Building Bridges, Earning Trust: The WHY and the HOW of Public Trust in Science

A Report by the
Aspen Institute Science & Society Program

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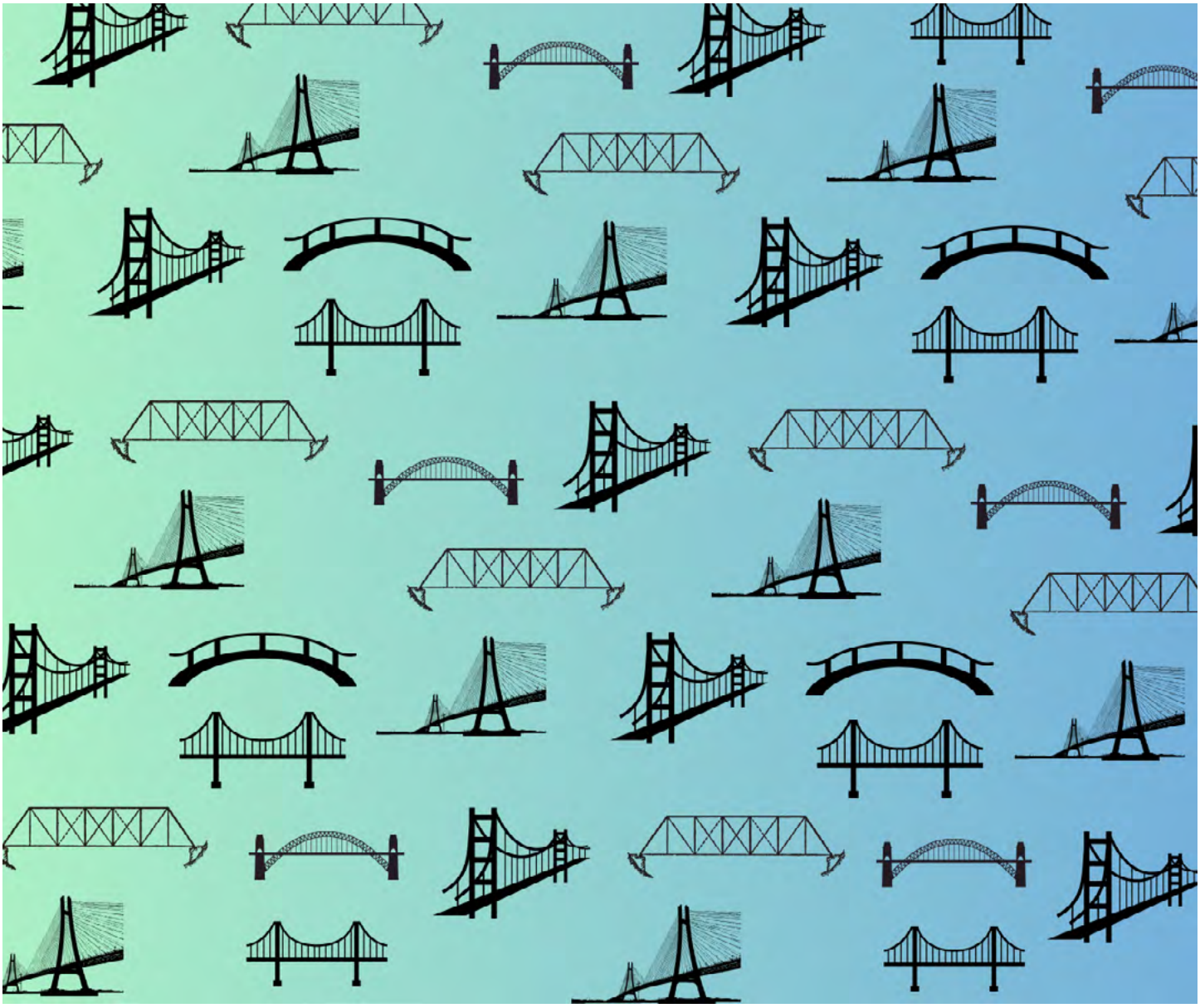

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The Aspen Institute Science & Society Program serves as a laboratory to test ideas and approaches that catalyze community leaders, current and future scientists, and the general public. Led by a core staff of trained scientists, the program is an early responder to emerging trends and is on the pulse of critical issues at the intersection of science and society.

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Editors' Note

"Trust" is a critical concept that has been described as being the "glue" of life[1]— holding societies, organizations, and the relationships within, together.[2] Often dependent on context and academic discipline,[3] there is no universally accepted definition of trust.[4] Common elements across definitions, however, are "perceived benefits and risks, uncertainty, credibility, and vulnerability."[5] While a long-standing topic of interest, there has been increasing attention and evaluation of *trust in science*; though trust in science has naturally ebbed and flowed over time, it has risen to the forefront of the national public conversation in the wake of the COVID-19 pandemic. Here, science is defined as "the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence."[6]

Public trust is one of three core pillars at the Aspen Institute Science & Society Program. In April 2023, we convened a diverse group of multi-sector experts to foster a candid, open conversation around the '**why**'—both why trust in science is important and also why levels of trust in science are variable. To translate these observations into action, a '**how**' discussion followed in October 2023 with a focus on identifying concrete strategies to build and sustain trust in science. When organizing this second roundtable, we prioritized bringing together representatives from sectors that participants in the first, more theoretical roundtable identified as needing to be more included in conversations about public trust.

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1. Covey, S. R., & Merrill, R. R. (2006). *The speed of trust: The one thing that changes everything*. Simon and Schuster.
2. Amaral, G., Sales, T. P., Guizzardi, G., & Porello, D. (2019). Towards a reference ontology of trust. In On the Move to Meaningful Internet Systems: OTM 2019 Conferences: Confederated International Conferences: CoopIS, ODBASE, C&TC 2019, Rhodes, Greece, October 21–25, 2019, Proceedings (pp. 3–21). Springer International Publishing.
3. Ibid.
4. National Academies of Sciences, Engineering, and Medicine (2015). Trust and confidence at the interfaces of the life sciences and society: Does the public trust science? A workshop summary. National Academies Press.
5. Ibid.
6. Science Council (n.d.). Our definition of science.

This report, which is freely available to members of the scientific community and the public whose trust we seek to earn, represents a summary of the two discussions. Our aim is to synthesize and share perspectives from the roundtables as a whole rather than to attribute any quotations or viewpoints to specific individuals. Participants are listed below (alphabetically by last name):

- **Lori Rose Benson, Dr.P.H. candidate** – Executive Director and CEO, *Hip Hop Public Health*
- **Luciana Borio, M.D.** – Senior Fellow for Global Health, *Council on Foreign Relations*; Venture Partner, *ARCH Venture Partners*; former acting Chief Scientist, *U.S. Food and Drug Administration*
- **Dorothy Chou, M.St.** – Head of Public Affairs, *DeepMind*
- **Elizabeth Christopherson** – President and CEO, *Rita Allen Foundation*
- **Francis Collins, M.D., Ph.D.** – former Director, *National Institutes of Health*; Acting Science Advisor to the President, *The White House*
- **Cary Funk, Ph.D.** – former Director of Science and Society Research, *Pew Research Center*
- **Melissa Heidelberg, M.S.** – Global Bioethics Lead, *Takeda*
- **Peter Hotez, M.D., Ph.D.** – Dean for the National School of Tropical Medicine, *Baylor College of Medicine*
- **Julia MacKenzie, Ph.D.** – Chief Program Officer, *American Association for the Advancement of Science (AAAS)*
- **Shirley Malcom, Ph.D.** – Senior Advisor and Director of SEA Change, *American Association for the Advancement of Science (AAAS)*
- **Lee McIntyre, Ph.D.** – Research Fellow, *Center for Philosophy and History of Science at Boston University*; author of *How to Talk to a Science Denier*, *The Scientific Attitude*, and *Post-Truth*
- **Ted Peters, Ph.D., M.Div.** – former Interim Dean, *Graduate Theological Union*; former Interim President, *Pacific Lutheran Theological Seminary*
- **Phyllis Pettit Nassi, M.S.W.** – Prevention & Outreach as Manager of Special Populations and Native American Outreach, *Huntsman Cancer Institute*
- **Bonnie Newsom, Ph.D.** – Coordinator for Knowledge Transfer Co-Lead, *Center for Braiding Indigenous Knowledges in Science*; Associate Professor of Anthropology and Faculty Associate, *Climate Change Institute, University of Maine*
- **Jenny Reardon, Ph.D.** – Professor of Sociology and Founding Director of the Science and Justice Research Center, *Department of Sociology, University of California, Santa Cruz*
- **Christopher Reddy, Ph.D.** – Senior Scientist, *Department of Marine Chemistry & Geochemistry, Woods Hole Oceanographic Institution*; author of *Science Communication in a Crisis: An Insider's Guide*
- **Annette Schmid, Ph.D.** – Senior Director, Global Science Policy, *Takeda*

