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# Modern Citizenship or Policy Dead End?

## Evaluating the need for public participation in science policy making, and why public meetings may not be the answer


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## Abstract

This paper examines the recent renaissance that consensus conferences and public meetings have experienced for potentially controversial emerging technologies. In a first step, it briefly outlines the policy history of consensus conferences and other forms of public meetings. In a second step, it outlines claims made by proponents about the potential of consensus conferences and related efforts to create a two-way dialogue among lay publics, experts and policy makers, to discover and debate relevant ethical, legal and social (ELSI) concerns early on, and ultimately to engage in better long-term planning about emerging scientific fields and their societal applications. In a third step, the paper provides a comprehensive empirical review of how consensus conferences and related efforts have lived up to the normative hopes of their proponents, or – in most cases – have fallen short or even produced results that are counterproductive to the notion of a productive public debate. The paper closes with an argument against small-group deliberative experiments with very limited reach and in favor of creating a long-term infrastructure for a balanced public debate in mediated and interpersonal channels.

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> "The greatest long-term threat to U.S. national security is not terrorists wielding a nuclear or biological weapon, but the erosion of America's place as a world leader in science and technology." – *Gordon England, Former Deputy Secretary of Defense*
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> "[W]e need to engage the public in a more open and honest bidirectional dialogue about science and technology" – *Alan I. Leshner, AAAS CEO*
>
> "[S]cience has a "serious marketing problem" – *Larry Page, Google co-founder*

The first two years of the Obama administration have produced an influx of scientific expertise into the political sphere in Washington, DC. Many appointed positions in mission agencies that were held by career politicians in previous administrations are now filled by academic experts, and science spending continues to increase, even after the one-time bump provided by the stimulus bill. The National Science Foundation, for instance, will likely receive a $552 million increase over FY10 and as much as an eight percent increase under the president's FY11 proposed budget. Much of this renewed focus on science is driven by the realization that emerging technologies are critically important for protecting U.S. global interests, both economically and in military terms (National Academy of Sciences 2010).

This renewed focus on science and emerging technologies in the political arena, however, stands in stark contrast to disturbingly low levels of public understanding and often acceptance of scientific facts. This problem is exacerbated by a set of increasingly complex scientific challenges facing science policy, ranging from personalized medicine, to nanotechnology and synthetic biology. All of these issues share at least one characteristic: The societal debates surrounding them will focus less on their scientific potential than on the ethical,

legal and political controversies surrounding them and their end market applications.

This science-public disconnect, especially for rapidly developing new areas of research and their societal implications, has led to calls for new modes of engagement of the general public in science (Cicerone 2007). Many of the most prominent voices in this discussion envision a transformation of citizens who currently approach science mostly as consumers to active shapers of government policies and programs (Cornwall and Gaventa 2001). Their hope is that formalized public meetings or consensus conferences can engage the public upstream, i.e., early on in the technology or issue lifecycle, and provide a forum for a dialogue among lay citizens, policy makers and experts.[1] Unfortunately, many of those voices also pay little attention to (a) the large body of academic work in political science, communication and sociology that has examined the dynamics surrounding public engagement efforts over the last few decades, and (b) the historic real-world experiences with often only marginally successful public engagement efforts in regulatory and policy making settings (Nisbet and Scheufele 2009).

These two areas, of course, are intertwined. And the lack of familiarity with systematic academic research on how lay publics make decisions about policy options in various settings is often linked to a naïve and unrealistic expectation about the potential of new opportunities to engage citizens by informing, consulting and collaborating with them (e.g., Lukensmeyer and Torres 2006).

This paper therefore takes a more systematic look at this disconnect between science, policy and lay publics. It positions its analysis, first, in an overview of the scientific and political landscape surrounding current Nano-Bio-Info-Cogno (NBIC) technologies and the various challenges – including policy ones – accompanying their rapid development (for an overview, see Roco and

Bainbridge 2003).[2] In a second step, I will outline how earlier iterations of public meetings or consensus conferences have played out in various artificial and real-world settings. This will also include a systematic overview of lessons learned from these efforts. Finally, the paper will offer recommendations for researchers and policy makers to develop more data-driven modes of policy making for emerging technologies that are able to negotiate scientific *and* public interests for the rapidly emerging NBIC field.

## New technologies, new policy challenges

The ongoing NBIC revolution in science is creating scientific fields, such as nanobiology or synthetic biology, that are more complex and developing more rapidly than previous technologies. The recent debates around J. Craig Venter's experiments creating synthetic cells or – as he called it – "'the first self-replicating species we've had on the planet whose parent is a computer'' (as cited in Wade 2010, 5) are just one of the most recent examples. As a result, the policy stakes surrounding NBIC technologies are exponentially higher than what we have seen for previous technologies for at least three reasons.

The first reason is the severity and immediacy of their potential ethical, legal and social impacts (ELSI). The field of nanotechnology serves as an excellent illustration. Since 2001, federal funding for nanotechnology research has more than quadrupled. Today, over 1,000 consumer end products are already being sold on the U.S. market, and most consultancies predict nanotechnology to create at least a $3 trillion global industry in the next five years (for an overview, see Scheufele and Dudo 2010; Project on Emerging Nanotechnologies 2009). At the same time, concerns have been raised in at least two areas: (1) Many experts have criticized a lack of comprehensive environment, health and safety (EHS) research on new nano particles (Scheufele et al. 2007) and the absence of a comprehensive

framework for nanoparticles with potentially unknown characteristics and properties (Berube et al. forthcoming); (2) the rapid pace of development and implementation raises ELSI issues at a rate that we have not seen before, and that will pose new challenges for science policy domestically and globally.

