

Expertise in an Age of Polarization: Evaluating Scientists' Political Awareness and Communication Behaviors

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During the George W. Bush administration, intense debate focused on the administration's interference with the work of government scientists. In this study, analyzing a May/June 2009 survey of members of the American Association for the Advancement of Science (AAAS), we evaluate the factors during this period that influenced scientists' awareness of political interference and their media outreach and communication activities. Controlling for demographic and professional-level influences, those members who were more liberal in their political outlook, who were frequent blog readers, and who felt strongly about global warming were substantially more likely to have heard "a lot" about political interference. However, neither ideology, partisanship, nor opinion-intensity were predictive of the various media and communication behaviors assessed. Instead, the strongest predictor was the belief that media coverage was important for an individual's career advancement. Implications for evaluating the expert community's participation in future political debates are discussed.

Keywords: science communication; expert advice; politicization; advocacy; public opinion; social media; public engagement

During the years of the George W. Bush administration, political appointees and staffers were accused of improperly editing and censoring scientific agency reports; controlling the public and media statements of government scientists; and manipulating the use of scientific expertise and evidence. Critics charged that the Bush White House used such strategies to bolster its antiregulatory stance on environmental issues; to defend its pro-life

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orientation toward family planning and biomedical research; to spread public doubt about climate change and evolution; and to achieve other political goals. These “abuses of science” and “threats to scientific integrity” were extensively documented by way of congressional inquiries, reports by advocacy groups, and well-publicized books (see McCright and Dunlap 2010; Sarewitz 2009 for reviews).

The most prominent news accounts focused on the Bush administration’s actions relative to climate change. In a front-page story of the Sunday *New York Times* by Andrew Revkin (2006), headlined “Climate Expert Says NASA Tried to Silence Him,” Revkin detailed revelations by James Hansen that NASA public affairs staffers had threatened to restrict his public lectures, articles, web postings, and media interviews. In subsequent reporting at the *Washington Post* by Juliet Eilperin (2006), other agency scientists confirmed that representatives of the Bush administration had “chastised them for speaking on policy questions; removed references to global warming from their reports, news releases, and conference websites; investigated news leaks; and sometimes urged them to stop speaking to the media altogether.” These accounts of the “muzzling” of government scientists were further analyzed, digested, highlighted, and passed on by way of science bloggers, an online community comprising scientists, journalists, and other commentators that grew in size and influence across the Bush years (Fahy and Nisbet 2011).

Democratic strategists leveraged these incidents to mobilize outraged activists, donors, and other key constituencies, the scientific community included. For example, in 2007, to mark the fiftieth anniversary of Sputnik, presidential candidate Hillary Clinton declared that she would “end the war on science” if elected (Phillips and Bumiller 2007). Most notably, in his January 2009 inaugural speech, President Barack Obama pledged to his supporters that his administration would “restore science to its rightful place” (Obama 2009a). Similarly, in March 2009, in announcing that he would overturn Bush-era restrictions on funding for stem cell research, Obama defined his decision as “about letting scientists like those here today do their jobs, free from manipulation or coercion” (Obama 2009b).

In this study, analyzing a May/June 2009 survey of members of the American Association for the Advancement of Science (AAAS) conducted in the weeks and months following Obama’s speeches, we examine factors such as ideology and blog reading that may have shaped scientists’ awareness of Bush administration interference in science. We similarly assess how awareness of the debate along with other factors may have influenced scientists’ communication-related behaviors during this period, including talking with reporters, engaging with the public directly, and writing for blogs.

Looking back at the communication activities of AAAS members during the months immediately following the Bush administration and as Obama took office allows for novel insight into scientists’ political engagement. This was a period of intense polarization in American politics, particularly around scientific and environmental issues. As science policy scholar Daniel Sarewitz (2009) notes, the sharply divided political landscape put new pressures on scientists and their

institutions to serve as news media sources, public communicators, policy advisers, and in some cases, partisan advocates.

In all, our study provides a snapshot of how AAAS members during this period learned about allegations of political interference and how this awareness may have motivated their willingness to engage journalists and the public. Just as importantly, however, our study also identifies a range of motivations, disciplinary factors, and organizational roles that—apart from any specific political controversy—likely will shape the communication activities of scientists across their careers and in relation to future political debates.

Engaging in Political Debates

Controversies over the use of scientific expertise in policy decisions are not new. Nearly 40 years ago, sociologist Dorothy Nelkin commissioned a series of classic case studies that examined the nature of such controversies (1978, 1984, 1992). According to Nelkin, debates in the 1970s and 1980s such as those over nuclear energy or fetal tissue research were fundamentally controversies over political control: who gets to decide the future of these technologies and emerging fields? Which values, interpretations, and worldviews matter? Each case reflected “disagreement over the appropriate role of government, the struggle between individual autonomy and community goals,” wrote Nelkin (1992, xi). Moreover, she warned, “Based on competing social and political values, few conflicts are in reality resolved. Even as specific debates seem to disappear, the same issues reappear in other contexts” (p. xxiv). In such controversies, traditional approaches to communication by scientists that emphasize the translation and dissemination of expert knowledge are unlikely to reduce conflict and promote consensus. Simply focusing on the dissemination of scientific evidence tends to reinforce entrenched positions, since such evidence is often sufficiently tentative to indefinitely support the values-based arguments and worldviews of competing sides (Funtowicz and Ravetz 1992; Sarewitz 2004; Nisbet 2014).