- **Jayshree Seth, Ph.D.** – Corporate Scientist and Chief Science Advocate, *3M*
- **Nancy Shute, M.S.L.** – Editor in Chief, *Science News*
- **Alec Tyson** – Associate Director Science and Society, *Pew Research Center*
- **Chris Volpe, Ph.D.** – Executive Director, *ScienceCounts*
- **Reuben Warren, D.D.S., M.P.H., Dr.P.H., M.Div.** – former Professor and Director, *National Center for Bioethics in Research and Health Care, Tuskegee University*; former Associate Director for Minority Health, *Centers for Disease Control and Prevention (CDC)*
- **Anonymous journalist** specializing in health reporting

Featured artists

Headings and Page 17: Elena Kuchko

Page 11: Ananth Pai

Page 13: Anders Jilden

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Executive Summary

Despite the organization of the two cross-sector roundtables around the themes of 'why' and 'how,' the discussions inevitably intersected, revealing several related takeaways:

- **Understand that trust in science is a high-stakes issue area**, with tangible consequences to life and death as well as the state of democracy. Ultimately, the goal is for individuals and communities to view science as a tool for public good.
- **Begin with trustworthiness**, which is a precursor to trust. People have differing webs of belief, but these are typically tied to shared values such as family, freedom, justice, and love that give scientists and scientific institutions a reason to be trusted if genuinely incorporated into their work. Once earned, trust cannot be taken for granted, but rather should be viewed as a long-term investment.
- **Prioritize the trustworthiness of scientists themselves**. Important considerations include transparency about scientists' value systems, allowing scientists to bring their whole selves to their work, making scientists accessible and relatable to members of the public, and thinking more inclusively about people who contribute to science without holding a formal position in science. At the same time, recognize the value of professional expertise. In other words, scientists have their own expertise, and communities have their own expertise fueled by their own lived experiences.
- **Embrace changing science** as a sign of a continued knowledge acquisition within a field that is responsive. Normalize corrections in professional scientific circles.
- **Be mindful of the historical harms** inflicted by science and scientists, at both the local and broader levels. Often, these impacts are repeatedly shouldered by the same subset of communities. Harms may look different, from attacks on one's body to attacks on one's knowledge systems.
- **Steer clear of a one-size-fits-all approach**. Different groups (by race, by religion, and so forth) have their own reasons for not trusting science. In fact, some groups may already be highly trusting of science. At the same time, not every scientific question is similarly divisive. Instead of focusing on science as a broad concept, channel energy into bridging understandings on specific scientific issues that are flashpoints of conflict.
- **Work locally and identify local champions**. Follow their lead in culturally tailoring and customizing approaches to collaborating with specific groups.
- **Recognize that communities have limited bandwidth** and have other basic needs that must be met. To this end, provide compensation where possible and meet people where they are.
- **Move out of institutional silos**. Initiate active and ongoing collaborations with fields that bring new insights, for instance political science, theology, history, and business. Historically, the role of the social sciences has been overlooked in science communication.

- **Focus on deliberate disinformation**, which is highly organized and produces victims. Core strategies for combatting disinformation include connecting local journalists with scientists, cracking down at the point of amplification, and creating an emotionally appealing counter-narrative. Still, misinformation and genuine confusion are also important sources of distrust.
- **Teach science as an ongoing, evolving endeavor** instead of an outcome that is 'done.' This is true of science education in both formal and informal settings. Consequently, utilize alternative mediums where public can learn about science, how to communicate about science, and way to share about science beyond just peer-reviewed journals.
- **Create the conditions for retention**, not just pathways to entry, for underrepresented voices in the sciences.
- **Distinguish between communication**, which tends to occur after the fact, and true co-creation.

CHAPTER I: WHY

Moving beyond theoretical conversations

The roundtable discussion opened with participants framing the conversation around trust in science within the context of the United States. In doing so, they immediately presented a failure to build trust in science as an issue having the most tangible of national consequences. As one participant with professional interests in drug and vaccine delivery argued, "the stakes are much higher than they used to be," with anti-science aggression killing Americans in ways that merit as much attention as any other deadly societal force. Others agreed, noting that society is at a critical juncture and that without action, a lack of public trust is likely to be amplified. It was emphasized that a lack of trust in science not only concerns those who have died as a result, but those who continue to be harmed.

At the same time, participants agreed with historian of science, Naomi Oreskes, in noting that trust in science is not necessarily in freefall.[7] Rather, it is normal for trust to fluctuate over time. Instead, experts across both roundtables emphasized that what isn't working is trust in science across diverse sectors and publics. The question then becomes: How do we increase public trust in science for specific groups? Answering this question requires identifying and committing to partnering with specific communities in sustainable ways.

Moreover, while historical examples of the complex relationship between science and society abound, the pace of science today is unprecedented. As the speed of innovation continues to increase, the dynamics around science have implications that will reach far into the future, informing approaches to emerging challenges. Experts in the roundtable agreed that the purpose of pushing back on the forces that hamper trust in science is not to impose information on others but rather to engage with them. That is, as a group who feels that science can help find solutions to the most difficult of issues, they asserted that it is imperative to move forward in ways that work for everyone, not just scientists.

Specifically, the conversation was largely informed by the recent successes and perceived shortcomings of the scientific community with regards to the COVID-19 pandemic. On the one hand, scientists diverged from historical practices of biospecimen work and garnered the trust of American Indian, Alaska Native, Black, and Latino/a/x communities during clinical trials and vaccination efforts through the National Institutes of Health (NIH)'s Community Engagement Alliance Against COVID-19 Disparities. On the other hand, vaccine hesitancy persisted into the later Delta and Omicron waves of the virus—a time when immunizations were freely available—translating to over 234,000 preventable deaths[8] concentrated in specific areas of the country, disproportionately occurring in the South.[9]

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7. Oreskes, N., ed. Macedo S. (2019, October 22). *Why Trust Science?* Princeton University Press.
8. Amin, K., Ortaliza, J., Cox, C., Michaud, J., & Kates, J. (2022, April 21). COVID-19 preventable mortality. KFF.
9. Stoto, M.A., Schlageter, S., & Kraemer, J.D. (2022, April 28). COVID-19 mortality in the United States: It's been two Americas from the start. *PLoS ONE* 17(4).

As society grapples with other pressing issues such as climate change, many of which have impacts that fall disproportionately on marginalized communities, participants stressed that society must move to a place where science can be seen as an empowering "tool." In other words, communities ought to have access to trusted information so that they are well-equipped to address societal problems such as environmental justice.

As one participant noted, "we should not expect trust until we have worked to earn it," a long-term challenge that must also include the maintenance of trust once it has been built.

Differentiating between misinformation and disinformation

Most participants agreed that critical aspects of the science 'infodemic' can be traced to intentional bad actors causing denial and pain through disinformation as opposed to misinformation. According to the American Psychological Association, "Misinformation is false or inaccurate information—getting the facts wrong. Disinformation is false information which is deliberately intended to mislead—intentionally misstating the facts."[10] As one participant explained based on their research, the "point of disinformation is not just to get you to believe a falsehood. It's to polarize you, to make you think that the people on the other side—the people who are telling the truth, are your enemy, even to hate them, to make physical threats against them." This is particularly visible in the case of disinformation spread by foreign governments, aimed at turning Americans against their domestic institutions.[11]

10. American Psychological Association (n.d.). Misinformation and disinformation.
11. Broad, W. J. (2021, June 16). Putin's Long War Against American Science. *The New York Times*.

Though disinformers have impacted trust in a range of scientific disciplines, participants noted that actors from flat-earthers to evolution objectors and from climate change deniers to vaccine opponents employ similar (flawed) reasoning strategies. In reference to COVID-19 vaccine disinformers, one participant summarized these groups as cultivating an "organized, well-financed, and politically motivated ecosystem that deliberately targeted individuals." Using the public health crisis to their advantage, such campaigns managed to strengthen their influence at a time when federal science agencies were faltering.