This second reason for why we are likely to see higher policy stakes surrounding NBIC issues are the tightening races with Europe, India and China over global leadership in patenting and research productivity. Some studies (e.g., Preschitschek and Bresser 2010) already show the U.S. falling behind other nations in global patent productivity, and in 2009, for example, 51 percent of United States patents were awarded to non-United States companies (National Academy of Sciences 2010).

Finally, higher policy stakes are also a function of not just more immediate and serious ELSI concerns connected to NBIC technologies, but of the rate at which these issues emerge on the public agenda. This phenomenon is exacerbated by the fact that scientific breakthroughs, such as nanotechnology, are enabling technologies with applications in a wide variety of arenas, ranging from synthetic biology to weaponry. Some ethicists have therefore argued very convincingly that we are seeing ELSI concerns emerging at a rate that outpaces our capacity to think through policy options, everything ranging from synthetic biology to weaponry. Khushf (2006) summarizes this dilemma best:

> We are already approaching a stage at which ethical issues are emerging, one upon another, at a rate that outstrips our capacity to think through and appropriately respond.…On the immediate horizon arises a point at which the traditional way we have addressed ethical issues fails, because it does not and cannot keep up with the rate at which new challenges emerge (p. 258).

The complexity of NBIC technologies and the policy questions surrounding them are particularly problematic since they play out in a public sphere that is ill

prepared for these debates. Surveys of the general public have demonstrated that, in the main, Americans know little about nanotechnology, with large majorities of individuals in any given survey reporting little to no awareness of the technology (Peter D. Hart Research Associates 2006, 2007). Similarly, levels of actual knowledge about nanotechnology among the U.S. public, measured with a series of true/false questions, have remained low and largely stagnant since 2004 (Scheufele et al. 2009).

These findings, of course, are not too surprising, given how disengaged many Americans are from science in general. During the 2004 election, for example, almost 7 out of 10 Americans (69%) reported that scientific findings are often "hard for people like me to understand," and almost two-thirds (60%) of the public thought that they did not know a lot about the issue of stem cell research, which was brought up by both presidential candidates during the debates (analyses based on data described in Ho, Brossard, and Scheufele 2008)

For issues such as nanotechnology, levels of self-reported knowledge are even lower, and 4 out of 5 Americans (81%) think that they are not well informed about nanotechnology, with about a fifth of all respondents (21%) thinking of themselves as "not informed at all" (analyses based on data described in Scheufele et al. 2007).

This lack of understanding of NBIC issues goes hand in hand with a woeful lack of understanding of broader scientific principles among the general public. In the latest Science and Engineering Indicators survey (National Science Board 2010), more than three out of five Americans were unable to pick the correct definition of a scientific experiment from a number of different options, and only one in five even understood the concept of a scientific study.

Part of the explanation for low levels of real and perceived knowledge lies in the lack of attention that the U.S. public pays to science as an issue. Half of all

respondents (50%) in national surveys (Scheufele et al. 2007) report that they watched "stories related to science, technology and medicine" on TV only once or not at all during the past week. The numbers are similar for science stories read in newspapers (49%), and even higher for web content, where 4 out of 5 Americans (82%) report that they read "stories related to science, technology and medicine" only once or not at all during the past week.

This public lack of familiarity with the scientific process among lay publics tends to go hand in hand with views that are at odds with scientific consensus on issues ranging from stem cell to evolution. In 2005, for instance, the U.S. public ranked second-to-last in acceptance of evolution when compared with Japan and over 30 European countries (Miller, Scott, and Okamoto 2006).

The emergence of NBIC technologies in this public and political climate has therefore reinforced calls for more public involvement in the science policy making process. This idea is not new, but has experienced a renaissance in the last two decades (Fishkin 1991; Luskin, Fishkin and Jowell 2002).

## Science Looking to the Public: The Return of Deliberative Democracy?

At a Pacific Cove, CA, meeting in February 1975, an international group of scientists decided that strict controls should be placed on the use of recombinant DNA, i.e., transplanting genes from one organism into another (Berg et al. 1975). The warnings from this group – often referred to as the Asilomar conference – were echoed in a report to the U.S. Senate Committee on Human Resources's Subcommittee on Health and Scientific Research (Powledge and Dach 1977), which argued that it was "increasingly important to society that the serious problems which arise at the interface between science and society be carefully

identified, and that mechanisms and models be devised, for the solution of these problems" (1).

In recent years this has translated into what some commentators have described as a "growing political commitment at the highest levels to giving citizens more of a voice in the decisions that affect their lives, and to engaging citizens in making government more responsive and accountable" (Cornwall 2008, 11). The renewed attention to public meetings and other modes of citizen engagement is particularly pronounced for the emerging NBIC field. Public meetings as a tool for formal citizen engagement were an integral part of a 2000 UK House of Lords report (UK House of Lords 2000) that recommended making the direct dialogue with the public a mandatory and integral part of policy processes, and also the 2003 U.S. Nanotechnology Research and Development Act, which mandated "convening of regular and ongoing public discussions, through mechanisms such as citizens' panels, consensus conferences and educational events" (*21st Century Nanotechnology Research and Development Act* 2003, STAT. 1924).[3]

These mandates are in part a response to the nature of these new technologies and their implications, as discussed earlier. In fact, the Asilomar meeting that had initiated discussions about many of the ELSI concerns has now become a regular part of the policy debates surrounding NBIC technologies (U.S. House Health Subcommittee 2010). The renewed attention to public meetings and other modes of engagement, however, is also a function of their perceived potential to replace traditional educational approaches to communicating about science with a truly two-way dialogue between science (policy) and lay publics (Cicerone 2007). This enthusiasm is also shared by some corporate stakeholders. In a letter to House Speaker Nancy Pelosi urging the passage of the 2008 National Nanotechnology Initiative Amendment Act, for example, IEEE President Russell

J. Lefevre emphasized the potential of public meetings and other outreach tools to "reach tens of thousands of people with information about nanoscience" (Lefevre 2008, 1).

