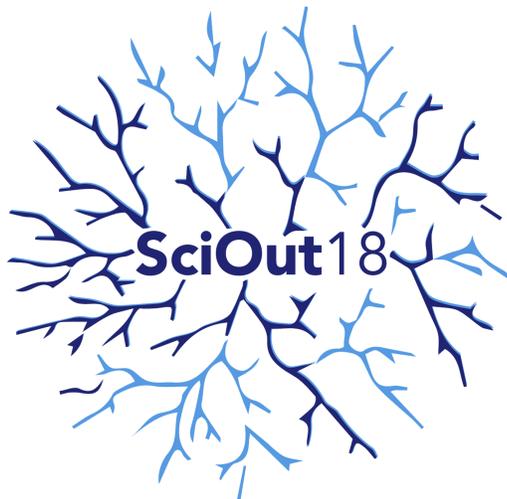


Recommendations for the Continued **Professionalization** of Science Outreach within the Scientific Enterprise



A report from **Science Outreach
2018: Models, Metrics, and
Measures Unconference (#SciOut18)**

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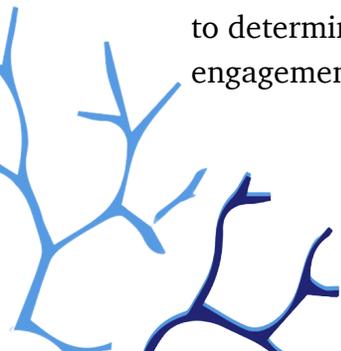
Executive Summary

In October 2018, nearly 150 members of the science outreach professional community gathered in New York City to discuss current issues surrounding the practice and profession of science outreach. With scientific representation spanning multiple academic contexts, professional societies, independent practice, members of science writing and journalism communities, funding bodies, and government organizations, the outputs from our unconference-style gathering -- SciOut18: Models, Metrics, and Measures -- takes into consideration many perspectives regarding the science outreach field from individual practitioners across the US.

The discussions from SciOut18 have prominently guided the content and context of this report, which primarily focuses on the practical aspects related to the continued professionalization and centralization of science outreach. While we specifically avoided defining “science outreach” at the meeting itself, the authors of this paper thought it is important to lay out how we are considering the phrase as it fits into the scientific enterprise, in order to discuss how this field can be sustained and scaled for the future. As such, we are defining science outreach as *a framework that brings together scientific and non-scientific communities around a set of shared science outreach goals, which are met through the application of effective science communication, public engagement, and/or informal education best practices, and achieves outcomes characterized by mutual learning for all involved.*

This definition is offered in the context of stakeholders, both inward and outward, as well as laying out the minimum requirements to meet the science outreach framework criteria. In this list we emphasize a clear identification of all stakeholder groups, sharing explicit goals for each group, and ideally co-designing a scientific engagement strategy that best represents these stated goals. Furthermore, the expected outcome for all science outreach strategies is shared learning among all stakeholders. While no science outreach framework will look exactly the same, it is these fundamental points that distinguish science outreach from one-sided efforts to promote non-scientist appreciation of science.

This paper also touches on the current expectations and realities related to science outreach metrics. The overwhelming consensus among SciOut18 attendees was that it is extremely difficult to both practice science outreach and develop clear research strategies to determine the impact of these efforts, particularly since a unanimous outcome of engagement surrounds the cultivation of positive human behaviors



around science. As such, this paper argues that, in many cases, evaluating scientific culture from the inward perspective (i.e. that of scientists and scientific institutions) could offer a clearer window into how science outreach shapes policies related to access to scientific programming, as well as the recruitment and retention of diverse trainees and faculty. We also argue that participation of faculty and trainees in the science outreach framework should be officially recognized and rewarded through inclusion in hiring and promotion processes.

The success of the SciOut18 unconference cemented the notion that science outreach is indeed a growing professional field, and that those currently occupying these spaces are hungry to develop and nurture a community of practice for sharing knowledge and strengthening professional networks. As we continue to grow as practitioners, and science outreach continues to gain momentum as a profession, the SciOut initiative offers an inclusive space to engage in lively discussion, share resources, and promote ideas and policies that bolster our efforts to support and scale. To this end, we have concluded our paper with a list of specific recommendations for scientific organizations, individual scientists, practitioners of science outreach, and funders.

The contents of this paper offer an early perspective, and we fully embrace the requirement to iterate on this material as we continue to learn from each other through future SciOut meetings and other professional gatherings. The authors of this text invite any and all commentary on the content offered here, including suggestions for next stages of SciOut community building. Please share your thoughts through our website (http://rockedu.rockefeller.edu/new_outreach/professionalization), by emailing the corresponding author directly at jgarbarino@rockefeller.edu, or on social media with the tag #sciout18.



Context

This paper represents a focused assessment of the science outreach practice and profession through the lens of experienced science outreach practitioners, and in summation of discussions from the national unconference, Science Outreach: Models, Metrics, and Measures (SciOut18), held at The Rockefeller University in October 2018. Intended as a jumping off point for deeper discussions and collaborative action, this paper presents: (a) a definition and minimum requirements for science outreach; (b) practical commentary around metrics of impact, and scaling and sustaining efforts within the science outreach framework; and (c) group-specific suggested recommendations to help advance the science outreach field.

