

SCIENTIFIC UNCERTAINTY AND PROFESSIONAL ETHICS: GETTING FROM STRONG PUBLIC SCIENCE TO SOUND PUBLIC POLICY

WORKSHOP OVERVIEW

With a grant from the National Science Foundation's Paleoclimate Program, the Environmental Law Institute (ELI) organized and convened in December 2016 its third multidisciplinary workshop, *Scientific Uncertainty and Professional Ethics: Getting from Strong Public Science to Sound Public Policy*. Around forty participants working in law, science and journalism continued to explore communication of scientific uncertainty on environmental and public health issues, and to discuss potential action. A majority of these participants had participated in earlier ELI-NSF workshops on the same subject in Fall 2014 and Spring 2016.

The workshop series' stated goals remained: (1) to facilitate more effective cross-discipline communications by deepening participants' understanding of the approaches their peers take to address scientific uncertainty, and the ethical and normative reasons underlying these approaches; (2) to promote more transparent and constructive debate on major environmental and public health issues by deepening understanding of the ethical and disciplinary constraints on scientific, legal, and media professionals charged with communicating scientific uncertainty; and (3) to bring the challenges in understanding and ethically communicating scientific uncertainty and potential solutions to the forefront through technical and non-technical presentations, peer-reviewed publication, and outputs for lay audiences. This event was the final workshop delivered pursuant to this grant.

STEERING COMMITTEE

In October 2015, ELI staff convened a steering committee drawn from all three fields to advise on workshop design and help develop the invitation list. The committee included:

- Mona Behl, Associate Director, Georgia Sea Grant, University of Georgia;
- Leslie Carothers, former ELI President and a Visiting Scholar at ELI;
- Jim Hilbert, Associate Professor, Mitchell Hamline School of Law;
- Jay Odenbaugh, Professor of Philosophy, Lewis & Clark College;
- Dave Poulson, Senior Associate Director, Knight Center for Environmental Journalism, Michigan State University; and
- Bud Ward, Editor, *Yale Climate Connections*.

PARTICIPANTS

With guidance from the steering committee, ELI again issued workshop invitations to a broad cross-section of scientists, lawyers, and journalists representing different sectors, perspectives, and regions of the country, with participants drawn roughly equally from each of the three professions. Participant biographies are available [here](#).

PRE-WORKSHOP READINGS

Prior to the workshop, ELI distributed selected short readings for participants to review. These readings introduced basic elements of the ethics of uncertainty in science, law, and journalism, and covered topical matters pertaining to climate change and to genetically modified organisms (GMOs), the subject of a case study that was the centerpiece of this workshop. ELI also distributed documents presenting hands-on “opportunities”— some working drafts and projects that emerged from the previous workshop, on which participant feedback, comments, and active participation were invited. These include an [annotated bibliography](#) being prepared by ELI; a draft outline of a primer on scientific uncertainty for lawyers and judges; a [call for drafting committee members](#) for a proposed informational statement for the American Meteorological Society (AMS); and news of a related panel discussion at the January 2017 AMS Annual Meeting.

Additionally, at the workshop, ELI made available hard copies of several longer, more technical articles and materials, many of which documents were authored by workshop participants. These readings are available [here](#).

WORKSHOP STRUCTURE

On December 5-6, 2016, ELI hosted the workshop at the Carnegie Endowment for International Peace in Washington, DC. The full workshop agenda is available [here](#). The workshop began with a welcome and introductory remarks by ELI Vice President John Pendergrass, followed by opening remarks from David Verardo, Director of the NSF Paleoclimate Program. ELI Senior Attorney Jay Austin and Steering Committee member Mona Behl outlined the workshop goals and approach.

The first workshop session, “Communicating Scientific Uncertainty,” was moderated by Paul Huttner of Minnesota Public Radio and featured presentations and remarks by Mandy Joye from the University of Georgia and Richard Somerville from the Scripps Institution of Oceanography. Joye discussed the aftermath of the *Deepwater Horizon* oil spill, and Somerville discussed communicating climate change between scientists and members of the public.

Dan Charles, National Public Radio’s food and agriculture correspondent, introduced and moderated the second workshop session on “GMO Science and Uncertainty.” Fred Gould of North Carolina State University presented research about how scientists write about uncertainty and discussed communication of nuance about uncertainty to the public. Belinda Martineau, of the University of California – Davis presented regarding her pioneering experiences working in the GMO industry and challenges for the public being able to make decisions in the absence of full information. Charles then moderated a discussion focused on public dialogue about the health and safety implications of genetically modified food products.