## Public Meetings: An Untested Model?

The notion of deliberative exchanges among citizens being at the center of enlightened democratic decision making is not new. If "a society is formed for discussion," as Tocqueville (1835-1840/1969, 98) noted, then only direct face-to-face interaction makes a nation democratic. In other words, public deliberation of political issues among citizens is the foundation for representative institutions, federalism and democracy (Pitkin and Shumer 1982).

Post–World War II notions of a deliberative democracy are often traced to Habermas' work on the public sphere, which was theorized to be necessary for any form of informed or rational decision making:

> A majority decision must be derived in such a fashion, and only in such a fashion, that its content can be claimed to be the rationally motivated but fallible result of a discussion concerning the judicious resolution of a problem, a discussion that has come temporarily to a close because coming to a decision could no longer be postponed (Habermas 1992, 450).

Habermas (1962) establishes two criteria for a properly functioning public sphere. First, a large number of citizens need to participate in the political processes and critical discourse about particular issues. Second, and more importantly, the quality of this discourse needs to be rational. Given these normative claims, critics have argued, "no plebiscitary democracy … would qualify for Habermas as having a functioning public sphere" (Schudson 1995, 192).

And empirical realities indeed deviate substantially from Habermas's normative ideals. First, most citizens in a democracy will never deliberate (Newport 1996). Second, discussion of political issues often takes place in isolated communities where people are surrounded by other people like themselves, and people from different social strata "are able to go about their urban lives in an almost complete lack of urbane contact with and awareness of each other" (Calhoun 1988, 226).

Bartlett illustrated this "curious paradox" in very simple terms for the UK: "[O]ne in five Britons are satisfied with the opportunities they have to engage in local decision making, and in practice, probably fewer than one percent actually do" (in Cornwall 2008, 7). The last two decades saw a number of efforts by policy makers and academics to address this paradox and create the infrastructure for systematic citizen participation in public decision and policy making, particularly about emerging technologies.

**Policy Efforts.** One of the earliest and most referenced efforts in the policy arena were consensus conferences in Denmark. First conducted in the late 1980s, they are designed "to enrich and expand the scope of traditional debate between experts, politicians and interested parties by communicating citizens' views and attitudes on potentially controversial technologies.…The conference creates the framework for a debate in which citizens' thoughts and recommendations come face to face with the arguments and attitudes of politicians and interested parties. In this way, the technological debate is enriched and developed." (Danish Board of Technology 2006).

Three elements of Danish consensus conferences are worth highlighting as relevant to similar applications in the U.S. system. First, consensus conferences are based on the notion that they can recruit a representative selection of participants from all across Denmark. About 2,000 randomly selected citizens are

invited to apply. From those who decide to apply, the Danish Board of Technology (DBoT) selects between 14 and 16 panel members to participate in the consensus conference itself. After reviewing extensive briefing materials on the topic prepared by an expert journalist, citizen panelists convene for multiple rounds of moderated discussions among each other, and with topic experts and policy makers. Consensus conferences typically result "in a final document containing a citizens' panel's stance on a given technological issue. Since the panel members must agree about the content of the final document, the document represents the consensus they were able to achieve with regard to the given topic" (Danish Board of Technology 2006).

I will discuss in a later section of this paper to which degree these meetings can live up to the implicit assumption that their outcomes can be generalized to the views of the general population. At this point, I will simply point out that – statistically – self-selected small group meetings or consensus conferences can never represent opinion distributions or policy preferences among the general public, in spite of frequent claims to the contrary by their proponents (e.g., Danish Board of Technology 2010).

The tensions between (self-)selection of highly interested citizens and representativeness of outcomes are already apparent in the criteria outlined by the DBoT for participants: "The [citizen] panel must be representative in terms of age, gender, employment and geographical location. In the selection process, emphasis is also given to the fact that members are both open-minded in relation to the conference topic as well as interested in debating the issue" (Danish Board of Technology 2006).

A second important aspect of consensus conferences is the fact that they are part of the administrative structure of the Danish government. They are organized by the DBoT, an independent body established by the Danish

Parliament (the Folketing) with an annual budget of about 10 million Danish Kroner and supervised by the Danish Ministry of Research. Based on consensus conferences and other public engagement mechanisms, the DBoT advises the Danish parliament and government (Danish Board of Technology 2010).

Third, and most importantly, Danish consensus conferences or similar approaches are often cited as models for more formalized efforts in the U.S. to involve the public in the governance of science (e.g., Einsiedel and Eastlick 2000; Einsiedel, Jelsoe and Breck 2001; Hamlett and Cobb 2006; Powell and Kleinman 2008). In fact, as outlined earlier, the concept of citizen panels or consensus conferences has recently even appeared as Congressional mandate attached to funding for major scientific initiatives in the U.S., such as the 21st Century Nanotechnology Research and Development Act.

**Academic Efforts.** Academic efforts to systematize citizen involvement in the policymaking process have tried to address some of the problems inherent to small, self-selected citizen panels, such as Danish consensus conferences, by developing larger-scale efforts, such as Fishkin's (1991, 1995, 1996) model of deliberative polling in the political arena. Logistically, this approach is very similar to Danish consensus conferences, but it adds significant rigor to the selection of participants and various other aspects of data collections.

For a deliberative poll, a brief face-to-face survey is conducted with a probability sample of adult citizens, followed by a self-administered questionnaire, while the interviewer is still present, and an invitation to attend the deliberative meeting on a given weekend. In the time period between the initial interview and the deliberations, "those who agree to attend are provided with carefully balanced briefing materials, which outline the issues, provide purely factual background, and describe some of the major policy proposals being mooted by politicians and the press" (Luskin and Fishkin 1998, 3). As soon

as participants have arrived on site, they participate in two types of discussions. First, they discuss a number of pre-selected political issues in randomly assigned groups of 15 to 20 participants, moderated by specially trained facilitators. Second, they participate in sessions where they can question policymakers, political candidates, and political experts about their views and information about issues. "As a result, participants are thought to become more engaged in issues, pay more attention to information, and come to more thoughtful conclusions, leading to a better quality of public opinion as measured by a survey of the participants at the end of the weekend" (Merkle 1996, 589-590).

