The U.S. News Media, Polarization on Climate Change, and Pathways to Effective Communication

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Abstract

The news media are a central source of information about climate change for most people. Through frames, media transmit information that shape how people understand climate change as well as the actions they are ultimately willing to support to address the problem. This article reviews the rise of climate change in the U.S. news media and the emergence of related frames in public discourse. In doing so, it traces the roots of partisan divisions over climate change and highlights the role that events, journalistic practices, technological changes, and individual-level factors such as ideological and partisan identity have played in fostering polarization. The article concludes by identifying the core challenges facing communicators who seek to build consensus for action on climate change and highlights the most viable solutions for achieving success.

The news media are a central source of information about climate change for most people.[1] Through frames, media transmit information that shape how people understand climate change as well as the actions they are ultimately willing to support to address the problem. The framing process refers both to the selection of language to communicate information about an issue as well as the effect of such choices on how audiences form opinions. Frames are unavoidable aspects of communication that people rely on to make sense of the political world; however, they are often employed strategically by communicators seeking to persuade an audience to support a particular agenda. This has been the case with respect to frames that have emerged in recent decades in media discourse on climate change. These frames have contributed to polarization among segments of the public in the U.S. and, in turn, increase challenges faced by communicators trying to raise the salience of climate change as a policy priority.

Any discussion about the emergence of frames in public discourse regarding climate change must include an assessment of the news media. The specific focus here is on the U.S. case, tracing the roots of partisan divisions over climate change and highlighting the role that events, journalistic practices, technological changes, and individual-level factors such as ideological and partisan identity have played in fostering polarization. We discover that the roots of distortion and imbalance in the news media are associated with a number of identifiable frames. The media is not the sole culprit,

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[1] We define the news media as "the publisher, editors, journalists and others who constitute the communications industry and profession, and who disseminate information, largely through newspapers, magazines, television, radio and the Internet" (Boykoff & Roberts, 2007, p.3).

however, as we show how interest groups and political leaders most effectively select and convey to the media those frames to employ in public discourse. The article then discusses the challenges facing communicators seeking to foster consensus among the U.S. public necessary for policy action, which include understanding how to: increase the importance of climate change as a priority; overcome partisan divisions regarding the fundamentals of climate science; effectively combat instances in which actors politicize climate science; and, overcome obstacles posed by selective attention and the perceived distal nature of impacts resulting from climate change. The article concludes by identifying viable avenues for communicators to overcome each of these challenges in order to build greater consensus in the U.S. for policy action on climate change.

The U.S. News Media's Coverage of Climate Change

Operationalizing "Frames"

All forms of human communication, including information in news coverage about climate change, involve the necessary and unavoidable selection of frames to shape how audiences understand a social problem, issue or event. The concept of a *frame in a communication* refers to words, symbols, phrases, or images that highlight a subset of the potentially relevant considerations toward any object (e.g., a candidate, a policy, or a political issue) (Druckman, 2001). In a news story focusing on the likely effects that will occur due to climate change, a communicator (e.g., a journalist) might emphasize environmental-, economic-, or public health-related implications, as well as a number of other potentially relevant sets of considerations. Frames, in this way, "select some aspects of reality and make them more salient in a communicating text in such a way as to

promote a particular problem definition" (Entman, 1993, p. 52). Importantly, "[they] are never neutral: they define an issue, identify causes, make moral judgments, and shape proposed policy solutions" (O'Neill, Williams, Wiersma, & Boykoff, 2015, p. 380). In Table 1, the primary frames that have emerged over time in media discourse related to the impacts of climate change are summarized. We discuss below the factors giving rise to many of these frames.

Hansen's Testimony

In the late 1980s, a number of factors contributed to the rise of news coverage of climate change and its attendant frames (Boykoff & Boykoff, 2004; Boykoff & Roberts, 2007). First, in 1988, NASA scientist James Hansen testified to Congress that global temperature increases were directly linked to fossil fuels being burned for energy, resulting in increasing concentrations of carbon dioxide in the atmosphere. His testimony, coupled with an intense heat wave and drought in North America that year, generated substantial news coverage both in newspapers and on television (Ungar, 1992). Krosnick, Holbrook, and Visser (2000) explain, "The drought and the fact that 1987 had been the hottest year on record received major news coverage, much of it speculating about whether global warming was responsible for the drought" (p. 240). By September of 1988, 58% of the U.S. public had heard or read about global warming (Nisbet & Myers, 2007). In that same year, the United Nations Environmental Program and the World Meteorological Organization created the Intergovernmental Panel on Climate Change (IPCC) to assess the varied impacts of climate change.[2] George H.W. Bush also

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[2] The IPCC released reports that received periodic attention in the U.S. press: in 1990, 1995, and 2001 (Boykoff & Roberts, 2007).

campaigned for president then under the pledge to "fight the greenhouse effect with the White House effect" (Boykoff & Roberts, 2007, p.6; Peterson, 1989, A1). From that point until the early 1990s, much of the press attention related to climate change focused on possible alternatives to carbon-based energy consumption as well as those policies that would promote alternative energy such as nuclear power (Gamson & Modigliani, 1989; Weisskopf, 1988). The primary frames employed in the U.S. news media during this period thus focused the economic and environmental consequences of climate change, and how technological advances and investments might alleviate the concern (Nisbet, 2009).