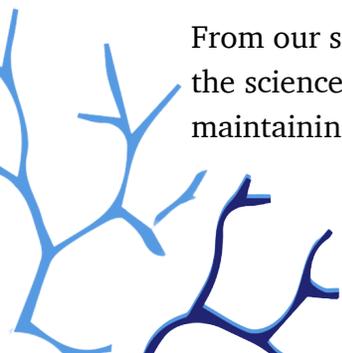
While this paper was written primarily for practitioners of science outreach, the information presented could be of use to funders, scientists who volunteer in the science outreach space, organizations where science outreach is a component, and/or other members within the science outreach community. We hope this paper appropriately conveys a genuine intention to help elevate the science outreach field, and work toward setting the bar for science outreach practice at its best.

About SciOut18

Because this paper draws largely from the outputs of the SciOut18 unconference, we wanted to provide context about this meeting, including what was discussed and who attended. SciOut18 brought together over 150 professionals from the national science outreach community (as well as a small number of people from the United Kingdom and South America) to discuss the current status of the science outreach profession. Collaboratively hosted by RockEDU Science Outreach and the American Society for Biochemistry and Molecular Biology (ASBMB), the goals for this meeting were threefold:

1. Enable members of the science outreach community to establish peer-to-peer connections and potential collaborations
2. Share practical approaches and strategies -- including failures -- to strengthen our understanding of science outreach education and engagement
3. Help harmonize science outreach efforts at both the local and national levels.

From our standpoint, SciOut18 was a unique approach to gathering together members of the science outreach community, with pleasantly unpredictable returns. In addition to maintaining a loose, unconference-style structure that allowed for and encouraged deep



discussion around the above goals, spontaneous formation of working groups, and ample opportunity for peer-to-peer networking, a strategic intention when planning this meeting was to remove financial barriers to participation in the SciOut unconference. As such, there was no fee to register for SciOut18, and thanks to generous combined sponsorship from Science Sandbox, The Rita Allen Foundation, HHMI Tangled Bank Studios, The Pinkerton Foundation, ASBMB, and RockEDU, all attendees had access to daytime meals, a two night hotel accommodation, and up to \$500 toward meeting transportation costs.

Another strategic intention when planning this meeting was to better understand field-specific context of each attendee prior to setting our unconstrained agenda, as a mechanism to help reveal and focus the conversations attendees were looking to have with one another. To do this, we required all attendees to submit preparatory work in advance of SciOut18. This preparatory work, which we felt was important to setting the major themes of the meeting, was a low-barrier effort requiring 1-2 hours of time, and involved free response to any or all appealing prompts centered on common areas of discussion related to the science outreach field ([the SciOut18 prompts can be found here](#)). The preparatory work also helped the SciOut18 organization committee identify attendees who could provide an interesting perspective around one of the SciOut18 themes during the meeting, through a 10 minute flash talk (without the use of technology). During SciOut18, the flash talks helped to seed deeper, peer-moderated, synchronous discussions among small groups of attendees, the contents of which were recorded and summarized by meeting theme at <https://rockedu.rockefeller.edu/outreach/sciout18/>.



Introduction: Science Outreach Represents an Infrastructure

As the professionalization and landscape of the science outreach field continues to evolve, it is important that systems for supporting science outreach professionals, including clear channels for knowledge sharing, evolve with it. As stated above, the goals for this white paper is to more clearly define science outreach, communicate findings from SciOut18 discussions around specific themes ubiquitous to science outreach activities and programs, and lay out recommendations to support science outreach in the future. While we fully acknowledge that established outreach exists within a variety of STEM disciplines, our experiences and discussions as reflected in this report -- pertain specifically to “science” as opposed to the T, E, or M fields of STEM. Though, much of what science outreach entails is applicable to these fields, too.

Laying Out the Science Outreach Framework

Historically, science outreach has been used synonymously with phrases such as public engagement with science or science communication¹. While these terms are all tightly related, we are establishing a clear distinction by defining science outreach not as a “thing you do,” but rather as an infrastructure that allows for the creation of a tailored roadmap for effective engagement with science. By no means are we the first to promote ways in which universities and other organizations can model engagement with outward community stakeholders^{2,3}, however, the SciOut movement is unique from other efforts in that there is no allegiance to or governance from a specific institution or organization, with outputs representing a summation of perspectives held by individual science outreach professionals from a diversity of contexts. In this model for science outreach, we require the identification of inward and outward stakeholders, an understanding of the science outreach goals held by each group, and the thoughtful design of science

¹ McCallie, E., Bell, L., Lohwater, T., Falk, J. H., Lehr, J. L., Lewenstein, B. V., Needham, C., Wiehe, B. (2009). *Many Experts, Many Audiences: Public Engagement with Science and Informal Science Education*. A CAISE Inquiry Group Report. Washington, D.C.: Center for Advancement of Informal Science Education (CAISE). http://caise.insci.org/uploads/docs/public_engagement_with_science.pdf

² Auerback, E. (2019). *Organizing and Reflecting Different Types of Engagement Activities: The Michigan Public Engagement Framework*. Center for Advancement of Informal Science Education (CAISE). <https://www.informalscience.org/news-views/organizing-and-reflecting-different-types-engagement-activities-michigan-public-engagement-framework>

³ Storksdieck, M; Stylinski, C.; Bailey, D. (2016). *Typology for Public Engagement with Science: A Conceptual Framework for Public Engagement Involving Scientists*. Corvallis, OR: Center for Research on Lifelong STEM Learning. http://www.aaas.org/sites/default/files/content_files/AAAS_Typology.pdf



outreach activities and programs that merge these goals and promote knowledge sharing **between** stakeholder groups.