## Public Meetings as Policy Tools: Taking a Closer Empirical Look

Given the similarities between the Danish consensus conference model and deliberative polling, it is ironic that the two academic literatures and their policy applications have developed in almost prefect separation from one another. This has also made it exponentially more difficult to systematically assess their potential as a policy making tool. And partly as a function of the disconnects between different academic literatures and their policy applications, the enthusiasm in policy circles and academe about the potential of public meetings to reinvigorate U.S. democracy is as pervasive as it is at odds with most empirical research in this area.

## Normative Goals and Outcomes

Before examining potential problems with deliberative experiments, it is necessary to review briefly the policy functions attributed to these meetings by their organizers and proponents.

At an abstract level, deliberative meetings or consensus conferences are designed to improve public discourse about policy options more broadly, while living up to a set of standards that theorists have outlined for enlightened deliberations among citizens in democratic societies. At a minimum, these include (a) fair procedures within which (b) all relevant political stakeholders engage in (c) reasoned arguments (d) for the purpose of resolving political conflicts (for overviews, see Delli Carprini, Lomax Cook and Jacobs 2004; Fishkin 1995; Price and Capella 2002; Sanders 1997; Scheufele 1999, 2000).

At a more concrete level, researchers and practitioners have outlined at least four potential contributions that public meetings can make to policy making and debate. First, consensus conferences can serve as important input mechanisms upstream in the policy making process. Particularly in the field of NBIC technologies, soliciting input from specialized sub-publics early on in the issue lifecycle can help with identifying ELSI issues exhaustively and with enough lead time to develop different policy options. As some observers have pointed out however, such upstream engagement of highly interested and often partisan sub-publics can also lead to a lack of "tolerance for any alternative views and a refusal on the part of … activists to consider alternative options involving this technology" downstream (Tait 2009, S18).

Second, consensus conferences are designed to help participants (and the broader community) reach consensus about complex and potentially controversial technologies. Participants in Danish consensus conferences, for instance, are expected to produce a single consensus report as a formal deliverable. Some have suggested that forcing groups to deliver a consensus report may lead to more polarized issue stances among individual participants, while others argue that the process of compiling a consensus report may in fact

mitigate pre-existing ideological extremity. But previous research has not provided consistent evidence for either position (Hamlett and Cobb 2006).

A third and related function of consensus conferences is to increase levels of trust, efficacy and learning among all participants, i.e., policy makers, experts and members of the lay public. This reflects Cicerone's (2007) call for a two-way policy discourse among all stakeholders. This notion is often coupled with hopes that deliberative polls can serve as a tool to increase deliberation among *all* members of the public, to increase awareness of important issues and to maximize levels of knowledge and enable citizens to make informed decisions (Luskin and Fishkin 1998).

## Empirical Realities

Unfortunately, normative hopes for public meetings often deviate substantially from empirical realities. One of the most visible recent examples is a multi-billion construction project to link the wealthy industrial region of southwestern Germany to Europe's high-speed rail system (Slackman 2010). The construction plans involve destroying parts of the old train station in Stuttgart, Germany and have triggered regular protest with tens of thousands of citizens taking the streets. Pundits quickly lamented the lack of upstream citizen involvement and called for moderated public meetings to resolve the conflict. But many also questioned the ability of citizens to collectively debate an issue as technically complex as a multi-billion urban planning proposal (Caspari 2010, October 22).

Stuttgart 21 is only one recent illustration of the constraints of public meetings dealing with complex technical issues. Based on previous research, these constraints can be grouped into intrinsic factors (related to the structure or

dynamics of consensus conferences), and extrinsic factors (pertaining to the social environment and impacts of public meetings).

**Intrinsic constraints of public meeting efforts**. Previous research suggests that the intrinsic dynamics of social meetings raise questions in at least two related areas. First, as discussed earlier, attendance in real-world public meetings is low and highly selective. In a national telephone survey by the Henry J. Kaiser Family Foundation (Fieldwork from January 3 to March 26, 2001, *N* = 1,206), 88 percent of all respondents agreed that holding town hall meetings was a "very good" or "somewhat good" way for government officials to learn what the majority of people in our country think about important issues. Similarly, in a national telephone survey conducted by the Democratic Leadership Council (Fieldwork from February 12-14, 1999, *N* = 509) 90 percent of all respondents thought that "participating in 'Town Hall' community decision making meetings" was "a very important" or "somewhat important" obligation "that a citizen owes to the country."

This broad abstract endorsement of meetings as a tool for public engagement, however, stands in stark contrast to real attendance figures, even if measured as self-reports, which tend to inflate reports of meeting attendance. In a national telephone survey conducted by Carnegie's Circle Foundation (Fieldwork from January 12- 15, 1995, *N* = 801) only eight percent of respondents reported having expressed their views publicly by speaking at a town hall meeting over the last year. It could be argued, of course, that recent trends in online communication have created new ways for citizens to interact and deliberate with each other. But the numbers are even more bleak for web-based deliberative exchanges, and only three percent of web users reported having used the Internet to "participate in an online town hall meeting" in 2009 (Pew Internet & American Life Project, national phone survey, fieldwork November 30 to December 27, 2009, *N* = 2,258).

These data are consistent with concerns related to sampling biases raised about deliberative polls, for instance. As Fishkin (1995, 1996) reports, the initial sample used for the pre-test national survey was largely representative of the U.S. population. Of the initial sample of 869 respondents, however, only 300 took up the invitation to participate in the deliberative meetings. Follow-up analyses suggest that attendees and non-attendees differed significantly on a number of important variables. Attendees were more interested in politics, and they talked to others about politics more often than non-attendees (for an overview, see Merkle 1996).