Kyoto and the Origins of Partisan Polarization

In terms of quantity, media coverage of climate change peaked in 1988 before declining in the early 1990s (McComas & Shanahan, 1999; Trumbo, 1996). Nonetheless, by then, "the environmental community in the United States – comprised of members of the environmental movement, sympathetic climate scientists, and environmental policy-makers – successfully defined climate change, or anthropogenic (human-induced) global warming, as a legitimate social problem" (McCright & Dunlap, 2003, p. 348). At the same time, Republican consultant Frank Luntz recommended in a strategy memo to lobbyists and members of Congress that the climate change issue be framed as *scientifically uncertain* and that the U.S. be described as bearing an unfair *economic* "burden" in the absence of international coordination. Nisbet (2009) explains, "this framing strategy was effectively incorporated into talking points, speeches, white papers, and advertisements by conservative think tanks and members of Congress to defeat major policy proposals along with the adoption of the Kyoto Protocol" (p.19). Despite the 1995

IPCC report stating that a consensus had emerged among the scientific community regarding human activity as the likely cause of the observed warming trend in global temperatures (Krosnick et al., 2000; Wilson, 2000),[3] the inherent *uncertainty of science* was accentuated during this period via a shared rhetorical tactic by conservative organizations and industry representatives seeking to protect their constituents' interests (McCright & Dunlap, 2003; Oreskes & Conway, 2010).

To develop an international treaty and framework for countries to respond to the anthropogenic causes of climate change, delegations from over 160 nations met in Kyoto, Japan in December, 1997. In the U.S., however, the option to participate in the Kyoto Protocol instigated the media-based origins of partisan polarization about climate change. The campaign for ratification of the Kyoto Protocol in the U.S. Senate and the ensuing rise in news attention to climate change by media more than doubled the newspaper coverage over previous months while increasing television coverage tenfold (Krosnick et al., 2000; Nisbet, 2011). A majority of the news coverage of climate change during the 1997 debate over ratification of the Kyoto Protocol reflected the *scientific consensus* viewpoint on the causes and threats of climate change; however, media reports often juxtaposed this with a *political conflict* frame. In the news, statements were presented from leading Democrats supporting the treaty, such as Clinton and Gore, as well as Republican leaders and other opponents. This resulted in "hundreds of newspaper, television, magazine, and radio news stories, as well as editorials, editorial cartoons, and

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[3] By 2001, the IPCC reinforced this position, concluding that "[h]uman activities… are modifying the concentration of atmospheric constituents… that absorb or scatter radiant energy" (Oreskes, 2004, p. 1686).

letters to the editor. The debate [over ratification] was further amplified in advertisements, paid for by business and other advocacy groups, as well as radio talk shows and numerous World Wide Web sites" (Krosnick et al., 2000, p. 241).

The *political conflict* frame was simultaneously supplemented with the continued presence of the *uncertain science* frame. McCright and Dunlap's (2003) content analysis of hundreds of documents produced by 14 different conservative think tanks between 1990 and 1997 showed that climate skeptics challenged the science of global warming by: (1) framing its supporting evidence as weak or nonexistent; (2) highlighting the potential net benefits that might result if climate change should occur; and, (3) arguing that the policies designed to address climate change would be economically harmful and ineffective (i.e. the *response efficacy* frame). McCright and Dunlap (2013) explain the process through which conservative think tanks "sponsored policy forums, public speeches, and press conferences in 1997 to present their counter-claims on global warming to policy-makers and the general public" (p. 357).