Once the pieces of this model have been defined, carrying out a program or activity within the science outreach framework requires the application of public engagement, education, and/or science communication best practices. As such we would like to take a stance and provide the following definition for science outreach:

Science Outreach is a framework that brings together scientific (inward stakeholder) and non-scientific (outward stakeholder) communities around a set of shared science outreach goals, which are met through the application of effective science communication, public engagement, and/or informal education best practices, and achieves outcomes characterized by mutual learning for all involved.

At a granular level, creating science outreach programs and activities requires an understanding of who the primary stakeholder groups are, the goals and value systems for each group, and the thoughtful design of activities or initiatives that is reflective of both the stakeholders' context(s) and goals. SciOut Community resources include an in depth analysis of the science outreach framework, which can be accessed at http://rockedu.rockefeller.edu/new_outreach/professionalization.

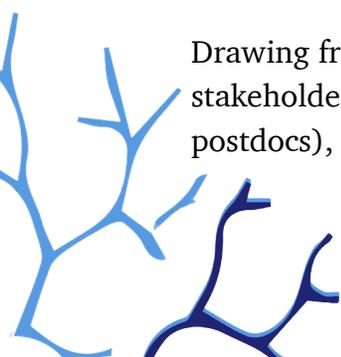
Stakeholders of Science Outreach

We can consider stakeholder groups within the science outreach framework at both the individual and community levels, both of which can be categorized as either inward or outward.

Inward Stakeholders: individuals or organizations facilitating activities or events as part of a science outreach framework

Outward Stakeholders: individuals or organizations presumably being engaged by inward stakeholder activities or events within the science outreach framework

Drawing from SciOut18 attendees and general experience, inward science outreach stakeholders tend to identify as scientists, scientific trainees (i.e. graduate students or postdocs), science communicators, and/or practitioners of science outreach who likely



are associated with academic institutions, though smaller numbers may hail from scientific societies, non-profits, or associate with independent entities. Anecdotal evidence suggests that, despite issues with representation in the scientific enterprise, women and underrepresented minorities tend to be highly active participants within science outreach frameworks, although further surveying is required to better understand the precise motivations and demographics within the science outreach community. Inward stakeholders may be building a science outreach strategy to align with funding requirements, in which case funders play an important role in the science outreach framework.

Outward stakeholders are typically considered individuals or groups of people who do not identify as scientists, or who might be considered non-specialists. These individuals may or may not associate with specific organizations, though most typically identify with one or more specific communities. As a note, we strongly discourage the use of “lay” to describe what is typically known as a “public audience” as it does not accurately portray the people within the outward stakeholder category. We instead prefer the terms **non-scientist** or **non-specialist** to describe outward stakeholder groups.

Minimum Requirements for Science Outreach

In addition to identifying the inward and outward stakeholders within a science outreach framework, it is important that we take stock of audience-specific goals before generating any strategy or curriculum. This means we must work to understand both what the inward and outward stakeholders want from this specific science outreach effort.

For example, it is very common for inward stakeholders to get involved in science outreach for career development, to meet broader impact requirements, and/or to simply give back ⁴. However, the goals of the outward stakeholders can be much more diverse. Compounding this is the fact that each outward stakeholder audience will interpret anything related to science through the lens of their own learned experiences, which can often include feelings of skepticism or downright rejection of science and/or scientists. As such, it is important for us to gain insight -- as best as possible -- into the current relationship that specific outward stakeholders have with science, as well as what they hope to gain from participation in any science outreach effort ⁴.

⁴ Christopherson, E. G., et al. (2018). "The Civic Science Imperative." Stanford Social Innovation Review. https://ssir.org/articles/entry/the_civic_science_imperative



Once goals for inward and outward stakeholders are made known, the ideal next step is for inward and outward stakeholders to co-design a science outreach curriculum, event, or strategy in order to best represent the stated goals for each group. However, we acknowledge that co-design is not always logistically possible. As such, we strongly recommend that discussions with representative members of inward and outward communities are held, as a means to shape and tailor the science outreach initiative as best as possible.

Lastly, the implementation of a science outreach framework requires us to build in time for reflection and iteration, as a means to determine the perceived effectiveness of our efforts, and to ensure that we can adequately adjust our science outreach work moving forward. While some inward stakeholder groups incorporate formal evaluations into their science outreach program design, we do not believe that formal metrics are a minimum requirement in the science outreach framework. In the next section, we share more detailed practical considerations in the area of evaluation and assessment.

In summary, the minimum requirements for the science outreach framework are as follows:

- Inward and outward stakeholder groups are clearly identified
- The science outreach goals for both inward and outward stakeholders are made known
- All science outreach efforts are designed with these goals in mind; best if efforts incorporate codesign between representative members of inward and outward stakeholders
- Post science outreach effort, time is dedicated to reflecting on the success of the effort, and iterations are incorporated should this be a repeat occurrence



Practical Considerations for the Profession of Science Outreach

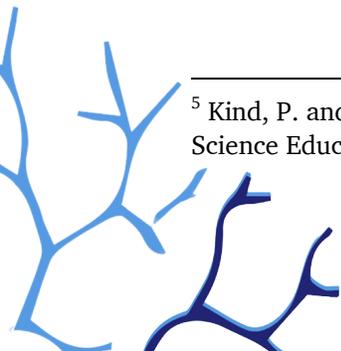
As science outreach continues to evolve into a formal discipline, there is a growing need to supply professional training, resources, and networking opportunities to those who work within the field. Furthermore, it is critical that we can build a professional community of science outreach practitioners, and set agreed upon standards of excellence to help move our field -- and our careers -- forward. The following represents a summary of SciOut18 discussions by meeting theme. These summaries are by no means entirely inclusive of all that was discussed, but represent key points that were consistently raised by meeting participants.

