

Science in the Public Eye: Leveraging Partnerships  
A Report on the Symposium and Follow-Up Workshop January 6-7, 2018  
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**Introducing the symposium and its hosting organization**

The Society for Integrative and Comparative Biology (SICB) is a prestigious professional organization of organismal biologists that fosters research, education, public awareness and understanding of living organisms from their cellular structures to their ecology and evolution. SICB members are not only active researchers and educators, but also willing collaborators on media and outreach projects for the public. The Society's annual conference hosted Science in the Public Eye: Leveraging Partnerships, the symposium proposed by iSWOOP Project leaders Nickolay Hristov, Martha Merson, and Louise Allen.

SICB members gather annually for symposia, workshops, and hundreds of science talks, as well as poster sessions. In service of the Society's mission, "to further research, education and public awareness in the areas of organismal, functional and evolutionary biology," the conference planners typically offer a session or two on science communication. In the past these sessions have focused on rhetorical moves, encouraging attendees to speak to the public about the relevance of their work in jargon-free terms. The 2018 conference in San Francisco (January 3-7) was exceptional in that the opening keynote by science journalist Carl Zimmer and two day-long symposia were dedicated to science communication. The iSWOOP project (Interpreters and Scientists Working on Our Parks) (NSF EHR DRL-1323030 and DRL-1514776) stepped into this arena, recruiting presenters who could speak to the challenges of and opportunities for partnerships—inspiring graduate students and long-time professors alike to think strategically about the sort of partnerships they could initiate or benefit from to achieve broader impacts.

The symposium spurred new partnerships and disseminated findings from iSWOOP's professional development model piloted in partnership with Carlsbad Caverns. Across the country, when scientists, park managers, park visitors, and interpreters hear about iSWOOP, they endorse the project's goals and generally speak both from their personal and institutional perspectives about the need for interpreters to have access to current, park-based, park-relevant science. Opportunities for scientists and interpreters to be together are welcome and also relatively rare ([Char, 2015](#)). When possible, the iSWOOP project keeps a bi-directional information flow going among interpreters, informal education researchers, and scientists. The SICB symposium, in organizers' minds, was an opportunity to extend that approach.

As part of our symposium, "Science in the Public Eye: Leveraging Partnerships," we spoke with and interviewed a number of symposium participants. Below is an excerpt from an interview with one attendee that encapsulates the purposeful excitement among participants:

*Early in my graduate career, I started doing crowdfunding to get money to do projects and to bring on undergraduate Research Assistants. So I started basically blogging about our research on a website [answering the questions:] "Why should you care that I want to know where lizards lay their eggs? Why does that matter to anybody except for me?" ... [Then] We made a few videos where we went out in the field, showing people, about catching lizards and why we care about them and what that research might tell us about larger issues. That led to ... the idea to make an interactive exhibit about climate change and climate science in general on campus ... [We are figuring out:] So how do you take all the information scientists have about climate, and*

*how different forms of life on earth might respond to changes in climate and make that something the general public would care about and want to learn about? ... which is why I liked that talk I went to about designing museum pieces.*

SICB members are scientists who make ideal partners for those working to advance informal STEM learning, but as trained scientists, much of what they know about informal educators (the way we work, what goes into the planning and training of docents in museums, science centers, parks, and other informal settings), is from personal experience and would count as general awareness. The symposium sponsored by the iSWOOP project: Science in the Public Eye: Leveraging Partnerships was intended to reveal some of the inner workings of informal learning institutions relevant to scientists.

### **Symposium Goals**

The goals of the iSWOOP symposium sessions were to:

1. Highlight the expectations, expertise, and artifacts that need to be brought to the table for effective partnerships.
2. Describe partnership opportunities
3. Equip academic advisors and mentors with additional strategies for guiding peers or grad students at their institutions in establishing partnerships with the potential for success.

The symposium was a logical outgrowth of NSF's portfolio of projects on Communicating Research to Public Audiences. Michele Korf and Associates, evaluators who spoke with CRPA funded project partners, heard that tools would be useful to clarify audiences and expectations. In our planning calls with presenters, we emphasized recommendations made in the final report on Communicating Research to Public Audiences (<https://crpaworkshop.wordpress.com>). The recommendations included a call to generate tools to help partners develop or maintain:

- ✓ Clarity about the meaning of informal science education and its place within the project
- ✓ A coherent and practical approach to coordinating secondary components of collaborations (e.g., teacher resources, follow up links for families)
- ✓ The ability to visualize the process of science and convey its excitement as distinct from entertainment as the driver
- ✓ Strategies for problem solving when something goes wrong as it inevitably does and to stay the course on larger goals related to integrity of the initiative

In the iSWOOP-convened symposium we set out to create a blueprint for launching collaborations—initiated either by scientists or informal educators aiming to increase visibility and discussions of scientific research. In borrowing the concept of a “blueprint” from architectural design, we mean to trigger consideration of the design of space, the need for early planning and the roles involving teaching and learning within a space.

