Charting a Path for Public Engagement in Basic Science: A Prospectus

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In Fall of 2019 at the SLAC National Accelerator Lab/Stanford, several of us were reflecting on the day of talks and conversations that had just occurred at the Department of Energy (DOE) Office of Science communications summit. These bi-annual summits bring together communicators from National Labs and DOE-funded universities to share insights and best practices about how to communicate the work and mission of the discovery research the DOE Office of Science supports. The Kavli Foundation (Kavli) was invited to contribute learnings and findings from the previous year of work that convened science communication leaders to discuss how best to advance public engagement with research -- and researchers. We unpacked the day's discussions, while also sharing details about Kavli Institutes and DOE Labs' latest science and discoveries – from climate models to theoretical physics to new insights into how the brain works.

Even as we marveled at some of the latest basic science discoveries, we couldn't help but notice a fundamental dichotomy between the basic science we support and the science we communicate about. Of what had been presented and shared about communication and engagement strategies, tactics, and outcomes during the summit, little was specific to *basic science* – the focus of both our organization's scientific investments. We realized that, **while there has been a lot of attention, practice and scholarship about science communication and public engagement in science generally, there did not seem to be much specific to basic science.**

At the same time, both DOE Office of Science and Kavli recognized that many of the scientists we employ, support, and collaborate with are communicating about and engaging the public in science (or are interested in doing so). Given the paucity of tools, resources, and advice for engaging about basic science, where should they turn to develop meaningful, effective public

engagement around the science they were doing? Are the few resources about communicating applied science and technology that are grounded in social science applicable to basic research? And if we identify or develop these resources, how do we make sure they are grounded in the best communication and engagement scholarship, and how could we ensure that these efforts would be valued and sustainable not just by our scientists but in the basic research landscape writ large?

With these questions in hand, our two institutions began conversations about how to work together to answer them. A year later, our organizations signed an MOU to create the Science Public Engagement Partnership (SciPEP) to deepen our understanding of effective public engagement around *basic research*, explore how we can improve this practice, and provide tools for scientists and practitioners at our organizations, as well as for the many scientists, professional communicators, and communication scholars who collectively make up the science communication and public engagement community.

Our first year, 2021, was a year of reflection on these issues at SciPEP. Backed by a set of robust reviews of the social science scholarship and a two-day virtual conference - this landscaping year confirmed the paucity of evidence about communicating about or engaging with basic science. We also learned a lot and discovered more complexity around the social and societal questions of engagement around basic science. Offsetting these challenges, though, is our recognition that SciPEP has struck a resonant chord among our colleagues in science, communication, and scholarship. The sheer magnitude of the *Communicating the Future: Engaging the Public in Basic Science* conference (more than 1200 attendees!), and the deep, rich discussions there, provided all the reinforcement we needed to know that this is what the community is hungry for: evidence-based tools and resources for basic science engagement.

Clearly, these issues are not going to be addressed by one literature analysis and one conference. While this may slow down the creation of practical tools and how to use them, we left the conference excited and energized about how pursuing these questions can enrich our scholarship and our craft. How do we expect to carry this work forward, and how can we continue to engage the wonderful community that came together to share their insights, best practices, and goals and aspirations with us at the conference?

We hope this prospectus - based on input from an outstanding and diverse conference steering committee, literature review authors, and colleagues with special expertise we tapped from the community - will serve as the table setting for our future work. It is in part a summary of where SciPEP believes we are on our journey to understand effective basic science engagement and a roadmap to key destinations we hope to arrive at along the way.

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SciPEP (**Sci**ence **P**ublic **E**ngagement **P**artnership) is a collaboration of The Kavli Foundation and the Department of Energy Office of Science to ensure that basic science engagement is supported, sustainable, and effective.

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The Landscape of Public Engagement in Basic Science

The common vision of both Kavli and DOE Office of Science for SciPEP is for basic science engagement to be supported, sustainable, and effective. Basic, curiosity-driven, or fundamental research is the fuel that runs our scientific knowledge and innovation enterprise. The ability to engage broader publics in discussion about basic science is paramount if we are to support a thriving research enterprise that underlies and continually transforms the modern world.

At the same time, science communication is a complex suite of activities that require advanced planning, resources, and skills. So, it is important to explore what we know and what we do not know about communicating basic science to stimulate strategic and sustainable resources and communities of practice.

Because it is important to both Kavli and DOE Office of Science that our communication and engagement efforts be grounded in social science scholarship— as supported by evidence as we expect our science to be, we first surveyed the landscape of relevant peer-reviewed literature for both theoretical research and evaluations of engagement practices. These literature surveys, one led by Todd Newman of the University of Wisconsin-Madison and the other by John Besley of Michigan State University, yielded two critical findings:

1. **There is strong public support in the United States for federal funding of basic research, but there is no published data about how non-expert publics think or feel about basic research specifically.** If anything, research on public support for basic research funding raises questions about whether publics even make a distinction between basic and applied science, or whether they need to.