In an effort to expand its audience, the media underlined this debate narrative in news reports on climate change (Boykoff, 2007; Boykoff & Boykoff, 2004, 2007), assigning parity between scientific evidence and the arguments of interest groups striving to generate uncertainty to protect their interests and the policy status quo (Boussalis & Coan, 2016; Brulle, 2014; McCright & Dunlap, 2000). The balance in reporting about the climate change "debate" continued through the late 1990s and early 2000s. By giving equal time to the *scientific consensus* and *uncertain science* frames, media coverage validated – or at least helped enable – the efforts of a minority of contrarian scientific voices. In their analysis of fifteen years of climate change coverage in major U.S.

newspapers, Boykoff and Boykoff (2004) discovered that the majority of newspaper articles on climate change gave nearly the same amount of attention to those arguing that global warming was due to human activities as compared to those arguing that global warming was due to Earth's natural fluctuations. From 1990 to 2002, "[c]overage was divergent from the scientific consensus on this issue in a statistically significant way" (Boykoff & Roberts, 2007, p. 13).

Hollywood and Climate "Alarmism"

Attention to and increased polarization regarding climate change in the U.S. news media was bolstered by the U.S. film industry in the early years of the 2000s (Hart & Nisbet, 2009). In May of 2004, the release of *The Day After Tomorrow*, a movie about climate change that employed a *disaster* frame, generated ten times the amount of news coverage in the U.S. compared to the 2001 IPCC report (Leiserowitz, 2004; Nisbet, 2011). A defining feature of the *disaster* frame commonly found in science-policy debates is that there is a looming catastrophe unless action is taken immediately. An unintended consequence of this frame is that it plays into the hands of climate skeptics who have cast this rhetoric as "alarmism" and motivated by partisan and ideological agendas (Nisbet, 2009). Nonetheless, Al Gore's release of the similarly framed *An Inconvenient Truth* in 2006 led to a marked increase in reporting on climate change in the U.S. Popularity for Gore also reached his highest-ever approval rating of 58% in 2007 after he received a Nobel Prize for his involvement with the film. However, as Nisbet (2011) explains, "The six years of Gore's political campaigning on climate change had mobilized a base of concern among Democrats but reinforced disbelief among Republicans…. [B]y 2008, Bush's last year in office, Gore's efforts had helped boost belief [in climate change]

among Democrats to 76% while belief among Republicans remained virtually unchanged at 41%" (p. 65). Ultimately, Gore's advocacy and efforts to mobilize public action on climate change and the associated media coverage highlighting *political conflict* frames helped lay the foundation for all subsequent and continuing partisan divisions among the American public regarding climate change.

Climate Coverage from 2007–Present

News coverage of climate change increased substantially in the U.S. news media between 2007 and 2010, driven largely by events such as the release of the third IPCC report in 2007, the 2009 UN Climate Change Conference in Copenhagen, and unsuccessful efforts to pass legislation (i.e. cap-and-trade) to curb greenhouse gas emissions (Feldman, Hart, & Milosevic, 2015). Feldman et al.'s (2015) content analysis of a sample of 642 articles appearing in *The New York Times*, *The Wall Street Journal* (*WSJ*), *Washington Post*, and *USA Today* on climate change between 2006 and 2011 revealed differences in the frames employed across news sources in substantive news stories (i.e. not editorials or op-eds). Focusing on frames related to climate change's impacts on the *environment*, *public health*, *national security*, and *economic consequences*, as well as frames highlighting the efficacy of taking action, the analysis revealed significant differences in the frequency of the usage of different frames across sources. For instance, with regard to climate change, relative to other news sources, the *WSJ* employed more negative *economic consequences* frames, more negative *response efficacy* frames (i.e. "solutions are unlikely to be effective"), and more *political conflict* frames.

Hart and Feldman (2014) conducted a parallel study that charted frames employed in U.S. network news – ABC, CBS, and NBC – between January 1, 2005 and June 30, 2011. A content analysis of 440 network news transcripts over this period coded for whether broadcasts included frames highlighting the threat posed by climate change and for whether it included "at least one mitigative or adaptive action that can be taken to address climate change" (p. 334). They also coded for the presence of the following emphasis frames: *environment*, *public health*, *national security*, *economic consequences*, *morality/ethics*, and *political conflict*. The results demonstrate that TV news rarely discussed both the impacts likely to result from climate change alongside frames highlighting actions to address the problem. Positive *efficacy* frames, in fact, were largely absent from news coverage, while the most prevalent frame focused on the likely short-term negative environmental impacts. Among cable news sources, coverage of climate change in 2007-2008 was significantly different on Fox News compared to CNN and MSNBC. Fox News coverage included a large number of guests that made statements dismissive of climate change, and a survey of viewers indicates that watching Fox News coverage is associated with decreased belief that human induced climate change is real. The research also demonstrates that Republicans who watch CNN and MSNBC are more concerned about climate change than other Republicans who regularly watch Fox News (Feldman et al., 2012).

