PREFACE

Two years ago, the MIT Knight Science Journalism Program and The Kavli Foundation teamed up on a symposium called “Are We All Science Journalists Now?” The goal of the symposium: explore how, in an era of evolving media platforms, scientists and engineers are bypassing traditional media outlets to communicate directly with the public, thus becoming unfiltered sources of news and perspective.

Our 2018 symposium, “Sharing the Values of Journalism with Science Communicators,” was an opportunity to more deeply explore this topic. In particular, this symposium focused on how the values of journalism—values that build trust between the media and the public—can be more fully shared with the growing body of scientist-communicators who are reaching their audiences directly, often through blogs and social media.

This time hosted by the Kavli Neuroscience Discovery Institute at Johns Hopkins University, twenty-four editors, journalists, researchers, communication experts and scientist-communicators joined the symposium, taking part in plenary discussions and breakout sessions. This included senior editors at media outlets who work routinely with scientist-communicators, as well as leading researchers and science bloggers. Together, they focused on this singular, and often overlooked, topic: how scientists can employ these journalistic values to more successfully directly communicate with, and engage, the public.

This report shares the substance of this symposium, with the goal of further catalyzing thought and advancing the conversation.

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INTRODUCTION

Rationale for the symposium

The public is increasingly getting its science news and perspective directly from the source: scientists and engineers. This Kavli Symposium explored the benefits—and challenges—of scientists and engineers bypassing traditional media outlets to tell their stories, thus becoming unfiltered sources of news and perspective. In particular, it focused on how the values of journalism could be deliberately shared with scientists to foster more effective science communication.

The four goals:

1) discussing the reach and impact of this direct communication;
2) exploring the changing role and relationship between scientists and media;
3) discerning how journalistic values can foster more effective communicators; and
4) bringing together publications that use the writing of scientists as both a means to support scientists’ communication efforts and effectively integrate journalistic values in their communication.

The underlying question: Can the values of traditional media be shared, fostered, accepted, distributed and perhaps even demanded by those who are building audiences and influencing the public?

What was discussed?

The organizing committee identified four topics of discussion: Trends/Impact; Practice and Ethics; Training; and Science “Blogging” Today.

How were the themes discussed?

The symposium agenda was divided into five sessions, each organized around the topics detailed above and consisting of a short presentation followed by a group discussion moderated by a session leader. On the second day, attendees split into three groups for breakout discussions and met again as a large group to summarize final thoughts and recommendations, with a particular focus on pragmatic steps that might address the issues raised during the symposia.

During the breakout discussions, participants were asked to consider:

- What are some ideas—big, medium, small—that we might be part of driving or partner on?
- Who else should we engaged and how?
- Thoughts on possible next steps—and other potential topics this particular group might want to visit together?
DAY ONE

TOPIC I: TRENDS/IMPACT

Moderator: Kevin Finneran, Editor-in-Chief of Issues in Science at Technology.

Presenters: Dominique Brossard, Professor and Department Chair, Department of Life Sciences Communication at the University of Wisconsin-Madison; and Dietram Scheufele, John E. Ross Professor and Vilas Distinguished Achievement Professor, Department of Life Sciences Communication at the University of Wisconsin-Madison.

The presentations are summarized below, followed by a synopsis of the group discussion that followed. (Questions asked after individual presentations have been incorporated into the individual summaries.) Additional presentation slides can be found in Appendix C.

The goal of this session was to examine the broad context of public opinion about science to help us understand the communications landscape in which scientists have to operate, and to explore how the relationship and communication between scientists and the public are changing in response to the rise of digital and social media.

Dietram Scheufele, University of Wisconsin-Madison

The session opened with a joint presentation titled “The Promise and Pitfalls of Communicating Directly with Public Audiences.”

Scheufele began by reviewing public opinion surveys focused on how the public perceives scientists and how that has changed over time. He delivered good news: Trust in scientists has been stable and remains exceptionally high, far surpassing the public’s trust in major corporations, the press and Congress. Those data, he said, contradict an idea that is gaining ground (known as the “trust-deficit model) that the scientific community needs to rebuild the public’s trust.

Next, he asked, what are we trying to do when we communicate science to the public? Scientists are often focused on informing the public (who are presumably uninformed), a model of science communication known as the knowledge-deficit model. He asked the participants to think instead about a new model in which scientists are participants in a broader culture of “civic science.” In this framework, scientists are one of many voices,
communicating science with the goal of providing the best available evidence to the public for interpretation. The public then uses this evidence, alongside input from other stakeholders, to make decisions on the questions modern science poses to society, such as, should we edit the human genome, how much money should we invest in basic research, and how should we regulate new technologies?

The “civic science” model acknowledges that for most of these questions, the answers are not informed by science alone; there are ethical, political and other trade-offs that must be considered. Scheufele underscored that scientist-communicators often struggle to distinguish between the role of providing the best available evidence and making policy decisions based on that evidence. For example, a scientist can tell you the likelihood that an epidemic will spread in a certain population based on vaccination rates. Based on those data, a scientist cannot tell you whether governments should mandate vaccines. That decision is a societal rather than a scientific one, he said.

Finally, Scheufele summarized three persistent challenges facing scientist-communicators, emphasizing that striking the proper balance in science communication, particularly on topics in which there is intense political, cultural or ethical disagreement, is not easy.

First is the assumption that being an expert is sufficient to win over the trust of an audience. Data show that other factors, such as warmth, play into how an expert is perceived: People tend to trust non-experts who communicate warmly more than experts who they perceive as cold.

Second, the values gap between different groups of Americans is widening. The ideology of scientists and their supporters aligns with liberal and Democratic values. At the other end of the spectrum are Tea Party members and conservative media. The views of the general public fall somewhere in between but are more closely aligned with the latter. Indeed, on issues such as nuclear energy, nanotechnology and synthetic biology, the views of scientists and the public appear far apart, if not conflicting.

The third challenge, he argued, is that most scientist-communicators are failing to reach the broadest possible audience, including people who are not already interested in science and who do not reside in large, coastal American cities. He held up “Cosmos 2.0” as an example of a television series that, despite its big budget, high-profile star and polished production, failed to draw an audience much beyond viewers who were already interested in science. Scheufele said this failure is common to most science communication and may eventually lead to problems of trust between scientists and the public.
Brossard began by discussing a major scientific controversy and her research into how it was shaped by scientists online (via blogs and Twitter). The controversy centered on a study published in the journal *Science* in 2010, led by a scientist at NASA, which claimed that bacteria were able to substitute arsenic for phosphorus in their DNA and other cellular components. Known as the “arsenic life” case, it made headlines globally because the findings challenged a fundamental tenet of biology and had major implications for the search for extraterrestrial life. Eventually, a scientist refuted the paper’s claims on Twitter and criticism snowballed, completely shifting the conversation about the research from a non-skeptical tone to a skeptical one. *Science* retracted the paper a year and a half after it was initially published. The case demonstrates that online scientist-communicators can lead critical—even corrective—discourse about research.

Following the case study, Brossard gave an overview of research conducted at UW-Madison showing that outreach, through social media and other forms of online communication, is beneficial to scientific researchers. Specifically, there’s a relationship between academic impact (measured by H-index) and outreach. Papers that reached broad audiences, including reporters and non-scientists, had a higher impact than those that did not. Papers mentioned on Twitter were also cited more than those that were not, suggesting social media can amplify impact.

Lastly, she presented research, also from UW-Madison, on scientists’ perceptions of social media and how those perceptions differ between graduate students and faculty. In general, the data showed that scientists recognize the value of social media and online communication. For example, faculty agreed with the statement that social media can increase a person’s academic impact; graduate students were more convinced than faculty that social media can impact their professional reputation, and less convinced than faculty that scientists should discuss controversial topics on social
media. The two groups agreed that scientists should not share scientific findings online prior to peer review. The data also suggest a cohort shift, with graduate students less likely to view social media as too time-consuming.

Group Discussion

The group discussion began on the topic of the self-correcting nature of scientific research and, in the case of arsenic life, whether online communication by scientists had truly accelerated that process. Scheufele said that whereas the best science will usually rise to the top, it’s important to consider the negative impact bad science could have on public perception. The arsenic life study was eventually retracted, but public perception that scientists discovered a new form of bacterial life likely persists because the study was so widely covered in the media. This raises the question: can scientists online help correct these false perceptions by spotting shoddy science and calling it out?

Relatedly, asked one participant, does the arsenic life case undermine public confidence in science and, in particular, in the peer-review process? In response, Brossard pointed to research showing that people believe in the science that supports their beliefs, even if that science is weak or discredited, and provided an example about the safety of genetically engineered crops.

Scheufele said there is an even deeper problem influencing public perception of science, which has been covered by journalist Christie Aschwanden for FiveThirtyEight (See: “There’s No Such Thing As ‘Sound’ Science”). Some politicians and government officials are trying to set standards of “sound” science that are unattainable because they fail to acknowledge that science is an ongoing process and that the best available evidence will change. Such standards have a pernicious effect, he said, because they create a situation in which policy makers don’t have to follow the science.

Next, discussion turned to the widening values gap between urban and rural communities in the United States and how to close it. Some participants pointed out that this problem is amplified by the crisis of journalism in rural areas, where small and mid-sized newspapers have closed down or scaled back to the point that they no longer cover science. Another person suggested that defunding agricultural extension programs at land-grant universities has also contributed to the problem. Brossard said science advocacy organizations such as the American Association for the Advancement of Science (AAAS) are trying to come up with ways to address it. For example, EurekAlert, the science news service of the AAAS, held a workshop aimed at helping public information officers from universities based in rural areas increase trust in science.
The group discussion closed with a reminder that digital literacy is as much of a problem among scientists as it is with the rest of the populations. Scientists tend to follow other scientists on Twitter and may lose sight of the fact that it is a public platform and that their tweets can have consequences outside the lab. For example, in 2013, some scientists began using the hashtag #overlyhonestmethods to share the less-than-perfect side of doing science. It went viral. Some people celebrated the hashtag because it had managed to demystify and humanize science in a way that other forms of science communication had not. But others worried it portrayed scientists as bunglers and had the potential to undermine the public’s confidence in science.