These conclusions fit closely with the findings of communication researchers, social psychologists, and political scientists, as they have investigated the factors that shape the formation of individual-level opinions and preferences among the public. As studies in this area demonstrate, the traditional goal of scientists in communicating about their work—for example, to boost technical knowledge—is a relatively ineffective way to influence public judgments and decisions (Allum et al. 2008; Nisbet and Scheufele 2009). In highly contested political environments where partisan leaders disagree, the impact of knowledge often varies by way of an individual’s political identity, such that well-educated liberals and conservatives tend to be the most divided in their opinions (Kahan et al. 2012; Nisbet and Markowitz 2014).

The reason is that individuals with higher levels of education tend to be more adept at recognizing politically congenial arguments and determining what others like them think, are more likely to react to these cues in ideologically

consistent ways, and tend to be more personally skilled at offering arguments to support and reinforce their positions (see Haidt 2012 for a review). As a consequence, in policy debates such as those over climate change and stem cell research where political leaders actively communicate their diverging policy views, differences in opinion among college-educated partisans tend to be greater on average than those among their lesser-educated counterparts (Nisbet and Markowitz 2014). In this context, even carefully crafted efforts to influence those individuals holding factually incorrect beliefs are likely only to reinforce those beliefs (Nyhan et al. 2014). When scientists do emphasize the benefits of scientific research or technologies such as nuclear energy, studies show that counterframing by opponents that exaggerates risks or costs can trump these efforts (Bolsen, Druckman, and Cook, forthcoming).

Despite the conclusions of these studies, scientists and their organizations since the Bush years have doubled down on their efforts to translate and disseminate the technical findings of their research. This is somewhat understandable given the rapidly evolving diffusion of ever more advanced digital and web-based communication tools. In this new media ecosystem for discussion of science and politics, highly motivated members of the public can follow, comment on, and repurpose content across news websites and various social media platforms (Brossard 2013). For scientists, investing in media and web-based outreach can be an important method of gaining attention, recognition, and funding for their research and institutions; for building their public profile and personal brand; and for expressing their opinions on politics, religion, and other social identity-related matters (Fahy and Nisbet 2011). In response to these trends, enthusiastic scientists across fields are enrolling in communication workshops where they are instructed on how to blog, use Twitter, make online videos, create visual presentations, employ Hollywood acting techniques, and cultivate relationships with journalists (National Research Council 2014).

With this surge in interest among scientists, studies published in the period since Bush left office—including analyses of the AAAS survey data used in this study—have begun to evaluate the factors that shape how scientists view the public, the media, and the political process (Besley and Nisbet 2013; Peters et al. 2008) and the impact of these perceptions on their communication behaviors (Allgaier et al. 2013a, 2013b). For example, research has examined how demographic and professional influences such as age, gender, and disciplinary field motivate outreach to the public and the news media (Allgaier et al. 2013b; Besley, Oh, and Nisbet 2013). Other factors such as a motivation to benefit the public good or the perception that media coverage is important for career advancement are also predictive of outreach (Besley, Oh, and Nisbet 2013).

However, these analyses have been primarily descriptive in nature, or have compared just a few possible influences, rather than using more advanced statistical techniques to control for a variety of confounding factors. Nor have these studies systematically examined how other political influences such as ideology, opinion intensity, political awareness, and differential attention to information sources such as blogs might influence scientists' communication activities. Similarly, studies to date have not evaluated how these factors may motivate

social media outreach by scientists, most notably blog writing. Finally, none of these studies have evaluated these processes through the lens of a particular historical controversy such as the Bush-era debate over interference with government scientists.

In this regard, to the extent that scientists' efforts to engage with the public and the media are forms of civic and political participation, past research suggests that a key set of factors is likely to influence behavior. Specifically, studies show that members of the public who are the most likely to participate in politics are often those who identify most closely with a particular ideology or political party (Scheufele, Nisbet, and Brossard 2003). Also more likely to participate are so-called single-issue voters who feel most intensely about a specific debate such as that over stem cell research (Goidel and Nisbet 2006) or climate change (Nisbet 2011).

Other studies indicate that blog reading—above and beyond these factors above—also has unique effects on political participation and civic engagement. For example, in a study of the general U.S. population, de Zuniga and colleagues (2009) find that heavier readers of public affairs–focused blogs are also more likely to engage in online conversations about politics, send politically relevant emails, and contribute financially to causes or campaigns.

Therefore, in our current study, analyzing the representative survey of AAAS members collected in the months following Bush's departure from office, we examine a range of likely factors influencing scientists' political awareness and communication behaviors. To start, we examine AAAS members' use of science-related blogs as a source of information and how blog reading along with other factors influenced awareness of the debate over the Bush administration's interference with government scientists. We then examine how blog reading, awareness of Bush interference, ideology, and opinion intensity may have motivated different forms of media and public outreach among scientists. We compare these factors to other previously identified influences on scientists' communication behaviors including extrinsic and intrinsic motivations, disciplinary background, career stage, and professional role.