2. **Published peer-review literature about communicating basic science is almost nonexistent.** Between 2015 and 2019 only 43 out of 1.5 million science communication articles published in disciplinary science journals focus on communicating basic science, none of which focus on public engagement. Similarly, of 2,386 articles on public engagement research published in the top tier of science communication journals, fewer than 5% focus on how or why to communicate basic science. The few available research articles examine only a few potential communication outcomes, with little connection made to increasing public support and other strategic long-term goals.

We also recognized that many public engagement efforts may not be found in the peer-reviewed literature, and given our discovery of this limited literature base, we also organized a

two-day virtual conference, *Communicating the Future: Engaging the Public in Basic Science,* for basic scientists, professional communicators, and communication scholars. Our original scope for this conference was originally conceived to identify research needs on *public engagement* in basic science (two-way dialogue between basic scientists and publics with mutual learning). The findings of the literature surveys, however, suggested that we expand the scope of our conference to explore a wider range of communication efforts as well as research questions and infrastructure needs that, if addressed, could inform and advance basic science communication and engagement.

Communicating the Future was organized around an exploration of the *why*, *what* and *how* of the relationship between the public and basic science. Speakers and panelists were invited to explore *why* the public and basic science should be connected; *what* current communication and engagement efforts are taking place, including the challenges and opportunities in this work; and *how* scientists and professionals could work to engage the public with basic research as effectively as possible. The conference planning included a broad call for abstracts to bring to light the range of basic science communication practices and training programs that are not included in the published literature. After review, selected abstract authors were invited to present their work in live poster sessions and recorded splash talks. Drawing from the expertise and experiences of scholars in science and science communication, participants at the conference discussed whether there are unique characteristics of the relationship between the public and basic science and brainstormed about questions that need to be addressed to advance the field.

These initial explorations around public engagement in basic science all happened within the first six months of SciPEP's creation. They laid the groundwork for this prospectus and for continuing community conversations about possible pathways forward for SciPEP and the broader basic science community.

More Questions than Answers

We optimistically expected that the literature survey and the conference would provide a clear path to develop the practical tools to help scientists and the communicators who work with them to engage people with basic science. Based on the landscape studies, conference plenary and parallel sessions, conference brainstorming sessions, and post-conference survey and discussions, we have more questions than answers.

Many of these questions were brought up by the conference participants, and especially by the rapporteurs at the close of the conference (see the transcript of their insights). All these

questions informed our thinking about the next steps for SciPEP. There is a lot of work to do before we can confidently craft effective goals, strategies, tactics - and therefore tools and resources - specific to basic science engagement and communication.

The questions we want to surface for our future work at SciPEP and for community consideration reflect the scholarship and insight of experts from diverse disciplines - social science scholars, basic research scientists, and professional communicators. Questions 1-3 focus on challenges and obstacles to science communication infrastructure - operational structures, policies, and cultures of basic research and science communication ecosystems. At the heart of these questions is this premise:

Basic science communication and engagement suffer from many of the same challenges and obstacles as the broader science communication landscape.

> **QUESTION 1:** How can critical issues of justice, equity, diversity, and inclusion be integrated and prioritized into current and future basic science public engagement efforts?
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> **QUESTION 2:** What pathways and incentives are needed to integrate science communication scholarship into basic science engagement practice and training? [And do so on an ongoing basis as knowledge advances?]
>
> **QUESTION 3**: What pathways and incentives are needed to institutionalize evaluation of public engagement in basic science communication and engagement?

As many conference participants noted, some infrastructure challenges for basic science communication may take on greater importance than they do for applied science, technology, and areas of research that may raise social controversy. Partly this could be the result of less obvious public interest and fewer community discussions about basic science, as there are surrounding health and medicine, environmental conservation, and emerging technologies with unknown societal impacts, for example. Organizations or actors with deep interests in the outcomes of these discussions seem to be more willing to fund scholarship and practice around applied or contested science than they are willing to fund discovery science. We also noted the potential impact of a research enterprise that inhibits opportunities and support for public interfaces with basic research.

Many research questions emerged from discussions with scientists, communication professionals, and social science scholars about the landscape studies and conference presentations. So, our fourth question focuses on research needs - particularly to learn whether and what is distinct about the basic science research enterprise that could or should inform public engagement practices and training.

> **QUESTION 4**: What should be included in a comprehensive research agenda to improve/advance practices and training for public engagement in basic science?