The organized nature of disinformation prompted roundtable participants to identify targets of these campaigns as victims. Importantly, victims do not have a facts deficit but rather a trust deficit, which prevents the further flow of information. In many circumstances, so-called 'science deniers' will present or refer to 'research' to justify their false assertions, expecting science advocates to refute each piece of their evidence before listening to the other side. Dynamics like these, particularly when coupled with a defensive approach from scientists, challenge the possibility of calm and respectful listening and engagement. Not to be overlooked is the role of other scientists in creating informational problems, particularly those who lack transparency in their methods and whose results are not challenged by other members of the scientific community.

At the same time, other participants reminded the group that when it comes to complex and rapidly evolving topics, a portion of mistrust stems from genuine confusion rather than misinformation or disinformation. A call for empathy is supported by data from the Pew Research Center, in which 60% of surveyed U.S. adults said they have felt confused about interpreting COVID-19-related guidance in light of changing public health recommendations.[12] Moreover, people hold competing interests such as small-business ownership or an inability to take time off of work that likely shaped their approaches to such guidance.

Identifying where trust falls apart

The other side of the disinformation coin

Although participants acknowledged the contributions of disinformation campaigns to the breakdown of trust in science, their collective experiences engaging with patients and other members of the public also shed light on the fact that disinformers and their victims see the same elements—organized, financed, and interested—as applying to a pro-science 'agenda.' In effect, a key barrier to building trust is that the debate has evolved into a head-to-head competition. Not helping the cause is the reality that, in the view of one participant, experts "tend to be absolutely the worst possible representative sample of the general public in that area of expertise."

Another participant contextualized the dislike of science using a conversation with their young daughter, who explained to them that "art and science are both subjects in grade school. When you grow up nobody tells you [that] you should like this art…but you do that with science. That's why people don't like it." As the same participant continued, "Think about it. It's all it is for people. It's

12. Tyson, A., & Funk, C. (2022, February 9). Increasing Public Criticism, Confusion Over COVID-19 Response in U.S. Pew Research Center.

a subject they had in grade school. Now you're suddenly telling them everybody has to go see the Mona Lisa. Everybody has to do this, and how we will all react to that. That's the humbling thought."

Differing webs of belief

The powerful metaphor of a web of belief is credited to 20th-century philosopher Willard Van Orman Quine. In brief, an individual's convictions can be visualized as smaller threads of belief that intersect with one another in specific ways, with the understanding that people naturally resist information that does not conform to their current web. However, the specific structure of the web is important to consider. The nodes closest to its center represent the beliefs a person is most attached to. Hence, each person is wired by cognitive bias to reject information that attacks their nodes, whereas facts challenging one's peripheral beliefs are more likely to be listened to and accounted for. As difficult as it can be to navigate differing webs of belief, participants pointed to one piece of good news: these webs do not float in space but instead are attached—be it in different ways—to significantly shared values such as family, freedom, justice, and love.

Building on this metaphor, one participant held the perspective that Americans view science as a commodity which they evaluate as good or bad based on how its aims are aligned with or orthogonal to their values rather than based on the quality of its scientific methods alone. Global research into the public perception of science confirms the importance of accounting for these pre-existing beliefs. As research from one participant's organization found, roughly 45% of adults surveyed pre-pandemic, across developed and emerging countries, said they only believed in science that aligned with their personal beliefs.[13]

13. 3M (2019). State of Science Index: 2019 Global findings.

Failure to organize a message

Despite the perception of science as an organized agenda by its deniers, conflicting messages from different scientific authorities have a role in prompting the distrust of science. Participants expressed concern that if the scientific community itself lacks a basic consensus understanding of the topic at hand, how can one expect to send a cohesive message that will then be accepted and interpreted by diverse audiences, including over 570 Federally Recognized Tribes with their own languages and cultures? This is not to say that scientists should not be critical of each other's research—in fact, the continuous questioning of the world and the existing body of knowledge is a core tenet of the scientific method—but rather to suggest that these alternative discourses should be used to caveat an otherwise unified message.

Once again, how the pandemic was handled highlights the need for consistent and well-updated guidance. Participants praised the National Institutes of Health (NIH) but listed the Centers for Disease Control and Prevention (CDC) and Food & Drug Administration (FDA) as federal institutions that have traditionally gotten it right but which failed to do so during the crisis, thereby contributing to public confusion. In some instances, scientific organizations acknowledged a lack of data but chose to proceed with COVID-19-related recommendations in order to put out a simplified message, a dangerous departure from past precedent. As another example, various cancer and health organizations have been known to publish inconsistent mammography guidelines,[14] which can put patients at risk.[15]

Historical harms

A current lack of trust in science cannot be understood without invoking the memory of historical wrongs such as the U.S. Public Health Service Syphilis Study at Tuskegee Institute against hundreds of Black men during the 1930s.[16] Of note is the reality that the burden of these harms is unduly and repeatedly borne by the same communities. Given these traumas, one participant suggested that "our science community has higher levels of trust than we likely deserve given the interaction of science and medical communities with people of color."

It was also noted that it is possible for people to have high trust in science while still feeling divided about it. For instance, the American public welcomed several benefits of science during the 1960s, but also came face-to-face with dangers of science including the thalidomide birth-defect crisis and exposure to Agent Orange as a tactical herbicide, not to mention the deployment of the atomic bomb only years before and the later partial meltdown of the Three Mile Island power plant.

Even in the present day, modern science is often perceived as holding a condescending view of traditional knowledge, such as that passed down within Indigenous communities. Moving forward, the scientific community must work from a perspective of cultural humility and inclusion.

14. Park, A. (2023, May 16). Mammogram Guidelines Are Changing. But They're Still Controversial Among Doctors. *Time*.
15. Dougherty, C. (2023, July 6). Inconsistent Breast Cancer Guidelines And Costly Diagnostic Screening Put Women At Risk. Health Affairs.
16. Tobin, M. J. (2022). Fiftieth Anniversary of Uncovering the Tuskegee Syphilis Study: The Story and Timeless Lessons. *American Journal of Respiratory and Critical Care Medicine* 205(10): 1145–1158.

Science as fact versus science as policy

It was acknowledged that science itself is usually a much more neutral topic than policy, with the debate turning heated at the point of implementing policy. In these situations, the public has a tendency to weigh the expertise of scientists directly against the expertise of policymakers rather than to pair the two in a complementary effort. "There's a sense that the policy views or the ideological views of the people making policy decisions are at least as powerful as the scientific facts driving those decisions," shared one researcher. The ability to formulate a cohesive scientific message is particularly important here so that science and policy can inform one another rather than drive a further wedge in an already divided society.

Roles of science in a democracy

As part of moving beyond theoretical conversations, members of the roundtable situated the discussion in terms of the limits, possibilities, and roles of science in a democracy. Such a framing prompted deep questions around how democratic systems govern themselves, what authority scientists—and by extension, medical professionals—should hold in the biomedical age, and trust in institutions more generally. The insights spurred by these reflections are particularly important given the ideological polarization of the nation, on topics of science and beyond.

Returning to a participant's previous assertion that disinformation is a means to polarization, who benefits from creating "victims of weaponized chaos"? In a federal system with divided powers, science has the capacity to act as a unifying force that drives forward a vision. Therefore, those who seek to separate are motivated by the opportunity to implement their own agendas.

As one participant shared, citizens' organizations like Braver Angels are currently creating space for the exploration of scientific trust through the specific lens of political polarization. Their insights from engaging in the organization's sessions on public health included the understanding that many people view science and the policies that it informs as trampling on their liberties.

In particular, demographic information suggests that rural "victims of far-right aggression"—the phrasing favored by roundtable participants to communicate that these members of society have been targeted rather than failed on their own terms—tend to be white, young, Republican, have low educational attainment, and do not normally receive the influenza vaccine each year.[17] Research also suggests that "[in] counties with a high percentage of Republican voters, vaccination rates were significantly lower and COVID-19 cases and deaths per 100,000 residents were much higher."[18]

One participant suggested that another way politics influences trust in a polarized society is through the conservative view of scientists as liberal agents.[19] Although older survey data from 2009 and 2014 did not reveal a perception of scientists as ideologically biased,[20] it is an important measure to continue tracking given that scientists' social identities influence the way they are perceived by the public.[21] Additionally, more recent studies analyzing political contributions have found that American scientists do lean more liberal than the general population,[22] lending credence to conservative concerns in cases where a scientist's biases muddy the scientific method.