Methods

For our analysis, we analyzed data collected as part of a May/June 2009 survey of 2,535 members of the AAAS, conducted by the Pew Research Center. With the survey taking place less than six months after President Bush left office and in close proximity to President Obama's speeches and comments about scientific integrity in policymaking, the timing of the survey is uniquely suited to evaluate awareness of Bush administration interference with government scientists and its relationship to communication activities.

To recruit respondents, Pew mailed a sample of 9,998 AAAS members a letter of invitation to complete the online survey with follow-up reminders occurring via either email or postal mail. A total of 1,411 of the 5,816 sampled members in

the e-mail group completed the interview for a response rate of 24 percent. In the mail group, 1,122 members of the 4,182 sampled completed the survey for a response rate of 27 percent. The overall response rate for the study was 25 percent (2,533 completed/9,998 sampled members). To correct for potential sampling biases, the data were weighted by Pew so that the sample matched key parameters of the AAAS membership database (Pew Research Center 2009). We apply this weight variable in all analyses conducted in our study.

Dependent variables

We examined two sets of dependent variables. The first set measured the frequency of reading science blogs and how much respondents had heard about Bush administration interference with government scientists. We then used this first set of dependent variables as predictors of our second group of measures evaluating communication-related behaviors. These included (a) talking to reporters, (b) talking to nonscientists, and (c) writing for a science blog. To improve comparability between several dummy variables that we used as independent measures in our regression models, we recoded response categories to each dependent measure on a 0 to 1 scale.

Read a blog about science. As previously reviewed, past studies of the general population have found that heavier readers of public affairs–related blogs are more likely to engage in various forms of political activity. Moreover, during the debate over Bush administration interference with government scientists, science-related blogs were an important online context where news reports were discussed and where the political significance of the events was framed. Many of these blogs were also used to actively argue on behalf of scientists speaking out in defense of “scientific integrity,” to urge scientists to respond to false or misleading information, and at times to advocate that scientists become involved in election-related activity.

Therefore, given these dynamics, to examine the frequency of reading science-related blogs, we used a question asking respondents “How often, if ever, do you do any of the following? Read a blog about science?” Responses were “Never” (31.9 percent of respondents, coded 0), “Rarely” (26.6 percent, coded .33), “Occasionally” (27.7 percent, coded .67) and “Often” (14 percent coded 1) ($M = .41$, $SD = .35$).

Heard about Bush administration interference. To evaluate awareness of Bush administration interference with government scientists, we used a question asking AAAS respondents “How much, if anything, have you heard about claims that government scientists were not allowed to report research findings that conflicted with the Bush administration’s point of view?” Responses were “Heard nothing at all” (14 percent of respondents, coded 0), “Heard a little” (30.4 percent, coded .50), and “Heard a lot” (55 percent coded 1) ($M = .70$, $SD = .36$).

Talk to reporters about new research findings. To evaluate news media outreach activities, we used a question that asked “How often, if ever, do you do any

of the following? Talk to reporters about new research findings?” Responses were “Never” (45 percent of respondents, coded 0), “Rarely” (31.1 percent, coded .33), “Occasionally” (20 percent, coded .67), and “Often” (3 percent, coded 1) ($M = .27$, $SD = .28$).

Talk to nonscientists about science/research findings. To examine direct outreach to the public, we used a question that asked AAAS respondents “How often, if ever, do you do any of the following? Talk with nonscientists about science or research findings?” Responses were “Never” (1.7 percent of respondents, coded 0), “Rarely” (11 percent, coded .33), “Occasionally” (48.3 percent, coded .67), and “Often” (38.7 percent, coded 1) ($M = .74$, $SD = .23$).

Write for a blog about science. To evaluate social media outreach activities, we used the question “How often, if ever, do you do any of the following? Write for a blog about science?” Responses were “Never” (82 percent of respondents, coded 0), “Rarely” (11 percent, coded .33), “Occasionally” (4.5 percent, coded .66), and “Often” (2 percent, coded 1) ($M = .09$, $SD = .21$).

Independent measures

Along with the influence of political awareness and blog reading on scientists’ communication behaviors, three categories of independent measures were of particular relevance to our analysis. The first group includes politically relevant influences such as partisanship, ideology, and opinion-intensity, factors that previous studies show predict forms of political participation among the general population (e.g. Goidel and Nisbet 2006; Scheufele, Nisbet, and Brossard 2003). The second group of influences includes extrinsic and intrinsic motivations such as a belief that media coverage is important for career advancement and a desire to benefit the public interest (e.g. Besley, Oh, and Nisbet 2013). The third group includes career, professional, disciplinary, and organizational-level factors such as career stage and disciplinary field; employment sector; funding sources; and time spent on research, teaching, and administration (e.g., Allgaier et al. 2013a, 2013b; Besley and Nisbet 2013; Peters et al. 2008).

