

# SCIENTIFIC UNCERTAINTY AND PROFESSIONAL ETHICS IN SCIENCE, LAW, AND JOURNALISM

## WORKSHOP OVERVIEW

With a grant from the National Science Foundation's Paleoclimate Program, the Environmental Law Institute (ELI) organized and convened a multidisciplinary workshop entitled *Scientific Uncertainty and Professional Ethics in Science, Law, and Journalism*. Nearly fifty participants working in these fields explored how they communicate scientific uncertainty on environmental and public health issues, subject to their respective professions' norms and ethical standards, and discussed what improvements can and should be made. Twenty of these participants had participated in an earlier (Fall 2014) ELI-NSF workshop on the same subject.

The workshop's stated goals were: (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 first of two workshops to be 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;
- Chad English, Science Program Officer, David and Lucile Packard Foundation;
- 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 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 QUESTIONNAIRE AND READINGS

One month prior to the workshop, ELI sent an informal questionnaire to all participants—tailored to participants by profession—posing three substantive questions:

1. What professional norms and ethical standards apply to your efforts to communicate scientific uncertainty? What constraints, if any, do these standards place on how you communicate uncertainty to various audiences?
2. How much do [certain specified] factors influence or have the potential to influence [your profession's] communication of scientific uncertainty? Are there other important factors that influence [your profession's] communication of scientific uncertainty? If so, what are they and how do they influence communication of scientific uncertainty?
3. What do you see as the other two professions' biggest challenges in communicating about scientific uncertainty? How, if at all, can/should [your profession] collaborate with other professions to overcome these hurdles?

ELI also distributed selected short readings for participants to review in advance of the workshop. These readings introduced basic elements of the ethics of uncertainty in science, law, and journalism, and also explored two important topical examples of areas where the ethical communication of scientific uncertainty has been critically important: (1) climate change, and (2) genetically modified organisms. A table of contents and links to these readings are available [here](#).

Additionally, ELI made available at the meeting hard copies of several longer, more technical articles and materials, many of which documents were authored by workshop participants. A list of these readings and links to each of them are also available [here](#).

## PRE-WORKSHOP WEBINAR

On April 15, 2016, ELI hosted an online webinar, "Issues in Communicating Scientific Uncertainty," in which three panelists examined the different roles that scientists, lawyers, and media professionals play in addressing scientific uncertainty. Moderated by ELI Senior Attorney Jay Austin, the webinar featured presentations from: Sunshine Menezes, Executive Director, Metcalf Institute for Marine & Environmental Reporting, University of Rhode Island; Jason Samenow, Weather Editor, *Washington Post*; and Margaret Davidson, Senior Leader, Coastal Inundation and Resilience, National Oceanic and Atmospheric Administration. They shared their perspectives on, respectively: effectively communicating scientific information, practicing climate and weather journalism in a shifting media environment, and translating uncertainty into policy.

The webinar was open to the public, and all workshop participants were encouraged to attend or listen to a recording. The webinar has been archived and is available, together with participant presentations and bios, at <http://www.eli.org/events/issues-communicating-scientific-uncertainty>.

## WORKSHOP

On April 21-22, 2016, ELI hosted the workshop *Scientific Uncertainty and Professional Ethics in Science, Law, and Journalism* 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 President Scott Fulton, followed by opening remarks from David Verardo, Director of the NSF Paleoclimate Program. ELI Senior Attorneys Jay Austin and Kathryn Mengerink outlined the workshop goals and approach.

The first workshop session, “Ethics of Communicating Scientific Uncertainty,” was moderated by former ELI President and Visiting Scholar Leslie Carothers (Carothers PowerPoint presentation is available [here](#)) and featured presentations and remarks by Jay Odenbaugh of Lewis & Clark College (Odenbaugh PowerPoint presentation is available [here](#)), Tom Lininger of the University of Oregon Law School, and Bud Ward of *Yale Climate Connections* (Ward PowerPoint presentation is available [here](#)).