The degree to which media outlets portray a *scientific consensus* among scientists about the fundamentals of climate change – that is, the degree to which global warming is occurring as a result of human activity – has varied over time and across sources. Nisbet (2011, Ch. 3) coded a random sample of over 1,200 articles in *The Washington Post*, *The*

New York Times, the *WSJ*, *CNN.com*, and *Politico* for whether the article conveyed the

"consensus view" that humans are causing climate change, a "false balanced view" that it

is uncertain whether climate change is real and if humans are the cause, or a "dismissive

view" that climate change is not occurring or humans are not a cause. Keeping in mind

that 2009-2010 represented a tumultuous period – cap and trade legislation was being

debated, Climategate made news, and the 2009 Copenhagen meeting of the Conference

of Parties (COP 15) occurred – it was found that, during the first nine months of 2009,

93% of all news and opinion articles presented the *scientific consensus* frame. However,

while the Copenhagen meetings and Climategate-related debate occurred in the fall of

2009 and early 2010, *consensus* was reflected in only 75% of the sample of articles

(Nisbet, 2011, p. 53).[4] Across the two-year period for these various media sources,

approximately 8 out of 10 articles reflected the *consensus* view overall. The exception,

again, was the dominance of false balanced or dismissive views in the *WSJ*, where "less

than half the [editorials] asserted that climate change was real and that humans were a

cause" (Nisbet, 2011, p. 54). These results, in line with prior work, demonstrate that,

even in the prestige press, news attention to climate change is episodic and event driven

(Hart, 2011; Iyengar, 1991). Indeed, the volume of coverage on climate change leading

up to the COP 21, Paris meeting in December, 2015 generated the most intense climate

change reporting worldwide over the last eleven years (Luedecke et al., 2016).

New Media's Role

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[4] Approximately 21% of the 263 news and opinion articles focused on climate change

mentioned the leaked/stolen emails that were the basis for Climategate, and 25% of these

articles originated in the *WSJ* (Nisbet, 2011, p. 52).

Although there has been a decline in the number of journalists focused on environmental reporting in recent years at traditional news outlets (Bagley, 2013), there has been a significant increase in reporting on climate change over time due to the growth of the online sector and new media, where "new media" refers to the various forms of Internet-mediated communication. The Internet and new media provide the public with greater access to traditional media content and also allow the public to contribute to the corpus of information through reposts on Facebook, YouTube, Twitter, etc. (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012; Matsa & Mitchell, 2014). Journalists engaged in online science reporting, as they curate and cull audience contributions, have in fact been redefining the traditional role of reporter and watchdog to also include public intellectual and civic educator (Fahy & Nisbet, 2011).

In important ways, advances in new media have built upon traditional media to affect the communication of climate change. This is not merely a reference to the growth of online news publishing services such as Environment & Energy Publishing, *The Huffington Post*, ProPublica, InsideClimate News, and the like. The Internet itself offers an entirely new vehicle for news communication (Brainard, 2015), as traditional media outlets continue to shift away from presenting reports on climate change and rely increasingly more on online blog posters and "advocacy journalists" to present information in a dramatic context and thus distort the climate change risks (Nisbet & Fahy, 2015). This is exemplified by the very different semantics employed in online posts relative to traditional journalism, particularly so with regard to climate change. For example, Hellsten and Vasileiadou (2015) show that Climategate hype began in online blogs that prompted a reaction in newspapers. The issue was semantically framed in

opposite ways online as compared to newspapers: "for the blogs the issue is about climate sciences withholding temperature data; and for the newspapers it is about a smear campaign and inquisition of science" (p. 599). Fortunately, and despite the growth of online sources relating to both sides of the climate change "debate" (Greenberg, Knight, & Westersund, 2011), the online community of science and environmental websites is largely dominated by verifiable scientists (Brown Jarreau, 2015).

Challenges and Strategies for Climate Change Communicators in a Polarized Era
<u>The Challenges</u>

Science communicators, journalists, and others who seek to raise awareness, mobilize engagement, and promote policy action to address climate change face a number of hurdles. First, it is not obvious how one can get the public to attend to scientific information about climate change given the number of other priorities competing for an individual's limited and selective attention (Druckman, 2015; Lupia, 2013). An abundance of survey research indicates that the public ranks climate change as a less important priority than a host of other political, social, and economic issues (Nisbet & Myers, 2007). Most recently, it was found that liberal Democrats ranked climate change the sixth most important issue facing the U.S. out of a list of 23 problems, while moderate and liberal Republicans ranked climate change twenty-first, and conservative Republicans ranked climate change as the very least (twenty-third) important issue (Lehmann, 2016). One challenge facing science communicators thus is how to secure the public's attention to motivate greater awareness of and bi-partisan interest in the issue of climate change (Druckman, 2015).