Partisanship, ideology, and opinion intensity. We measured partisan identification using the question, “In politics today, do you consider yourself a Republican, Democrat, or independent?” Among AAAS respondents, 55.4 percent identified as Democrats, 31.6 percent as independents, and 6.2 percent as Republicans. For our regression analysis, we included dummy codes for Republicans and independents. Political ideology was measured using the item, “In general, would you describe your political views as...” Very conservative (0.9 percent of AAAS respondents, coded 0), Conservative (8.0 percent, coded .25), Moderate (35.4 percent, coded .50), Liberal (38.2 percent, coded .75) or Very liberal (14.2 percent, coded 1). As a measure of issue-specific opinion intensity, given the significance of the issue to the debate over the Bush administration, we controlled for a AAAS members’ perceived seriousness of global warming using

the following question: “In your view, is global warming:” Not a problem (2.4 percent of respondents, coded 0), Not too serious a problem (4.4 percent, coded .33), Somewhat serious a problem (22.4 percent, coded .67), Very serious problem (70.4 percent, coded 1).

Intrinsic and extrinsic motivations. Consistent with previous studies (Besley, Oh, and Nisbet 2013), to control for intrinsic motivations, we included an item that asked: “Looking back, how important was each of the following to your decision to become a scientist? A desire to work for the public good:” Not at all important (3.7 percent of respondents, coded 0), Not very important (15 percent, coded .33), Somewhat important (39.8 percent, coded .67), Very important (41 percent, coded 1). Also in line with this previous research, to account for extrinsic motivation, we included an item that asked: “How important for career advancement is it for scientists in your specialty area to get their research covered by the news media?” Not at all important (14 percent, coded 0), Not too important (48 percent, coded .33), Important (29 percent, coded .67), Very important (8 percent, coded 1).

Career, professional, disciplinary, and organizational factors. We also assessed a number of other factors that past studies suggest may influence scientists’ communication-related activities. These included dummy codes for whether an AAAS respondent was retired (19.2 percent of respondents), a full-time student (15.9 percent), and employed full time (70.9 percent). We also included dummy codes for those respondents indicating their principal field was biology and/or medicine (51 percent of respondents), the geosciences (6 percent), or the social sciences and policy (7 percent). These dummy codes allowed for a comparison versus all other fields asked about in the survey, including chemistry, physics and astronomy, engineering, and computer science and math—fields that previous studies indicate are less likely to engage in outreach activities (see Besley, Oh, and Nisbet 2013). We also assessed the influence of research experience, using a question that asked “Including time spent on research in graduate school, how many years have you been involved in conducting scientific research?” ($M = 23.09$ years, $SD = 15.4$).

We additionally included dummy codes if the respondent was employed by a university (50.9 percent of respondents), the government (6.5 percent), or a non-governmental organization (NGO) (6.5 percent) (with the comparison to those employed in health care, by a hospital, or industry/business). We similarly included dummy measures indicating whether in the last five years an individual had worked on a research project that had been funded by a government agency (not including the Department of Defense) (64.8 percent of respondents) or by an industry/private sector sponsor (46.8 percent).

Finally, we also assessed how an AAAS member spends his/her professional time. The first item asked: “Thinking about the last five years of your career, how much of your time has been devoted to research?” Little or none (10.5 percent of respondents, coded 0), Some (22.3 percent, coded .33), A lot (33.9 percent, coded .67), Most or all (31.9 percent, coded 1). The second item asked “How much of your time has been devoted to teaching?” Little or none (26.9 percent,

coded 0), Some (40.6 percent, coded .33), A lot (22.8 percent, coded .67), Most or all (7.7 percent, coded 1). The third item asked "How much of your time has been devoted to management and administration?" Little or none (28.1 percent, coded 0), Some (35.2 percent, coded .33), A lot (24.7 percent, coded .67), Most or all (9.8 percent, coded 1).

Other controls. Demographic variables controlled for in our regression model include sex (52.2 percent female; male coded 0), race (77.6 percent white, 22.4 percent other; white coded as 0), and age ($M = 45.68$ years, $SD = 17.52$). To evaluate possible midcareer influences, we included an age-squared variable. To assess economic well-being, we used a question asking "How would you describe your household's financial situation? Would you say you..." Don't even have enough to meet basic expenses (1.4 percent of respondents, coded 0), Just meet your basic expenses (8.0 percent, coded .33), Meet your basic expenses with a little left over for extras (28.2 percent, coded .67), Live comfortably (60.4 percent, coded 1).

To evaluate the factors predicting our outcome variables of interest, we ran a series of ordered probit regression models. Regression coefficient estimates are reported, along with standard errors and model fit statistics. Following established methodological procedures, we additionally used data visualization techniques to explore any significant interaction effects.

Results

Frequency of reading a blog about science

For the reasons previously outlined, we began by evaluating the factors shaping the frequency of science blog reading among AAAS members. As shown in Table 1, after all controls, ideology was the strongest predictor of science blog reading. Liberal AAAS members were substantially more likely than their moderate and conservative counterparts to be frequent science blog readers. In addition, those AAAS members who believed that media coverage was important for career advancement, who were motivated to work for the public good, and who spent more time on teaching were also more likely to be frequent science blog readers. In contrast, older AAAS members; women; those working in the biological and medical fields; and those employed by universities, government, or NGOs were each less likely to read science blogs.