Judge Merideth Wright of the Vermont Environmental Court (ret.) introduced and moderated the second workshop session, “Topics in Communicating Scientific Uncertainty.” Richard Somerville of Scripps Institution of Oceanography at UCSD delivered a presentation on climate change (Somerville PowerPoint presentation is available [here](#)). Lisa Palmer of the National Socio-Environmental Synthesis Center (SESYNC) discussed climate and food security (Palmer PowerPoint presentation is available [here](#)). Finally, Greg Jaffe of Center for Science in the Public Interest gave a presentation on genetically modified organisms (Jaffe PowerPoint presentation is available [here](#)).

Ms. Mengerink of ELI then presented the results of the pre-workshop questionnaire and provided an opportunity for workshop participants to share additional insights (see detailed summary below). Following the questionnaire discussion, workshop participants divided into five self-selected breakout groups, two each on issues within journalism and science and one on the legal profession. The breakout groups discussed and reported back their answers to three questions: (1) What are the challenges with existing ethics and norms related to communicating scientific uncertainty? (2) What can be done to address these challenges? (3) What can this group do to address these challenges?

Ms. Mengerink opened the second day of the workshop by facilitating an extensive, in-depth plenary discussion—on a profession-by-profession basis—of key issues and challenges identified from day one, as well as ideas and approaches for potential work products. By consensus, the workshop remained in plenary session rather than returning to break-out groups. Next, Ms. Mengerink conducted a plenary wrap-up discussing potential future working group projects and next steps. The workshop concluded with closing remarks from Mr. Austin of ELI.

## HIGHLIGHTS OF QUESTIONNAIRE RESULTS AND MEETING DISCUSSIONS

### QUESTIONNAIRE RESULTS

This section provides a brief overview of the questionnaire results, by profession, as further informed by the workshop plenary discussion.

*Applicable professional norms and ethical standards.* Results from the **science** participants emphasized the absence of a written code specifically dealing with how to communicate uncertainty. Nevertheless, scientists are

constrained by the standards of statistics (e.g., with respect to statistical significance and confidence intervals). Transparency also is a factor, as scientists must be sensitive to conflicts of interest and concerned with the requirements of funders. Scientists usually resist making efforts to manage the messages that are derived from their research. Their aim is to provide all of the information needed to help others judge the value of their work, rather than to steer that judgment in a particular direction.

During discussion, participants noted that another factor is the necessity of being able to respond to challenge; scientists should be open to this and able to dialogue about it. Dissent is a critical aspect of science. Peer review, too, can be viewed as imposing professional norms. Certain scientific journals have codes. The caveat was made that not all scientists perform academic work: In meteorology, for example, there is both a public side and a private side. So if the client is public, the role of certainty in the communications may be different from a one-on-one context.

Results from the *journalism* participants similarly noted the absence of any general code while pointing out the existence of some news outlet-specific codes (e.g., NYT, NPR). For some journalists, “transparency is the new objectivity,” leading to increased disclosure of bias. Journalists are constrained by short attention spans when it comes to communicating nuanced information about scientific uncertainty. With the decline in beat reporting, another constraint is some general assignment journalists’ relative lack of expertise, which affects their ability to evaluate scientific information. Most agreed that given the opportunity, journalists should (and generally do) look to a preponderance of the evidence (rather than equally present sides), critically evaluate sources, and interpret information based on their own knowledge and research.