Within this political context, the vaccine debate has developed from one that concerns false causal assertions related to autism spectrum disorder[23] to a hallmark of medical freedom that has been advanced by Republican-affiliated PAC money.[24] Though one expert cautioned against blaming the media, another participant took a slightly different position, criticizing specific politicized media figures on Fox News due to their active promotion of anti-vaccine disinformation in ways that they felt were not the case for outlets. The House Freedom Caucus, Senator Ron Johnson's roundtables with the "vaccine injured,"[25] and far-right think tanks that use academics as a cover for their political motivations were similarly criticized.

Paraphrasing insights from writer Elie Wiesel and bishop Desmond Tutu, the same participant com-

17. Kirzinger, A., Sparks, G., & Brodie, M. (2021, April 9). KFF COVID-19 Vaccine Monitor- Rural America. KFF.
18. Albrecht, D. (2022, January 14). Vaccination, politics and COVID-19 impacts. *BMC Public Health* 22(96).
19. Jewett, A. (2020, December 8). How Americans Came to Distrust Science. *Boston Review*.
20. Kennedy, B., & Funk, C. (2015, November 9). Majority of Americans say scientists don't have an ideological slant. Pew Research Center.
21. Nauroth, P., Gollwitzer, M., Kozuchowski, H., Bender, J., & Rothmund, T. (2016, February 22). The effects of social identity threat and social identity affirmation on laypersons' perception of scientists. *Public Understanding of Science* 26(7): 754–770.
22. Kaurov, A. A., Cologna, V., Tyson, C., & Oreskes, N. (2022, October 13). Trends in American scientists' political donations and implications for trust in science. *Humanities and Social Science Communications* 9(368).
23. Centers for Disease Control and Prevention (n.d.). Autism and Vaccines.
24. Molteni, M. (2018, November 5). How Antivax PACs Helped Shape Midterm Ballots. *WIRED*.
25. Sen. Ron Johnson Hears from Experts and Medical Professionals on COVID-19 Vaccine Efficacy and Safety. (2022, December 8). Ron Johnson.

mented, “sometimes neutrality favors the aggressor or the tormentor and that’s what I think we’re doing. We’re so afraid to talk about this politicization that we normalize the victims.”

Acknowledging and embracing scientific uncertainty

Amid a recognition of the confusion created by rapidly changing public health guidance throughout the pandemic, participants shared the view that scientists need to be transparent about their work, including by embracing limitations and uncertainties. As participants noted based on their personal experiences, debates ease up when scientists own up to their uncertainty, while past events have shown that an approach driven by the logic of not admitting uncertainty was unsuccessful. Instead, such high-mindedness promotes a vision of scientists as whitecoat elites who are removed from the concerns of the general public. In fact, one global survey from 2018 found that 58% of adults believed scientists to be elitists.[26]

Rather than position science as an immediate panacea, scientists must learn to communicate to the public that the promise of science is to provide a truth today and a better truth tomorrow as new evidence emerges. This flexible ethos, summarized as the “scientific attitude,” can be positioned as a strength rather than a weakness of the discipline and as lending a logical explanation of how outdated guidelines differ from lies.

One participant shared their thoughts on this flexibility in a pre-roundtable email to the group, writ-

26. 3M (2019). State of Science Index: 2019 Global findings.

ing that "not just 'the public' (whoever that is) but scientists themselves need to become more literate about science, and recognize that it is a social institution, and like other institutions it needs to always work on its accountability and its ability to respond (or response-ability) to the diverse forces and interests that shape it."

The discussion also arrived at the consensus that humility is one of the biggest keys to bridging the scientific trust divide. As one community-engaged research advocate summarized, "If we don't change, the trust in us is not going to change."

This humility involves accountability for one's mistakes and an acknowledgement of the inherent cognitive biases among key actors in science and society, including science advocates. Take for example the seeking of information that confirms one's studies rather than provides a bigger picture. While the scientific process and the diversification of research groups have an important role in catching these mistakes, they cannot fully counteract bias because it is embedded in the valuable lived experiences that people bring to the table.

These issues are often tightly linked to 'do-good' feelings that must be set aside in an attempt to not betray intuition, data, and genuine community concerns. While being attacked for a scientific project that has been criticized as problematic can prompt complicated feelings for the involved scientists, participants highlighted that it is best to proceed with humility and ask honest, constructive questions about where these accusations stem from. With this in mind, it is also crucial that scientists do not approach victims facing hardships that were preventable using science from an 'I-told-you-so perspective.'

Partnering across communities and disciplines

Scientists' best chance for building trust is through communication channels in which the messenger shares world views, values, and/or ideologies with the audience. As things stand, the institutions of science tend to disseminate information in a top-down fashion, leading to the impression that scientists are "talking heads" rather than fellow humans and citizens. Since intimate conversations risk

turning into elitist lectures as they scale, it is necessary to promote numerous, deep partnerships at community and disciplinary levels.

Participants identified the "exhausted middle"—a term originating from the framework of attorney and political commentator David French—as the most important group to reach and empower. In this model, the country can be understood as two polar Americas, with a third group in the middle that is still searching for the trusted information to piece the U.S. back together. Relaying this information will require trusted messengers whose approaches to communication are tailored to the needs of different communities, along with a willingness to meet people where they are.

As focus groups hosted by one participant's organization revealed, young people are keenly interested in science but want to be engaged in spaces they are comfortable with rather than traditional journalistic outlets. Among these spaces are social media platforms, which U.S. adults under age 30 trust nearly as much as traditional national news.[27] With the understanding that many posters on social media tend to be those without verified facts, there are new opportunities for scientists to provide accurate, actionable information via these platforms.

It was made clear that despite the urgency of building trust, this must be a long-term commitment. Meaningful participation and the co-creation of knowledge are processes that do not allow for shortcuts. Roundtable participants expressed concerns that without patient, deliberate, and respectful engagement, the scientific community will risk being perceived as planting ideas in people's heads.

The work ahead will require a deeper understanding of the behavior of rural and frontier populations, as the disparities in science engagement are not just racial and ethnic but also geographic. For instance, rural communities are often news deserts *and* STEM deserts. In either case, it remains imperative that messengers have a connection—or ideally multiple connections—to that community.

The gap between support and non-support of science is often built on social constructs (e.g., values, worldviews, ideology). Aspects of society such as popular culture, power structures, and the distribution of moral labor can be difficult for natural and hard scientists to quantify. Engagement of groups like social scientists throughout the research process was repeatedly called for by participants, especially when working with underserved populations. In order to ask the right questions and communicate the findings in meaningful ways, members of the roundtable proposed active and ongoing collaborations with fields including the following:

Sociology	Provides insight into the social and cultural factors that help individuals formulate their beliefs, as well as how these factors vary across different communities and contexts.
Political science	Sheds light on the institutions and frameworks that govern trust, as well as how disinformation campaigns may fit into an authoritarian playbook.

27. Liedke, J., & Gottfried, J. (2022, October 27). U.S. adults under 30 now trust information from social media almost as much as from traditional news outlets. Pew Research Center.

Communications	Possesses expertise in sharing information with context and relatability. This is particularly important given that public engagement is rarely a focus of higher science training. Instead, scientists may be taught that engaging with journalists or the media is a discouraged form of self-promotion.
Anthropology	Understands how different cultures and communities approach knowledge and expertise, as well as the role of trust and mistrust in social relations.
Psychology (in particular, social psychology)	Thinks about communication to victims who do not know that they have been lied to. Psychologists are also able to provide strategies for eroding trust in disinformers.
History (in particular, history of science)	Brings the nuance of historical context and shows that many contemporary challenges are new manifestations of long-standing issues.
Business	Is equipped to make value propositions, in this case for the value of scientific innovation in society's marketplace of ideas. From a venture capital perspective, if the market does not see the need, it is unlikely to be addressed. In many ways, public audiences are professional consumers who make information decisions by weighing short- and long-term benefits.
Theology	Includes trusted figures who are also familiar with competitive environments of ideas. Rather than pitting science against religion and other belief systems, it is possible to foster coexistence.

