which shows that the desire to obtain more information decreases in conditions where anxiety and threat decrease, and support for the technology increases. For example, when positive scientific information (i.e., condition 2) is presented only 7% to 9% of respondents requested to receive more information about fracking or CNTs, respectively, while the percentages in the politicized scientific information condition (i.e., condition 3) ranged from 56% to 73%. A warning or correction with an accuracy motivation significantly reduced perceptions of threat and anxiety associated with each technology’s usage, and reduced the associated information seeking that anxiety and threat induce, with the warning generating a greater reduction than the correction. We anticipated these results given that it is well established that anxiety generates information seeking behavior (e.g., Briñol & Petty, 2005, p. 298-299; Marcus, Neuman, & MacKuen, 2000, but see Case, 2012, Ch. 5, p. 115, on contexts where anxiety can lead to information avoidance). Nonetheless, they raise a perplexing challenge for science communication because efforts to reduce the impact of politicization when consensual scientific information exists causes individuals to be less interested in learning about emergent scientific technologies. Second, as mentioned in a prior note, we asked respondents the extent to which they believe that political considerations affect the nature of the information that the public receives when it comes to fracking or CNTs. While we find that these scores significantly correlate with a different question that we asked about whether respondents believe political considerations affect the nature of the information that the public believes when it comes to science in general (for fracking, \( r = .29; p \leq .01 \); for CNTs, \( r = .23; p \leq .01 \)), given the similarity of the questions, the modest size of the correlations suggests that politicization is a domain specific dynamic.