Understanding the Impact of Science Outreach

Understanding the efficacy and impact of science outreach programming is critical for sustaining and scaling, yet this seems like a universal black box for the science outreach community. It's hard to capture our impact given the diversity of stakeholders, content, and approaches. Furthermore, there really is no standard tool in the field for measuring effectiveness, and many of us don't have the expertise to design and/or carry out such evaluations. Yet, reporting these metrics is near essential for obtaining funding and/or institutional support, and has the potential to inform how changes in program design and execution should be implemented to achieve better outcomes.

A major challenge associated with metrics is that it is not always clear what the goals of science outreach programs and activities *should* be, making it difficult to ascertain, in advance, what strategies are most appropriate for measuring impact. There tends to be some focus on improving diversity in science fields through recruitment and retention, but is creating an army of scientists truly the sole goal of scientific engagement? Even if science outreach activities help to improve issues related to underrepresentation in science, there are still unresolved issues related to retention. Moreover, fostering a genuine connection with the process of science can be important for a democratic society as well as simply to appreciate the cultural role of scientific knowledge in our society⁵. Where does that leave those who wish to engage with science, but not in their education or career?

⁵ Kind, P. and Osborne J. (2017). *Styles of Scientific Reasoning: A Cultural Rationale for Science Education?* Science Education, Vol. 101, No. 1, pp. 8–31.

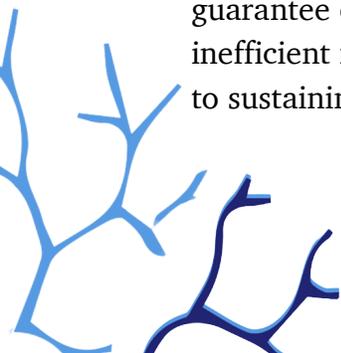


Often, the desired outcomes of science outreach programming centers on human emotion and shifts in human behavior -- few of us in the science outreach field are equipped to handle measuring what trained psychologists and social scientists are still working to understand. While learning the impact of science outreach on outward facing audiences will allow us to iterate and build better programs and initiatives, we mustn't ignore the impact of science outreach on inward scientific communities and institutions. Perhaps the easier goal is to focus on shifting the culture within the scientific enterprise to value and promote science outreach. This has a lot to do with scaling and sustaining efforts, and does not necessarily address independent science outreach outside of an institution or established organization, but it can be a good start. At SciOut18, we worked on listing some general goals for science outreach, which are described in more detail in [value statement paper].

Geoff Hunt, National Academy of Sciences: The ideal outreach project is a sustained interaction that results in a significant impact on participants' behavior and ways of thinking. This definition is so open-ended and includes so many loosely-defined terms that I'm not sure if there is one unifying tool or metric that could be used for precise, quantifiable evaluation across all programs and projects. There are even those who would argue that evaluation is irrelevant. If you as the organizer have identified a clear problem and a defined target audience affected by said problem, then your efforts will be impactful whether or not something quantifiable is able to be picked out. While nihilistic and partially facetious, this approach does have the benefit of obviating the time and effort spent on crafting evaluation tools that are often ineffective and limited to one-off applications.

Scaling and Sustaining Science Outreach Efforts

At SciOut18, there were legitimate concerns over our current ability to sustain and scale the many science outreach efforts taking place across the United States. This largely stems from the fact that many of the efforts falling within the science outreach framework are done by passionate individuals as an extracurricular activity, as opposed to being a formally supported endeavor. Often, science outreach efforts are spearheaded by early-career scientists, usually science trainees (undergraduate or graduate students, or postdocs), who are temporary members of inward stakeholder communities. As these trainees move to their next career stage, science outreach efforts often fizzle out, with no guarantee of resurrection -- and if resurrection does occur, it is more often than not an inefficient reinvention of the wheel. Issues pertaining to succession are clear roadblocks to sustaining any science outreach framework.



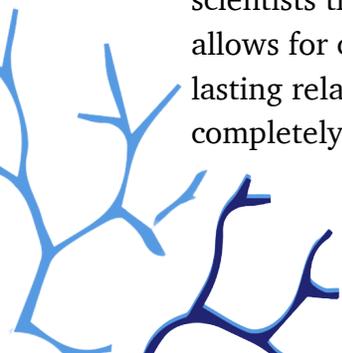
Ben Wiehe, Science Festival Alliance, MIT Museum: Meaningful outreach is a product of genuine relationships, and genuine relationships require real people to be present. It isn't just institutional memory or trained skills that are lost when some moves on, it is also their relationships.

Moreover, we must acknowledge that many inward stakeholders participating within the science outreach space are often members of underrepresented and/or historically marginalized communities. When members of these communities are not professionally incentivized (or in some cases are penalized) by their immediate supervisors and/or institutions for their participation in the science outreach framework, we run the risk of devaluing marginalized scientists institutions hope to recruit and support. In order to genuinely sustain a science outreach framework within institutions, we must make it worth the time and effort spent by these community members by incorporating incentivization and recognition into formal professional evaluation processes. This could mean adding some form of outreach portfolio to tenure applications and/or salary or position incentives, among other possibilities.