The focus on GMOs continued with the third session, “Science Communication in the Public Arena: the Debate over GMO Labeling.” Helena Bottemiller Evich, a journalist with *Politico*, moderated a discussion between Sylvia Wu of the Center for Food Safety and Steve Armstrong, formerly with the Campbell Soup Company. The conversation focused on general perspectives on GMO labeling and on federal and state GMO labeling efforts in the United States.

The final session of the first day, “Scientific Uncertainty & Public Policy through the Lenses of the Three Profession,” was moderated by ELI’s Dave Rejeski. The purpose of this conversation was to move beyond the focus of the previous sessions to consider the communication of uncertainty about other topics that are important now and in the future.

On the second day, several workshop participants presented brief updates on their projects that had emerged from the prior ELI-NSF workshops. Several additional participants presented other initiatives that had emerged since the earlier workshops. These presenters sought engagement from other workshop participants on the projects that they described.

The workshop concluded with a presentation from Andrew Light, of George Mason University, regarding the post-election prospects for the Paris Agreement on climate change and for climate policy more generally. The discussion following this presentation included questions regarding the role of climate change in the 2016 presidential campaign and the possible positions of the Trump Administration regarding climate change.

HIGHLIGHTS OF THE WORKSHOP SESSIONS

COMMUNICATING SCIENTIFIC UNCERTAINTY: A DIALOGUE

The session began with a framing question from moderator Paul Huttner: when is an issue certain enough that one can say that it is “actionable”? Following Huttner’s introduction, Mandy Joye described her involvement as a scientist in the aftermath of the *Deepwater Horizon* oil spill, and the experience of presenting information that others—including responsible decisionmakers—did not want to hear. She also described criticism that she received for releasing information at a stage that other scientists thought premature. Richard Somerville, of the Scripps Institution of Oceanography, discussed the importance of scientists communicating with the public, including with journalists. He emphasized that word usage matters, particularly because the meaning of words often can differ for scientists and others.

Following these presentations, a discussion with the session participants generated the following suggestions and conclusions, among others:

- There are **urgent situations** when it is necessary to develop and share research rapidly, as well as to ensure the reliability of the research, such as the aftermath of the *Deepwater Horizon* spill. There are discussions underway about creating a fast-tracking system among publications such as *Science*, *Nature*, and *PNAS* to review and publish such research. Discussions are also underway to facilitate communication pathways between government decisionmakers in urgent situations and engaged members of the scientific community.
- To facilitate communications among scientists and journalists, journalists can ask scientists to **connect the dots**. Journalists can also *ask* about connections to climate change, even though it may not be ultimately possible to show causation in a specific case.
- When a **journalist calls** a scientist, it can be a good strategy to ask the journalist to send questions in advance in order to facilitate an informative interview. Another participant suggested asking about the journalist’s deadline and asking which other people are being contacted for the story.
- There are differences of opinion within the journalistic profession about how much of a story **can be shared** with a source before it is published. Those that share less with a source do so in order to maintain credibility and independence. One good practice for a source is to ask a journalist to repeat information back to ensure it was communicated effectively.
- Other participants reiterated that **language** is important. In particular, the choice of a metaphor can have a significant effect, and subtle differences can have a large impact.

- Another suggestion was that scientists can learn to assess **opposing arguments** in advance so that scientists can understand, anticipate, and rebut those arguments as necessary.
- For experts, it can be tempting to say “it’s complicated,” but experts should remember that a journalist will have to **encapsulate the materials**. Therefore, it can be useful for experts to convey how *they* would encapsulate the material themselves.

GMO CASE STUDY

The workshop included a two-part case study of issues pertaining to GMOs and uncertainty, with the goal of illuminating broader questions about science, uncertainty, and communication. The first session focused on disputes about uncertainty and the *science* of GMOs. The second session focused on the *labeling of products* that include GMOs, while seeking to address the broader issue of science communication in the public arena.

PART I: GMO SCIENCE AND UNCERTAINTY

The session, moderated by Dan Charles of NPR, began with a presentation from Fred Gould about how scientists communicate about uncertainty. He emphasized the importance, for scientists, of making clear the limits of knowledge. With respect to GMOs, for example, it is easier to say that GM foods will not cause immediate fatalities than to say that they will or will not have specific impacts over the long term. He indicated that the onus ought to be on the public to make their own decision. He suggested the issues underlying the public’s risk perceptions of genetically modified foods are trust in government, trust in large corporations, and a desire to live healthy lives.

Next, Belinda Martineau of the University of California–Davis discussed her experience as a scientist working on the “Flavr Savr” GMO tomato. She emphasized the amount of information about GM products that is still unknown and the importance of conducting further studies to expand the current pool of knowledge. She also emphasized that the public has not been provided adequately nuanced information that would facilitate informed decisions.