Summary of Key Points/Recommendations

- **Public trust in scientists is high and has remained stable over time.**
- **Two models still dominate science communication: the knowledge-deficit model and the dialogue and engagement model.**
- **A third model of science communications is emerging: the culture of “civic science.”**
- **Three major challenges for science communicators: expertise isn’t everything; the values gap between scientist and their audiences is widening; and reaching beyond traditional audiences is hard.**
- **The arsenic life case was a failure of science and of science journalism, but it illustrated that scientists online can play a positive role in correcting bad science.**
- **Online communication is here to stay: Outreach pays off and scientists are increasingly recognizing that.**

**TOPIC II: PRACTICE & ETHICS**


**Presenter:** Itai Maytal, Senior Legal Counsel, Springer Nature.

**MORNING SESSION:**

The goal of this session was to use case studies to examine and then collectively discuss risks that may arise when scientists take on the role of “journalists” and serve as unfiltered sources of news and perspective. The session also discussed journalistic practices that can mitigate those risks. The presentation was for educational purposes only, and not to be considered legal advice. Presentation slides can be found in Appendix C.
Following Session I, which focused on understanding the new landscape of science communication, DiChristina and Maytal began with a stage-setting presentation on historic U.S. Court opinions and the role judges play in settling scientific disputes, and an overview of where the First Amendment is today.

**Science in the Courts:** Maytal offered good news: The courts are reluctant to resolve academic, scientific or scholarly debate. In fact, for the vast majority of lawsuits against scientists or scientific publications, of which only 22 have gone to trial since 1978, the courts have ruled in favor of the defendants. Excerpts from these rulings illuminate the courts’ position: “[J]udges are not well equipped to resolve academic controversies...Scholars have their own remedies for unfair criticisms of their work— the publication of a rebuttal.” And “…courts are ill-equipped to undertake to referee such controversies. Instead, the trial of ideas plays out in the pages of peer reviewed journals, and the scientific public sits as the jury.” However, Maytal cautioned that it is impossible to know how many scientists have been threatened with lawsuits and how many lawsuits against scientists have ended in settlements or arbitration.

He closed this section of his presentation by referencing a 2017 editorial, “Take Science Off the Stand,” which concludes: “The future is unclear, and perhaps even more litigious. As this issue of Nature Medicine went to press, many advocates of free speech remained concerned about campaign promises made by U.S. President Donald Trump, who spoke during his 2016 candidacy about changing libel laws to make it easier to sue. It's unclear what precise changes he has in mind, and whether they would have implications for scientific free speech. But what remains certain is that when scientists withhold well-researched findings out of fear of retribution and costly lawsuits, everyone loses. That is a future no one should want.”

**First Amendment:** Next, the presenters examined the First Amendment and the most prominent exception to its guarantee of free speech: defamation. (Defamation is defined as “a statement of fact that’s published, that’s false, that diminishes someone’s stature in their community and is not privileged.”) Defamation suits have traditionally targeted large organizations, such media outlets, with the assets or insurance policies to ensure they can pay damages. However, in today’s changing media landscape, individual scientists could also become targets of libel suits if, for example, they publish something on their blog that could be false or cause harm to someone’s reputation. In situations in which individuals do not have the resources to pay damages, alternatives to defamatory libel suits are becoming more common and also harming free speech. Those include criminal libel prosecution, the use of injunctions, and public-private enforcement, wherein individuals turn to a company like Google, instead of the court, to get potentially libelous content de-indexed. Despite these recent developments, Maytal said scientists still have many freedom of speech protections, including truth and opinion (discussed in the section on Practice & Ethics 2).

Lastly, the presenters discussed how to negotiate the risks of publishing in international (non-U.S.) jurisdictions governed by different libel laws. Typically, Maytal said, U.S.-based editors and lawyers review articles from a U.S. perspective, ensuring the stories conform to an acceptable level of risk under U.S. libel law. But that isn’t always enough. A case study from Belarus served as a reminder that many other jurisdictions do not offer the same protections to journalists and publishers as does the U.S. “The First Amendment is not like a passport,” said Maytal. “You can’t just take it with you.”
Conflicts of Interest: At this point, the focus of the Practice and Ethics session shifted to conflicts of interest. In recent years, several high-profile cases have illustrated the risks associated with failing to disclose conflicts of interest to the public. DiChristina and Maytal presented several of those cases and used them as a starting point to talk about how those conflicts could have been avoided.

The first case focused on Kevin Folta, an American plant scientist and advocate for genetically modified organisms who hosted a podcast aimed at “sorting through the shills and charlatans to distill the scientific truth.” On his show, Folta adopted an alter ego who interviewed guests. In one episode, he interviewed himself as Kevin Folta and discussed the science of GMOs and the false perception of ties between agricultural scientists and industry. He never disclosed his financial and intellectual ties to Monsanto, however those conflicts of interest were eventually revealed. Folta responded by saying he had followed the protocols of his university.

The second case focused on STAT News, a publication that covers health, pharmaceutical and biotech news. STAT has come under fire for publishing opinion pieces written by physicians with undisclosed industry ties, including one article penned by a public relations firm instead of by the physician who was listed as the author. The physician in question had received more than $300,000 from the drug industry over a four-year period and yet failed to disclose these financial ties. STAT retracted the article.

The final three legal cases hinged on the courts distinguishing between commercial and non-commercial speech, probing territory that was unfamiliar to most of the participants but relevant to scientists who consult for businesses and then may communicate on directly related topics. For example, in World Kitchen vs The American Ceramics Society (ACS), Richard C. Bradt, Richard L. Martens, Peter Wray, the manufacturer of Pyrex sued ACS for a journal article it had published by two materials scientists. The article provided a scientific explanation of why some glass cookware abruptly shatters when heated. This case again raised questions about whether the courts should be deciding matters of scientific inquiry as well as the limits of free speech.

Group Discussion

A discussion ensued about commercial versus non-commercial speech and the line between them. One participant pointed out that the difference is critical, particularly when scientists describe new research as “noteworthy” and “novel”—two criteria used to evaluate patent applications. When does writing about a technique or tool, such as the CRISPR gene-editing technology, as “novel” and “noteworthy” cross from being non-commercial to commercial speech with patent implications? This question recently arose in the scientific community in response to an article written about CRISPR by scientist Eric Lander, founding director of the Broad Institute at MIT, while the Institute was entangled in a patent dispute about CRISPR. (The article, “The Heroes of CRISPR,” appeared in the “Perspectives” section of the journal Cell in January 2016.) In such a case, the question for the courts becomes, what is the primary motivation of the speech, e.g., advancing scientific and general knowledge or winning a patent? Another participant commented that this example also shines the spotlight on the role of academic journals. What are the necessary conflict of interest disclosures, as well as the ethical issues associated with publishing articles like this? This is a common issue for editors at both scholarly journals and media outlets that publish commentaries by scientists who conduct publicly funded, university-based research and have spin-off companies to commercialize that research.
Folta’s case—and in particular his defense that he had disclosed his conflicts of interest to his university—sparked a lively debate about the role of universities in enforcing ethical standards. Should the onus be on universities to decide, for example, which of a handful of funding sources for a given research program pose a conflict of interest and should be disclosed by a researcher in his or her public communications? Some participants felt that universities have a clear responsibility to establish and enforce such standards. Others strongly disagreed and felt that that smacked of government-regulated speech.

Discussing the STAT News case, participants pointed out that STAT has introduced an author agreement for contributors to its opinion section to try to ensure that all conflicts of interest are disclosed. However, Maytal reminded the group that there is a limit to what a publication can do to ensure full transparency and compliance with conflict of interest policies. DiChristina raised the questions of where an author’s affiliations and disclosures should appear, and how editors and publications can “educate” their contributors about conflicts of interest. One editor said his publication has a disclosure form built into its content management system and an article cannot be published if the form hasn’t been completed by the author. At that publication, disclosures appear under the authors’ bylines, along their articles. The editor encourages his writers to disclose more rather than less because disclosure can also strengthen a piece by establishing an author as a credible expert. Another participant added that the perception of conflicts of interest can be just as damaging as real ones because, over time, they may undermine a scientist’s credibility.

The STAT News example also sparked a debate about authorship and what level of editing and writing support is acceptable without disclosure or credit. University communication offices often employ writers to assist faculty members with commentaries; and editors commonly make substantive changes to articles prior to publication. Should this support be disclosed? And is there a distinction to be made based on the intent of the editing support, for example, whether it is objective or not? Some participants advocated for co-bylines. Others felt that co-bylines dilute the responsibility of the author. Legally, the person whose name is on an article is responsible for the content, regardless of who else contributed.

Finally, some of the bloggers said that the threat of litigation is a very real deterrent for scientists and physicians, especially on social media. One pointed out that in addition to defamation suits, SLAPP ("strategic lawsuit against public participation") suits are another threat to free speech and that their use is on the rise in the U.S. SLAPP suits are designed to silence debate on matters of public interest through intimidation, and commonly target environmental organizations. Anti-SLAPP protections exist but vary greatly from state to state in terms of their effectiveness. SLAPP suits are also a nuisance and expensive to defend against.

**Summary of Key Points/Recommendations**

- U.S. courts are reluctant to settle matters of scientific inquiry.
- Proposed changes to U.S. libel laws, however unlikely, could make the future more litigious for scientists.
- Only 22 defamation suits against scientists or scientific publications have gone to trial since 1978; only four of them were decided in favor of the plaintiffs.
- Publishers have won the vast majority of libel suits in pre-trial motion practice or on appeal in the U.S., but legal cases are in any event costly and time-consuming.
- Libel law differs from country to country. Scientist-communicators should familiarize themselves with the differences.
- The line between what constitutes commercial and non-commercial speech is blurry and hinges on intent, among other factors.
- Failure to disclose conflicts of interest can have serious consequences for scientists, publishers and universities, but who should enforce disclosure?
- There is a limit to what publications can do to ensure authors comply with their conflict of interest policies.

AFTERNOON SESSION

The goal of this session was to use cases that illuminate the legal boundaries of opinion versus fact, the limits of contracts of silence and the perils of violating confidentiality, and copyright. Those themes arose from a survey of participants about their chief interests and concerns, conducted in preparation for the symposium. The presentation was for educational purposes only, and not to be considered legal advice. Presentation slides can be found in Appendix C.

Presentation and Group Discussion

Following a working lunch (see next topic), Mariette DiChristina and Itai Maytal led the participants in a second Practice and Ethics session, this one focused on the boundaries of opinion, confidential information, copyright and fair use.