Awareness of Bush interference

Next we examined the factors predicting how much AAAS members had heard about claims that the Bush administration had interfered with government scientists. After all controls, by a considerable margin, the strongest predictors of awareness were ideology and opinion intensity. The more serious a problem that an AAAS member perceived global warming to be and the more liberal they were

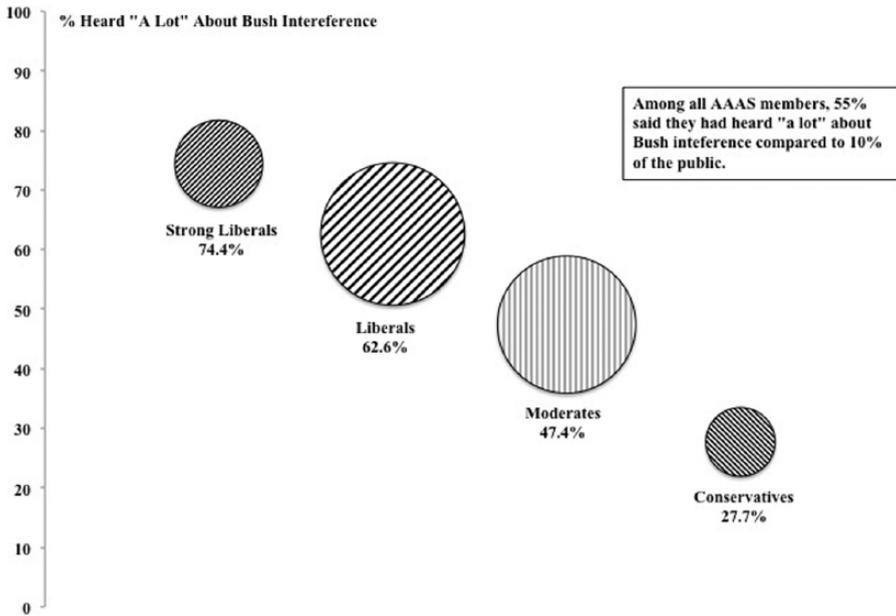
TABLE 1
 Results of Ordered Probit Regression Models Predicting Frequency of Science Blog Reading and Awareness of Bush Administration Interference with Government Scientists

Predictor	Science Blog Reading		Aware of Bush Interference	
	Estimate	SE	Estimate	SE
Age (years)	-.010**	.004	.008^	.004
Age squared	.000	.000	-.001***	.000
Sex (female)	-.142°	.062	-.477***	.069
Race (nonwhite)	.180^	.098	-.289**	.107
U.S. citizen	-.029	.101	-.307**	.110
Economic well-being	-.101	.132	.288^	.148
Republican	-.024	.131	-.371**	.143
Independent	.050	.063	-.119^	.070
Ideology	.484**	.151	1.042***	.175
Employed	-.053	.109	.143	.122
Retired	.152	.149	.443°	.178
Student	.126	.099	-.015	.110
Research experience	-.003	.003	.002	.004
Field: Bio, medicine	-.211**	.061	-.020	.070
Field: Soc sci, policy	.045	.117	-.035	.139
Field: Geoscience	-.104	.121	.220	.146
University employee	-.302***	.086	-.200°	.098
Government employee	-.253°	.115	-.286°	.131
NGO employee	-.271°	.119	-.055	.139
Time research	.122	.112	.045	.130
Time teaching	.240°	.102	.338**	.117
Time admin	.090	.103	.209^	.120
Government funded	.130^	.068	.096	.078
Private funded	.071	.056	-.190**	.064
Media importance	.473***	.104	.117	.121
Public motivated	.307**	.103	.020	.117
GW serious	-.045	.139	1.217***	.155
Blog reading	-	-	.453***	.092
Threshold 1	-.334	.245	-.136	.276
Threshold 2	.441	.245	1.114	.277
Threshold 3	1.366	.247	-	-
Nagelkerke R ²	.098		.320	
-2 ° Log Likelihood	4507.215		2751.993	
χ ² (DF)	166.480 (27)***		550.223 (28)***	

NOTE: N = 2,535.

^p < .10. °p < .05. **p < .01. ***p < .001.

FIGURE 1
Percentage of AAAS Members by Ideology Who Heard "A Lot" about
Bush Interference with Government Scientists



NOTE: Bubble size is proportionate to percentage of AAAS respondents self-identifying by each ideological category. Those respondents saying they identified as either "conservative" (8.0 percent) or "very conservative" (0.9 percent) were collapsed into a single category. Respondents were asked "How much, if anything, have you heard about claims that government scientists were not allowed to report research findings that conflicted with the Bush administration's point of view?" Responses were "Heard nothing at all"; "Heard a little"; or "Heard a lot." AAAS survey ($N = 2,535$) and general public survey ($N = 2,001$) conducted by Pew Research Center (2009).

in political outlook, the more likely they were to have heard about Bush interference. The substantial differences in awareness by ideology are plotted in Figure 1 with bubble sizes representing the proportion of each ideological group among AAAS members. It is important to note the differences in awareness between AAAS members as a group and the general public. In this case, 55 percent of AAAS members reported hearing "a lot" about Bush interference compared with just 10 percent of the public.