Christine Liu, University of California, Berkeley: Much outreach for marginalized communities are done by people who identify with those communities. So long as outreach labor is not valued, we are devaluing the marginalized scientists we work so hard to recruit and support. We must empower those who can instill the most trust in neglected communities in order to maximize the impact of our collective resources.

There exists a perception among some academics that science outreach is not a scholarly endeavor, and that participation takes away from research or other primary duties. However, mounting anecdotal evidence suggests that science outreach efforts not only compliment the research enterprise, but can also serve as a tool for faculty and graduate student recruitment, as well as for building and strengthening community relations. One of the SciOut goals moving forward is to better understand how these perceptions shape institutional support for the practice and profession of science outreach. We will start this process via a [national survey](#), which is supported by the National Science Foundation.

Overall, members of the SciOut community are in favor of institutional centralization of science outreach as a means to sustain and scale these important efforts. By having a well-defined, institutionally-supported science outreach framework in place, it gives scientists the permission and time to genuinely participate in their community, and allows for consistency -- this latter part is important for creating authentic and long-lasting relationships, both inside and outside of institutional settings. However, it completely defeats the purpose of centralization if the majority of efforts spent in this

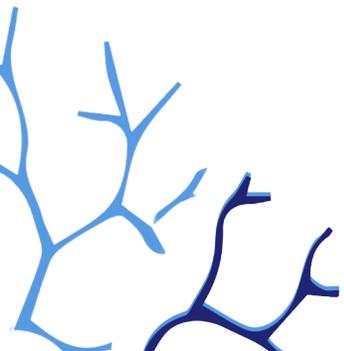


space go toward fundraising. In order for centralization to work, there must be a dedicated staff, space, and hard money to support this work.

Courtney Price, The Ohio State University: As a general rule, program sustainability comes through having multiple stakeholders genuinely invested in the development and implementation of a program. The knowledge of how the program runs -- and who the partners are -- cannot be held by a single individual. The more people that benefit from and are invested in a program, the more likely it is to be sustainable even in the face of staff turnover. From a funding standpoint, being able to demonstrate impact is very important to continued funding. Showing a connection to existing infrastructure (whether that be within the University or in the community) shows that the program is not reinventing the wheel. It is important to tell your story and share your successes. A great program that no one knows about except the people who are directly involved runs a greater risk of losing steam than one that external people are aware of and has been recognized for its successes.

Building and Nurturing a Community of Practice around Science Outreach

Given the incredible diversity of science outreach efforts -- in terms of geography, stakeholder audiences, topic areas, goals, etc. -- it is next to impossible to create a single set of best practices that can be broadly applied in all contexts. We recognize that the generation of knowledge is a social endeavor, and that knowledge is most useful when it can be reused and applied in novel contexts. By creating opportunities to share and iterate upon the knowledge held by each member of the SciOut community, a science outreach community of practice could support enormous collective capacity in the science outreach space. While those working in the science communication, engagement, and outreach spaces approach this work with tailored strategies and goals, we can all come together around the idea that engaging non-scientist audiences (outward stakeholders) is important and worthwhile, and as such, there are some aspects of shared identity. We hope that through the SciOut initiative, we can take note of who is participating, as well as who is not participating (but should be). Once we are able to come together more regularly, it will be easier for us to assess what we are doing together to cultivate both the generation and sharing of knowledge for the purposes of driving our field forward.



Recommendations to Support Science Outreach Professionalization

Here we lay out targeted recommendations to aid in the continued professionalization of the science outreach field, specifically for scientific institutions, practitioners of science outreach, and funding organizations.

Scientific Institutions and Organizations

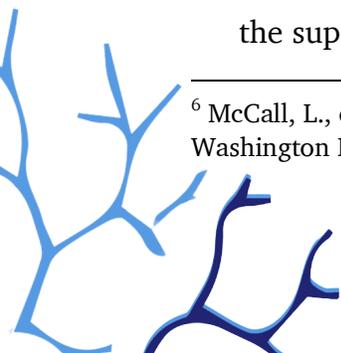
Scientific Institutions and Organizations include official entities that primarily employ or provide membership to scientists and science professionals, and have a central mission involving the generation, interpretation, and/or the dissemination of knowledge as it pertains to science. Universities, research institutes, and professional scientific societies are some examples of “Scientific Institutions and Organizations.”

1. Establish a centralized science outreach department with a dedicated staff and resources, including an institutionally supported budget (hard money).

Centralization of science outreach offices will streamline the efficacy of scientific engagement efforts from scientists, labs, or departments by tapping into established knowledge and networks, essentially allowing scientists to simply plug-and-play within the science outreach framework. However, it is critical that funding sources are clearly secured for the design and implementation of engagement strategies, and science outreach staff is *not* tasked with required grant writing while also working to deliver quality programming. Programs that are centered around soft money are likely to tax science outreach program staff in ways that impact efficacy. Institutions like The Rockefeller University (RockEDU Science Outreach) and Columbia University (Zuckerman Institute Education Programs) have established, institutionally-funded science outreach departments, and can serve as models for other institutions.

2. Incentivize participation in science outreach efforts by recognizing and rewarding those doing the work. Given all of the potential benefits of incorporating science outreach frameworks, academic institutions can support science outreach by formally recognizing its value⁶. This recognition may take the form of prizes, salary enhancements, and improved visibility for individual scientists. To truly demonstrate the support and significance of science outreach, work in the science outreach space

⁶ McCall, L., et al. (2016). What Counts? Evaluating Public Communication in Tenure and Promotion. Washington DC.



should be included in the tenure process. Recognition may also come in the form of funding for science outreach professionals, dedicated spaces, resources and administrative support. Creating an environment inclusive to the communities surrounding a research institution is highly interwoven with developing an institution where everyone has an equal opportunity to thrive. Creating a research culture that shows dedication to engaging and supporting underserved communities can also help in recruiting and supporting scientists from these communities.