Science communication has often overlooked the social sciences despite the usefulness of their frameworks in the natural sciences and hard sciences. One participant, whose organization has been experimenting with covering the social sciences as a science—a practice that is rare in the journalistic community—explained that "social sciences can really be the gateway…to science for a lot of people because they want to know what's happening in their communities and why these things [are] happening to [them]." These people can typically be characterized as members of David French's Third America.

Too often, academic health departments are structured in similarly siloed ways, a reality that was painfully clear during the COVID-19 crisis, which impacted important domains such as economic strength and global security in addition to public health. The Oxford Pandemic Sciences Institute and The Pandemic Institute based in Liverpool, U.K., were referenced as examples of research organizations that are making progress in bridging these disciplinary knowledge bases. Still, few resources exist for the creation of institutional structures that secure spaces for different disciplines to

jointly review and shape science, particularly at the university level where experts are prime candidates for partnership given their shared affiliation.

Earning trust through institutional restructuring

Participants were in clear consensus that distrust is the product of lacking representation, inclusion, and engagement, all of which has been exacerbated by a history of exploitation and marginalization in scientific research. As it stands, the scientific world is the product of straight, conservative, white, and male lived experiences. Such perspectives then give rise to the current scientific questions, research agendas, and objects of experimentation, as well as professional definitions of merit and excellence. While these dynamics are slowly beginning to change, it was stressed that these histories can only be addressed by undoing the structures that have perpetuated them for so long.

In the U.S., 50% of those saying they were discouraged from pursuing science said it was because of their race, gender, or ethnicity.[28] When compared to the global average of 27%,[29] it becomes clear that this is a particular problem in America. Importantly, it is not simply a matter

of bringing these underrepresented groups into the sciences but also one of creating the conditions for their retention.

An inward look at science

This process of undoing includes a critical examination of science itself, for instance the questioning of bad outcomes and so-called knowledge in biological areas that has been produced without drawing representative samples from the general population.

Throughout the roundtable, calls were made for broader definitions of 1) science and 2) institutional structure. To use an example from the discussion, community practices like the customization of lowrider vehicles can be framed as a within-reach application of hydraulics. Likewise, scientists may begin including authors of communities that are being researched in the paper as a concrete act of co-creation.

Incentivizing change

Participants agreed that institutions do not currently give people a reason to trust them. The overhaul that members of the roundtable insisted upon will require transformative change to systems such as granting, government funding, financing, compensation, promotions, and venture capital. At the same time, change must come from the academic culture that is currently driven by such metrics.

One major lever of institutional change is the restructuring of grant requirements. Ultimately, these requirements have the potential to incentivize scientists to incorporate a "boots on the ground" approach to their work, which might involve critical interactions such as explaining the clinical trial

28. 3M (2021, February 11). Celebrating women and girls in science.
29. Ibid.

process and informed consent to community members. One researcher credited the requirement of a three-month education period and the act of giving community members a seat at the table when building grants with creating a visible change in who participates in their organization's clinical trials. As another example, requirements of the Cancer Center Support Grants funded by the National Cancer Institute have changed to include community outreach and engagement components. To reach their fullest potential, the incentives discussed must be supplemented by the active diversification of funding and decision-making bodies. Inclusion ought to be end-to-end, such that community members are not only trial participants but are actively involved in the trial review and rollout process.

One asset of science is its status as a heavily applied discipline (with the exception of pure or blue-sky research). This allows for leverage when dealing with businesses in the scientific supply chain. Put simply, "our world requires innovation. Innovation needs science. Science demands diversity, and diversity warrants equity."

Equitable distribution of the benefits of science

To return to the opening of the report and the messages conveyed by participants throughout the roundtable, a failure to build trust in science permeates both the theoretical—for instance, the question of defining science itself—and the practical—such as Black maternal mortality rates.

The benefits of science are not equally distributed across communities,[30] with members of the roundtable noting that there is a keen public awareness of this reality. As one participant commented in the closing minute of the 'why' discussion, "What's a better driver of trust than a sense of what science has done for your community, right? And so the way I think about the equity question is directly tied to a strategy for improving and growing trust."

30. UNESCO (1999). Declaration on Science and the Use of Scientific Knowledge and the Science Agenda: Framework for Action.

CHAPTER II: HOW

Starting with trustworthiness over trust

A core perspective introduced during the second roundtable was the need to consider the concept of *trustworthiness*, which was described as the predecessor of trust. Stated differently, trust is not something that can be built against the public's will but rather a response to institutions and scientists who can prove themselves to be deserving of this trust. "Start with trustworthiness versus trust, and start with scientists before you talk about the science," summarized one expert.

Listening first and building early relationships

Participants advocated a shift away from the current, top-down model of science communication—in which experts set research agendas and issue findings that are prone to rejection by the public—and toward an early engagement model. Prioritizing listening and being proximate to communities allows for bidirectional conversations and a co-creation approach to knowledge that has historically been lacking in science.

Returning to the earlier question 'How do we increase public trust in science for specific groups?' forces scientists to think deeply about identifying and defining the communities whose partnership will be vital in the long road to trust. One participant shared that their nonprofit focuses specifically on exchanging expertise with policymakers, journalists, faith leaders, and judges by recruiting those with deep experience in these fields to help lead programs within their organization.

It was emphasized that these relationships should be established early on and proactively—rather than on a conditional basis limited to times of crisis—and should be local in a geographic or cultural sense.

One size does not fit all: Making engagement culturally tailored and relevant

Much of the 'how' roundtable discussion focused on adopting approaches that respect the deep-seated cultural reasons communities hold for distrusting science and scientists, including references to those historical harms shared during the 'why' roundtable.

One participant noted that while scientists might silently ask themselves whether a person or community's grounds for distrust are legitimate, this question does not matter because people need to be met where they are. "Some people have skepticism of science because they feel like they've been burned by science, or that the scientist doesn't have their best interest at heart. And so we have to figure out how to handle that, too. Not just the idea that everybody who doesn't trust science is irrational and ridiculous," the participant explained.

Finding champions within the community

Building early and local relationships begins with identifying community members who are willing to communicate their needs with researchers. As one participant noted, communities are diverse in and of themselves and may contain groups who favor, or are opposed to, specific science. For example, though many Indigenous communities share a desire to understand their ancestral heritage, they may disagree on whether the appropriate avenues for doing so are through oral tradition, archaeological excavation, or mixed methods. In these circumstances, consultation is even more critical to striking a delicate balance based on culturally appropriate and culturally sanctioned practices.

One successful community campaign highlighted during the roundtable was the "Panola Project," a personalized effort led by retired Black woman Dorothy Oliver and county commissioner, Drucilla Russ-Jackson, to counter vaccine hesitancy in rural Alabama, resulting in a nearly 99% COVID-19 vaccination rate among residents of Panola.[31] Running the vaccine coordination center from a convenience store located within a mobile home, the Panola Project coupled vaccination efforts with the provision of basic necessities. Another champion spotlighted was Felisia Thiboudeaux, a Black woman in San Francisco who helped vaccinate over 1,500 community members by coupling

31. AlSayyad Y. (2021, August 21). An Alabama Woman's Neighborly Vaccination Campaign. *The New Yorker*.

COVID-19 testing and vaccination efforts with existing services such as hot meals offered at a local community center.[32]

Ensuring relevance and taking a multimedia, multisensory approach

Scientists should confirm that their research is part of an effort to fill real community gaps in knowledge rather than an agenda being pushed on communities. Then, as findings are disseminated, messaging should emphasize this relevance and avoid cultural triggers that can quickly turn people off science.

Meeting people where they are involves both physical and values-based considerations. As an example, youth may be more likely to engage with digital content rather than attend a science conference or read a peer-reviewed article. Similarly, formats such as op-eds, songs, and videos that teach through empathy rather than condescension and which are created by relatable figures are more likely to align with how people want to absorb information about science.

Representatives across sectors at the roundtable proposed rethinking science engagement to incorporate creative strategies such as documentary storytelling, movement, and music. While one participant feared being overly "crafty" with messaging, another expert suggested that strategies from the advertising and marketing world that encourage people to act in specific and often unnecessary ways can instead be used in service of the more educational goal of science messaging.