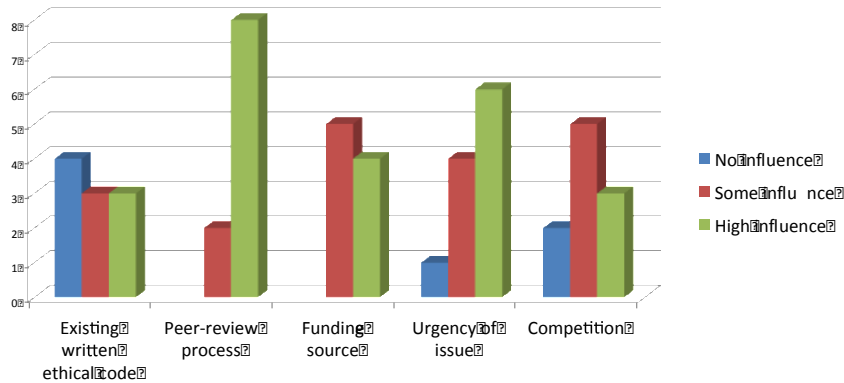
During plenary discussion, participants observed that transparency is not necessarily equal to objectivity; it may not be sufficient simply to disclose. Also, the unfortunate truth is that many journalists shy away from writing stories about uncertainty. With respect to the oft-discussed issue of false balance/equivalence, it was noted that when journalists don’t know enough (due to lack of expertise on a topic, or for new reporters, a lack of context in which to place the latest science, study, etc.), they fall back on balance. Professionally, this is the safest way to ensure ethical reporting, and even if the journalist does have the depth to evaluate sources’ claims, the editor may not, which in turn can create job risks for journalists. Additionally, balance can create a sense of controversy or drama, which may appeal more to readers. One journalist volunteered that he uses the phrase “scientific results with robust support,” rather than “settled science or consensus.” But another countered that using the phrase “settled science” forces the reader to confront facts, effectively giving the reader “no place to hide.”

Participants who responded to the survey from a *legal* perspective noted that practicing attorneys (e.g., those advising clients and representing them in litigation) are bound in their communications by detailed codes of ethics, while lawyers working outside of attorney-client relationships (e.g., law professors, policy attorneys, and analysts) have fewer ethical constraints. Lawyers typically must balance their duty of loyalty to the client with a duty of candor to the tribunal (“A lawyer shall not knowingly: ... offer evidence that the lawyer knows to be false.”), which sets a fairly low bar. For trial lawyers, questions of uncertainty are resolved subject to various standards of proof (e.g., preponderance of the evidence) depending on the proceeding.

During plenary discussion, participants re-emphasized that in thinking about legal ethics and professional norms, one must remember that many, if not most, lawyers are not working in the courtroom but in myriad other advisory, policy, and educational contexts. Lawyers are in an interesting position in that they can argue to their clients’ advantage that areas of both science and the law itself are uncertain or unsettled. Finally, a participant observed that while there seemed to be a sense in the room that “communicating scientific uncertainty is a good thing,” there are risks both to communicating it and to not communicating it.

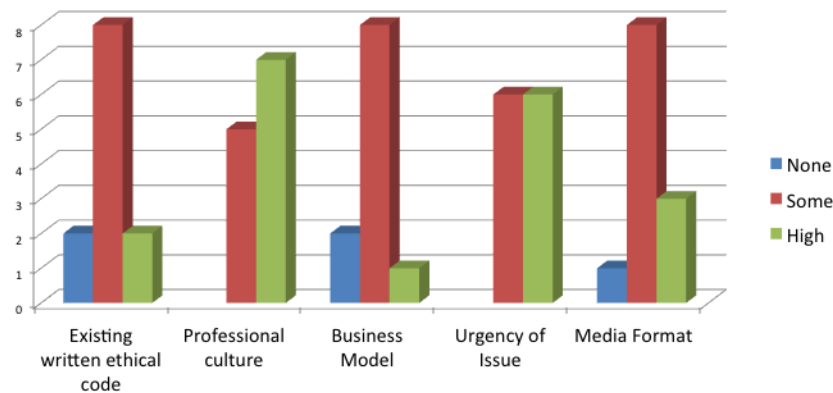
Factors influencing the communication of scientific uncertainty. Survey respondents from each profession identified and elaborated on the factors that influence their ability to communicate scientific uncertainty:

FOR SCIENTISTS



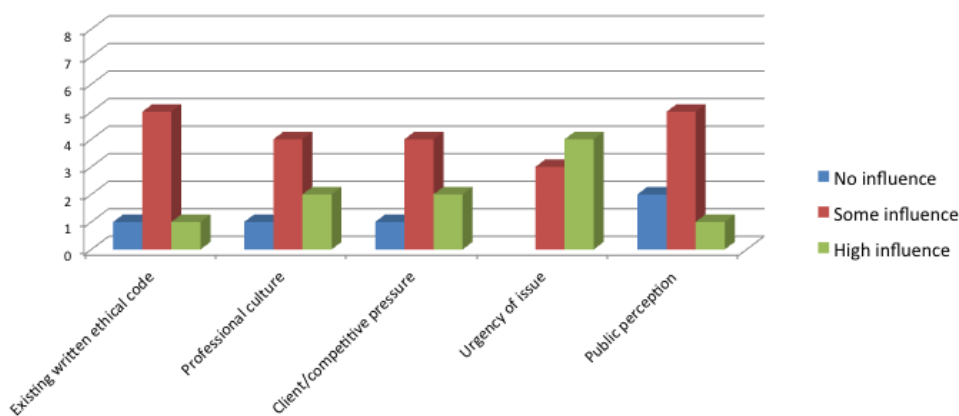
Element	Comments
Existing written code	<ul style="list-style-type: none"> <li>• Could be helpful</li> <li>• IPCC example of code carefully followed</li> </ul>
Peer review process	<ul style="list-style-type: none"> <li>• Strong driver for communicating uncertainty</li> <li>• Concern that high profile paper goal may be chosen over rigorously analytical paper goal</li> </ul>
Funding source	<ul style="list-style-type: none"> <li>• Expectation of funder could influence willingness to communicate uncertainty (especially as funding sources diversify)</li> </ul>
Urgency of issue	<ul style="list-style-type: none"> <li>• Can affect when information is shared (e.g., when less certainty)</li> <li>• Could cut corners in effort to publish</li> <li>• Potential for greater subjectivity</li> </ul>
Competition	<ul style="list-style-type: none"> <li>• Pressure to publish first could be negative</li> </ul>
Other	<ul style="list-style-type: none"> <li>• Audience matters</li> <li>• Lack of scientific training in subject (from statistics to communication)</li> <li>• Factors vary according to scientific discipline</li> <li>• Too much discussion of uncertainty can obscure value of what is known</li> </ul>

FOR JOURNALISTS AND COMMUNICATION SPECIALISTS



Element	Comments
Existing written code	<ul style="list-style-type: none"> <li>No general code to address scientific uncertainty communication</li> <li>Strong shared code with most mainstream outlets</li> </ul>
Professional culture	<ul style="list-style-type: none"> <li>Code and standards less rigid due to changing landscape of media</li> <li>Personal and cultural practices that enforce norms</li> </ul>
Business Model	<ul style="list-style-type: none"> <li>Unethical to make a decision based on newspaper's potential to make/lose money</li> </ul>
Urgency of issue	<ul style="list-style-type: none"> <li>Can affect due diligence; fall back on he-said/she-said</li> <li>News focus on today so future predictions garner less attention</li> </ul>
Media Format	<ul style="list-style-type: none"> <li>Format changes how uncertainty is communicated; e.g., broadcasters' stories measured in seconds</li> <li>Short pieces = less room for discussion (longer pieces challenged by readers' attention spans)</li> </ul>
Other	<ul style="list-style-type: none"> <li>Issue can be raised within discipline through conferences, websites, newsletters//peers can influence what is reported</li> <li>Education of journalists in science and statistics needed</li> <li>Uncertainty seen as negative and can move story from A1 to B37</li> </ul>