This leads to a second challenge facing climate science communicators: public opinion about the existence and causes of climate change is sharply divided along partisan and ideological lines in the U.S., which generates protective forms of information acquisition and processing (Kahan, 2015; McCright & Dunlap, 2011). Polarization on the issue contributes to directional motivated reasoning in how scientific arguments and evidence about climate change are acquired, processed, and evaluated (Druckman, Peterson, & Slothuus, 2013). Directional motivated reasoning "refers to the tendency to seek information that confirms prior beliefs (i.e. a confirmation bias); to view evidence consistent with prior opinions as stronger or more effective (i.e. a prior attitude effect); and to spend more time counter-arguing and dismissing evidence inconsistent with prior opinions, regardless of objective accuracy (i.e. disconfirmation bias)" (Druckman, 2015, p. 60; also see, Druckman & Bolsen, 2011; Taber & Lodge, 2006). Druckman (2015) further explains: "the central point is that relaying even ostensibly credible scientific information faces a serious hurdle if individuals reject any evidence that seems to contradict their prior opinions" (2015, p. 60). Even more troublingly, as partisans become more factually knowledgeable, or scientifically literate, they become more likely to discount information that challenges their existing identities and values (Bolsen, Druckman, & Cook, 2015; Kahan, 2015). And media fragmentation associated with the rise of partisan news outlets such as MSNBC and Fox News allows politically aware partisans to consume information that affirms their existing beliefs about climate change, resulting in stronger opinions that are more resistant to opinion change.

A third challenge for communicators stems from the aforementioned media fragmentation of partisan news in conjunction with the availability of other media sources.

Internet-based information in particular magnifies "media bias, leading to large swings in aggregate behavior made more severe when individuals can select into media outlets" (Siegel, 2013, p. 803). In other words, members of the public seek out specific information and individuals online who share similar views about climate change, consistent with the behavior of individuals that are motivated by confirmation bias (Del Vicario et al., 2016; Feldman, Myers, Hmielowski, & Leiserowitz, 2014; Zhao, 2009). These findings are consistent with recent research that combines aspects of network qualities and distrust of the media. Using a nationally representative sample of the American public, Hart, Feldman, Leiserowitz, and Maibach (2015) established the relationship between the homogeneity of one's online network and the degree to which the discussion that occurs in that network is polarizing. Discussions in homogeneous networks are more polarized than in heterogeneous networks, and liberals are less likely to support climate change policies in the latter (Hart, Feldman, Leiserowitz, & Maibach, 2015). Thus, the unobstructed pursuit of information in new media is likely resulting in the creation of echo chambers, increased polarization, and politicized discussions among the public. Preliminary findings about YouTube content, for example, have shown that the public is mobilized around climate-change-related issues (Porter & Hellsten, 2014); yet, the post-video discussions among members of the YouTube-viewing public tend to debate the science of climate change regardless of its relevance to the content of the videos to which they are attached (Shapiro & Park, 2015). In other words, the public is using YouTube – and likely other social media discussion platforms – not to deliberate but rather to campaign for increased activism or skepticism about climate change (Shapiro & Park, 2017).

The Strategies

Science communicators, journalists, advocacy groups, and political leaders must develop strategies that shift public support toward greater consensus for action on climate change. Bernauer and McGrath (2016) argue, "without strong public support, ambitious climate policy is infeasible since mitigation efforts are bound to have important and manifest implications for nearly every citizen. Therefore, democratic policy-makers face strong incentives to adopt policies preferred by the majority of voters" (p.1). In the face of the challenges mentioned immediately above, science communication scholars have begun to explore strategies to overcome these hurdles including: (1) choosing frames that resonate and promote efficacy with target audiences; (2) highlighting the existence of a *scientific consensus* and widespread agreement among experts over the fundamentals of climate science; (3) promoting accuracy goals (rather than directional goals) among citizens when processing new scientific information; and (4) recruiting credible messengers and spokespersons for diverse audiences. Although we highlight strategies that demonstrate how communicators can more effectively communicate the issue of climate change to diverse audiences, it is important to acknowledge that "framing is not an elixir" (Druckman & Lupia, 2016, p. 7). In fact, framing efforts have often failed to produce support for policy action on climate change or personal engagement on the issue, or even backfire in some instances (Hart & Nisbet, 2011). The key is to recognize what scholars currently know about the most effective communication approaches across different contexts.