The same participant highlighted the importance of culturally tailoring and norming these experiences to a particular community, a step which first requires a clear understanding of the community itself. From the perspective of this participant's organization, connecting culturally allows their organization to better capture and maintain precious attention, particularly among youth. For instance, music connects to memory, learning, and recall in unique ways that communications like a journal article does not. This participant's organization has found that the broader culture around music also involves a degree of social norming in the sense that audiences want to be like their favorite artists and so trust the messages they amplify through their lyrics and public appearances.

Successfully incorporating the arts and other creative angles to issues of science requires developing another set of partnerships. As one nonprofit leader explained, engagement is about bringing together "the message, the messenger, the right medium, and the right moment: putting that all together across this systemic framework in an intentional way."

Setting reasonable expectations

Engaging the community is not simply a matter of opening an institution's doors through public talks and expecting people to walk in, explained participants. Instead, scientific institutions and scientists must be active in reaching out and be prepared to have difficult conversations about what they expect from the community and about what the community expects from them.

Additionally, those committed to building trustworthiness and trust in science must be aware of

32. CBS News Bay Area (2021, September 2022). San Francisco Woman Helps Hundreds of People Get Vaccinations.

a community's capacity and bandwidth, which are often tied to social determinants of health and the conditions where people live, work, pray, and so forth. One participant referenced Maslow's Hierarchy of Needs,[33] adding that people's basic needs must be met before they are in a position to fully commit to science.

Even when providing funding, scientists need to ensure they are not overextending community partners. Instead, one participant suggests that scientists ask themselves "How do we weave the science into activities or events that are already ongoing within the community rather than try and draw people from the community to participate in our project?"

Moreover, institutions should understand that trustworthiness and trust take a long time to build and must be continually maintained; trust takes credibility, which takes relationships, which take time.

Combatting disinformation

In the words of one roundtable expert, "disinformation feeds denial," suggesting that combatting disinformation is a strategy to keep people who would otherwise trust sound science from turning against it. Recognizing the vicious cycle created by deliberate disinformation and the well-financed agenda behind it, participants talked through both defensive and offensive strategies.

33. Maslow, A. H. (1943). Maslow's Hierarchy of Needs: A Theory of Human Motivation. Research History (originally published in *Psychological Review*.)

Equipping journalists

Journalists play a large role in shaping the media landscape, yet roundtable participants with backgrounds in media noted that journalists covering science issues often do not specialize on a science beat and nearly always work on tight deadlines. One participant suggested collaboration with news organizations on a "blockchain of facts." Importantly, such a database would need to be continually updated to reflect new knowledge.

Services such as SciLine—a free hotline by the American Association for the Advancement of Science (AAAS)—and the ACS Experts network organized by the American Chemical Society fill this gap by connecting journalists with limited lead times to relevant Ph.D.-level experts. Notably, SciLine incorporates an equity and relationship-building angle as it aims to serve local news organizations and to connect these outlets with scientists who are local to that geographic area. The service also provides journalists with access to resources such as Quick Fact guides on specific topics, a database of grabbable quotes by published science authors, and recorded interviews with experts. The combination of these local and national tools positioned SciLine's model to be recognized during the roundtable as both deep and scalable.

Cracking down on disinformation amplifiers

Intervening in the cycle of disinformation is ultimately easier said than done. While fact checking can help people looking for correct information, it lacks the power to change hearts and minds and therefore tends to be ineffective against media consumers who come in with a bias, explained one media professional in the roundtable.

Though it was acknowledged that disinformation is not confined to the online social media ecosystem, one participant highlighted the role these platforms play in amplifying disinformation. Since disinformation is difficult to stop at the source, they suggested that these nodes of amplification represent the most effective point for intervention.

Multiple participants pointed to the "Disinformation Dozen," a group of 12 prominent social media users identified by the Center for Countering Digital Hate as contributing to 65% of anti-vaccine content on Twitter (now X) and Facebook.[34] Though the Center has received criticism in Congress[35] for its recommendations on how platforms should moderate the spread of disinformation, its analysis provides an example of the concentrated power individual users or a small group can have in spreading disinformation by virtue of the amplification capabilities of social media platforms.

One participant responded that some small-scale "vigilantes" are cropping up to combat disinformation, though the questions of whether this approach should be scaled up and how this would be accomplished remain unanswered.

34. Center for Countering Digital Hate (2021, March 24). The Disinformation Dozen: Why platforms must act on twelve leading online anti-vaxxers.
35. Bokhari, A. (2023, August 30). Jim Jordan Subpoenas Center for Countering Digital Hate, Org Behind Biden's 'Disinformation Dozen.'

Centering an emotional appeal

Communications experts represented at the panel also drew attention to the importance of connecting with audiences on an emotional level rather than through purely intellectual information. For instance, one participant highlighted vaccines as an area where effective storytellers can share insights into why parents chose to vaccinate their children. These types of appeals can be paired alongside expert-informed reporting using resources like SciLine to create a counter narrative to disinformation.

Acknowledging limitations

Concerns were raised that in the ever-evolving digital information space, it will be difficult to move the needle in light of algorithms that determine the information people are served based on their identities.[36] Generative Artificial Intelligence (AI) was also flagged as amplifying information regardless of its veracity.

Focusing on flashpoints

Rather than attempting to build trust in a diffuse sense, experts across both roundtables observed that individuals considered to be 'anti-science' or 'science deniers' often coalesce around well-defined issues that ought to be prioritized by the scientific community.

"We need to formulate those specific areas where we have public conflict and not worry too much about whether people respect science or not, because I think even when they're anti-science, they're showing that they do, in fact, respect it. They use science," explained a participant who frequently interacts with science skeptics.

36. Kupferschmidt, K. (2023, July 27). Does social media polarize voters? Unprecedented experiments on Facebook users reveal surprises. *Science*.

Indeed, several roundtable attendees shared their takeaways from conversations with individuals labeled as 'anti-science,' in which they referenced their own set of 'facts' produced by an 'alternative science.' In general, these vignettes suggested a high regard for the scientific concept and process, undercut by a deep distrust of the scientists behind it. Where those who have been labeled as 'science deniers' are concerned, participants highlighted that engagements must be calm and respectful and will likely require iterative dialogue.

Building trust in scientists

Leading with transparency, values, and intellectual humility

A firm consensus across participants in the 'how' roundtable was that *building trust in science* is in many ways a question of *building trust in scientists*. The public "distrust[s] the outcome because they distrust the people that they're hearing it from…. The distrust in the people is sometimes what drives the distrust in the science," spelled out one participant.

It was suggested during the discussion that scientists are often perceived by the public as operating without a value system. Hence, it was underscored that scientists must be transparent about the values and motivations guiding their work. Moreover, scientists should take care to avoid being argumentative, a quality alienating to others, as it runs counter to the goal of having scientists serve as community resources. Instead, calmness and intellectual humility, particularly by way of transparency about the relationship between science and uncertainty, are important for the public to feel that they can build connections with scientists.

Broadening the definition of scientist

In favoring a more inclusive approach to the production of scientific knowledge, several participants highlighted the disparity between those who do science and those who call themselves scientists. As another expert suggested, there is a shared set of scientific values that brings these groups together. "You don't need a Ph.D. in a lab to have a meaningful, beneficial outcome in a science question," added another researcher.

Multiple experts used the analogy of superpowers, encouraging that a more holistic definition of scientists include STEAM (STEM + Arts). One participant explained that their organization takes a 'both/and' approach to who is at the table, with another participant noting that those who contribute different strengths should be uplifted, as they have great potential to shift the state of trust away from the status quo.

On the other hand, a participant from the second roundtable warned that "egalitarianism ought not to compromise our respect for expertise." The perception of scientists as an elite group—a view highlighted during the first roundtable as contributing to distrust—does not have to be a bad thing, they explained. Instead, they suggested reframing this as a unique elitism driven by legitimate expertise. The participant noted that even medical professionals practice deference among themselves when a topic is not within their field of specialization, and that members of the public similarly defer to experts.

An inclusive approach also means making clear that scientists, like all people, are intersectional and hold multiple identities, including religious and faith identities. In the words of one participant, "if it were clear that one could be a scientist regardless of one's religious commitments, we cease creating this anxiety and this kind of reaction on the part of some religious communities that feel that they're being attacked."