Boundaries of Opinion: The difference between fact and opinion comes up frequently when scientists communicate directly or indirectly with the general public. As a member of the symposium’s advisory group wrote, in response to our survey: “We ask all our authors, whether they’re Ph.D. students or emeritus distinguished professors, to not just state what they understand to be true, but to explain why they do, including links to evidence.”

Maytal opened with a presentation on opinion, a protected form of speech in U.S. defamation law, by saying it also one of the most heavily litigated. He introduced the participants to a landmark legal case, ImmunoAG vs. Moor-Jankowski (1995), which was featured in a Pulitzer Prize-winning newspaper series and subsequent book, The Monkey Wars, by Deborah Blum. The defendant was a primatologist and scholarly journal editor, Jan Moor-Jankowski, who published a letter to the editor that was highly critical of a drug company’s plan to capture chimpanzees for medical research. The company sued Moor-Jankowski, among others, for libel. After seven years of litigation and $2 million in legal fees, generating 4,000 pages of court records, the court found in favor of Moor-Jankowski on the grounds that the letter expressed an opinion.
This case raised the questions: How do the courts distinguish between opinion and fact, and what lessons can science communicators take from that? Courts consider whether a reasonable reader or listener could understand the statement as asserting a verifiable fact, as well as the context of the statement. (A verifiable fact is one that can be proven true or false.) Maytal summarized two major lessons: First, saying “I believe,” or “I think,” or “In my view,” isn’t sufficient to guarantee a judgment of opinion. Second, labeling a statement as opinion, such as in a letter to the editor or in the comments of a blog, doesn’t make it so.

Confidential Information: Next, DiChristina and Maytal explored contracts of silence, such as employment agreements, non-disclosure agreements, settlement agreements and trade secrets, and what they mean for science communicators.

The courts have established that it’s possible to communicate information subject to confidentiality when it is deemed to be a matter of public interest. The presenters used another famous case to illustrate this point: Brown & Williamson vs Jeffrey Wigand (1995). (The case became the subject of the Oscar-nominated film The Insider.) Wigand was a biochemist at a tobacco company, Brown & Williamson, who worked on the development of reduced-harm cigarettes. He became an unintentional whistleblower in an interview with CBS News, in which he stated that Brown & Williamson had intentionally manipulated its tobacco blend with chemicals such as ammonia to increase the effect of nicotine in cigarette smoke. His employer sued him for breach of trade secrets. Other examples abound in which confidentiality agreements have prevented scientists from talking about environment hazards, dangers of silicone breast implants, product defects and much more.

What resources do scientists have to deal with these? More than 20 U.S. states have whistleblower protection laws and regulations, designed to guarantee freedom of speech, especially speech disclosing threats to public health and safety. But those protections are piecemeal, covering some types of wrongdoings but not others, and limiting reports of wrongdoing to specific government agencies. As a result, whistleblower laws may not protect bloggers who disclose confidential information to the public.

Finally, Maytal cautioned that there are significant risks associated with breaking confidentiality agreements. Even if the law is on your side, potential consequences include enduring the threat or fear of legal action, costs associated with going to court, and other reputational effects.

Copyright and fair use: The last part of the Practice and Ethics section was dedicated to discussing the principles of copyright and fair use, including when is it permissible to link to information, quote from articles and blogs, or use someone else's images or other creative works?

On the one hand, copyright is designed to protect the creator by controlling the right to copy and distribute their content; on the other hand, fair use is designed to balance the rights of others by ensuring copyright doesn’t stifle creativity and innovation.

The discussion quickly focused in on fair use, which the Copyright Act says Is “…for purposes such as criticism, comment, news reporting, teaching, scholarship, or research, is not an infringement of copyright.” Examples of fair use include publishing a clip from a film or an excerpt from a book for the purposes of review or criticism, making multiple copies of an article for classroom use, and parody. But as Maytal pointed out, there are no hard and fast rules for fair use. “It’s not a license,” he said. It’s an
argument, and so fair use has been described by at least one U.S. judge as “arbitrary, unpredictable, unreliable, ad hoc....” A person cannot argue fair use simply because the content is publicly available on the Internet, because they are using the content for non-commercial or educational purposes, or because they provided credit.

How do the courts decide fair use? The courts look at four factors, none of which are determinative:

- What is the purpose and nature of the use? Transformative uses are favored over copying in judgments of what constitutes “fair use”; non-commercial uses are also favored.
- What is the nature of the copyrighted work? Factual or fictional? Published or unpublished? Creative works receive more copyright protection; factual material is more often fair use.
- What amount of the work is being used? Are you only using the part that you need in order to make your point?
- Does the use affect the market value of the original?

The presentation ended with a series of short cases as part of a quiz: Fair use or not? This was followed by a short discussion on copyright and fair use of images. DiChristina showed a series of images taken by the scientist, photographer and blogger Alex Wild, along with various derivatives of his work. She asked participants to weigh in on which derivatives should be considered fair use and relayed Wild’s opinion on each example, which had been part of a blog series he’d written for Scientific American. She emphasized that courts use the same criteria to evaluate fair use of images as they do for any other type of content.

Summary of Key Points/Recommendations

Boundaries of opinion

- Opinion is a protected form of speech.
- To establish a statement as “opinion,” it isn’t enough to say, “I think” or “I believe,” or to label the statement as opinion.
- Courts use various criteria to establish whether a statement is opinion or fact, including whether a reasonable reader or listener could understand the statement as asserting a verifiable fact, as well as the context of the statement.

Confidential information

- Confidentiality agreements have prevented scientists from disclosing wrongdoing related to environmental hazards, the dangers of silicone breast implants, faulty medical devices and much more.
- Many states have whistleblower protection laws and regulations that allow people to break confidentiality agreements under certain circumstances.
- Despite these protections, violating confidentiality agreements still carries significant risks.

Copyright and fair use

- The risks associated with copyright violations are real, especially in an era of digital communication.
- Fair use should be considered a last resort.
Courts use a four-part test to determine fair use, which considers the purpose and nature of the use, whether the use is transformative, how much of the original content was used, and whether the use affects the market value of the original.

Visual content (including images) is subject to the same fair-use criteria as written content.

TOPIC III: SCIENCE “BLOGGING” TODAY

The participants convened for a working lunch moderated by Paige Jarreau, PhD, Director of Social Media, LifeOmic; Science Communication Specialist, Louisiana State University. Jarreau introduced the session by presenting research on the roles and impact of scientists who communicate directly with the general public via digital media, and then facilitated a panel discussion with four prominent communicators: Jennifer Gunter, John Hawks, Phil Plait and Samantha Yammine.

The goal of this session was to explore the motivations, practices, ethical standards, norms and potential responsibilities of scientists who communicate directly with broader audiences via blogs and other forms of new media. A complete slide presentation can be found in Appendix C.

Paige Jarreau, Science Communication Specialist, Louisiana State University

To begin, Jarreau defined “science blogs” broadly to mean any online and social media scientists are using for unfettered communication with their audience, includes platforms such as Instagram and Facebook.

Jarreau briefly presented some of her doctoral research on what scientists are doing on social media and why. In sum, her research suggests they have many different motivations, from expressing themselves to brainstorming with other scientists, to sharing knowledge with the general public and bringing context to new discoveries. However, most scientists do not see themselves as filling the role of journalist or watchdog. Instead, they view themselves as explainers and public intellectuals. She also discussed a separate study showing that on social media, most scientists follow other scientists, which suggests that if the goal of their communication efforts is to reach non-scientists, they have to be deliberate about it.

Next, Jarreau presented research on why non-scientists read science blogs. There are two main reasons:
entertainment and information. Furthermore, she said the majority of blog readers consume but don’t produce content in the form of comments, sharing, etc. These data raise two questions. One, could scientists who blog have more impact on their readers by using popular-science strategies, storytelling and other journalistic practices to produce more entertaining content? And two, should scientists find ways to give readers seeking specific information more access to themselves and their expertise?

What does this research suggest about the impact science blogging can have on non-scientists? With that question in mind, Jarreau is conducting a study about scientists on Instagram. Specifically, she and her collaborators are asking whether images of scientists’ faces can impact public trust. Their initial findings suggest that smiling at the camera improves the perceived warmth of scientists and doesn’t take away from their perceived competence. She posed a few additional questions about the impact of Instagram to the group: Can this type of visual communication fulfill a unique role in science communication, distinct from journalism or research communication, such as sharing science in progress? And if so, what are the practical and ethical standards for that? Jarreau also presented the results of a brief (and unscientific) poll of scientists on Instagram that suggests many of their followers are also scientists or science students. If the goal of scientists on Instagram is to reach a broader audience, then it will be important to understand what Instagram content is reaching non-scientists and why, and to create content that will succeed in doing so.

Jarreau closed by considering what the impact of science blogging could be on scientists themselves. Based on existing research, she suggested that science blogs may have more impact within the scientific community than without. They are a powerful way for scientists to exchange ideas, start collaborations and boost their exposure. This fact prompts the question, what happens when scientists begin covering other people’s research? Should that be considered a form of public peer-review or are the scientists crossing into journalistic territory? If the latter, what skills do they need and what standards should exist to guide them?

Lastly, Jarreau drew attention to the role science blogging can play in mentoring the next generation of scientists, a topic that Samantha Yammine, a panelist and scientist-in-training, holds dear. Yammine said she is part of a global community of young scientists who support one another’s mental health, and discuss equity, diversity and career development issues using social media, something that was difficult to do before its advent.
Panel Discussion

The discussion began with a brief introduction from each panelist about his or her motivations for communicating science online, as well as his or her communication platforms of choice.

Samantha Yammine, who is a doctoral candidate studying how stem cells build and maintain the brain, began blogging about her research on Instagram about two years ago. Her goal was to build more excitement and enthusiasm for fundamental science by showcasing the small, everyday aspects of research she finds fascinating. She was spurred on, in part, by her frustration with the research funding process, which appears to favor applied over fundamental research. She considers Instagram a very powerful platform for reaching a wide variety of audiences because of its versatility.

Jen Gunter is an OB/GYN and a pain medicine physician. She began blogging eight years ago to counter misinformation, predominantly about women’s reproductive health, on the Internet. She aims to provide accurate information to her readers and empower them as patients. On her blog, Gunter has taken on several high-profile celebrities, including Gwyneth Paltrow and her media company, Goop, for promoting the use of consumer health products and services that, at best, aren’t backed by evidence. Gunter also writes a column in the New York Times called “The Cycle,” and is currently working on her second book.