Employ Frames that Resonate and Engage

It is crucial that communicators employ frames that resonate and engage audiences as a way to shift public attitudes (Moser, 2010). One line of research focuses on how visual imagery and concomitant frames in media stories depict climate change and thus impact individuals' beliefs and engagement with the issue (O'Neill et al., 2013; O'Neill & Nicholson-Cole, 2009). Images engage an audience at an emotional level and thereby influence cognitive appraisals of risk by drawing upon an experiential learning system that drives emotions and subsequent cognitions (Leiserowitz, 2006). That is, "the use of particular visual framings helps to promote particular ways of conceptualizing climate change, whilst marginalizing others" (O'Neill, 2013, p.12), implying that climate change images commonly included in media stories affect individuals' beliefs about climate change and the efficacy of action to address the problem in the same way as textual frames in news stories (Hart & Feldman, 2014). Yet, content analysis of the most prominent visual images included in stories on climate change identifies images that typically contain political figures, highlighting a *political conflict* frame (O'Neill, 2013; O'Neill & Smith, 2014). A second prominent group of visual images highlights geographically and psychologically distant *environmental* impacts of climate change such as "generic images of industrial smokestacks, ice imagery or non-human nature, rather than as an issue with impacts, causes and solutions close to home" (O'Neill, 2013, p. 16; also see DiFrancesco & Young, 2011). Although such images can increase the perceived importance of addressing climate change, they often leave people feeling powerless and with lower levels of efficacy about how they can respond to climate change (O'Neill, Boykoff, Niemeyer, & Day, 2013).

Consequently, recent work has begun to explore how frames that target the perceived *efficacy* of action on climate change shape individuals' beliefs and actions in this domain (Hart & Feldman, 2016a, 2016b). "Efficacy refers to the individuals' perception… that they are able to engage in the relevant action needed to address the problem" (Hart & Feldman, 2016a, p. 2). Hart and Feldman's (2016a) experiment manipulated imagery and text by presenting subjects with photographs and text relating to one of the following: solar panels, large-scale flooding, a protest calling for action on climate change, and smoke rising from a power plant. The solar power image was found to significantly increase perceptions of efficacy relative to a control condition. In addition, text emphasizing the *efficacy* of actions that can be taken to address climate change significantly increased perceptions of personal efficacy, and this belief mediated the effect of the *efficacy* treatment on behavioral intentions to engage in energy conservation as a way to combat climate change (also see Hart & Feldman, 2015). This suggests that images and frames in communication that generate a sense of positive *self efficacy* will ultimately generate engagement and support for action on climate change.

Other work explores messages most likely to affectively engage diverse audiences by highlighting personally relevant and near-term effects. Myers et al. (2012) state, "Positive emotions… increase the probability that individuals will choose to engage with [climate change] and adopt beliefs and behaviors consistent with efforts to stem the problem… hope is often aroused as perceptions of efficacy increase" (p. 1107, also see Chadwick, 2015). As such, Myers et al. conducted an online experiment using a nationally representative sample to test the impact of various textual frames on different audiences and the emotions that were elicited. Specifically, participants were randomly

assigned to read one of three versions of a news article that emphasized either the *environmental*, *public health*, or *national security* aspects of climate change. Interestingly, the results showed that the public health frame increased perceptions of hope among subsets of the population mostly likely to be skeptical about climate change, i.e. conservatives who are disengaged, doubtful, or dismissive about the issue.

In a series of experiments that focused on individual-level emphasis framing effects on climate change beliefs, Petrovic, Madrigano, and Zaval (2014) found that a frame that focuses on the present *public health* benefits that result from reducing "air pollution" as opposed to a frame implicating the burning of "fossil fuels" causes conservatives to increase their support for mitigation efforts. On the other hand, this frame was less effective at increasing support for mitigation among liberals compared to a "climate" frame that mentioned how fossil fuel burning results in "dire environmental consequences." Conservatives, as they have in previous studies (O'Neill & Nicholson-Cole, 2009), responded negatively to the *environmental / disaster* frame. While nationally representative surveys confirm that the majority of Americans have not thought about how global warming might impact people's health (Maibach et al, 2015), this frame has the potential to affectively engage and resonate with diverse audiences as it becomes more prevalent in public discourse (but see, Hart & Nisbet (2011) regarding how this frame can backfire among conservatives when identification with the victims, or social distance, is low). More broadly, research on how emotions shape reactions to messages is likely to be one of several promising avenues for future research (see Lu & Schuldt, 2015; 2016).