- 3. Support mandatory cultural competency trainings for members of the scientific community.** A successful science outreach framework will include formal training for setting expectations when working with audiences from diverse populations, as well as more involved training opportunities for those interested in curriculum design and program management. As scientific organizations continue to acknowledge and correct historic inequities in hiring and promotion practices, it is essential to nurture a culturally responsive professional environment, both internally and community facing. Centralized science outreach departments would be natural fits for the planning and execution of cultural competency trainings for all members of an organization, and could provide individual consultation in this area as needed, thereby circumventing the need to hire outside firms for this necessary task. Furthermore, by organizing these trainings and consultations “in-house,” recommendations are specifically effortlessly tailored to the home environment.

Individuals Volunteering For Science Outreach Efforts

This set of recommendations is intended for scientists and scientific professionals who regularly engage, typically as a volunteer, as inward stakeholders within the science outreach framework. There are a variety of reasons why scientists and scientific professionals participate in science outreach, yet these core requirements should be met by all whenever possible.

- 1. Connect with your target audience (outward stakeholders) to understand what they wish to gain from the science outreach framework.** It is very common for a scientist to enthusiastically get involved in science outreach to share their work and connect with new audiences. In order to meet the minimum requirements for science outreach, it is essential to learn about, and possibly partner with, your target outward stakeholder group when designing and executing any science outreach program or initiative. To do this effectively, particularly if you do not have a personal connection to this community, it is essential to learn best practices for minimizing bias, and maximizing inclusivity. The implementation of culturally inclusive practices helps to

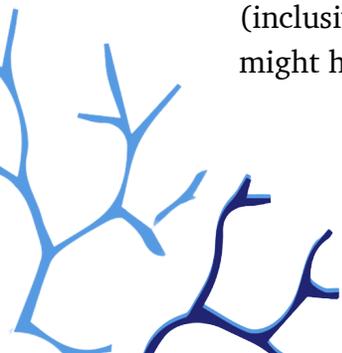
meet audiences where they are, and promote interactions that are meaningful and relevant.

2. **Seek out existing local science outreach initiatives.** In connecting with and learning from established science outreach programs, it reduces the possibility of reinventing the wheel when it comes to engagement. Whether you want to plug into the existing efforts, or simply get advice on how to start your own initiative, tapping into a more developed science outreach network can save you time and effort.

Science Outreach Practitioners

The following recommendations apply to those who regularly practice science outreach in some capacity -- from those who regularly participate in the science outreach framework as a volunteer, such as graduate students leading a science outreach club, to those who are compensated for their science outreach work, either part or full-time.

1. **For practitioners representing established organizations, connect with other departments within your institution to identify areas of synergy.** There are many obvious (and a few not-so-obvious) examples of how science outreach practitioners can collaborate with departments and laboratories within an organization. For example, science outreach teams can work with Human Resources for national “Take Your Child to Work Day” efforts, collaborate with a specific laboratory to create an aligned curriculum, or partner with development offices to creatively entice new or existing philanthropy to support your institution. By creating these internal partnerships, you increase the value that science outreach can have on the professional scientific community, which, in turn, strengthens the argument to support science outreach at the institutional level.
2. **When recruiting scientists as volunteers, be clear and transparent about expectations and goals, and communicate the best practices for your audience and context.** In this paper we are promoting the centralization of science outreach efforts within institutions of science. However, science outreach efforts often require the participation of scientist volunteers. To ensure that volunteers are supported, and to promote continued recruitment of volunteers, it is essential to be clear and transparent with the expectations you have for your scientist volunteers. Prior to volunteer recruitment, take the time to clearly define the time requirements (inclusive of preparation and/or travel time), as well as any other expectations you might have.



- 3. Survey the science outreach landscape in your local community to help identify and connect with others for the purposes of ideas and resource sharing.** Perhaps the most powerful way to scale is to truly outsource science outreach: to put the tools in the hands of others and help them achieve their outreach goals. Open sharing of our tools, methods and ideas will also help to prevent those who are just starting out from reinventing the wheel. Since we have established that the need for science outreach work far exceeds the current resources, we must be generous with our knowledge, connections, and tools in order to reach further and deeper into our communities.

Funders of Science Outreach Endeavors

There are many organizations that directly support science outreach efforts, from governmental bodies to family foundations. However, for those who seek funding, it can often be incredibly challenging to prepare the “right” proposal. As an attempt to provide tangible feedback from science outreach stakeholders to funding organizations, we recommend the following:

- 1. Provide accessible examples of outcome scenarios to help potential awardees have more focused, relevant, and practical metrics around their science outreach efforts.** A common challenge for practitioners of science outreach when preparing funding proposals is designing a strategy to determine metrics of impact. Typically, there is a clear distinction between practitioners and researchers within the science outreach field, and for those squarely in the “practice” space, evaluation and assessment can be a foreign language. Funders can help remove barriers by summarizing example outcomes of previously funded projects, or generate a few fictional example scenarios for new contexts. Making proposal expectations more clear will not only elevate the quality of submitted proposals, it will also help support those spearheading emerging science outreach initiatives. While clarity in funding guidelines should always be a priority, the latter point is particularly important to help pave the way for innovation and diversity in science outreach.
- 2. Promote metrics of impact that focus on inward stakeholder groups.** Fostering a positive relationship between institutions of science and diverse outward stakeholder audiences is a universal goal. However, there are many ways in which this can be accomplished, and measuring outcomes pertaining to human behavior is tricky. Shifting evaluation efforts toward inward stakeholders -- at both the individual and institutional levels -- provides a more clear picture on what strategies can be effective in promoting an inclusive scientific culture. This is particularly important when