FOR LAWYERS



Element	Comments
Existing written code	<ul style="list-style-type: none"> <li>Low bar</li> </ul>
Professional culture	<ul style="list-style-type: none"> <li>Judicial culture may keep judges from learning about scientific principles</li> <li>Lawyers are word people</li> </ul>
Client /competitive pressure	<ul style="list-style-type: none"> <li>Clients exert significant influence over lawyers</li> <li>Can lead to exaggerating or discounting evidence of harm or cost</li> </ul>
Urgency of issue	<ul style="list-style-type: none"> <li>Responsive to concerns of stakeholders (policy realm)</li> <li>Moves communication to top of strategy</li> <li>Precautionary principle, intergenerational equity</li> </ul>
Public Perception	<ul style="list-style-type: none"> <li>Depends on issue or case</li> </ul>
Other	<ul style="list-style-type: none"> <li>Lack of training in scientific uncertainty</li> <li>Nuance and qualified statements do not translate well</li> <li>Varies based on role of lawyer and audience</li> </ul>

*Biggest challenges in communicating about scientific uncertainty.* Survey responses painted a picture of the major challenges for each profession. For *scientists*, these include a lack of trust of journalists; a lack of support within

the university/tenure culture for time spent speaking to journalists; and a lack of training on how to effectively communicate with mass audiences.

Major challenges experienced by *journalists* include space and time limitations that make it difficult or impossible to fully describe concepts that are already not intuitive to many news consumers; limitations of language, as it is difficult to clearly articulate the value of uncertainty for the research process in a way that is easily understood; inability of the journalist to discern the validity of a scientist’s argument; and the reality that headlines are not effective in communicating nuance—to the contrary, headlines tend to convey a sense of certainty.

The biggest challenges faced by *lawyers* are a lack of scientific training; the fact that many lawyers work in an adversarial context, where uncertainty can ethically provide an opportunity for tactical advantage; the legal profession’s tendency toward bright-line answers and all-or-nothing results; and the need to protect society (or at least clients) in the face of the uncertainty inherent in scientific research.

Several broader takeaways emerged from the questionnaire with respect to challenges. One is that it is important not to conflate uncertainty with the unknown, with risk, or with ignorance. These are very different concepts. Another point is that scientists and lawyers live in a world of nuance and caveats, whereas journalism demands clarity and brevity for the sake of effective communication. Also, there must be a recognition of the general lack of scientific knowledge among the public.

### SMALL-GROUP BREAKOUT DISCUSSIONS

On the first day of the workshop, participants divided into five breakout groups with a charge of discussing the challenges for effectively communicating scientific uncertainty in light of existing ethical standards and professional norms; the broad needs for dealing with this; and what, practically, can be done. The following key points and observations emerged.

#### SCIENTISTS

Breakout Topic	Ideas
Challenges	<ul style="list-style-type: none"> <li>To build trust and maintain scientific credibility</li> <li>To convey accurate information</li> <li>It feels like the right thing to do/social norms/affect</li> <li>To allow us to narrow down a research agenda and craft good policy options</li> <li>To convey when outcomes are actionable</li> <li>To help students analyze science and information, and to ask good questions</li> <li>Help public understand, maximize understanding with all audiences, make wise choices</li> </ul>
Needs	<ul style="list-style-type: none"> <li>More clarity on what is known versus unknown</li> <li>Existing process of learning and training</li> <li>The norms for when/how to include uncertainty varies by context &amp; organization</li> <li>Nature of impact; explain uncertainty in light of context; consider circumstances (e.g., emergency v. non-emergency)</li> <li>Navigate roles as scientist, science advocate, activist; maintain credibility while communicating; maintain objectivity and be part of the solution</li> <li>Scientists need to know what the policymakers need to help them make policy; scientists need to be answering the right questions</li> <li>Always communicate that SCIENCE IS A PROCESS: public does not realize that each experiment tells you one thing you know, but you learn ten things you don't know</li> </ul>
What we can do	<ul style="list-style-type: none"> <li>Interdisciplinary discussion: key on overlap between professions</li> <li>Curriculum development for undergrad/grad students</li> <li>Short course development that could be applied to any professional society</li> <li>Panel discussions at each of our respective professional society meetings</li> <li>Create guiding principles to share with professional societies</li> <li>Co-produce knowledge through boundary organizations</li> <li>Create a special issue journal, maybe in Risk Analysis, on the subject</li> </ul>