The following are some of the suggestions and conclusions that emerged from the discussion generated by these presentations:

- There was an exchange among the panelists about whether, for the purposes of evaluating GM activities, only the *result* of attempts to modify a species (the phenotype) is important or whether the *process* by which the modifications occur is important as well.
- Studies should be **published** even if the result is inconclusive.
- One commenter emphasized that there are **values** at stake in the use of GM products beyond simple food “safety” impacts of the foods on those that ingest them. These values include broader health impacts and the impacts of industrial agriculture.
- When multiple issues are related, clarity about how to **frame** an issue is critical.
- **Transparency** about the regulatory process for reviewing proposed GM foods is important.
- In a regulatory process, it matters who has the **burden of proof**. One commenter emphasized that a developer of a new product or technology ought to have the burden of proof.
- Having a **national biotechnology strategy**, like many other countries, could help guide the development of any GM technologies and products in a manner that is consistent with a public process and with collective values.

- Given the level of **public distrust** of GM foods, one panelist emphasized the importance of more scientific research, additional follow-up studies, transparency in labeling, and transparency regarding the regulatory process.
- In light of the **complexity** of these issues, it is particularly important that scientists interface with journalists regarding them.

PART II: SCIENCE COMMUNICATION IN THE PUBLIC ARENA: THE DEBATE OVER GMO LABELING

This session, moderated by Helena Bottemiller Evich of *Politico*, began with comments by Steve Armstrong. Armstrong described how the Campbell Soup Company has supported GMO labeling because of the importance of providing consumers information that they seek. He described how Campbell's sought to label its own products and supported a national uniform labeling standard. He emphasized that the specific terminology used in a labeling scheme is important and that consumers desire fact-based statements.

In her comments, Sylvia Wu of the Center for Food Safety emphasized the importance of how one frames the question of the propriety of GM products. With respect to "safety," she said, the critical question is safe *for what* and *for whom*. She also noted that there are broader questions about the impacts of GM foods that are not encompassed within the "safety" frame. She emphasized that it is difficult to say how much information would be sufficient for the public given how the interconnection between an array of issues. She also noted that the existing regulatory framework is not well-suited to the issues raised by GMO development.

The following are some of the suggestions and conclusions that emerged from the discussion following these presentations:

- There are **parallels** between issues pertaining to climate change issues and issues pertaining to GMOs, and certain lessons can be shared in light of those parallels.
- It is difficult to determine the **right amount of information** to share through a labeling scheme. There was some discussion about the labeling of individual ingredients, rather than an entire product, as well as the regulatory hurdles to doing so.
- In response to questions about state-specific labeling laws, one of the panelists noted that the "**devil is in the details**," and the specific labeling proposals have varied widely.
- One commenter emphasized the distinctions between the **European approach** and the approach in the United States, questioning whether it would be feasible to change approaches in the United States at this time.

SCIENTIFIC UNCERTAINTY & PUBLIC POLICY THROUGH THE LENSES OF THREE PROFESSIONS

In framing this session, Dave Rejeski of ELI explained that the goal is to expand the conversation that had been occurring to policy areas beyond climate and GMOs. He noted three key obstacles in the realms of law, science, and journalism: regulatory uncertainty, trust, and timing and inevitability.

To explore these themes further, Rejeski presented an example of a foreign company coming to a country to engage in a mosquito-related intervention intended to reduce disease. This plan would raise questions, he suggested, about whether the company was trustworthy, the propriety of intervening in nature, whether the residents of the area had requested and/or consented to the intervention, and the availability of third-party validation of the planned scientific methods. It would raise questions about both scientific uncertainty and

business uncertainty. He argued that, before a project is initiated, there is an important opportunity to have a public conversation about the risks and benefits of a project.

Rejeski then opened the conversation for comments and questions, seeking (1) to identify other key topics of current public policy debate where communicating scientific uncertainty is central to informed, effective decision-making; and (2) to explore the opportunities for and potential obstacles to effective communication about those topics. The following are some of the suggestions and conclusions that emerged:

- Participants suggested **other examples** to explore in examining uncertainty, including fracking, nuclear power, water supply, disease outbreaks, technological development, antibiotic resistance, and persistent water pollution. Some of these examples are notable because risks and benefit may fall on **different populations** and raise issues of geographical, temporal, and demographic equity.
- Different **value systems** can lead to different evaluations of phenomena such as climate change and GMOs. Such systems include ones that emphasize the purity and/or sanctity of nature.
- There is a challenge in communicating uncertainty when users often only spend **limited time** on a website.
- Other participants discussed the factors that shape **trust in science** and explored how to prevent advocates from using “bad science.”
- One commenter argued that advocates should focus more on the benefits of responding to climate change, such as **clean energy and jobs**. Another commenter noted that even people who are climate skeptics may become engaged with renewable energy and energy efficiency.
- Because of cultural cognition challenges, **slow change** is often insidious and difficult to prevent.
- The **risk management** perspective of engineers may provide an additional useful perspective in considering the practical impacts of scientific uncertainty.
- Continuing discussions **across disciplines** is important regarding public health and environmental issues.