Making scientists accessible

Without a personal connection to professional scientists, it becomes difficult for the public to understand their motivations. Members of the roundtable expressed concern over the reality that many Americans do not know a single scientist.[37]

After reflecting on their experience at a march for science, one participant posed the question "How much better might it have been if that group had gone out to the public schools or made business cards and handed them out at the grocery store so that people could actually meet scientists?"

Normalizing Corrections

Corrections are a natural piece of the scientific process. As new information is discovered, it is in society's best interest that this knowledge is incorporated into prior research, even if it requires updating long-standing beliefs. Corrections, and to some extent retractions, were described as "a

37. Whitlock, S. (2017, February 7). A lot of Americans don't know a single scientist. We need to fix that. *Stat News*.

cornerstone of science" that must be normalized within the scientific community in order to avoid sending disconcerting signals to the public. Self-corrections in particular should be encouraged, according to participants.

"Science isn't a house of cards, where one thing falls down, but rather this infinite jigsaw puzzle that's ever expanding. Once in a while, we might get the wrong piece in, but it usually gets corrected," analogized one researcher.

Advancing formal and informal education about science

Even with the best practices above in mind, education is needed to support their effective implementation and to create a strong foundation for trustworthiness.

Rethinking graduate science education

It was observed that in recent years, science communication training has increasingly become part of graduate science education. At the same time, "we do [students] a disservice to pretend that tacking on a science communication 101 course will change the course of their professional careers," commented one expert.

To remedy this, lessons should be incorporated throughout various components of the curriculum, ensuring that the purpose is not just to teach students how to promote or disseminate research (for example, for the purpose of commercialization), but to encourage genuine public engagement as well. In other words, there ought to be emphasis on a community-based, participatory approach to information sharing.

In addition to communicating about their research, graduate students must also learn how to communicate their values as scientists and help the public understand what it means to adopt a scientific attitude.

Reframing early science education

The need to improve science education begins from the first years of a student's exposure to the scientific process. Young people are budding scientists at their core, yet the education system does a poor job of teaching them how to become scientists, shared experts at the roundtable.

As one participant explained, American education must do a better job of teaching what science is. According to this participant, the current approach is one of "science appreciation." That is, educators teach students that they are lucky to be born in an era where the great discoveries have already been made by geniuses, then give them the task of simply learning about these findings.

Instead, early education should focus on how scientists think: through the lenses of experimentation, uncertainty, and changing one's mind as evidence changes. The same participant reflected on their positive experience with the 'unknowns lab' in their high school chemistry class, describing the challenges and excitement of discovery in this early context.

Reforming institutions of science education

As graduate-level science students are increasingly receiving basic levels of science communication education, participants noted that the same trend has been unfolding in professional science circles.

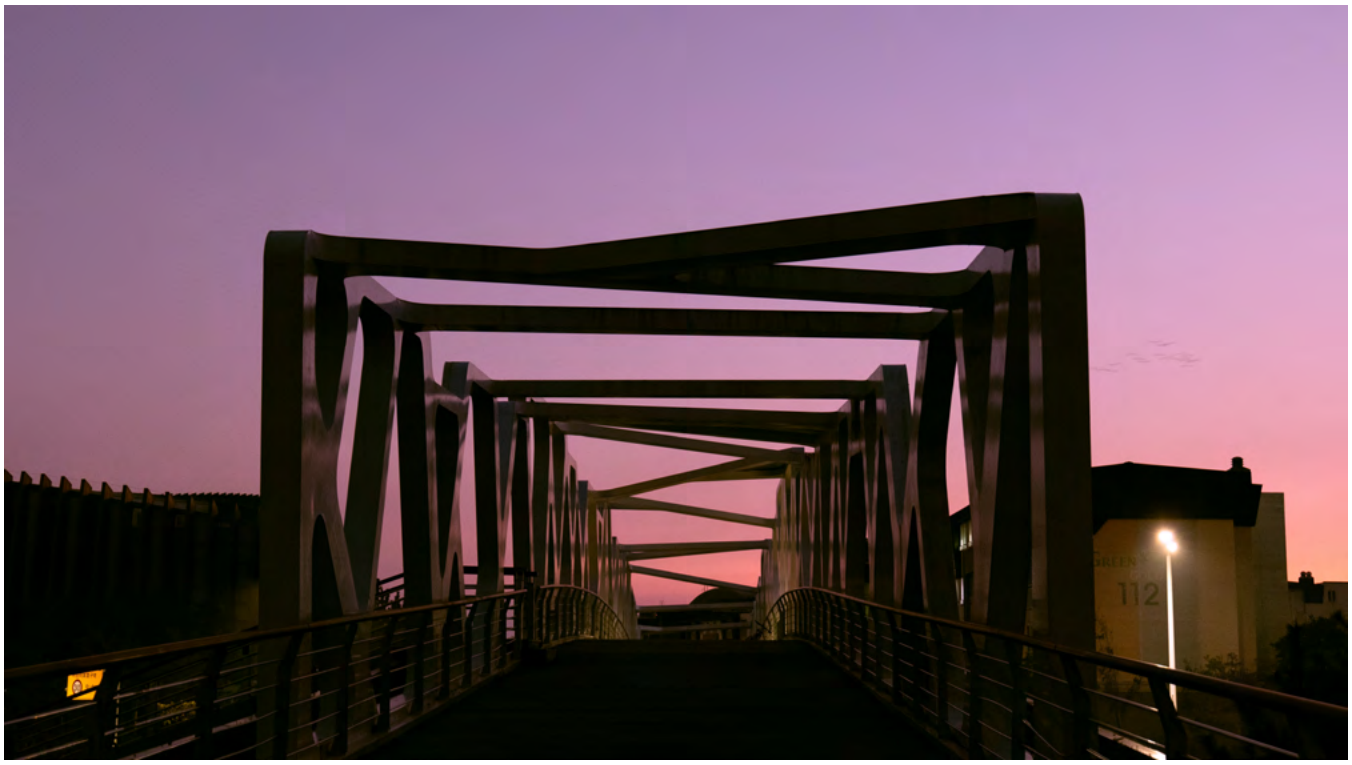
However, one participant emphasized that trainings held on good science communication typically focus on elements such as preparing an 'elevator speech' and avoiding acronyms or the metric system. Instead, focus must be shifted toward first identifying the value systems and cultural perspectives of those who have an interest in science, before worrying about messaging.

Examples of dedicated science engagement and communication hubs shared during the roundtable were the University of Cincinnati Center for Public Engagement with Science and the Alan Alda Center for Communicating Science at SUNY Stony Brook.

Investments in early-career scientists and emerging leaders who consider issues of science in their work are also critical. Whether through fellowships or other forms of support, these types of investments yield long-term transformations with great potential to shape trustworthy institutions and scientists. As a result, institutions must embrace redistribution of power within their organizations and incentivize rather than cast aside scientists who contribute to positive restructuring.

Reflecting on public science education

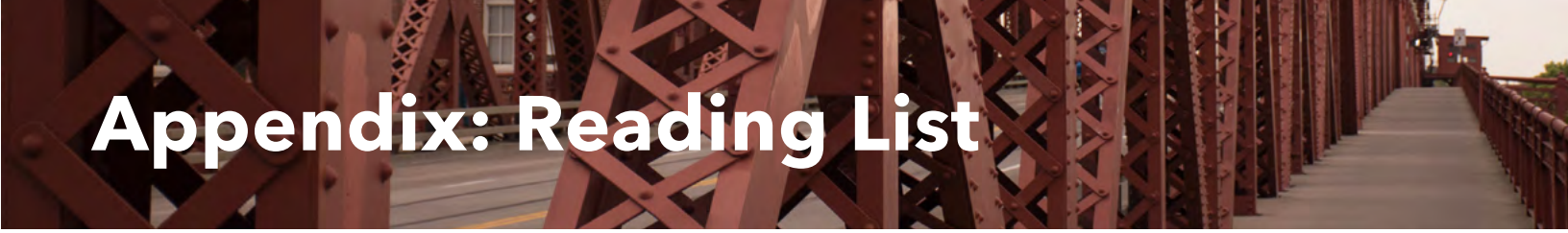
Notably, one participant pushed back on the phrase "public engagement with science" altogether, explaining that it "invokes 'sage on the stage,' which we know and have long known we can't be doing anymore. It invokes all important scientists, and 'if only we could get the public to engage with us.' So, I think what I would invite us to consider is to really challenge ourselves about what the masses of graduate students should be challenged to do as individuals."