As this overview shows, attendance in public meetings tends to be low and characterized by significant self-selection biases due to lack of interest among many members of the lay public, and disproportionately higher motivations among small, opinionated issue publics to participate and express their viewpoints. Historically, this is not too surprising. Even in modern democracies, real-world examples of face-to-face democracy seldom include the whole electorate. The "New England town meetings, where registered voters attend mass public meetings to debate and vote on a variety of policy, administrative and budgetary issues" (de Santis 1998, 2) provide a good example. Turnout at annual town meetings in Massachusetts in 1996, for instance, averaged 7.6 percent, a figure which was considerably lower than the average municipal election turnout of 31.1 percent (de Santis and Renner 1997). Over a five-year period, only 5.5 percent of the respondents in a survey of Massachusetts citizens reported having attended all of the annual meetings. More than half of the respondents reported having attended meetings "only rarely" or "never" (de Santis 1998).

Viewing these low levels of turnout as a modern-age phenomenon only, however, is not justified. Even though about three quarters of the population

usually attended 17th century town hall meetings in Dedham, Massachusetts, for example, the significance of this number "is mitigated by the fact that every inhabitant lived within one mile of the meeting place, there were fines for lateness to town meeting or absence from town meeting, a town crier visited the house of every latecomer or absentee half an hour into the meeting, and only some 60 men were eligible in the first place" (Schudson 1995, 193).

A second intrinsic concern related to public meetings deals with the violation of key deliberative principles during the meetings. Well-conducted consensus conferences are moderated and monitored to minimize imbalances in the conversation based on gender, socioeconomic status (SES), and other participant characteristics (Danish Board of Technology 2006; Hamlett and Cobb 2006). There are very few empirical studies, however, that systematically code and analyze the conversational dynamics during consensus public meetings.

The assumption for all of these meetings, of course, is that the rational, fair and goal-directed exchanges among citizens are responsible for changes in attitudes and knowledge about issues. Commenting on deliberative polls, however, Adair (1996) points out that "[d]epending on the makeup of the group (preference distribution, status differences, member perceptions, etc.) the group discussions could actually *inhibit* the types of outcomes Fishkin envisions and may lead to survey results that differ substantially from the 'theoretical' informed populace he envisions" (18).

And empirical findings support his suspicion. Group dynamics and personality characteristics of participants have been shown to play an important role in producing the outcomes of discussions. In particular, the five most outspoken members in each group made more than half of all the comments recorded during the discussions. The five least outspoken participants accounted for less than eight percent of the comments (Merkle 1996).

**Extrinsic constraints of public meetings.** In addition to intrinsic concerns, there are at least three extrinsic concerns that need to be raised about public meetings. The first extrinsic concern relates to the potential real-world outcomes of deliberative processes. Well-conducted public meetings or consensus conferences (e.g., Danish Board of Technology 2006; Fishkin 1995; Hamlett and Cobb 2006; Powell and Kleinman 2008) try to minimize potential conversational imbalances due to demographic, cognitive or personality characteristics of participants by carefully moderating conversations and controlling the a-priori information environments that participants are exposed to. This creates a Catch-22, since these artificial illustrations of "the conclusions people would come to, were they better informed on the issues and had the opportunity and motivation to examine those issues seriously" (Fishkin 1996, 1) tell us little about what happens in real-world settings. By carefully moderating and guiding conversations, however, consensus conferences create captive audiences (Hovland 1959) who behave in ways that may differ substantively from what is likely to occur in real-world group discussions.

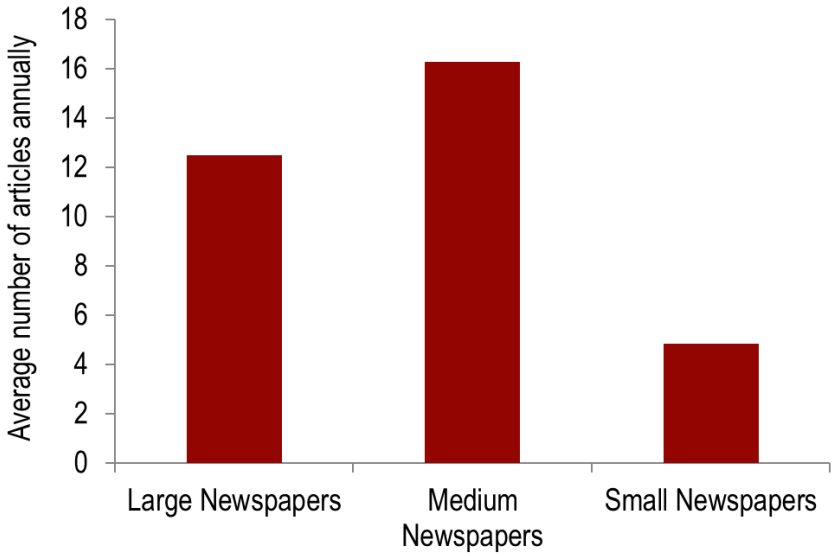
In fact, some researchers have suggested that real-world outcomes of political discussions that expose citizens to a wide variety of viewpoints may – in some circumstances – produce a sense of ambiguity rather than a better understanding of issues, and increase ideological cross-pressures that make people less likely rather than more likely to participate in the political process (Mutz 2002). Similarly, Binder and his colleagues (Binder et al. forthcoming) showed that discussions among members of the lay public about controversial science topics may in fact polarize different groups around a-priori issue stances and do little to promote informed debate.