In addition to the influence of ideology, those AAAS members who frequently read science blogs were also more likely to have heard about the claims of Bush interference as were those AAAS members reporting that they were better off financially, who devoted more of their time to teaching, and/or who were retired. In contrast, women, nonwhites, non-U.S. citizens, Republicans (in comparison with Democrats), those employed by universities, and those receiving private

sector funding were all less likely to have heard about Bush administration interference. Of interest, despite being potentially impacted by Bush administration actions, those AAAS members working for the government were less likely to have heard about the claims.

Given the influence of ideology and blog reading on awareness, we tested the interaction between these two variables, expecting that the impact of blog reading varies by ideology. In a separate regression, controlling for all variables displayed in Table 1, the interaction term was statistically significant ($B = -1.134$ [.415], $p = .006$). Adding the interaction term also significantly improved overall model fit ($\Delta x^2 = 7.463$ [df = 1], $p = .006$). As Figure 1 indicates, the effects of blog reading on political awareness were greatest among conservatives and moderates. In other words, conservatives and moderates who frequently read science blogs were more likely to report hearing “a lot” about Bush administration interference. Yet for liberals and strong liberals, blog reading had little impact on awareness (which was already uniformly high).

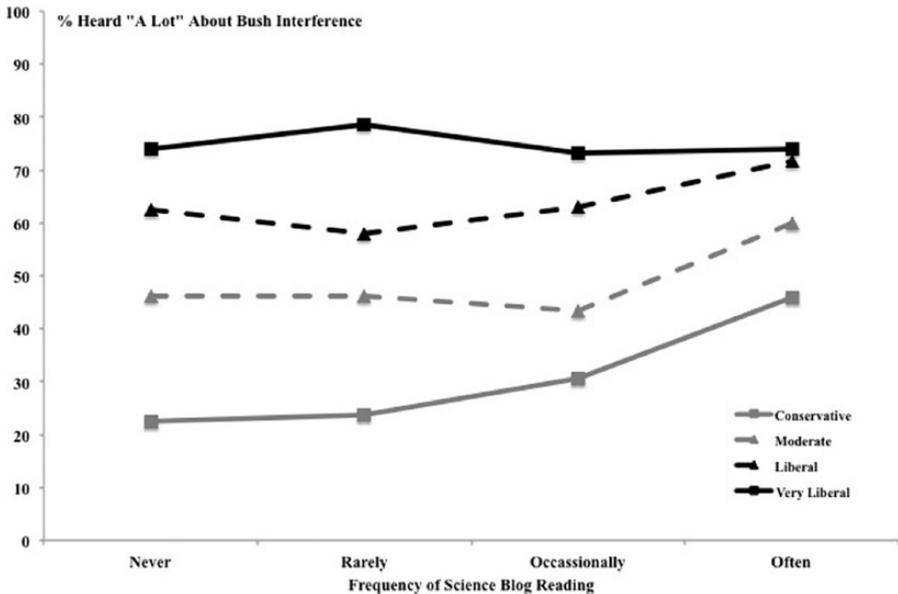
Though we do not have measures of other forms of news exposure and discussion available in our dataset, this finding likely suggests that liberals were seeking out and paying attention to the debate by way of media and interpersonal sources other than science blogs (such as newspapers, magazine articles, books, casual conversations, and/or public talks), whereas moderates and conservatives did not seem to have shared the same patterns of selective exposure and attention by way of other sources. Additionally, even among heavy blog readers, as our figure indicates, there remained considerable gaps in awareness by ideology, also suggesting selective attention to and recall of Bush interference claims.

Talking to reporters about new research findings

Next, we evaluated the factors influencing how frequently AAAS members talked with reporters about new research findings. As shown in Table 2, neither partisanship, nor ideology, nor perceived seriousness of global warming was significantly related to media outreach activities. Frequency of blog reading was significantly related to media outreach, but awareness of Bush interference had no significant relationship.

Perhaps not surprisingly, the strongest predictor was the extrinsic motivation of believing that media coverage was important for career advancement. Those working in the geosciences, employed in the social sciences, and spending more of their time on administration were also more likely to interact with journalists. To a lesser degree, those who were male, financially well off, and experienced researchers also spoke more frequently with reporters. The same finding held for those employed by universities and NGOs (compared with those working in health care, for a hospital, or in industry/business), those spending more of their time on teaching, and those funded by the private sector. Of interest, despite being potentially affected by Bush administration actions, those employed by government or funded by a government agency were each more likely to talk to journalists about research than their counterparts in the private sectors or those not receiving funding.

FIGURE 2
Influence of Science Blog Reading on Awareness of Bush Interference by Ideology



NOTE: To measure awareness of Bush interference, respondents were asked: “How much, if anything, have you heard about claims that government scientists were not allowed to report research findings that conflicted with the Bush administration’s point of view?” Responses were “Heard nothing at all”; “Heard a little”; or “Heard a lot.” To measure science blog reading, respondents were asked: “How often, if ever, do you do any of the following? Read a blog about science?” AAAS survey conducted by Pew Research Center (2009); $N = 2,535$.