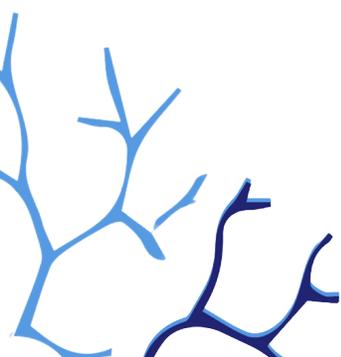


considering recruitment and retention of historically minoritized groups. Science outreach can be an effective vehicle for promoting a culturally inclusive scientific environment that supports the training and retention of diverse groups in science. These metrics are likely more accessible and straightforward than understanding the impact of science outreach on outward stakeholders, and should be promoted as a valid strategy for impact.

Looking Ahead

The SciOut meetings embody an effort to decentralize community building efforts within the national science outreach professional space in order to acknowledge that every member of the SciOut community brings with them unique perspectives through learned experiences, and to ensure that each member of this community has a mechanism to share their knowledge, and/or learn from others. As we continue creating dialogue at future SciOut meetings and other professional gatherings, we must always ask how we can best build from the knowledge that we create and share.

We feel that our next steps should include efforts to cement communities of practice around science outreach, and to always promote manageable and realistic actions that are respectful and inclusive of diverse identities, and take into consideration shared goals. Furthermore, we believe that science -- and thus science outreach -- does not exist in a vacuum. It is critical, now more than ever, to build relationships with individuals and organizations outside of science, and to have clearly defined intentions around the most pressing scientific issues in society, primarily climate change. In strengthening the standing of science outreach within the scientific enterprise, we have the opportunity to create unity around shared goals, and promote widespread appreciation for the process of science.



Appendix

About the authors

After the SciOut18 meeting, a small group of attendees—the SciOut18 Task Force—met on a regular basis (in person and over Zoom) to determine how to best represent the outputs of our meeting, and create a potential strategy for moving forward. We all hail from the science outreach space, although our primary professional roles vary widely. As such, we believe that our group houses a broad perspective, which we hope is apparent in this paper.

We also acknowledge that there are many efforts to bring together people who identify as members of science communication, outreach, and engagement spaces. While several extant meetings (including the Association of Science-Technology Centers meeting, the Science Events Summit, the National Alliance for Broader Impacts Summit, the annual meeting of the American Association for the Advancement of Science, and the National Science Foundation’s Advancing Informal STEM Learning meeting, among others) address separate aspects of the science engagement landscape, there is a noticeable lack of an umbrella convening that is inclusive enough to cater to the field writ large. It is our hope that through the SciOut meetings and related communication streams we can help strengthen and grow the science outreach community, and promote the continued professionalization of our field.

SciOut18 Task Force Members

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Quira Zeidan

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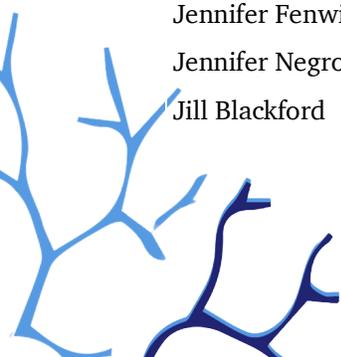
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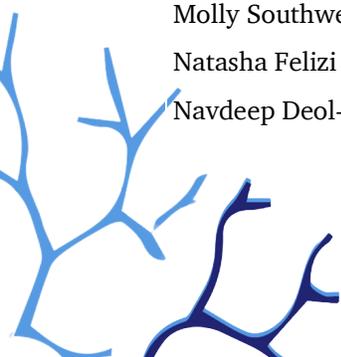
SciOut18 Attendees List

Name	Organization (at the time of SciOut18 Meeting)
Aliyah Weinstein	University of Virginia
Allison Coffin	Washington State University, Science Talk
Alyson Davis	Icahn School of Medicine at Mount Sinai
Amanda Smith	Penn State University
Amy Hawkins	Genetic Science Learning Center, University of Utah
Amy Stark	University of Notre Dame
Ana Zambrana	American Society for Biochemistry and Molecular Biology
Ana Maria Barral	National University
Andrea Acevedo	University of Pennsylvania
Angela Hwang	Stanford University (nano@stanford)
Annie Handler	The Rockefeller University
Arthee Jahangir	NYU Langone
Barbara Natalizio	Rita Allen Foundation
Ben Lillie	Caveat
Ben Wiehe	Science Festival Alliance, MIT Museum
Beth Tuck	Genspace
Brianna Bibel	Cold Spring Harbor Laboratory
Brooke Smith	The Kavli Foundation
Caitlin Fritz	Philadelphia Higher Education Network for Neighborhood Development (PHENND)
Caitlin Weber	University of Utah STEM Ambassador Program
Candace Jones	Lane College
Carolyn Nichol	Rice University
Catherine Vrentas	The Engaged Scientist
Chidi Paige	Zuckerman Institute - Columbia University
Christina Marvin	University of North Carolina at Chapel Hill
Christine Liu	UC Berkeley
Christine Marizzi	DNA Learning Center at Cold Spring Harbor Laboratory
Christine O'Connell	Alan Alda Center for Communicating Science/School of Journalism Stony Brook University
Christine Zardecki	RCSB Protein Data Bank, Rutgers
Claire Duggan	Northeastern University Center for STEM
Courtney Price	The Ohio State University
Cristina Fernandez-Marco	Cold Spring Harbor Laboratory