John Hawks is an anthropologist who studies human origins, including the genetics of ancient people and how they are related to modern humans. He co-leads a major field study in South Africa on an extinct human species, Homo naledi. Hawks stressed the importance of science communication as a two-way process, and provided examples of how he and his team strive to achieve that for their South Africa-based project, which encompasses 150 scientists globally, including funders, government officials and other local stakeholders. He described the team’s social media strategy, which includes live webcasts and tweets from the field, and their efforts to increase diversity and represent indigenous science. He said they are trying to broaden the impact of their work by using African languages and practicing open science. Hawks has been blogging since 2003 and is also active on Twitter and Facebook, however, he said his highest-impact science communication work is consulting on documentaries. He talked about best practices in science communication, including the need to think about diversity, make your point of view clear to readers, and track, or quantify, the impact of your communication efforts.

Phil Plait is a former astronomer who has been blogging since graduate school in the 1990s. His first post debunked a questionable television news story about science, which started him on the course of writing about misconceptions and misinformation in science. In 1998, he started the “Bad Astronomy” blog and eventually transitioned to full-time science communication. In addition to his blog, his science communication work has ranged from developing educational modules for NASA, to writing popular science books, to video game consulting, to hosting a YouTube series. In addition to his blog, Plait is very active on Twitter and Facebook. As his popularity has grown, he said he has tried to leverage his social media presence to get to know diverse audiences and to provide more exposure to marginalized voices in science communication, particularly those of women.

Following these introductions, the panelists fielded questions from Jarreau about who their audiences are and what motivates them—and given those motivations, what responsibilities the panelists feel they have to their audiences. The panelists’ responses varied but they emphasized that there is no single path to
blogging and to successful science communication. However, a key factor to their success has been getting to know their audiences, listening to them, and responding to their needs.

Yammine said her followers are mostly graduate and undergraduate science students, as well as high school students and their parents. She deliberately creates content aimed at general audience by modeling her aesthetic after what’s popular on Instagram, including in non-science categories such as fashion. She is conscious that she may be the only scientist some of her followers come into contact with, and that her followers are quite young. As a result, she aims to represent science broadly rather than focusing just on her own field of stem cell research. She is also deliberate about trying to present ideas to her followers on a platform that is often associated with consumerism.

Plait emphasized that there is no single recipe for success, and it’s important to listen to your audience and learn from your mistakes. He gave the example of how he used to review movies with a scientific lens and typically shredded them. Eventually, he realized this wasn’t what his audience wanted. His readers weren’t judging movies based on the story’s scientific value or accuracy but on its entertainment value. So he eased up on his criticism. He also emphasized the importance of treating your audience with respect. As an example, he mentioned a blog post he wrote addressing why the most common arguments creationists make about evolution are wrong. He could very easily have alienated his intended audience, he said, but by treating creationists and their ideas with respect, he was able to have a dialog with them and may have even changed some of their minds on the issue. Jen Gunter echoed that idea. She recounted the effect of a blog post she wrote about sex-selective abortion. By framing the abortion issue around maternal mortality, she said she was able to persuade some pro-life readers that there are situations in which abortion can be condoned.

During her presentation, Jarreau raised the question of whether scientists should share their own research, and the responsibilities and challenges that come with doing so. She pointed out that unlike journalists, scientists are better positioned to share ongoing research, such as photos from the lab. In response, Hawks said that scientists have very polarized views about their peers who choose to popularize their own research. Some consider scientists who do the “P.T. Barnums of science,” engaged in self-promotion rather than in helping the public understand and value of research. As a result of these views, Hawks said scientists should think very careful about when and how they communicate their research. He gave an example of live tweeting from one of his field sites, where some newfound fossils his team recovered couldn’t be identified or dated. His team chose to turn this uncertainty into an educational opportunity, but the decision to share that kind of science in progress was controversial among some of his peers. Other times, he chooses not to discuss ongoing research and the scientific ambiguities surrounding it. Yammine echoed Hawks’ assertion that there are scientists who seem to relish discrediting their peers who choose to discuss their own research in the public sphere.

The last part of the group discussion focused on how science communicators develop their skills, and specifically on whether the panelists explicitly considered issues such as transparency, copyright and journalistic values when they began their public engagement activities. All four panelists said they learned on the job, and improved their communications skills over time. For example, Gunter’s writing style relaxed and her writing voice came to reflect her personality more closely, which she felt has helped establish her authenticity with readers. Some of the participants said they have enjoyed tremendous support from colleagues. For example, Gunter’s blog posts are frequently used by her fellow OB/GYN’s to educate their
patients. Others admitted that the choice to communicate science publicly has had a negative impact on some aspects of their careers, while offering unexpected benefits in other ways.

The panelists all stressed that there is no single path to science communication, and that they have found their communication work harder and yet more gratifying than expected.

### Summary of Key Points/Recommendations

- Scientists engage in online communication for many reasons.
- Scientists who communicate don’t view themselves as fulfilling the role of journalists or watchdogs; rather, they see themselves as explainers and public intellectuals.
- Non-scientists read science blogs for entertainment and information.
- Images of scientists’ faces on Instagram may increase public trust in science.
- Scientists are mostly connected to other scientists, therefore reaching non-scientists online may require deliberate communications strategies.
- Science blogging brings costs and benefits.
- Communication is still undervalued by many scientists and scientific institutions.
- Understanding and respecting your audience is essential to succeeding as a scientist-communicator.
- Most scientist-communicators develop their skills “on the job.”

### TOPIC IV: TRAINING

**Moderator:** Fenella Saunders, Editor in Chief of American Scientist and Director of Science Communications and Publications, Sigma Xi.

**Presenters:** John Besley, Associate Professor, Brandt Chair, College of Communication, Michigan State University; Anthony Dudo, Associate Professor, Moody College of Communication at the University of Texas at Austin.

The presentations are summarized below, followed by a synopsis of the group discussion that ensued.

The goal of this session was to explore the motivations of scientist-communicators and of science communication trainers, and also whether the goals of these two groups are aligned. A second goal was to discuss the ethical norms and best practices of journalism that could guide scientist-communicators.

John Besley, Michigan State University, and Anthony Dudo, University of Texas at Austin

The session opened with a presentation entitled “Training Scientists to Communicate,” and focused on Besley and Dudo’s research on why scientists communicate, the science communication training landscape and the role of scientific societies in public engagement and training.
Dudo began by providing an overview of what social science researchers know about the quantity, quality and effects of scientists as communicators, and what they seek to understand. In terms of quantity, social scientists have a good handle on how often scientists communicate, how willing they are to do so, what platforms they use and even the factors that impel them to communicate. However, more research is needed on the quality and sophistication of their communication efforts, as well as the skills scientists-communicators possess and need to acquire. There is also a need to ascertain how much communication support scientist-communications are receiving through their universities, scientific societies, and elsewhere. Social science researchers know the least about the effects of scientists’ communication efforts—on themselves, their colleagues, the scientific community and other stakeholders.

For context, Besley presented the results of public engagement surveys that Dudo and he have conducted with more than 8,000 scientists. (These data are part of ongoing research for the National Science Foundation grant on scientists’ attitudes toward public engagement.) They found that scientists are very willing to participate in public engagement activities, and that scientists’ willingness is influenced by how much they expect to enjoy the experience and how much impact they think they will have. Interestingly, willingness is not affected by concern about the “Sagan Effect”—the perception that academics who popularize science are less successful than their peers who do not.

Does training work? probably ... we hope

Besley and Dudo have also studied scientists’ communication goals and objectives, and found that scientists’ are most likely to say they prioritize getting policymakers to use scientific evidence and society at large to value science. These goals underscore that scientists’ motivations differ from those of journalists: contrary to journalistic norms, scientists have a goal; they want something to happen as a result of their engagement efforts. Additional findings show that scientists’ top communication objectives are informing people about
scientific issues and getting people excited about science. They are less likely to say they would prioritize trust-related objectives such as hearing what other people think about scientific issues. This suggests many scientists don’t see engagement as a dialogue with their audience. (A caveat to these results is that most scientist haven’t thought much about their communications goals and objectives prior to being surveyed.)

Shifting to the topic of the science communication training landscape, Dudo described the results of focused interviews with more than 30 trainers in North America, and presented topline results. (Note: These data are still unpublished.)

Besley and Dudo found that scientists who receive communication training range from graduate students to faculty and are largely self-selected. Most training programs focus on helping scientists decode or distill science for the general public—metaphors that suggest that many continue to perpetuate the “knowledge-deficit model” of science communication—as well as enlighten and entertain. Little training is provided on how to achieve specific communication goals. Most programs emphasize narrative storytelling but when and why that style of storytelling is effective. Besley and Dudo’s research also found that while training programs tend to be highly interactive, providing scientists with a lot of opportunity to practice engagement, they do not typically provide opportunities to practice new skills outside the classroom. Lastly, they found there is little evaluation of training programs to measure their effectiveness. There is also mixed views among trainers on the value of social science research on science communication and whether it does, or should, inform training programs.

Most recently, Besley and Dudo have surveyed scientific societies about public engagement. They found societies are more strategic than trainers. For example, societies’ objectives went beyond sharing knowledge with various audiences to include: demonstrating the scientific community’s ability to solve real-world problems; framing research to resonate with the public’s values; and, showing the scientific community cares about society’s well-being. Collectively, the majority of their members (55%) are demanding public engagement support, yet fewer less than half of the societies surveyed (38%) have more than one staff member dedicated to providing it. As was the case with the independent training programs, the training offered by scientific societies tends to focus on helping scientists learn to communicate clearly, concisely and compellingly, and on tailoring their messages for different audiences, rather than on journalistic norms and values.
Based on this research, Besley closed by suggesting five ways to improve the training landscape. First, increase the interaction among trainers via conferences, virtual communities or other means of developing appropriate norms and best practices. Second, establish a shared methodology for evaluating the success of communication training programs and embed it into the programs. This would likely require financial support for researchers to create this methodology, establish its use, and feed results back to the training community. Third, broaden the training curricula to provide more focused training, especially in the area of strategic communication wherein the emphasis is on achieving goals through careful selection of objectives and underlying tactics. Given the variety of training programs, improvements could also be made by considering how different curricula fit together. For example, Besley and Dudo suggested one particular program may be a good starting point for many scientists because it teaches participants how to be present and build a rapport with their audience, after which researchers could turn to other training programs focused on different skill sets. Four, foster greater diversity among science communication trainers and trainees to ensure that a wide range of perspectives are part of conversations about science. Fifth, foster coordination between those who can support scientists in their communication efforts. This might include trainers, universities, scientific societies, and others, to share best practices, reduce redundancy and build on the strengths of each one. This final point reflects the fact that different types of actors may have different goals, including both competing (e.g., individual scientists or fields eager to increase their share of funding or universities seeking to attract key scholars) and shared goals (e.g. promote support for science-based decision-making and robust funding).