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**JOURNALISTS AND COMMUNICATION SPECIALISTS**

Breakout Topic	Ideas
Challenges	<ul style="list-style-type: none"> <li>• Lack of time &amp; experience</li> <li>• Misleading headlines</li> <li>• Pressure to generate clickbait</li> <li>• False balance problem</li> <li>• Need to maintain relationship with sources</li> </ul>
Needs	<ul style="list-style-type: none"> <li>• Robust accuracy checks</li> <li>• Propose, collaborate, correct</li> <li>• Targeted education</li> <li>• Respectful, avoid labels, stand by facts, well researched</li> </ul>
What we can do	<ul style="list-style-type: none"> <li>• Be willing to suggest headlines, brainstorm w/ colleagues, and change bad online headlines after the fact</li> <li>• Venues for collaborative education (e.g., Society of Environmental Journalists, the Metcalf Institute, and the Knight Center for Environmental Journalism)</li> <li>• Story or stories in SEJ Journal</li> <li>• Panel at a SEJ meeting</li> <li>• Training or support for training lawyers and scientists on how to communicate uncertainty, either to journalists or directly to the public</li> <li>• Developing a checklist of basic questions for journalists to ask (How do you know what you know? Could you point me to a respected colleague whose views differ from yours? What is your confidence level? What areas of research remain? Why does your research matter?)</li> <li>• Engage scientists for support</li> </ul>

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**LAWYERS**

Breakout Topic	Ideas
Challenges	<ul style="list-style-type: none"> <li>• Client-centered paradigms</li> <li>• It's VERY easy to make colorable claims</li> <li>• We do a LOT outside of courtroom settings</li> <li>• Even if there is scientific certainty there can be legal uncertainty</li> <li>• Lawyers lack training in scientific uncertainty</li> <li>• Standards are deferential to gov't agencies</li> <li>• Scientific uncertainty is the lawyer's friend!</li> <li>• In reality, lawyers limited only by "red-faced" test: if there is some plausible argument, that is all you need</li> <li>• Judges can't explore this in connection with pending cases</li> </ul>
Needs	<ul style="list-style-type: none"> <li>• Improved scientific literacy for lawyers</li> <li>• Important to address lawyer's responsibility to talk to client about uncertainty outside of the courtroom; you can counsel clients away from implausible positions</li> </ul>
What we can do	<ul style="list-style-type: none"> <li>• Support judges <ul style="list-style-type: none"> <li>• be helpful to judges; proactive in judicial training</li> <li>• model judicial methodologies? booklets?</li> <li>• survey judges? perhaps via state judicial institutes?</li> </ul> </li> <li>• Need for sci. literacy in law schools <ul style="list-style-type: none"> <li>• model syllabus?</li> <li>• transcendent org. principle? get it into torts, etc.</li> <li>• can law schools improve on this?</li> <li>• sci. is a much bigger aspect of legal practice than it ever was before</li> </ul> </li> </ul>



## FINAL PLENARY DISCUSSION: THE SEARCH FOR SOLUTIONS

The second day of the workshop was dedicated to a facilitated, in-depth discussion of how this group of professionals might advance the issues identified and discussed on the first day with respect to effectively and ethically communicating scientific uncertainty. The group agreed that progress can and should be made incrementally, with key people taking positive steps and others catching on. This may be a more feasible and realistic approach than pursuing a global solution.