Crystal Harden	UNC's Morehead Planetarium and Science Center
Dagnia Zeidlickis	Cold Spring Harbor Laboratory
Dan Pomero	Mil international labortory
Daniel Hicks	UC Davis
Danielle Snowflack	ASBMB
Dave Hiller	Yale University
Devon Collins	The Rockefeller University
Disan Davis	Rockefeller University
Doug Heigl	RockEDU Science Outreach
Douglas Vakoch	METI (Messaging Extraterrestrial Intelligence)
Edwin Li	Saint Joseph's University
Elizabeth McMillan	The Sanford PROMISE: Sanford Research
Elizabeth Christopherson	Rita Allen Foundation
Ellen Jorgensen	Biotech Without Borders
Emily Cloyd	American Association for the Advancement of Science
Emily Rice	CUNY College of Staten Island
Erica Kimmerling	American Academy of Arts and Sciences
Erika Shugart	American Society for Cell Biology
Eve Klein	Institute for Learning Innovation
Gail Begley	Northeastern University Center for STEM
Geoff Hunt	National Academy of Sciences
Grant Garrison	Public
Greg Boustead	Science Sandbox, Simons Foundation
Hannah Alexander	University of Missouri
Heather McKellar	Neuroscience Institute at NYU Langone Health
Heidi Roop	Climate Impacts Group, University of Washington
Helen Cheng	New York Sea Grant - Science and Resilience Institute at Jamaica Bay
Ivvet Modinou	British Science Association
James Bell	Center for Advancement of Informal Science Education (CAISE)
James Roche	American Physical Society
Jared Lipworth	HHMI Tangled Bank Studios
Jeanne Garbarino	The Rockefeller University
Jennifer Fenwick	Science Friday Initiative
Jennifer Negron	The Pinkerton Foundation
Jill Blackford	Simons Foundation



John Baker	University of Pennsylvania
John Tracey	Science Sandbox, Simons Foundation
Jonathan Frederick	UNC's Morehead Planetarium and Science Center
Jory Weintraub	Duke Initiative for Science & Society, Duke University
Joshua Pak	Idaho State University (Department of Chemistry)
Joshua Witten	South Carolina Governor's School for Science & Mathematics
Juan Maestre	University of Texas
Julie Nadel	Currently unaffiliated
Julie Wolf	American Society for Microbiology
Karen Ingram	Karen Ingram & Associates
Karen Kinsman	UNM STEM-H Center for Outreach, Research, & Education
Kate Bredbenner	Rockefeller University
Kate Downey	Caveat
Katherine Lontok	American Society for Microbiology
Kaye Storm	Stanford University
Kellie Vinal	Atlanta Science Festival
Kishore Hari	Chan Zuckerberg Initiative
Kitty Cahalan	Caltech
Kristen Coakley Ashare	University of Pennsylvania
Kyle Marian Viterbo	The Symposium: Academic StandUp
Latasha Wright	BioBus, Inc.
Laurie Van Egeren	Michigan State University
Lily Raines	American Chemical Society
Lou Woodley	AAAS
Lynda Kennedy	Intrepid Sea, Air & Space Museum
Maiken Bruhis	Stanford University
Maria Strangas	American Museum of Natural History
Maria Voigt	RCSB Protein Data Bank / Rutgers
Mark Rosin	Guerilla Science / Pratt Institute
Martin LaMonica	The Conversation
Matt Koci	NC State University
Michelle Juarez	City College of New York
Molly Southwell	Saint Joseph's University
Natasha Felizi	Instituto Serrapilheira
Navdeep Deol-Johnson	Imagine Science



Nica Rabinowitz	RockEDU Science Outreach
Nicole Hernandez Hammer	Consultant
Nicole Woitowich	Northwestern University Women's Health Research Institute
Odaelys Walwyn-Pollard	The Rockefeller University
Parmvir Bahia	University of South Florida/Scientists, Inc.
Patricia Wonch Hill	University of Nebraska - Lincoln
Paula Croxson	Columbia University
Polly Basore Wenzl	Wichita State University College of Engineering
Quira Zeidan	ASBMB
Rachel Chaffee	American Museum of Natural History
Rachel Haberstroh	Genspace
Ray Sweet	Self-employed consultant
Rebecca LaCroix	Yale University
Rebecca Thompson	American Physical Society
Ricardo Williams	Nerd Nite
Riley St. Clair	University of Vermont
Sabriya Stukes	The City College of New York
Sara Kobilka	University of Arizona STEM Learning Center
Sarah McAnulty	University of Connecticut
Sarah Weisberg	BioBus
Sonali Majumdar	University of Virginia
Sonia Epstein	Museum of the Moving Image
Stuart Ravnik	UT Southwestern
Susan Renoe	University of Missouri
Susanna Greer	American Cancer Society
Tracy Englert	University of Southern Mississippi
Tricia Berry	The University of Texas at Austin, Women in Engineering Program
Wade Miller	Schrödinger Inc.