Expecting that ideology among scientists may differentially shape—as it does among the general population—the influence of information sources and political awareness on politically relevant behavior, we tested in separate regressions the interactions between ideology and science blog reading, and ideology and awareness of Bush interference. Both interactions were nonsignificant, suggesting that liberal or conservative, blog reading (positive influence) and political awareness (no influence) had the same relationship to media outreach efforts.

Talking to nonscientists about science or research findings

We next evaluated the factors influencing how often AAAS members said they spoke with nonscientists about science or research findings. Neither ideology, nor partisanship, nor the perceived seriousness of global warming was significantly related to direct public outreach (see Table 2). Awareness of Bush interference was only weakly and positively predictive.

TABLE 2
 Results of Ordered Probit Regression Models Predicting Frequency of Talking to Reporters, Talking with Nonscientists, and Writing for a Science Blog

Predictor	Talk to Reporters		Talk to Nonscientists		Write for Science Blog	
	Estimate	SE	Estimate	SE	Estimate	SE
Age (years)	.006	.004	.003	.004	.009 [^]	.006
Age squared	.000	.000	.000	.000	.000	.000
Sex (female)	-.200 ^{**}	.068	.070	.066	-.195 [°]	.096
Race (nonwhite)	.187 [^]	.104	-.514 ^{***}	.103	.584 ^{***}	.126
U.S. citizen	.159	.108	-.093	.106	.279 [°]	.137
Econ well-being	.517 ^{***}	.146	.288 [°]	.141	.070	.192
Republican	-.056	.142	.037	.139	-.124	.203
Independent	-.033	.067	.007	.067	-.062	.093
Ideology	-.198	.162	-.216	.162	-.090	.220
Employed	-.114	.120	-.190	.118	-.147	.150
Retired	-.155	.156	-.237	.160	-.170	.212
Student	-.167	.112	.155	.106	.044	.139
Research experience	.018 ^{***}	.004	.001	.004	-.001	.005
Field: Bio, medicine	.093	.065	.066	.065	-.036	.091
Field: Soc sci, policy	.477 ^{***}	.122	.148	.128	.254	.160
Field: Geoscience	.695 ^{***}	.124	.400 ^{**}	.132	.398 [°]	.167
University employee	.425 ^{***}	.092	-.123	.092	-.089	.124
Government employee	.307 [°]	.121	-.092	.122	-.340 [^]	.180
NGO employee	.451 ^{***}	.124	.133	.128	-.087	.176
Time research	.207 [^]	.119	-.283 [°]	.119	-.051	.168
Time teaching	.331 ^{**}	.110	.583 ^{***}	.110	.155	.153
Time admin	.630 ^{***}	.109	.182 [^]	.110	.098	.154
Government funded	.266 ^{***}	.073	.121 [^]	.073	.103	.101
Private funded	.279 ^{***}	.060	.201 ^{**}	.060	.132	.083
Media importance	.740 ^{***}	.110	.484 ^{***}	.112	.442 ^{**}	.151
Public motivated	.389 ^{***}	.110	.512 ^{***}	.109	.043	.158
GW serious	.012	.152	.112	.150	-.235	.206
Blog reading	.256 ^{**}	.084	.514 ^{***}	.085	2.018 ^{***}	.132
Aware interference	.126	.093	.180 [°]	.092	.073	.128
Threshold 1	2.205	.272	-1.471	.275	1.321	.351
Threshold 2	3.278	.276	-.175	.262	2.124	.354
Threshold 3	4.638	.287	1.398	.264	2.813	.361
Nagelkerke R ²	.315		.154		.292	
-2 ° Log Likelihood	3544.375		3238.908		1723.850	
χ ² (DF)	582.465 (29) ^{***}		246.870 (29) ^{***}		400.339 (29) ^{***}	

NOTE: N = 2,535.

[^]p < .10. [°]p < .05. ^{**}p < .01. ^{***}p < .001.

Instead, among the strongest predictors of direct public outreach activities were science blog reading, motivation to serve the public good, and a belief that media coverage was important to career advancement. Perhaps not surprisingly, those focused on teaching were also more likely to say they spent time talking to nonscientists about research. Other predictors of public outreach activities were economic well-being, working in the geosciences, and support by way of private sector funding. In contrast, those AAAS members who were nonwhite or spent more of their time focused on research were less likely to say that they engaged in conversations about science with nonscientists. When tested, no significant interactions among ideology, blog reading, and awareness on the frequency of talking with nonscientists emerged.

Writing for a blog about science

Finally, as shown in Table 2, we evaluated the factors influencing how frequently AAAS members wrote for a blog about science. Neither partisanship, nor ideology, nor perceived seriousness of global warming, nor awareness of Bush interference was significantly related to this major form of social media outreach. In contrast, those AAAS members who were male, who worked in the geosciences, who believed media coverage was important for career advancement, and who frequently read science blogs were all more likely to engage in this form of social media outreach. Of particular interest, nonwhite AAAS members were substantially more likely to write for a science blog than their white counterparts. No significant interactions among ideology, blog reading, and awareness emerged.