A second extrinsic concern relates to the translation of what is happening in consensus conferences to real-world policy decisions. In an international

comparison, the Danish consensus conferences are in many ways an outlier, since they are explicitly designed to inform the policy making process. In other countries, including the U.S., even congressionally mandated efforts to organize public meetings are much more ad-hoc and often remain disconnected from formal policy decisions. This raises the question if and how these small-group discussions have the potential to inform public policy discourses more generally outside of the formal structures that countries like Denmark have created.

A quick look at U.S. media coverage of science- and technology-related public meetings suggests that spillovers from public meetings to broader social discourse are moderate at best. Figure 1 groups newspapers into three size classes based on circulation (for an overview, see Dudo, Dunwoody, and Scheufele forthcoming). If there is a significant spill-over effect from public meetings into media discourse, it could favor either larger or midsize papers that are more likely to have trained science writers on staff, or smaller papers that tend to cover local meetings and events. Figure 1 suggests that these spillovers are minimal, with newspapers in any size class covering science and technology related meetings less than 20 times a year on average.

**FIGURE 1: COVERAGE OF SCIENCE AND TECHNOLOGY-RELATED PUBLIC MEETINGS IN U.S. NEWSPAPERS 1992-2009**




**Notes:**

(1) Search string: BODY(("townhall meeting" or "public meeting" or "consensus conference" or "deliberative poll") and (science or technology)) OR HLEAD(("townhall meeting" or "public meeting" or "consensus conference" or "deliberative poll") and (science or technology))

(2) Large-circulation newspapers: *New York Times, Washington Post, Houston Chronicle, Atlanta Journal and Constitution, USA Today, Star Tribune* (Minneapolis); Medium-circulation newspapers: *The Plain Dealer, Pittsburgh Post-Gazette* (1994 through current), *St. Louis Post-Dispatch, St. Petersburg Times, Philadelphia Inquirer* (1994 through current), *The Oregonian*; Small-circulation newspapers: *The Augusta Chronicle, Santa Fe New Mexican* (1994 through current), *Bangor Daily News* (1994 through current), *Lewiston Morning Tribune, Pasadena Star-News* (2001 through current; gap in coverage 2004), *Wyoming Tribune-Eagle* (1997 through current)

Simply tallying mentions of science- and technology-related meetings could be somewhat misleading, of course, given the narrow geographic focus and relevance of many public meetings. In addition, the impact of local meetings is often amplified through follow-up coverage of related issues or events that may not explicitly reference the meeting itself. These social amplification effects

(Kasperson et al. 1988) may in fact help transfer the debate from a narrow discussion at the meeting to a larger discussion in the broader community.

Assuming that these spillovers between public meetings and communities actually occur, some agencies and communities have begun to use public meetings and the subsequent social amplification of the debates as a means of soliciting public input on policy proposals from the broader community early on in the decision process. Unfortunately, this approach has some serious pitfalls.

Data from a recent study examining the social dynamics surrounding the site-selection process for the National Bio- and Agro-Defense Facility (for an overview, see Binder et al. forthcoming), for example, suggest that using these meetings as gauges of broad public reactions may in fact produce conclusions (and policy choices) that are diametrically opposed to public preferences (Binder, Scheufele, and Brossard 2010). Evaluations of potential sites for the facilty by the sponsoring agency (Department of Homeland Security) were based upon a number of broad criteria, including community acceptance.

Interestingly, however, Department of Homeland Security assessments tended to correlate visible expressions of opposition rather than true overall levels of support in each community. In fact, in all communities that were ranked as not or only partially fulfilling DHS's community acceptance criterion, respondents viewed the climate of opinion as overwhelmingly negative, in spite of significantly higher levels of real support among the public (Binder, Scheufele, and Brossard 2010). In other words, in spite of potentially very balanced and structured public meetings, subsequent coverage and opinion dynamics may have produced a situation where the voices of some of the most vocal groups were amplified to a point where the perceptions of majority opinions deviated substantively from real opinion distributions.

The third extrinsic problem may also be the most serious one. Previous research has identified a series of demographic, cognitive and contextual variables that make some groups in society more likely to attend public meetings than others (for overviews, see McLeod, Scheufele, and Moy 1999; McLeod et al. 1999). Previous research and theorizing, however, also suggests that these attendance gaps may be widened even further by the conversational dynamics during deliberative meetings or consensus conferences. Are respondents who dominate the discussion (e.g., Merkle 1996), for example, more or less likely to "learn" from discussion? In other words, do they mainly persuade others or do they, at the same time, listen to arguments made by others in the group? Similarly, do more informed respondents discuss issues in a way that is hardly accessible for respondents with lower levels of education (Sanders 1997)?

Widening knowledge gaps, i.e., higher rates of learning among high-SES vs. low-SES populations, are a particular concern for NBIC technologies. Recent national surveys, for example, show widening gaps for factual knowledge about nanotechnology between high-SES and low-SES respondents. And the outcomes do not bode well for democratic decision making about NBIC technologies: "People who are already information rich are benefiting from traditional outreach efforts….Unfortunately, those who need outreach and education the most — those with little or no formal education — are being left behind" (Corley and Scheufele 2010, 22).

It is reasonable to assume that public meetings and consensus conferences have the same potential to create or widen similar gaps between different groups of citizens. Given the intrinsic and extrinsic considerations discussed earlier, this may be a function of at least two mechanisms: (1) significant demographic, predispositional and cognitive differences between the small proportion of the population who attends public meetings and the vast majority who do not; and

(2) conversational dynamics that allow subgroups of highly educated or highly interested participants to dominate the conversation during the meetings. In other words, public meetings may have the unintended consequence of helping the already information rich to further develop their understanding of NBIC issues and to provide input into the policy making process, while leaving behind lower-SES audiences and widening existing gaps even further.