### Implications

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<thead>
<tr>
<th>Ways to Improve the Training Landscape</th>
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<tr>
<td><strong>1. Interaction</strong></td>
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<td>Enable more fluid, regular interaction between trainers, and between trainers and researchers.</td>
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<td><strong>2. Evaluation</strong></td>
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<td>Support efforts from trainer-researcher partnerships that seek to rigorously evaluate the impacts of training.</td>
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<td><strong>3. Curricula</strong></td>
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<td>Broaden the topics covered within training curricula (e.g., more strategy, concepts, context, and execution).</td>
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<td><strong>4. Diversity</strong></td>
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<td>Increase diversity across the training landscape; more diverse trainers, trainees, and stakeholders.</td>
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<tr>
<td><strong>5. Coordination</strong></td>
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<tr>
<td>Synergies across the key players: trainers, universities, professional science societies, and boundary spanners.</td>
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**Group Discussion**

The discussion began on the topic of science communication curricula and for whom it is targeted. Besley and Dudo interviewed many independent trainers who work with groups of scientists at all career levels. Increasingly, universities—primarily in Europe but also in the United States—are developing curricula to introduce undergraduates and graduate students to the basics of science communication. Dudo argued that classes for these students are necessary to change the culture of communication among scientists and should be offered by research-intensive (R1) universities. Such courses would not only be pragmatic but also play a symbolic role by making communication training normative. He also said that there is a need for a systematic curriculum review to identify best practices. His own ad-hoc review suggested the knowledge deficit model of science communication is still dominant at many universities.
Next, moderator Fenella Saunders surveyed the editors in the room about how much training they provide to scientist-communicators in the course of their work, as well as how much training those scientists require. The responses suggested that training happens on a case-by-case basis and tends to focus on the nuts and bolts of storytelling, such as how to write a compelling lede, avoid jargon, and make a persuasive argument. Many of the editors agreed that more training would help raise the quality of science communication. One suggested that conducting a pre-interview with scientists, which requires them to think about and articulate their goals and objectives, would help the scientists think beyond the mechanics of science communication. Questions could include: “What are you trying to achieve? How are you planning to frame your story, and why?”

There was also a brief discussion about whether the widespread emphasis on narrative storytelling, within training programs, is really serving scientist-communicators and their readers. One participant argued that narrative is very difficult to do and inherently ambiguous. As a result, it often fails when the writer’s goal is to promote policy change. This led to the idea that the most effective way to raise the quality and integrity of science communication may be to champion the work of scientists who excel at communication rather than to improve the skills of a much broader—and, perhaps, less receptive—group.

The group discussion closed with Sanders posing questions that require further dialogue: Would best practices guidelines on topics such as conflicts of interest and disclosure be helpful to the science communication community? Who is responsible for fact-checking unmediated forms science communication such as blogs and tweets? What other kinds of training can editors offer scientist-communicators?

Summary of Key Points/Recommendations

- Social scientists are working to understand the quantity, quality and effects of scientists’ communication efforts; the least amount of research has been done on effects, such as the impact of their communication efforts on various audiences, including the general public.
- Scientists are very willing to participate in public engagement.
- Scientists have a variety of communication goals and objectives, and importantly their goals and objectives differ from those of journalists.
- Science communication training programs vary greatly in terms of content and little is known about their effectiveness.
- Members of scientific societies are looking for communication support but societies are struggling to meet their needs.
- Research universities are beginning to offer science communication training to undergraduate and graduate students but there is a need to identify and share best practices.
- Scientist-communicators receive informal training from editors on a case-by-case basis. There are no best practice guidelines on topics such as conflicts of interest that are used across the industry to improve the integrity of science communication.
DAY TWO

BREAKOUT SESSION SUMMARY & RECOMMENDATIONS

Following a day of plenary presentations and conversations, three breakout groups discussed next steps toward promoting journalistic values in science communication and then reconvened to share their recommendations. Deborah Blum of the MIT Knight Science Journalism Program outlined three questions for the breakout groups to consider:

- What are some ideas – big, medium, small – that we might be part of driving or partner on?
- Who else should we be engaging and how?
- Thoughts on possible next steps – and other potential topics this particular group might want to visit together?

Below is a summary of the immediate recommendations, presented as starting points for further consideration rather than fully developed ideas. The recommends are sorted into three areas of focus: training, broadening reach and supporting excellence.

Training

The participants recommended developing and supporting opportunities to train scientists on journalistic values. These opportunities could take place either as part of existing communication training programs or independently, developed and promoted by the symposium participants and other interested partners. The recommendations focus on three areas: training, influence and partnerships.

- Explore creating online training modules or other resources, e.g., “how-to” videos and infographics, to promote the use of journalistic values in science communication taught or practiced by individuals, institutions or science-communication trainers.
- At research universities, create and/or disseminate interdepartmental training models (depts. of science and of communication) to provide science graduate students with communication training, and perhaps vice versa.
- Connect scientists and communicators (editors, reporters) through mentorship or fellowship programs to provide scientists with exposure to the norms and practices of journalism, as well as practical writing, broadcasting or social media experience.
- Promote or strengthen informal networks of scientists and communicators (editors, reporters) with a shared interest in science communication, for example, by funding for a platform for collaboration or video conferencing.
- Help science-communicators access legal advice, fact-checking, or other services that would help them avoid the pitfalls that can arise in scicomm.
Broadening Reach

Another set of recommendations focused on broadening the reach of our conversation by building the circle of engaged and involved participants, as well as raise the visibility of the issue. The ideas here ranged from conducting a second symposium or colloquium that follows from the symposium at Johns Hopkins, to the participants partnering on ways to bring attention to and promote journalistic values. Ideas for the latter included jointly publishing a white paper and using their collective media platforms to shine a spotlight on the topic.

- Spearhead a colloquium with leaders in media and scholarly publishing, as well as scientist-communicators, to produce a set of best practices for responsible science communication.

- Continue discussion among participants about ways to bring added attention to scientist-communicators who employ journalistic values. Consider ways to help the scientist communicators to “help themselves”.

- Partner with scientific societies to develop and disseminate the values and norms of journalism to their members; make use of their existing platforms (annual conferences, websites).

- Publish a white paper based on the symposium that can be signed/supported by symposium participants.

- Continue discussion among symposium participants on joint and coordinated ways to bring attention to science communication that employs journalistic values, e.g., coordinated editorials, common statement of values, and other ways to use their substantial media platforms to promote this responsible communication.

Supporting Excellence

Finally, the participants raised the idea of rewarding or otherwise raising the visibility of scientists who routinely employ journalistic values and can serve as exemplary practitioners.

- Reward scientists who are effective communicators and employ journalistic values through an awards program; such a program could be extended to recognize outstanding science communication by university departments, institutions/societies or other programs.

- Raise the visibility of effective scientist-communicators who employ journalistic values and their work with small grants for travel or equipment, such as cameras.

In considering all of the above, it was also recommended that special focus should be used to identify new partnership opportunities, with particularly attention to organizations that will allow us to engage a diversity of scientist-communicators. Among those noted were the Association of Public Land Grant Universities and Historically Black Colleges and Universities.
DETAILED SUMMARY OF BREAKOUT SESSIONS

Following Day 1 of the symposium, three breakout groups spent an hour and a half discussing next steps toward promoting science communication that employs journalistic values and then reconvened to share their recommendations. Deborah Blum of MIT’s Knight Science Journalism Program outlined three questions for the breakout groups to consider:

- What are some ideas—big, medium, small—that we might be part of driving or partner on?
- Who else should we be engaging and how?
- Thoughts on possible next steps—and other potential topics this particular group might want to visit together?

BREAKOUT GROUP 1

Leader: Rick Weiss, SciLine

Participants: Mariette DiChristina, Anthony Dudo, Kevin Finneran, John Hawks, Mićo Tatalović and Samantha Yammine

Group 1 identified five core values of journalism—transparency, objectivity, rigor, fairness and humility—that could strengthen outreach efforts by scientists. They also made five recommendations about how to promote those values: 1) establishing interdisciplinary training opportunities at universities to ensure that science graduate students receive some communication training. 2) Identifying innovative ways to achieve this, such as co-teaching or the development of teaching modules that can be incorporated into existing classes, and then broadly disseminating those methods.

Another recommendation was to help create or support networks of scientists and communicators who can learn from one another, by funding video conferencing, an annual meeting or shared services, such as access to legal advice. Another idea was to award scientist-communicators for their engagement efforts, as well as provide funding to individual scientist-communicators for travel and camera equipment. All of these ideas stemmed from the view that there are already many talented scientist-communicators. The most immediate way to have an impact on science communication would be to support them.

A fourth recommendation was to create mentorship programs or fellowships that would allow scientists to receive on-the-ground training from journalists and, importantly, provide opportunities to use that training to create content. The team envisioned fellowships that are shorter in duration and less formal than the AAAS Mass Media Fellowships.

Their final recommendation was to partner with organizations such as the Association of Public Land Grant Universities and the Historically Black Colleges and Universities to not only foster diversity among scientist-communicators but also among their audiences. They observed that in the past, agricultural extension programs played an important role in bringing science to rural communities and may still represent an effective way to reach those audiences today.
BREAKOUT GROUP 2

Leader: Tim Appenzeller, Science

Participants: Deborah Blum, Dominique Brossard, Karen Florini, Itai Maytal, Phil Plait and Fenella Saunders

Group 2 summarized the lessons learned from the previous day’s discussions about trends/impact, practice & ethics and training. Like Group 1, they identified some core values of journalism that would serve scientist-communicators, including a commitment to objectivity and balance, and concluded that there is a need for a set of norms or “ground rules” for communicating science ethically and responsibly.