Conclusion

In the wake of the controversy over the Bush administration's interference with government scientists, our findings show that among AAAS members there were strong levels of selective information seeking, attention to, and recall of the debate. Those AAAS members who were more liberal in their political outlook and who felt the most intensely about global warming were more likely to say that they had heard "a lot" about the issue. Our findings also provide the first insight into the selective use and differential effects of blogs on the political awareness of scientists. Of particular relevance, ideology was the strongest predictor of science blog reading, with liberals more likely than their moderate and conservative counterparts to say that they frequently turned to blogs for information. Yet, importantly, as our interaction results show, science blog reading had only negligible effects on liberals' awareness of the Bush controversy. Instead, the effects of science blog reading on awareness were strongest among moderate and conservative AAAS members. This suggests that liberal AAAS members may have been relying on other media and interpersonal sources to be kept informed about the debate.

Apart from awareness, ideology also appears to have influenced AAAS members' interpretation of the claims that the Bush administration improperly interfered with government scientists. In this case, among AAAS members who had heard about the controversy, 57 percent of conservatives said the claims were true, compared with 87 percent of moderates and 97 percent of liberals. Those answering *true* were also asked whether the Bush administration engaged in greater levels of political interference than past administrations, with 68 percent of conservatives answering in the affirmative, compared with 88 percent of moderates and 96 percent of liberals. These descriptive results, however, should be interpreted cautiously. The design of the AAAS survey does not allow for regression analysis of the answers to these questions (due to the smaller sized subsamples that were asked to respond to each question,) and therefore we are not able to control for various confounding factors.

From our analysis, we are also provided a picture of which AAAS members and scientists remained comparatively unaware or unconcerned about the allegations of Bush administration interference. In this case, we find that female, minority, and non-U.S. citizen members of AAAS were all less likely to have heard about the debate. Of interest, those members of AAAS who were employed by the government were also less likely to report hearing about Bush administration interference. In comparison, men, retirees, those who spent more time teaching, and those who were better off financially followed the controversy more closely.

At the end of eight years of intense debate over the actions of the Bush administration, we do not find, however, that ideology, partisanship, or opinion intensity were predictive of either talking to reporters, engaging with nonscientists, or writing for a blog. Moreover, among these outcome measures, awareness of the Bush administration controversy was only weakly and positively related to talking with nonscientists. Instead, the strongest and most consistent predictor of all three media and communication activities was the belief that media coverage was important for career advancement. Similarly, those AAAS members who frequently read science blogs and those working in the geosciences were also more likely to engage in all three of the media and communication activities that we assessed.

Similar to the general population, blog reading among scientists appears to promote various forms of civic engagement, though research should examine more closely whether this relationship still holds true today. In the case of geoscientists, because of their expertise relative to climate change and energy, as the Bush era came to a close, these experts may have felt more of a duty to engage in outreach and/or be called on more frequently for information by the media and the public. Of relevance to future research, our analysis suggests a unique disciplinary orientation that stands apart from—or in addition to—any motivations that might derive from a geoscientist's intensity of belief about climate change or ideological outlook.

Beyond the snapshot in time (i.e., the cross-sectional nature our study) there are several important considerations that were limitations to our study and that therefore should be more closely examined in future research. First, similar to

studies of the general public, future surveys should ask scientists specifically about donations to political groups and candidates; the writing of op-eds and letters to the editor; their volunteering in support of political candidates or causes; their participation in protests or demonstrations; and their participation in public meetings or in providing expert testimony.

Along with these more fine-grained assessments of political activity, specific questions should be asked about different sources of news and public affairs information; and the interpersonal conversations about politics that scientists might have with colleagues and friends. With these activities, if past studies of the general public are predictive of scientists as a group, researchers are likely to find that ideology, partisanship, and issue-specific opinion intensity play significant roles.

Future studies should also more carefully evaluate scientists' understanding of the different roles they can play in the policymaking process and how an individual's specific role conception influences their communication activities and political engagement. Do scientists consider themselves to be passive and neutral responders to requests for information from the public and decision-makers? Do they alternatively view themselves in a proactive role as issue advocates promoting a specific set of preferred policies and political outcomes? Or do they define their role as advisors helping to expand the portfolio of policy options considered by decision-makers and the public? (See Pielke 2007 for a review of these possible roles and others.)

Also, how might role conceptions and communication activities differ among scientists working across disciplines and sectors, including those, for example, employed by public and land grant universities, institutions that have a mission to specifically address through research and translation the needs of their states and regions?

Finally, as debate over deeply polarized issues such as climate change continues, future research should also examine how the strong ideological and partisan skew of AAAS membership—and the science community more generally—might shape the perceptions and communication activities of experts. For example, given that 55 percent of AAAS members self-identify as liberal and as Democrats, as a community they may be more critical of the handling of science policy by Republican administrations while overlooking or giving a pass to the political calculations that shape the decisions of Democratic administrations (for discussions, see Sarewitz 2009; Pielke and Klein 2009). The findings and questions raised by our study should prove fertile ground for social scientists as they examine the various factors that influence the political judgments, behavior, and communication activities of the expert community in an age of intense polarization.

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