Communicate the Existence of a Scientific Consensus

Although scientific agreement regarding human-caused climate change has strengthened over the past two decades, a large segment of the U.S public remains skeptical about the role that human activities play (Cook, Forthcoming). A number of studies suggest that communicating the existence of a *scientific consensus* about human-caused climate change shifts the public's belief toward the scientific consensus (Ding et al., 2011; Lewandowsky et al., 2012; Lewandowsky, Gignac, & Vaughan, 2013; Maibach & van der Linden, 2016; Myers et al., 2015; van der Linden et al., 2014, 2015). Using descriptive text, pie charts, or metaphorical comparisons in a pre-post design survey experiment to measure perceptions about levels of scientific consensus among respondents, van der Linden et al. (2014) evaluated the effects of communicating the level of scientific consensus about human-caused climate change. Some participants were informed, "97% of climate scientists have concluded that human-caused climate change is happening," while other respondents were given this same information in the form of a pie chart. Both the textual frame and pie chart that communicated the level of scientific consensus significantly increased respondents' perceptions of the level of scientific consensus. Moreover, the treatment effect was strongest among Republican respondents, providing little evidence of group-based motivated reasoning in this context. Despite the fact that the consensus information affected respondents' perceptions about the level of scientific consensus, it had no effect on belief in the existence of human-caused climate change, concern about the issue, or support for policy action. In a similar vein, Myers et al. (2015) conducted two online experiments that examined how best to effectively communicate scientific consensus information to influence individuals' perceptions about and their confidence in the level of scientific agreement on climate change. Across both

liberals and conservatives, the results indicate that numeric information about the precise level of scientific agreement on climate change had a powerful impact on perceptions of scientific agreement and confidence. Deryugina and Shurchkov (2016) also conducted an experiment to evaluate consensus messages that included increased numerical precision about the level of scientific agreement versus more general information about the existence of a consensus on respondents' perceptions about the extent of scientific agreement. They found that, particularly for low (climate change) knowledge respondents, providing precise information about the beliefs of U.S. scientists who have published in leading journals increases belief that the effects of climate change are underway and man-made. In line with van der Linden et al. (2014), Deryugina and Shurchkov found little evidence that scientific consensus messages influence support for policy action. They also showed that the effects of the consensus messages decay over time, necessitating their repetition.

Although communicating the existence of a scientific consensus can lead citizens to shift their opinions in the direction of that information, the precise impact depends on the political context in which that information is encountered (Bolsen & Druckman, 2017; Cook & Lewandowsky, 2016). Bolsen and Druckman (2017) conducted an online experiment using a nationally representative sample of U.S. residents to study the effects of communicating scientific consensus information about human-caused climate change in competitive information contexts. The consensus stimuli they employed differs from that employed in the studies discussed above insofar as it informed respondents about a recent report produced by over 300 expert scientists and reviewed by the National Academy of Science as well as agencies with representatives from oil companies,

"[putting] much of the uncertainty to rest by stating that climate change 'is primarily due to human activities'" (Bolsen & Druckman, 2017, SI, p. 1–2). Although this information shifts beliefs toward the scientific consensus position regarding whether human activities are primarily responsible for climate change for Democrats and low knowledge Republicans, high knowledge Republicans shift their opinions away from the scientific consensus position relative to high knowledge Republicans randomly assigned to a control group. Moreover, the positive impact of communicating the scientific consensus information among low knowledge partisans is eliminated when politicization – i.e., a frame highlighting the inherent uncertainty of science employed to cast doubt on scientific consensus – is introduced into the communicative context. In addition, in line with the results reviewed above, there is no effect of the scientific consensus messages on partisans' support for policy action relative to a control group. The results demonstrate that consensus climate change messages can be impactful in certain contexts, but that the positive impact may be tempered in the presence of rhetoric that politicizes science, as well as the need to distinguish between messages that may impact beliefs but potentially have little direct effect on behavior or policy support (Campbell & Kay, 2014).

Promote Accuracy Goals

To enhance the impact of strategic framing and persuasive messaging efforts that seek to generate support for policy action, it is essential that climate science communicators attend to the information processing mechanisms that divide and leave many Americans largely misinformed with regard to climate change. First, to overcome directional motivated reasoning in science communication more generally, it must first be acknowledged that, "when individuals are motivated to form 'accurate' opinions such

that they need to justify them later, when the information comes from a mix of typically disagreeable groups (e.g., Democrats and Republicans), or when individuals are ambivalent about the source of information, then they tend to view the information in a more 'objective' manner" (Druckman, 2015, p. 61). Thus, "those passing on the information must try to stimulate their audience to be motivated to form accurate opinions; when this occurs, [directional] motivated reasoning disappears and people spend more time elaborating on and accepting the information" (Druckman, 2015, p. 65). For instance, Bolsen, Druckman, and Cook (2014b) conducted an experiment in the context of a nationally representative survey in the U.S. that varied whether Democrats or Republicans (or both parties) supported aspects of the *Energy Independence and Security Act of* 2007. Some respondents were also informed that they should view the policy in an evenhanded manner because they would be asked to justify their opinion. The authors found that partisans engage in directional motivated reasoning when they are presented with an in-party or out-party endorsement in support of the policy sans the justification request. However, partisans' evaluation of the policy does not depend on the endorsement if they are required to justify their opinions (this inducement stimulated an accuracy motivation). In other words, partisans support or oppose an identical policy based on whether it was endorsed by Democrats or Republicans, but this tendency is eliminated when an accuracy processing motivation is effectively induced.