## Framing the *Infrastructure* for Conversations

In spite of these obvious limitations of public meetings and consensus conferences as tools for policy making or gauges of public sentiment, it is important to keep in mind that public meetings and consensus conferences can play an important role in involving highly interested and mobilized sub-publics in specific policy debates about NBIC technologies early on in the issue cycle. As the various challenges intrinsic and extrinsic to public meetings show, however, these sub-publics constitute a very specific set of stakeholders with unique perspectives, values and agendas. Tait (2009) summarizes the very specific potential and dangers of consensus conferences and other forms of upstream engagement efforts: "Public dialogue, in terms of allowing people to contribute to ongoing debates about relevant issues, is to be encouraged. More problematic … is the expectation that the outcomes of these dialogues should contribute to decisions about scientific research at the upstream stage, or should be used to discourage developments, based on opinion rather than the best available evidence of potential benefits and risks" (Tait 2009, S21).

In spite of these warnings, many practitioners in the non-profit world and governmental agencies continue to be excited about the potential of consensus conferences and similar tools of public engagement (e.g., Lukensmeyer and Torres 2006), and a number of scholars have made suggestions on how to

improve these exercises, given their obvious constraints. Some of these suggestions have focused on the overall nature of the discourse and pointed "to a crucial challenge of initial framing. Care should be taken in presenting the issues to citizens, keeping ethical, cognitive and political spaces as open and flexible as possible, subject to contestation" (Blok 2007, 177). This point about the necessity to pay careful attention to how issues are framed is well taken, and is – in fact – at the very center of any successful effort to create an open dialogue between science, policy and the lay public. But it does require some modification.

Framing as a concept is often traced back – at least in part – to Kahneman's Nobel Prize–winning work in economics dealing with human decision making (Kahneman 2003; Kahneman and Tversky 1979, 1984). All perception, he argued, is reference dependent. This means that the same piece of information may mean very different things to different people, depending on which interpretive schema they use to make sense of this information (Scheufele and Scheufele 2010; Scheufele and Tewksbury 2007).

As a result, people's views on emerging technologies are heavily influenced by the interpretive schema they use when trying to make sense of these issues. An ideal public debate should therefore offer a wide variety of frames and expose stakeholders to all sides of the debate and to all possible ways of making sense of the issue.

Blok's (2007) assumption that there is a neutral or "unframed" way of presenting issues at the outset of consensus conferences, unfortunately, is incorrect, particularly for complex scientific debates. In fact, any narrative or terminological vacuum surrounding NBIC technologies will be filled quickly by interest groups, political actors or corporations promoting particular viewpoints (Scheufele 2007).

This is particularly important, since NBIC issues and the ELSI aspects surrounding them are – in many ways – "ambiguous stimuli," as Kahneman calls objects that are open to different interpretations, depending on peoples pre-existing schemas, value systems, or cognitive resources. And once a particular frame for an issue has emerged on the public agenda, it is difficult to counter or to remove it from public consciousness for the sake of a deliberative exercise. In fact, the way issues are being framed early on also determines their interpretation by lay and expert audiences throughout the issue cycle (Nisbet and Scheufele 2009).

The most recent example is White House science advisor John Holdren's attempt to reframe the global warming debate around the label "global climate disruption" in order to more accurately capture the fundamental nature of the long-term changes to the global climate. He was immediately attacked by various partisan commentators for trying to "rebrand" the issue to make it sound more dangerous (FoxNews.com 2010).

This example has important implications for public meetings. The issues that are debated at consensus conferences likely have a scientific and political history, which has already shaped the framing of news coverage in various news outlets, the pre-conceived ideas that participants bring to the meeting, and – most likely – also the materials distributed to the participants. In the long run, it is therefore absolutely critical for governmental agencies and policy makers to distinguish the controlled and hypothetical democracy of public meetings from the larger real-world dynamics of the political discourse that precedes them, and to make sure that the political discourses surrounding emerging technologies are framed in ways that allows for an informed and balanced political discussion that does not a-priori favor particular viewpoints or outcomes.

But agencies or governmental bodies cannot do this alone. Establishing or contributing to a public discourse around emerging technologies that does not marginalize certain views or groups is not easy. It requires coordination across all stakeholders. A good example of a successful effort is the National Academy of Engineering's committee on Developing Effective Messages for Improving Public Understanding of Engineering (Committee on Public Understanding of Engineering Messages 2008). Funded by the National Science Foundation, it used a research-based approach to identify existing communication disconnects with minority and female students who are disproportionately less likely to pursue engineering careers. The National Academy of Engineering developed and implemented a set of messages that had tested particularly well and coordinated the roll-out of their communication campaign in partnership with stakeholders in industry, academia and the non-profit world.

Such partnerships will be increasingly important for governmental agencies as they take a leadership position in bringing together lay publics, science and policy in the debates that *will* take place about NBIC technologies and their social impacts. These debates will have to involve all societal stakeholders, their values and concerns, and – most importantly – reasonably exhaustive scientific information about risks and benefits. They will also have to involve forms of engagement that address some of the extrinsic and intrinsic challenges outlined in this paper, and will therefore have to be substantially different from public meetings or consensus conferences. These new forms of engagement may involve innovative uses of online modes of communication to close widening knowledge gaps. Most importantly, they will require a significant future investment into what I would call the social science of emerging technologies, i.e., an understanding of how political and scientific discourse get created, emerge and potentially constrain policy debates and solutions. Ultimately,

however, this investment is absolutely critical for creating future societal debates about NBIC technologies that adequately represents all relevant viewpoints and stakeholders and ultimately lead to long-term decisions that help maintain U.S. leadership in science and technology (Scheufele and Corley 2008).