The group members asked themselves: “How can we disseminate key journalistic values to scientists, given how limited their time is and how few have received communication training?” In response, they envisioned a colloquium, convened by an organization (or organizations) with significant authority in science, such as the National Academies, and in collaboration with editors from the major scholarly publishers, science media and scientist-communicators. The goal of the colloquium would be to establish a set of best practices for science communication that could be endorsed and shared with scientists, for example, by the Academies and the publishers. The guidelines would be “authoritative, consensus and concise,” and, in time, shift the culture or create norms that would raise the quality of science communication. The group also proposed that journals could request a sample tweet from authors once a manuscript has been accepted for publication, provide feedback on it as a way of promoting outreach and improving its quality, and tweet it out.

One participant pointed out that the National Academies convenes journal editors on a biennial basis and that could serve as a forum in which to discuss the issues raised during the symposium.

The group’s idea of using a top-down approach to establish and disseminate guidelines for science communication was controversial with some participants. One even felt it would be perceived as censorship. Another participant cautioned that similar approaches have met with mixed success in other countries and that those should be studied. Overall, most participants agreed that there is a need for best practices guidelines. However, they disagreed on the mechanism for establishing and sharing those guidelines.

BREAKOUT GROUP 3

Leader: Jamie Vernon, Sigma Xi

Participants: Monya Baker, John Besley, Jen Gunter, Jeff Inglis, Paige Jarreau and Dietram Scheufele

The participants in Group 3 asked themselves, where do we want to be in five or 10 years? Their answer? “More scientists, communicating with more people, effectively.”
In order to realize that goal, they considered whether public information officers (PIOs), based at research universities, could play a role in promoting science communication that employs journalistic values. The participants recognized that while scientists and PIOs have different motivations, there may be a way to equip PIOs with tools to assist and/or train scientist-communicators at their institutions, including graduate students. The group was clear on the need to find ways to start science communication training early, ideally at the undergraduate level, and to provide trainees with the opportunity to implement what they learn.

Group 3 made the following recommendations: Create online modules or infographics that teach the norms, values and best practices of journalism; train the trainers so there are people at universities and institutions who can champion effective science communication that employs journalistic values; integrate journalism, communications and scientific training, and learn from those who are already doing that effectively; provide incentives or reward scientist-communicators who are getting it right, as well as university departments, institutions and programs that are succeeding; and, finally, engage scientific societies about these issues and make use of their existing platforms to get the message out to scientists about how to communicate science in a way that employs journalistic values.
APPENDICES

A. Participant Bios

B. Agenda and Session Summaries

C. Presentations

- Session 1: Trends/Impact
- Session II & IV: Practice & Ethics
- Session III: Science “Blogging” Today
- Session V: Training
Appendix A:

PARTICIPANT BIOGRAPHIES

Tim Appenzeller

*News Editor*

*Science*

**Tim Appenzeller** leads *Science*’s award-winning news section and supervises its global team of staff and freelance writers and editors. He has spent 30 years as an editor and writer specializing in science and the environment for magazines including *Scientific American*, *U.S. News & World Report*, and *National Geographic*. He started as an English major who loved science, but never thought of science journalism as a career until his first job, at Time-Life Books, where he was assigned to write and edit about Earth science, and was hooked. His *National Geographic* article “The Case of the Missing Carbon” won the Walter Sullivan award for excellence in science journalism in 2005, and his June 2007 *National Geographic* cover story on global warming, “The Big Thaw,” shared an award for best explanatory reporting from the Society of Environmental Journalists. Appenzeller was *Science*’s Features Editor during the 1990s, and most recently was Chief Magazine Editor at *Nature*, responsible for its journalism and opinion.

Monya Baker

*Senior Editor*

*Nature*

**Monya Baker** is a senior editor on *Nature*’s opinion desk based in San Francisco. She commissions and edits World View columns and comment articles and has a longstanding interest in improving science. After working as a AAAS Mass Media Fellow for ABC News, Monya fled broadcast journalism for a high school classroom, where she taught biology, chemistry and math before venturing into print journalism at the *Acumen Journal of Life Sciences*. As synopses editor at MIT’s *Technology Review*, Monya solicited input from scientists and venture capitalists to select the most promising emerging research. She has written for *The Economist*, *New Scientist*, *The Scientist*, *Wired* and other publications. Monya has a BA in biology from Carleton College and an EdM from Harvard University.

John C. Besley, Ph.D.

*Associate Professor | Ellis N. Brandt Chair in Public Relations*

*Michigan State University*

**John Besley** studies both public perceptions of science decision-makers and science decision-makers’ perceptions of the public. He is interested how views about decision-
makers and processes affect perceptions of science and technology (S&T) with potential health or environmental impacts. In recent years, he has focused on finding ways to help science communicators think strategically about their engagement efforts. He is the author of more than 65 journal articles and the 2014, 2016, and 2018 chapters on public attitudes and understanding about S&T in the National Science Board’s *Science and Engineering Indicators* report. John has received research support from the National Science Foundation and the U.S. Department of Agriculture.

**Deborah Blum**

*Director*

**Knight Science Journalism Program | MIT**

Deborah Blum is a Pulitzer-prize winning science journalist and the director of the Knight Science Journalism Program at MIT. A long-time science writer, she has written for publications ranging from *The New York Times* to *Wired* to *Tin House* and is the author of five popular science books, most recently the *New York Times* best seller, “The Poisoner’s Handbook.” Her sixth book, “The Poison Squad,” will be published by Penguin Press in September. She is a past president of the National Association of Science Writers and current sits on the board of directors of the Council for the Advancement of Science Writers.

**Lindsay Borthwick**

*Freelance Journalist*

**LABmedia**

Lindsay Borthwick has been journalist for more than 15 years, telling stories about science, health and the environment. She has worked as an editor at national consumer magazines based in the United States and Canada, including: *Seed*, a science and culture magazine; *Best Health*, an evidence-based women's health magazine; and *Green Living*, an environmental and sustainable living magazine. For the past 7 years, she has been freelancing for a variety of publications, as well as science philanthropies, including The Kavli Foundation, Simons Foundation and the Chan Zuckerberg Initiative. Lindsay has been nominated for a Canadian National Magazine Awards and is the winner of a Canadian Institutes for Health Research Journalism Award. She holds graduate degrees in neuroscience from McGill University in Montreal and in journalism from Ryerson University in Toronto.

**Dominique Brossard**

*Professor | Chair, Department of Life Sciences Communication*

**University of Wisconsin-Madison**

Dominique Brossard is professor and chair in the Department of Life Sciences Communication at the [University of Wisconsin-Madison](https://www.wisc.edu). She teaches courses on strategic
communication theory and research, with a focus on science and risk communication. Her research focuses on the intersection between science, media and policy with the Science, Media and the Public (SCIMEP) research group, which she co-directs. A fellow of the American Association for the Advancement of Science and a former board member of the International Network of Public Communication of Science and Technology, Brossard is an internationally known expert in public opinion dynamics related to controversial scientific issues. She is particularly interested in understanding the role of values in shaping public attitudes and using cross-cultural analysis to understand these processes. SCIMEP’s recent work has focused on scientific discourse in online environments, such as Twitter. Brossard’s varied professional background includes five years at Accenture in its Change Management Services Division and as the communication coordinator for the Agricultural Biotechnology Support Project II. Brossard earned her M.S. in plant biotechnology from the Ecole Nationale d’Agronomie de Toulouse and her M.P.S and Ph.D. in communication from Cornell University.

Jim Cohen

Director of Communications & Public Outreach
The Kavli Foundation

Jim Cohen is the director of communications and public outreach for The Kavli Foundation, which is dedicated to advancing science for the benefit of humanity, promoting public understanding of scientific research, and supporting scientists and their work. Cohen’s department provides strategic direction and oversight for all of the Foundation’s communications programs, from support of science journalism to helping scientists become better communicators to a variety of direct public outreach initiatives. Prior to joining the Foundation, Cohen was director of media relations at the University of California, Irvine, as well as associate director of communications. He is a member of the Author’s Guild and Writer’s Guild of America, West.

Mariette DiChristina

Editor-in-Chief, Scientific American
Springer Nature

Mariette DiChristina is Director of Editorial & Publishing for Nature Research’s Magazines division, leading the award-winning global editorial teams of the journal Nature’s magazine, Nature Research’s Partnership & Custom Media and Scientific American, for which she also serves as editor in chief, appointed 2009. She was honored as a “Corporate Visionary” in Folio’s 2014 Top Women in Digital Media. In 2011, she was selected as a Fellow of the American Association for the Advancement of Science. She is on the executive board of Science Counts and the committee for the Climate Change Initiative of the National Academies. She is past president of the National Association of Science Writers in the U.S. as well as of Science Writers in New York, and was an adjunct professor and Visiting Scholar in the graduate Science, Health and Environmental Reporting program at New York University for the several years. Among her frequent
appearances as a lecturer and moderator, she attends the World Economic Forum’s Davos and “Summer Davos” annual meetings as a Media Leader, supporting their science and innovation programming, especially around the challenges and opportunities of emerging technologies. She is based in New York.

Anthony Dudo, Ph.D.
Associate Professor
University of Texas at Austin

Anthony Dudo (Ph.D., University of Wisconsin-Madison) is an associate professor at the University of Texas at Austin where he researches the intersection of science, media, and society. He is particularly interested in scientists’ public engagement activities, media representations of science and environmental issues, and the contributions of informational and entertainment media to public perceptions of science. Much of his recent work has examined factors influencing scientists’ likelihood to participate in public engagement, scientists' goals for public engagement, and the growing community of science communication trainers. His research has been funded by the National Science Foundation and he has been named a Kavli Fellow of the U.S. National Academy of Sciences. He is the former Head for the Communicating Science, Health, Environment, and Risk Division of AEJMC, and is an affiliate faculty member of the UT Center for Health Communication and the UT Environmental Science Institute. He teaches undergrad- and grad-level science communication courses at UT and oversees UT’s new minor in science communication. His research has appeared in numerous journals including Nature Nanotechnology, Communication Research, Science Communication, Public Understanding of Science, Risk Analysis, Journalism & Mass Communication Quarterly, the Journal of Research in Science Teaching, and New Media and Society. Dudo previously worked in strategic communication for the Academy of Natural Sciences, a natural history museum and scientific research institution operating in Philadelphia since 1812.