Promoting accuracy is not simply a matter of addressing the partisan nature of climate change as other research demonstrates that frames emphasizing the local impacts of climate change may be another way to promote issue engagement (Ansolabehere & Konisky, 2014; Leeper 2012). Scannell and Gifford (2013), for example, found that

frames that accentuate the local impacts that will result from climate change cause individuals to become more engaged and seek out information (also see, Lu & Chadwick, 2015; Spence & Pidgeon, 2010). As scholarship on this area expands, climate change communicators will learn more about which specific frames and contexts promote accuracy goals for individuals.

Actions by Scientists and News Organizations

Complex scientific information has to be effectively communicated for it to contribute to efforts to combat climate change (Druckman & Lupia, 2016). Scientists and scientific organizations can do much more to combat efforts to cast doubt on scientific consensus by issuing direct challenges to politicization when it occurs. This can vitiate the uncertainty and anxiety that politicization induces and result in, for example, increased support for cleaner energy alternatives and thus a pathway forward to reduce anthropogenic climate change (Bolsen & Druckman, 2015). Other recent experimental evidence has shown that efforts to inoculate individuals from frames emphasizing *political conflict* and *scientific uncertainty* about human-caused climate change are largely ineffective for low knowledge partisans, even though, as mentioned already, these groups are positively influenced by *scientific consensus* frames sans politicization (Bolsen & Druckman, 2017).

What is incontrovertible is the need for credibility among those who step forward to reach diverse audiences who may be skeptical about climate change. Only frames from credible sources are likely to be impactful in shaping opinions (Druckman, 2001; Lupia, 2013), especially in politicized environments where there can be suspicion about the true motives and expertise of a science communicator and whether or not there are shared

common interests (Kahan, Jenkins-Smith, & Braman, 2011; Lupia, 2013). One solution is to bring together scientists and communicators who hold varied sets of values and ideological leanings to communicate consensus about fundamental science when it exists. Given the current partisan divide on the issue of climate change, Hoffman (2015, p.67) argues that "it is only logical that more climate brokers must emerge from the political Right…. [C]limate change must be presented by bona fide conservatives and conservative organizations that see the solutions to climate change as consistent with a conservative ideology." In other words, conservatives and Republicans are more likely to be persuaded by information provided by credible leaders who they trust (i.e. fellow partisans and ideologies). Nisbet (2014, p. 6) explains, "… once community members from differing political backgrounds join together to achieve a broadly inspiring goal like protecting people and a local way of life, then the networks of trust and collaborations formed can be used to move this diverse segment toward cooperation in pursuit of national policy goals."

To expand on the previous point, persuasion does not occur unless a listener perceives both expertise and shared interest (Druckman, 2015; Lupia, 2013), and it is thus crucial to find credible voices that speak to broad segments of the U.S. population. Druckman and Lupia (2016) state, "[c]redibility is an important asset for science communicators, helping draw attention to effectively framed arguments. Yet, many scholars and science communicators have false beliefs about how credibility is built and maintained, particularly in competitive and politicized environments" (p.17), arguing that credibility is a "perception bestowed by an audience" that represents "the extent to which audience members perceive a communicator as someone whose words or interpretations

they would benefit from believing" (p. 18). In that case, relative expertise and perceived common interests are thus crucial aspects that individuals use to judge the credibility of a message. Thus, perhaps the most compelling voices are those that represent converted skeptics and those whose research was originally funded by the fossil fuel industry, such as University of California, Berkeley, physics professor Richard A. Muller (Banerjee, 2012; Muller, 2012).

Should the scientific community reinvest in the American public's civic capacity to discuss, debate, and participate in collective decisions, as Nisbet (2014) and Nisbet and Markowitz (2015) have claimed, it will likely provide a forum for different stakeholders to articulate solutions and build greater consensus over time. Universities, urban areas, and media partners in local regions can develop communication initiatives to challenge how all citizens think and talk about climate change as a way to build consensus through public engagement efforts. As this paper's final strategy to shift public support about climate change, engagement by the scientific community is arguably the most important, drawing together individuals from disparate communities and with disparate ideologies and values to create both an entirely new communication medium as well as an elevated level of climate change-related discourse to counter the frequently invoked *political conflict* and false balance of climate change in the news media.

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