FOLLOW-UP AND ONGOING PROJECTS

At the previous workshop held in April 2016, participants had discussed how this group of professionals might advance the issues discussed with respect to effectively and ethically communicating scientific uncertainty. At this December workshop, several participants presented activities that had emerged from prior workshops, and others presented new projects that had emerged in the interim. These presenters requested feedback from the workshop participants and sought engagement in these efforts going forward.

First, participants described the following efforts that grew out of previous workshops:

- Gina Eosco of the Eastern Research Group described a panel discussion that would be occurring at the 2017 **American Meteorological Society Annual Meeting**. This panel discussion, which then took place on January 25, 2017, covered the ethical considerations that practicing meteorologists face in communicating uncertainty to their audiences.
- Mona Behl explained that the American Meteorological Society periodically issues statements on topics that fall within the organization’s expertise and speak for the institution as a whole. Behl’s proposal for an **informational statement on communicating uncertainty** regarding weather, water, and climate has been accepted by the Society. Behl successfully recruited participation in this ongoing drafting process from several of the workshop attendees, with the statement expected in Fall 2017.
- Leslie Carothers and Merideth Wright, both affiliated with ELI, presented their idea for developing a concise **accessible primer** to help lawyers and judges help understand science, science

communication, and the relevant ethical norms. They sought feedback from the participants as to the need for such a primer, ideas for potential case studies, and involvement from lawyers open to engaging in such a project.

- Benjamin Solomon-Schwartz of ELI presented a draft **annotated bibliography** that gathers materials related to scientific uncertainty, including both materials distributed for the workshops that were part of this series and other materials. Solomon-Schwartz requested ideas for additions to the bibliography.
- Sunshine Menezes, of the Metcalf Institute for Marine & Environmental Reporting at the University of Rhode Island, described a proposed **new podcast** that might include a series of short interviews with lawyers, scientists, and others about their interactions with scientific uncertainty. She sought feedback on the project.
- Lisa Palmer, of the National Socio-Environmental Synthesis Center, sought to convene an **additional workshop** for further discussions about the role of scientific uncertainty in decisionmaking. That conversation might cover safe levels of uncertainty and the role of government and regulation in connection with uncertainty. One goal would be to produce several papers in different formats that could be transmitted to a variety of audiences.

Next, participants described the following outside efforts that had emerged since the prior workshops:

- Dave Poulson of Michigan State University described a project pertaining to **science, journalism, and communications regarding environmental issues**, particularly in the aftermath of the 2016 election. He described how these issues unfolded with respect to the lead-related water crisis in Flint, Mich.
- Tom Lininger of the University of Oregon School of Law described his planned **upcoming publication** pertaining to the ability of climate activists to invoke the “necessity” defense in connection with their protest activities. Lininger sought suggestions for communicating the imminent nature of hardships resulting from climate change.
- Mandy Joye described **articles** in progress regarding communicating uncertainty and humanizing science. She discussed alternative methods of communicating these ideas to wide audiences, including podcasts and video streams. With respect to the humanization of science, she discussed showing what motivates scientists in their work and showing that scientists are “real people.”
- Andrew Rosenberg of the Union of Concerned Scientists spoke about UCS’s ongoing efforts to engage scientists in dialogue pertaining to political and policy issues. He also spoke about preliminary indications of the Administration’s activities regarding science.

NEGOTIATION OF THE PARIS AGREEMENT AND THE CURRENT POLITICAL CONTEXT

In the final session, Andrew Light, currently of George Mason University, described his previous role serving in the State Department’s Office of Policy Planning. He outlined the achievements of the Paris Agreement, including the changing dynamics among the United States, China, and India. He then discussed the ramifications of a withdrawal by the United States from the Paris Agreement, or of reduced engagement without a formal withdrawal. Light also discussed the prospects for changing roles for China and/or India if the U.S. is less engaged in the Agreement.

The conversation turned to other questions about the aftermath of the 2016 election. It included a discussion of the role of climate change in the campaign itself, efforts to connect scientists and scientific information to decisionmakers on climate change policy going forward, and brainstorming about other pathways to deliver persuasive scientific information to decisionmakers in the new Administration.