Below are some of the research questions that arose repeatedly and that could inform the creation of meaningful, strategic tools and resources for scientists and communications professionals:

STRATEGIC GOALS AND MOTIVATIONS

- What are strategic goals for communicating about and engaging people in basic science?
- What types of strategic communication goals are unique, distinctive, or best suited to basic science communication in comparison to applied science?
- Do the goals differ (and if so how) with respect to the diversity of scientists, research supporting institutions, and STEM disciplines?
- What goals and objectives do basic scientists have when communicating/engaging? How do these compare to scientists writ large?
- Do scientists' or research supporting institutions' strategic goals reflect and/or perpetuate hierarchies that privilege or marginalize specific groups (among both scientists and members of the public) in basic science communication?

PUBLIC PERCEPTIONS ABOUT BASIC SCIENCE

- What do publics feel (think/perceive) about basic scientists and their supporting institutions, and how do these perceptions vary among cultural, political, economic, and other community demographics?
- Do publics differentiate between basic and applied research? If the distinction between basic and applied research is important for strategic communication goals, what terminology or descriptors (e.g., basic, use-inspired, discovery, fundamental, pure) are the most meaningful to publics?
- Does communication of basic research stimulate different types or magnitudes of publics' emotions (e.g., curiosity, hope, joy) compared to applied research?

- Where do publics seek information about or opportunities to interact with basic research? What type of research topics (i.e., field of science and degree of instrumental value) receives the most public attention (and why)?

TWO-WAY ENGAGEMENT ABOUT BASIC SCIENCE

- What are the approaches for public engagement that best enable basic research to effectively achieve different goals?
- How does the nature of basic research (e.g., instrumental value, degree of public controversy, etc.) influence the scale of effective public engagement (hyper-local to national to global)?
- Do emotions, and which emotions (e.g., joy, hope, curiosity), of scientists and publics influence the potential for mutual learning through public engagement with basic science?
- What are the best approaches to assess and monitor the effectiveness/impact of public engagement in basic science efforts?

COMMUNICATION AND ENGAGEMENT TRAINING

- Is general communication training sufficient for basic scientists to achieve their goals or, are there training needs specific to basic research?
- How does diversity and cultural competency of existing training programs/trainers influence the willingness of basic scientists from marginalized groups to seek out those training programs?
- What are the barriers to using social science scholarship to inform basic science communication training and practice? What infrastructure(s) would support scholarship and practice to collaborate?

With these and many other questions, we need to prioritize where to start. Is identifying strategic, long-term basic science communication goals a critical first step toward creating cohesive strategies with measurable and impactful outcomes? Do we first need to know how the public thinks and feels about basic science, including whether the term “basic science” is meaningful to all communities? Scientists and scientific institutions who are interested in basic science engagement, including SciPEP, might benefit from an overarching research strategy - infrastructure and partnerships to identify, prioritize, and address research questions. A challenge, as some conference participants pointed out, is that funding for communication

research is typically tied to individual actors who have questions about communicating discrete science topics, for example climate change, synthetic biology, or COVID-19. So, this raises an additional question about how to develop and implement a master scholarship strategy for a unified understanding of basic science communication.

Next Steps for SciPEP

Answering these questions highlights our role here at SciPEP. We plan to use our convening power and expanding relationships in these communities to stimulate and facilitate the discussions needed to identify the most productive areas for future scholarship and practice. We also intend to bring other entities -- philanthropic institutions, research performing institutions, professional societies, and others -- to a space with common goals, aspirations, and consensus on what works and what does not. While each of the founders, DOE Office of Science and Kavli, have resources to support some activities in these spaces, SciPEP was not created to serve as a funding mechanism.

In addition, we've said from the outset that SciPEP will focus on building community tools and resources that scientists and professionals can access to effectively communicate and engage people in basic science. The SciPEP partners will use the research questions and observations from the SciPEP conference detailed here, as a roadmap to catalyze and advance research and community building that can contribute to effective tool development. We plan to:

- **Champion** evidence-based approaches and sustainable communities-of-practice.

- **Catalyze** conversations, research, and resource development to address the questions above and to advance knowledge and skill in effective basic science engagement.

- **Connect** communicators, scientists, communities and interested publics.
  SciPEP will bring basic scientists, communication scholars, and communication practitioners (and their supporting institutions) together to discuss and connect with others holding discussions about critical topics relevant to public engagement in basic research. This could be webinars, workshops, social media chats, and when at a critical mass, another conference.

We will need your help to bring to bear the critical wisdom, expertise, and experience for this endeavor, and

invite your thoughts and suggestions for the path forward.

SciPEP (Science Public Engagement Partnership) is a collaboration of The Kavli Foundation and the Department of Energy Office of Science to ensure that basic science engagement is supported, sustainable, and effective.
Learn more at scipep.org.