Various potential work products, approaches, and other ideas for necessary next steps emerged from this plenary, as summarized below and further refined by post-workshop discussions:

### FOR ANY OF THE THREE PROFESSIONS, INDIVIDUALLY OR JOINTLY, INCLUDING MULTIDISCIPLINARY EFFORTS

- Create an **online repository/clearinghouse** of articles, webinars, and other materials (such as examples of where scientific uncertainty has been successfully communicated to positive effect).
- Develop new **resources and materials that explain scientific uncertainty**, or ensure more effective dissemination of existing resources (including materials previously produced by the Metcalf Institute, ELI, and others).
- Have workshop participants **propose and participate in panel discussions at national meetings of professional societies** and other relevant organizations and associations. E.g., the Society of Environmental Journalists, the American Meteorological Society, the American Geophysical Union, the National Association of Science Writers, the American Bar Association, and the Environmental Grantmakers Association.
- Produce **interdisciplinary webinars** on the subject.
- Conduct informal **brown-bag lunches** for professionals.
- Jointly author a **1,000-word piece to appear in a publication such as *Science* or *Nature*** to frame a synthesis of challenges and solutions, which would help serve as a public conversation starter.
- Jointly author **peer-reviewed articles** in a professional journal or special issue of a journal.
- Jointly author an **interdisciplinary white paper containing case studies on several high-profile topics** (such as climate, GMOs, and nuclear power) and discussing the communication of scientific uncertainty across these disciplines.
- Develop **course curricula, syllabi**, or other materials for college and graduate/law school courses.
- Develop **professional training programs for practitioners**.
- Promote **reform of each profession's ethical code(s)** with respect to communicating scientific uncertainty.
- Develop **recommendations to professional societies and academic institutions to encourage adoption of ethical standards** for communicating scientific uncertainty
- Develop **informational statements for professional societies** on communicating scientific uncertainty.
- Deliver a **mock legislative hearing** so that scientists and journalists can better understand how scientific uncertainty plays out in the policymaking context.
- Jointly or individually submit **op-eds addressing the topic of suppression of the communication of the results of publicly funded science**.
- Develop and promote **interdisciplinary fellowship/mentoring programs**, such as a program that allows scientists to work with journalists to better understand how science is communicated.
- For future workshops such as this one, consider **expanding the participant pool** by inviting (1) decision-makers who rely on the communication of scientific uncertainty in their work, and (2) professionals with other relevant expertise, such as economists and insurance experts.

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**FOR SCIENTISTS**

- Develop **targeted policy recommendations to NSF** to more effectively address the communication of scientific uncertainty (and science communication generally) through mechanisms such as (1) the “broader impacts” criterion of RFPs, and (2) inclusion within the training requirements for the ethical conduct of science an element on the ethical communication of science.
- **Research key journals** in certain topical areas (such as climate) to collect any existing **guidelines they may have on characterizing scientific uncertainty**.
- Recognize and act on **the need to communicate about and be accountable for science that is publicly funded**.

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**FOR JOURNALISTS AND COMMUNICATION SPECIALISTS**

- **Enlist SEJ-affiliated staff in universities as ambassadors** around the country.
- **Write about the institutional barriers** (e.g., imposed by universities and government) faced by publicly funded scientists who are working and publishing on subjects that generate public controversy.

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**FOR LAWYERS**

- Develop **booklets, pamphlets, or other concise educational materials to support judges and lawyers** in understanding and communicating scientific uncertainty.
- Seek ways to **improve lawyers’ science literacy**, including through continuing legal education and the training of law students.
- Promote **reform of model ethical rules**, including to better address science.
- Research **existing lawyer ethical rules and required oaths of bar admission** for relevant provisions on communication of scientific uncertainty.
- Research the **legal resource materials on science communication and scientific uncertainty that are already available** to the bench and bar.

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**POST-WORKSHOP PARTICIPANT SURVEY AND NEXT STEPS**

Following the workshop, ELI surveyed participants on their interest in and availability to work on the project ideas that emerged from the workshop, and also inquired about their willingness to participate in a follow-up workshop. ELI is presently using these responses to (1) identify, prioritize, and shepherd practical next steps for the improved communication of scientific uncertainty consistent with professional norms and ethical standards; and (2) begin planning for the next workshop under this NSF grant, tentatively scheduled for late 2016 or early 2017.