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## APPENDIX 1:
## LEGISLATIVE EFFORTS RELATED TO CONSENSUS CONFERENCES AND PUBLIC MEETINGS: A FEW EXAMPLES

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| 2007 | National Park Service | Director's Order #75A: Civic Engagement and Public Involvement | The Order is based on a departmental manual by the Department of the Interior which mandates to "offer the public meaningful opportunities for participation in decision-making processes" and requires keeping an "up-to-date and consistent policy guidance" on public involvement. The Director's Order implements that, but does not include measurable outcomes and enforcement mechanisms. |
| 2005 | 109th Congress, House of Representatives, Committee on Science, Subcommittee on Research | Hearing before the Subcommittee on "Nanotechnology: Where does the U.S. stand?" | The hearing includes references to successful outreach and public engagement efforts, addressed in the managing interagency Nanotechnology Public Engagement Group. Continued attention to the topic is recommended. |
| 2004 | 108th Congress, House of Representatives, Committee on Energy and Commerce, Subcommittee on Health | Hearing before the Subcommittee on "Scientific Opportunities and Public Needs: Balancing NIH's Priority Setting Process", Including a Report by the NIH Director's Council of Public Representatives (COPR): "Enhancing Public Input and Transparency in the National Institutes of Health Research Priority-Setting Process" | The report contains seven recommendations on public input, emphasizing the importance of two-way communication with the public, the necessity for public input to be considered by senior decision makers and cooperation with grassroots initiatives and community leaders. |

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| 2003 | 108th Congress, House of Representatives, Committee on Science | Hearing on "The Societal Implications of Nanotechnology" | Besides general statements about the importance of a broad and early involvement of the public in policy processes, the failure to produce and share information with public stakeholders in the case of GMOs is explicitly mentioned. Another suggestion is the increased use of citizen panels. |
| 1989 | 101st Congress, Senate, Committee on Commerce, Science, and Transportation, Subcommittee on Science, Technology, and Space | Hearing before the Subcommittee on "The Human Genome Initiative and the Future of Biotechnology" | In these hearing proceedings, the minimum of 3 percent of the overall budget for public education and the study of ethical, legal and social questions is highlighted as a positive development. The proceedings also include expert suggestions for the increased use of focus groups and polling to identify the public's values and views. |
| 1989 | New York State Legislative Commission on Toxic Substances and Hazardous Wastes, Albany, New York | Public Input and Siting of a Waste Disposal Facility: New York State's Low Level Radioactive Waste Policy Act of 1986 | This document describes how the 1986 Radioactive Waste Act changed the involvement of the public from informal public comment periods to more formal engagement and outreach to inform the public about complex technologies and include citizens in siting commissions, technical advisory boards, public education programs, etc. |
| 1977 | 95th Congress, Senate, Committee on Human Resources | Transcript of proceedings, edited for the Subcommittee on Health and Scientific Research | In this meeting, participants raised the idea of direct financing of public input mechanisms. The idea presented is that citizens outside of lobbying groups can directly apply to the government for funding to coordinate public input into the research community or the administration. |

| International Examples | | | |
|---|---|---|---|
| 2010 | Canadian Institute of Health Research | CIHR Three-Year Implementation Plan and Progress Report 2010–13 | The report lists a variety of successful outreach and engagement projects. The corresponding objective in the five-year strategy is to "increase citizen engagement and public outreach initiatives". Performance measures are, for example, the number and type of activities, attendance at events, number of media citations and hits on the CIHR website. |
| 2010 | United Kingdom, House of Lords, Science and Technology Committee | Nanotechnologies and Food, Science and Technology Committee, 1st Report of Session 2009–10,Volume II: Evidence | The report emphasizes the importance of upstream engagement and early public involvement at the planning stage. A series of reconvened workshops and the "Sciencewise Programme" are highlighted as outreach activities. |
| 2008 | Canadian Institute of Health Research | CIHR's Framework for Citizen Engagement | The framework identifies four focus areas for citizen engagement: Representation on CIHR's boards and committees; corporate and institute strategic plans, priorities, policies, and guidelines; research priority setting and integrated knowledge translation; knowledge dissemination and public outreach |
| 2005 | HM Government in consultation with the Devolved Administrations | The Governments Outline Programme for Public Engagement on Nanotechnologies | The document lists and describes a variety of government activities (e.g."Nanodialogues" and "Nanotechnologies Engagement Group") and the allocated funding. Additionally, non-governmental initiatives are described. |
| 2005 | European Group on Ethics in Science and New Technologies (EGE) | Mandate 2005-2010 | The mandate includes, that the European Group on Ethics in Science and New Technologies will organize a public round table in order to promote dialogue and improve transparency for each opinion that it produces. |
| 2000 | Canadian 36th Parliament, House of Commons | Bill C-13: Canadian Institutes of Health Research Act | The legislation mandates to "engage voluntary organizations, the private sector and others, in or outside Canada, with complementary research interests". Further details are not specified. |

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|---|---|---|---|
| 2000 | United Kingdom, House of Lords | Science and Technology - Third Report | The report includes the recommendation to make the direct dialogue with the public a mandatory and integral part of policy processes, instead of being optional. Furthermore, the report emphasizes the importance of transparency and mentions the problem of public meetings monopolized by single-issue groups. |

## Endnotes

[1] The labels used for these efforts range from "consensus conferences" (Danish Board of Technology 2006; Powell and Kleinman 2008), to "public meetings" (21st Century Nanotechnology Research and Development Act 2003), and "deliberative polls" (Fishkin 1996).

[2] NBIC refers to the converging research fields based on the recent nano revolution in science and engineering. It involves research at the intersections of nanotechnology, (synthetic) biology, cognitive science, and information systems. Nanotechnology, more specifically, is what many commentators have called an enabling technology, i.e., a technology that creates new scientific breakthroughs in a variety of scientific disciplines, including chemistry, physics, engineering, material science and many others. The term "nano" (greek for "dwarf") usually refers to observations or modifications at the nanoscale, i.e., 1-100 nanometers. A nanometer is one billionth of a meter.

[3] For examples of related efforts and mandates – including international ones – see Appendix 1.