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Communicating Discovery Science

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Communication and engagement for basic science: insights and practical considerations

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Abstract

Basic research underpins the innovations that power the global economy and shape society. It is the focus of scientific investment for both The Kavli Foundation and the U.S. Department of Energy Office of Science. Yet it has been rare to see basic research command much attention, practice, or scholarship in science communication. In December 2020, we launched the Science Public Engagement Partnership, or SciPEP, a limited term public-private partnership, to dive into basic science communication headlong. Our work through SciPEP has led to new insights about audiences' relationship to basic science, as well as the needs and interests of those who communicate basic research. We see a path forward that involves forging more partnerships between scholars who study science communication and practitioners of basic science communication.

Keywords

Bridging research, practice and teaching; Diversity, equity, inclusion and accessibility in science communication; Science communication: theory and models

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At The Kavli Institute for Particle Astrophysics and Cosmology, located at both Stanford University and the SLAC National Accelerator Laboratory, scientist-communicators are hosting events like stargazing parties and Noches Astronómicas — conversations in Spanish sharing research discoveries and what it's like to be a scientist. At Oak Ridge National Laboratory, researchers and communicators are connecting with audiences on Instagram by filming ninety-second-long videos about topics like quantum mechanics or radioactive isotopes and connecting them to blockbuster films like *Ant-Man and the Wasp: Quantumania* or *The Martian*. What do these efforts (and others like them) have in common? Both communicate about basic research, also called discovery, curiosity-driven, or fundamental science. And both draw on a nascent but growing body of insights about communicating basic science.

Basic research underpins the innovations that power the global economy, advances our understanding of the universe and ourselves, and contributes to shaping society. Yet it has been rare to see basic research command much attention, practice, or scholarship in science communication.

Our organizations, The Kavli Foundation and the U.S. Department of Energy Office of Science, are a private foundation and a public (federal government) agency, respectively, that fund basic science and support scientists exploring the frontiers of research. Our organizations also care deeply about the relationship between publics and the sciences we fund. In December 2020, we launched the Science Public Engagement Partnership, or SciPEP, a limited term public-private partnership, to dive into basic science communication headlong [Borchelt, Sawyer & Smith, 2022; Sawyer, Church & Borchelt, 2021]. We've surfaced quite a few insights on our explorations. But the journey is far from complete, which is why we were so pleased that the *Journal of Science Communication* put out a call to collect more ideas and scholarship in this area.

What do we mean by communicating basic science? For us, it is a focus on communication of research for which applications are neither a guarantee nor the point. It is also communication by the scientists who conduct such research, communication professionals, and others. It is about making meaningful connections between that research and publics. This "basic science communication" work requires an ecosystem of professionals—scientists, communication professionals and trainers, and social science scholars who study communication and public engagement.

It's worth noting that basic science communication is a wide-open field: two 2021 reports we commissioned concluded that the body of social science scholarship on basic science communication and engagement is very limited [Besley, Peterman, Black-Maier & Robertson Evia, 2021; Newman et al., 2021]. However, the registrants for two SciPEP virtual conferences numbered over 3,400 and came from around the world; clearly, a sizable and enthusiastic community wants to learn more about basic science communication and test new ideas.

It's also worth noting that while SciPEP's learnings are laser focused on basic science communication, we understand that advancing all fields of science and science communication is not possible without centering justice, equity, diversity, and inclusion. Many groups have been excluded from engagement with basic science [Dawson, 2014, 2018; Judd & McKinnon, 2021]. Their communities have been exploited and their contributions to humanity's body of scientific knowledge marginalized [Graves, Kearney, Barabino & Malcom, 2022]. Those barriers are ongoing [Volpe, Klein & Race, 2022]. As has been said by many

experts, including at SciPEP's 2021 conference, engagement and partnerships with marginalized groups must focus on relationship building that advance at a pace commensurate with the level of trust.

Our work through SciPEP has led to the following new insights about audiences' relationship to basic science, as well as the needs and interests of those who communicate basic research:

- *Setting concrete, actionable goals is indispensable* for basic science communication and engagement [Besley & Dudo, 2022]. This exercise requires that communicators think beyond the ideas of sharing information with audiences or eliciting wonder. They must determine the change they want to see in others (or themselves) that results from efforts to communicate and engage. Certain communication goals, like encouraging young people to pursue science majors and careers, may play to the strengths of scientists focused on basic research [Besley & Dudo, 2023]. We suspect that articulating any communication goals tends to be more challenging for scientists whose focus is basic research, compared to applied scientists. [Budenholzer, Sawyer, Borchelt & Smith, 2023; Hendricks & Fond, 2023].
- *Understanding emotions that concepts evoke in audiences* can help communicators develop strategies to connect with them. In the U.S., scientists and non-scientists feel differently about science [Volpe, 2023]. Publics surveyed largely equate science with hope; they are more payoff-minded and see science as a path to better lives. Scientists, however, feel more joy; they are more process-minded and love the work they do. The hope/joy divide appears to be more pronounced when comparing publics with scientists focused on basic research [Newman et al., 2019]. This suggests that communicators of basic science need to work diligently to learn their audiences' interests in and feelings about science before they embark on a communication venture.
- *Curiosity is a valuable currency* for sparking initial connections with audiences. It is a top motivator for interest in science among adults in the U.S. [Volpe et al., 2022]. However, research suggests there's no universal way to prompt a jaw-dropping reaction in audiences. Awe, which many communicators try to elicit because they feel it can generate curiosity about science, is a learned emotion that emerges from repeated exposure in one's culture and lived experience [Silva Luna & Bering, 2021]. Beyond curiosity, wonder, or awe, fostering connections to people's non-science interests or removing barriers around belonging and identity for marginalized communities might be needed to bring about lasting connections to science [Volpe et al., 2022].
- *Make science relevant* for audiences, as it is a mainstay of science communication strategy. Relevance for basic science is often assumed to be synonymous with utility—identifying and talking about potential applications of the work—but it is so much more. Understanding the full nature of relevance is especially important for communicating basic science [Feliú-Mójer, 2022]. Explaining potential applications is key when communicating to certain audiences, such as policymakers [Persons, 2019]. But this utilitarian framing is only one way to connect with audiences. It can alienate would-be communicators who see it as antithetical to the nature of basic research. Moreover, this framing is limiting from a conceptual standpoint. Relevance is connection with people—their interests, concerns, cultures, identities, and more.

- *Distinguishing basic research from applied research may not always be useful* [Hendricks & Fond, 2023]. Surveys in the U.S. suggest that few scientists do basic research exclusively. Furthermore, the term "basic science" may not be familiar to many audiences. Providing additional context about the nature of the basic research can equip non-scientists to provide their opinions about it [Funk & Strauss, 2018], though they may not give unconditional support [Tyson, Kennedy & Funk, 2021].

We are grateful to the *Journal of Science Communication* for pursuing this special issue. To use a basic science communication metaphor (and with apologies to Star Trek), SciPEP has probed our solar system and a bit of our galaxy, but we know a whole universe exists out there. We have more questions than answers, and we are appreciative of the community of experts eager to find answers, and to boldly go where no basic science communicator has gone before. We acknowledge that the community has more ideas than funding opportunities and test spaces to pursue them – but we see this changing. We see a path forward that involves forging more partnerships between scholars who study science communication and practitioners of basic science communication.

We would like to thank the editors and the entire team at *Journal of Science Communication*, as well as all contributors to this special issue, for their hard work. Get ready. Get set. Go explore the expanding universe of basic science communication!

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