Kevin Finneran
Editor-in-Chief
Issues in Science & Technology

Kevin Finneran has been editor-in-chief of Issues in Science and Technology (the quarterly policy journal published by the National Academies of Sciences, Engineering, and Medicine, the University of Texas at Dallas, and Arizona State University) for almost three decades. During part of that period he was also director of the National Academies’ Committee on Science, Engineering, Medicine, and Public Policy. Previously he was Washington editor of High Technology magazine, a correspondent for the London Financial Times energy newsletters, and Sun Times magazine. He was also a writer for the Cousteau Society and did freelance writing for Technology Review, the US Agency for International Development, the Environmental Protection Agency, and
the Congressional Office of Technology Assessment. He taught writing, literature, and film studies at Rutgers University.

Karen Florini
Vice President for Programs
Climate Central

Karen Florini joined Climate Central in mid-2017 as Vice President for Programs. Throughout her career, her work has involved the intersection of science, communications, and public policy. During the Obama Administration, she served as the State Department’s Deputy Special Envoy for Climate Change. Previously, Karen spent more than 25 years at Environmental Defense Fund, where she led the Environmental Health Program and served as Managing Director for the International Climate Program among other roles. She earned a bachelor’s degree with majors in biology and environmental policy at Oberlin, and a J.D. at Harvard Law School, where she was Editor-in-Chief of the Harvard Environmental Law Review.

Jen Gunter
OB/GYN | Pain Medicine Physician

Dr. Jen Gunter is a board certified OB/GYN and pain medicine physician. She received her medical training at the University of Manitoba, did her OB/GYN residency at the University of Western Ontario, and completed a fellowship in infectious diseases at the University of Kansas. She started her eponymous blog (she couldn’t come up with a catchy GYNO name) to clean up her little corner of the Internet because it takes accurate information to become an empowered patient. Her motto is, “Come for the sex stay for the science, come for the science stay for the sex.” Her column, The Cycle, appears approximately once a month in the New York Times. She has also written for The New Republic, The Cut, The Hill, Self, and Chatelaine. Her book, “The Preemie Primer,” was published in 2010 and her next book, “The Vagina Bible,” is slated for publication in 2019. Dr. Gunter has been called Twitter’s Gynecologist by The Cut (NYMAG.com), “one of the most outspoken women’s health advocates in the country” (by WXXI, NPR affiliate in Rochester, NY), and “strangely confident” by GOOP.com.

John Hawks
Paleoanthropologist

John Hawks is a paleoanthropologist who explores fossil hominins and genetics, with fieldwork in Africa, Asia, and Europe. He has investigated the rapid evolution of modern humans within the past 40,000 years, and has explored the contribution of ancient Neandertals to the ancestry of living people. He is a core member of the team that discovered the new species
Homo naledi, from the Rising Star cave of South Africa. A leader in public engagement with science, he was one of the earliest science bloggers, he has produced massive open online courses, and he regularly consults on documentary films.

**Natasha Hussain**  
*Scientific Director, Kavli Neuroscience Discovery Institute*  
*John Hopkins School of Medicine*

Natasha Hussain is Scientific Director of the Kavli Neuroscience Discovery Institute (Kavli NDI), for which she designs and develops new initiatives, and oversees program operations that support the Kavli NDI mission. In her leadership role, Natasha facilitates interactions among neuroscientists, engineers and data scientists with the goal of advancing neuroscience discovery by fostering transdisciplinary research. Natasha earned a Ph.D. in Neurology and Neurosurgery at McGill University’s Montreal Neurological Institute. Since completing her doctorate, her research has focused on understanding the functional role of several proteins enriched at synapses, the points of connection between neurons that mediate their network communication. She conducted her postdoctoral training at MIT in the Picower Institute for Learning and Memory, Cambridge, MA, and, prior to joining Kavli NDI, worked as a research associate in the Department of Neuroscience at Johns Hopkins University, studying the molecular components of synaptic plasticity. Natasha is the recipient of numerous awards including a Human Frontiers Postdoctoral Fellowship, FRSQ-FCAR-Santé and CIHR Fellowships, Martin L. Wills Scholarship from Canadian Heart & Stroke Foundation, and the Canadian Institute of Neurosciences, Mental Health and Addiction Brain Star Award.

**Jeff Inglis**  
*Science + Technology Editor*  
*The Conversation US*

Jeff Inglis has two decades of experience working for news organizations in Antarctica, New Zealand, Vermont, Missouri, Maine and Massachusetts. He has covered many topics in science and technology, and beyond. He has a BA in history from Middlebury College and an MA in journalism from the University of Missouri-Columbia.

**Paige Jarreau**  
*Director of Social Media & SciComm | Blogger*  
*LifeOmic | From The Lab Bench*

Paige Jarreau is Director of Social Media & SciComm at LifeOmic and a science blogger for the College of Science Louisiana State University. She is also a researcher, social media consultant and speaker specializing in SciComm and social media. Her research focuses on the intersection of science communication, journalism and new media, including blogs and Instagram. She was previously Science Communication Specialist at LSU and a postdoctoral
researcher studying and teaching science communication. She holds a PhD in mass communication and trained in biomedical engineering. From The Lab Bench is Jarreau’s personal blog about all things science. She has also written for Nature, EMBO Reports, Altmetric, the Scientific American blog network and more.

Itai Maytal
Senior Legal Counsel
Springer Nature

Itai Maytal is Senior Legal Counsel and advisor to Nature, Scientific American, Open Research and Sales in the Americas, based in New York. Among his various responsibilities, he provides pre-and post-publication counselling to and training of the Scientific American and front-end of Nature teams. Prior to joining Springer Nature, Itai served as the General Counsel to Newsweek. At Newsweek, he provided legal support in commercial, licensing, intellectual property, privacy, employment, publication matters and litigation. He also previously served as First Amendment fellow to the New York Times in its legal department and as an associate in a media law practice. He has taught media law at the Columbia University Graduate School of Journalism and the Benjamin N. Cardozo School of Law.

Phil Plait
Astronomer | Science Communicator
Bad Astronomy Blog | SYFY.com

Phil Plait is an astronomer and science communicator. His Bad Astronomy Blog has been around more than a decade and has been hosted by Discover Magazine, Slate, and currently SYFY.com. He has written three books on science and astronomy and many articles for venues such as Astronomy, Sky and Telescope, Discover, The Boston Globe, Die Frankfurter Allgemeine Zeitung, and the New York Post. He was the head science writer for the first season of "Bill Nye Saves the World" on Netflix and is currently the technical consultant for the CBS series "Salvation." He’s also a public speaker who has traveled the world talking about astronomy and space, and has appeared on numerous television programs as an expert on various aspects of science.

Fenella Saunders
Editor in Chief
American Scientist

Fenella Saunders is Editor in Chief of American Scientist, a general-audience science magazine published by Sigma Xi, the Scientific Research Honor Society, where she is also Director of Science Communications and Publications. She has been a science journalist and editor for more than 23 years, and has covered science for Discover magazine, Popular Science, Popular Mechanics, NYU Physician, Scholastic, The Learning Channel, and The Discovery Channel.
received an A.B. degree in computer science from Duke University and a Master's degree in psychology and animal behavior from Hunter College of the City University of New York. She has been selected as a Knight fellow for several bootcamps on nanotechnology and for UC Berkeley’s bootcamp on multimedia production.

**Dietram A. Scheufele**

*John E. Ross Professor and Vilas Distinguished Achievement Professor*

*University of Wisconsin-Madison*

Dietram A. Scheufele is the John E. Ross Professor in Science Communication and Vilas Distinguished Achievement Professor at the University of Wisconsin-Madison and in the Morgridge Institute for Research. His research deals with the public and political interfaces of emerging science. He is an elected member of the German National Academy of Science and Engineering, and a fellow of the American Association for the Advancement of Science, the International Communication Association, and the Wisconsin Academy of Sciences, Arts & Letters. Scheufele has been a tenured faculty member at Cornell University, and held visiting positions at Harvard University, the University of Pennsylvania, and the Ludwig Maximilian University Munich. His consulting experience includes work for the Public Broadcasting System, the World Health Organization, and the World Bank.

**Mićo Tatalović**

*Editor | New Scientist*

Mićo Tatalović is an editor at *New Scientist*, currently on leave for a Knight Science Journalism fellowship at MIT, Cambridge, MA. As a science news editor at *New Scientist* and earlier at SciDev.Net, he has worked with dozens of freelancers from around the world. He’s originally from Croatia, and is still actively involved in promoting science journalism there. He studied biology at the universities of Oxford and Cambridge, and then science communication at Imperial College London. Mićo has several years of experience as a board member of the Association of British Science Writers, most recently as its chairman. At ABSW, he helped organize UK and European conferences of science journalism, and summer schools of science journalism.

**Jamie L. Vernon, Ph.D.**

*Executive Director and CEO | Publisher of American Scientist*

*Sigma Xi | The Scientific Research Honor Society*

Dr. Jamie Vernon is Executive Director and CEO at Sigma Xi, The Scientific Research Honor Society and publisher of American Scientist. From 2014 to 2017, he served as Sigma Xi’s director of science communications and publications and editor-in-chief of American
Scientist. He was also Sigma Xi’s co-director of operations from 2014 to 2015. An experienced molecular biologist and award-winning science educator, he began communicating science as a public speaker and independent blogger in 2007. He has contributed to numerous science publications, including American Scientist, the Discover magazine blog, The Intersection, and Scientific American guest blogs. From 2011-2014, he served as an American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellow and an Oak Ridge Institute for Science and Education (ORISE) Fellow at the U.S. Department of Energy, where he developed strategies to measure and communicate the economic impacts of the Department’s investments in clean energy technologies. In 2012, he was appointed co-chair of digital media for the interagency climate communications working group within the White House’s U.S. Global Change Research Program. He holds a B.S. in zoology from North Carolina State University, M.S. in biotechnology from East Carolina University, and Ph.D. in cell and molecular biology from The University of Texas at Austin.