Concluding Message

This report is the culmination of ideas and insights from leaders across sectors and disciplines, featuring reflections that shift the conversation from 'why' to 'how.' The goal is for the findings outlined here to foster understanding and change across a similarly diverse set of actors. The topics discussed in these roundtables are complex and evolving; through its ongoing projects, the Aspen Institute Science & Society Program will continue to explore trust in science and related topics in pursuit of its mission to catalyze community leaders, current and future scientists, and the general public to build a better scientific ecosystem, society, and world.

The Aspen Institute Science & Society Program would additionally like to thank Takeda for their support of this project as a 2023 Lead Program Sponsor.



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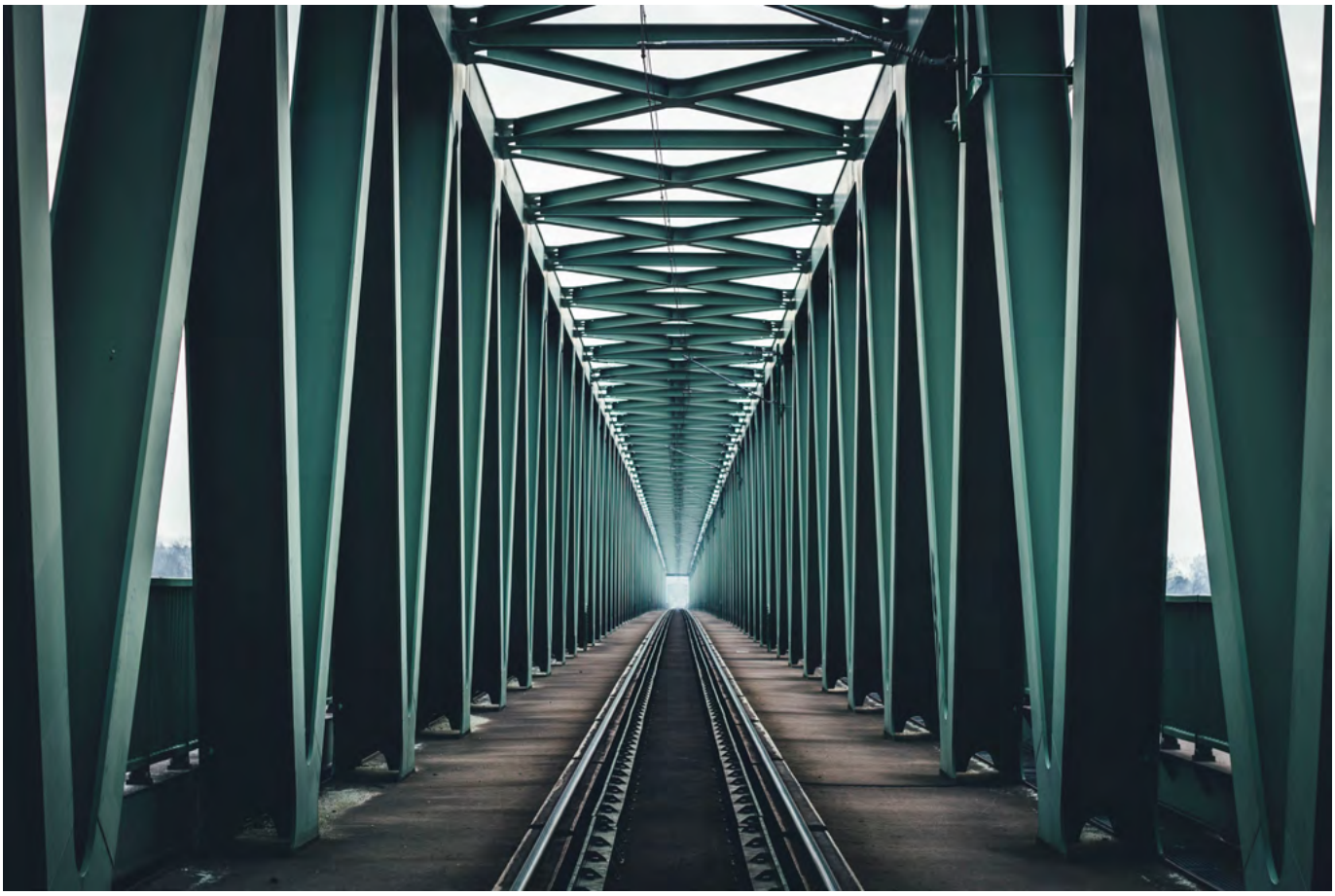

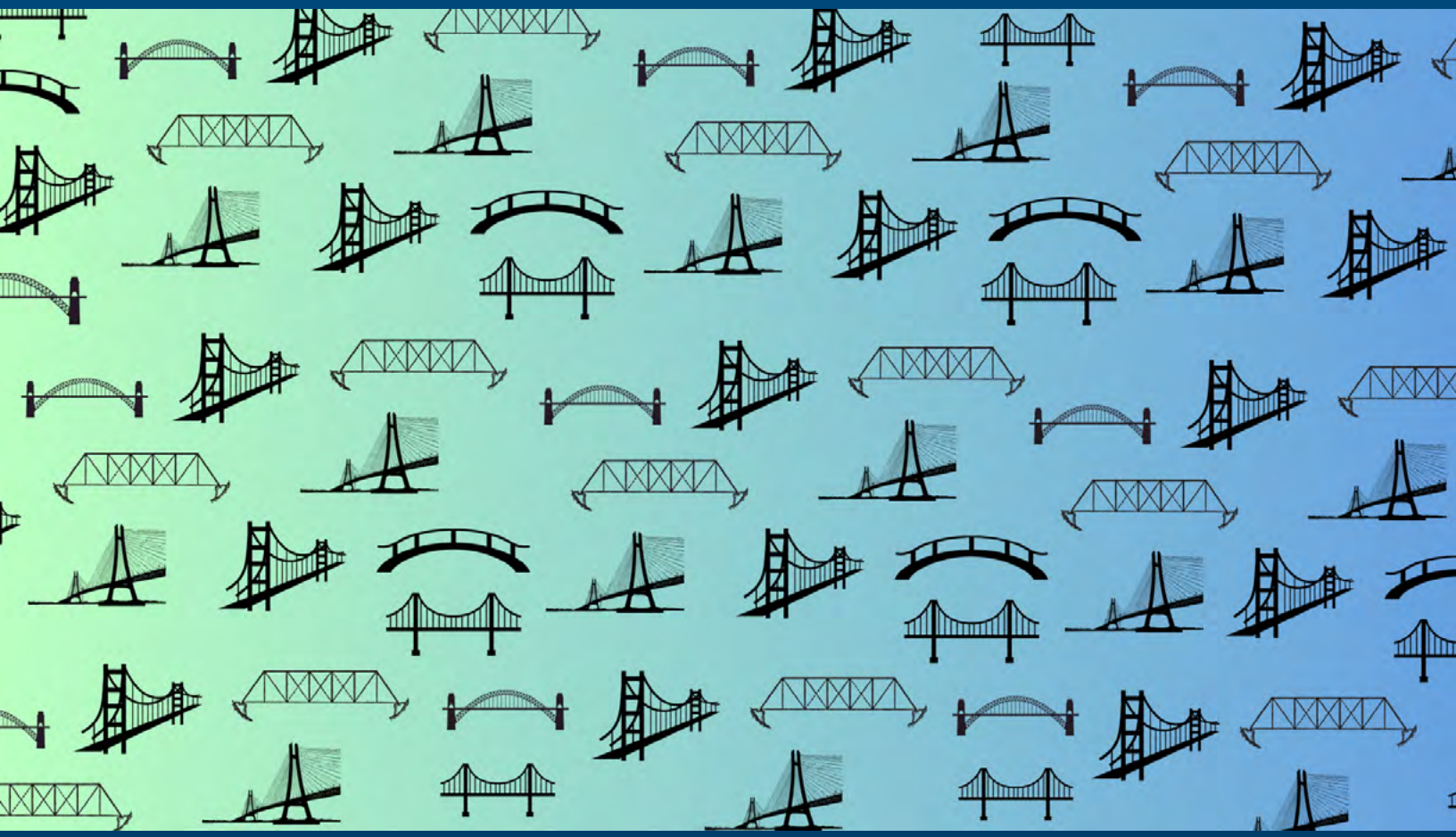

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