Rick Weiss  
*Founding Director*  
*SciLine*

Rick Weiss is the founding director of SciLine, a philanthropically supported, editorially independent, free service for reporters covering science, health, and the environment. Rick has more than three decades of experience in journalism and public affairs, including 15 years as a science reporter at the Washington Post, where he wrote more than 1,000 news and feature articles about advances in science and technology and their economic, societal, and ethical implications. Before launching SciLine, Rick served for five years as director of strategic communications at the White House Office of Science and Technology Policy and for three years as communications director at the Defense Department’s Defense Advanced Research Projects Agency. Rick’s awards include the Council for the Advancement of Science Writing’s Victor Cohn Prize for Excellence in Medical Science Reporting; the National Association of Science Writers’ Science and Society Award; and the American Association for the Advancement of Science’s Science Journalism Award. He earned a bachelor’s degree in biology from Cornell University and a master’s degree in journalism from the University of California, Berkeley, and holds a license in medical technology with the American Society for Clinical Pathology. He lives in Takoma Park, Maryland, with his wife Natalie Angier, the New York Times science writer and author.

Samantha Yammine  
*Ph.D. Candidate & Science Communicator*  
*University of Toronto*

Samantha is a science communicator and PhD Candidate at the University of Toronto researching how stem cells build and maintain the brain. She shares highlights from her lab daily on Instagram as @science.sam to de-mystify the scientific process and foster open dialogue between researchers and the public en masse. Her communication efforts are fueled by her passions for science policy and promoting equity, diversity, and inclusion in STEM. You can find out more about her at heysciencesam.com.
APPENDIX B:

AGENDA

DAY 1  May 6
6:15pm – 9:00pm  Reception and Dinner  Inn at the Colonnade: Hopkins Room
Conversation led by Deborah Blum

DAY 2  May 7

Unless otherwise indicated, symposium sessions will take place in Rooms 314, 316 & 318 at the Kavli Neuroscience Discovery Institute at Johns Hopkins University – North/Homewood Campus: 3400 N. Charles Street, Clark Hall 316, Baltimore, MD 21218

7:30 – 8:40am  Breakfast

8:45 – 10:15am  Session: Trend/Impact (90 minutes)
  Session leader: Kevin Finneran. Presenters: Dominique Brossard, Dietram Scheufele
10:15 – 10:25am  Break
10:25 – 12:25pm  Session: Practice and Ethics I
  Session leader: Mariette DiChristina. Presenter: Itai Maytal
12:30 – 2:30pm  Working Lunch
  Session: Communicators (90 minutes)
  Session leader: Paige Jarreau
  Participants: Jen Gunter, Phil Plait, John Hawks, Samantha Yammine
2:30 – 4:00pm  Session: Practice and Ethics II
  Session leader: Mariette DiChristina. Presenter: Itai Maytal
  4:00 – 4:10pm  Break
4:10 – 5:40pm  Session: Training
  Session leader: Fenella Saunders. Presenters: John Besley, Anthony Dudo
5:40 – 6:30  Free time; Return to Inn at the Colonnade
6:30 – 7:00  Dinner - Inn at the Colonnade: Hopkins Room
  Presentation and Conversation: “When Scientists Become Social Media Personalities” (led by Mariette DiChristina and Itai Maytal)

DAY 3  May 8, 2018

Kavli Neuroscience Discovery Institute at Johns Hopkins University - Rooms 314, 316 & 318

9:00 – 10:00  Breakfast; Opening Discussion led by Deborah Blum
10:00 – Noon  Breakout groups
Noon – 1:30  Lunch; Final Discussion led by Deborah Blum
1:30pm  Departures
SESSION I: TRENDS/IMPACT

Moderator: Kevin Finneran, Editor-in-Chief, Issues in Science and Technology

The opening session will examine the broad context of public opinion about science to help us understand the communications environment in which scientists have to operate. As editors and communicators, we appreciate the need to understand one’s audience in all its diversity, and we are learning that our online audience can differ significantly from our print audience, and that the nature of discussion varies with the medium. The session will also explore how the relationship and communication between scientists and the public are changing with the rise of digital and social media.

Dietram Scheufele, the John E. Ross Professor in Science Communication and Vilas Distinguished Achievement Professor at the University of Wisconsin-Madison, will provide an overview of public opinion surveys. He will explain not only overall favorable/unfavorable attitudes but also changes over time, the depth of feeling about science, the differences along age/gender/education/political affiliation, and the specific exceptions around topics such as climate change and genetic engineering. He will also look at the line scientists must walk in preserving what the public values in science—knowledge and rational objectivity—and enhancing the attributes where scientists are seen as lacking—warmth and human values. Among the many considerations for scientists who want to communicate directly with the public is the voice/persona they want to adopt when they write. Achieving the proper balance, particularly on topics where there is intense political, cultural, or ethical disagreement, is not easy. Must one sacrifice authority in pursuit of warmth?

Dominique Brossard, professor and chair in the Department of Life Sciences Communication at the University of Wisconsin-Madison, will explore the particular challenges scientists encounter when venturing into the realm of online communications through blogging and social media. She will illustrate potential problems by taking a detailed look at the “arsenic-life” controversy. The debate began with a journal article that claimed the existence of a species of bacteria in which phosphorus could be replaced by arsenic in its DNA. The finding was controversial, and much of the discussion about it took place in social media. Brossard will discuss how this influenced the debate and how scientists regard the use of new communication channels in discussing their work. What role are online discussions playing in the conduct and communication of science—and what role should they play?

References:
- “Public Face of Science” report (American Academy of Arts and Sciences)
- Brief update on public attitudes about science (Pew Research Center)
Moderator: Mariette DiChristina, Editor-in-Chief and SVP, Scientific American, and Director, Editorial & Publishing, Magazines, Nature Research Group

As scientists and engineers increasingly are serving as unfiltered sources of news and perspectives for the public on platforms such as blogs and social media, they take the role of “journalists” without necessarily understanding the traditional values—and risks—of that role. This session will also examine how this content is received, used—and, perhaps, misused.

Emphasizing conversation over mere presentation, DiChristina and Itai Maytal, who is Springer Nature’s Senior Legal Counsel and advisor to Nature, Scientific American, Open Research and Sales in the Americas, will use selected, thought-provoking case studies to examine and then collectively discuss a number of themes that arose when we surveyed participants ahead of the meeting about their chief interests and concerns.

The late-morning session will begin with a stage-setting discussion around historic U.S. court opinions on the role judges play in settling scientific disputes; we will learn good news about speech freedoms, but also some cautions. We will then devote a focused block of time on what can be a treacherous area for scientist-communicators: ethical issues that arise from posting materials that do not reveal conflicts of interest, or can be mistakenly interpreted as evidence-based information.

For the early afternoon, we will delve into examples of cases that illuminate the legal boundaries of what is considered opinion versus fact, the special care that needs to be taken to avoid perils with confidential information, and an old favorite—copyright—that can be mined for new insights, specifically around the challenges of “fair use” of images.

Over dinner, we will share insights and lead a conversation with the group about the risks of scientists becoming social-media personalities, including doxxing and public excoriation.

References:
- Take Science Off the Stand
- Companies Win U.S Free Speech Shield Over Scientific Articles
- Libel Concerns Are a Reality for Scientists Who Speak Out in Public
- Code of Best Practices in Fair Use for Scholarly Research Communication
- Contracts of Silence
- How to Protect Yourself from Doxxing; Nieman Reports articles:
  - [http://niemanreports.org/articles/how-to-deter-doxxing](http://niemanreports.org/articles/how-to-deter-doxxing)
SESSION III: SCIENCE “BLOGGING” TODAY

Moderator: Paige Jarreau, Director of Social Media, LifeOmic; Science Communication Specialist, Louisiana State University

Scientists today are engaging with broader society directly via new media. However, we still know little about the impacts of this direct engagement, for example on perceptions and trust of scientists as communicators. In trying to evaluate this engagement and its impact, it helps to understand scientists’ motivations and goals related to media content creation, where they feel their primary responsibility resides (e.g., to scientific progress vs public audiences), what constraints they have, how well they’ve been prepared for effective public engagement (e.g., science communication training), and what standards they communicate by (e.g., ethics and communication practice / journalistic norms). These motivations and practices can not only inform how we evaluate scientists’ communication efforts, but also how we evaluate—and potentially influence—their impact.

In this session, we will discuss the motivations, practices, ethical standards, norms and potential responsibilities of scientists communicating directly with broader audience via new media. It will begin with a short presentation by Paige Jarreau about research on science bloggers’ practices and standards, and potential impacts in terms of who reads science blogs. It will then jump into a panel discussion with three scientists and a physician—Dr. Jennifer Gunter, John Hawks, Phil Plait and Samantha Yammine—who regularly engage broader audiences online.

Gunter is an obstetrician-gynecologist and pain medicine physician who blogs about women’s health and evidence-based medicine. John Hawks writes a blog on paleoanthropology, genetics and evolution. He is Vilas-Borghesi Distinguished Achievement Professor of Anthropology at the University of Wisconsin-Madison. Phil Plait is a former astronomer who writes the Bad Astronomy blog and popular science books, and has hosted a YouTube series about astronomy. Samantha Yammine is a doctoral student at the University of Toronto who is studying brain development and stem cells. She is an active science communicator on Instagram, YouTube and other digital platforms.

References:
• Science Bloggers' Self-perceived Communication Roles
• Science in the Social Media Age: Profiles of Science Blog Readers
SESSION V: TRAINING

**Moderator: Fenella Saunders**, Editor in Chief, American Scientist

Scientists who decide to become communicators take any number of paths. Some sit down and just start writing, either on social media or as a guest blogger on someone else’s site. Some have an interview experience and turn that into more communication opportunities. Some decide they need formal training before they do anything. There may be no wrong path, but as the previous sessions have shown us, taking up SciComm without understanding, say, what an ad hominem attack is or what level of scholarship exists in the field of communication, can lead to mistakes and backlash.

This session will begin with two speakers—John Besley and Anthony Dudo—who will give us some background about what motivates scientists to get communication training and what kind of training different venues do and do not give scientist-communicators. Specifically, they will discuss the results of their research with scientists about their communication goals, and what they have learned from in-depth interviews with science communication trainers about the goals and impact of existing training programs. Besley and Dudo’s research suggests that scientists primarily communicate to ensure that governments and citizens use science in their decision-making. The trainer interviews, however, show that most trainers emphasize basic writing and speak skills and have only a limited focus on the types of communication strategies scientists may need to consider to achieve their stated goals.

We’ll then discuss the ethical norms and best practices of journalism that could guide scientists in communicating science, and whether there’s a way to create resources that can be shared with the scientific or trainer community. For example, how do the editors in attendance support scientists’ communication efforts? What practices have they put in place to safeguard against the issues we’ve described? How can we share this knowledge effectively?