Presenters prompted consideration of:

- ✓ the audience and the emphasis, e.g., impact on local businesses or implications for policy or emotional connection
- ✓ quality assurance, that is how intermediaries (e.g., volunteers, park rangers, or docents) are trained to collaborate on scientific data collection or to convey the content
- ✓ where talks and briefings are held, e.g., in the field, in a seminar-setting, or during a visit to a lab, and
- ✓ with what “furnishings,” such as instruments, visualizations, or other props.

To refine this notion of a blueprint for initiating and sustaining collaborations among scientific researchers and informal educators, iSWOOP arranged for points of reflection, collected, and analyzed video data, observation notes, and text (both participants' applications and their written reflections during the symposium workshop and debriefing session). We will continue to promote the issue with papers based on the conference presentations, encouraging others to think about the resource as a blueprint that they can modify for their own outreach designs.

Proceedings from the symposium feature a number of articles that could be useful to research scientists, informal educators and their partners. The issue is in its final stages of production (as of July 2018). Abstracts are available on the website for the journal of *Integrative and Comparative Biology*, searchable by title and author's name. A pdf of the issue will be available for a limited time. Highlights of a few articles follow. Links to individual articles and talks, where available, are provided.

[Link to Full Integrative & Comparative Biology Volume 58, July 2018](#)

### **Highlights of articles that advance possibilities for outreach and partnerships**

[“Unveiling Impact Identities: A Path for Connecting Science and Society,”](#) by Julie Risien and Martin Storksdieck's (of the Center for Research on Lifelong STEM Learning) opens this issue, framing the importance of delineating an individual impact identity that takes into account variations in scientists' individuals' strengths, their institutional context, the nature of their research, and the desired outcomes of their public engagement activities. The authors argue that a more integrated approach towards research and outreach will ultimately benefit society, and also improve a scientist's research success.

*Carol Lynn Alpert*, of the Museum of Science in Boston, lays out the rewards of teaming up with informal science learning organizations. In her article, [“So you want to share your science.... Connecting to the world of informal science learning,”](#) Alpert offers advice to scientists about when and how to approach a science center or museum to form a partnership. When prospective partners begin discussions early in a proposal development process, they increase the likelihood of successful outcomes in funding, implementation, and impact. Alpert provides a strategic planning worksheet. Subsequently, Alpert (in Providence, RI, at the National Alliance for Broader Impacts Summit), gave a workshop on this same subject – Building Partnerships with Museums and other Community-Service Organizations for Broader Impact. She wrote: “We had about 40 people, and it went over really well. I made four new versions of our worksheet, designed for different roles, and they worked well too. Great discussions were going on at the tables.”

[“Exposing the Science in Citizen Science: Fitness to Purpose and Intentional Design”](#) by Julia K. Parrish, of the University of Washington, and co-authors Hillary Burgess, Jake F. Weltzin, Lucy Fortson, Andrea Wiggins, and Brooke Simmons offers a constructive look at citizen science with a new typology and realistically tempered enthusiasm for citizen science. Citizen science projects are one of the more visible types of partnerships between environmental scientists and others. Parrish et al lay out the statistics to show fascinating discrepancies (between scale of involvement and funding allocated; between planned contributions to peer-reviewed journals and actual numbers of published articles that feature one-time involvement, crowd-sourced data). The authors acknowledge the importance of outcomes apart from published, peer-reviewed contributions to scientific knowledge, however, their focus is on a typology that takes the perspective of science contribution, looking at the scale needed to make a contribution and then the ways the structure for participants and supports needed to accomplish the study goals. At a large scale of involving volunteers across time and geographic space, quality assurance is an issue.

Managing the under-performance of participants could be handled in a number of ways—approaches to consider include selective recruitment, training, expert oversight/confirmation of reported data, crowd-sourcing, algorithms to compensate for predictable bias, statistical pruning, and more. If taken up, authors hope their recommendations will result in honest signaling needed to help the mainstream science community more confidently use citizen science and accept its results. Further, scientists will have language and a framework to help participants recognize the degree to which precision and accuracy are required, and participants are more likely to see their efforts result in accepted scientific contributions. Such understandings advance the trust, respect, and mutual benefit from such partnerships.

[“Beyond the Brown Bag,”](#) by Louise Allen, of Winston-Salem State University, along with Cynthia Char, Tracey Wright, and Martha Merson, is so titled because, when the opportunity occurs at all, researchers typically, give a one-time lunch hour talk, generally a modified version of a presentation aimed at scientific peers. Talks during which scientists show slides and interpreters mainly listen are a missed opportunity. They leave the scientist no wiser about the public’s interests and the nagging questions interpreters have. The article describes iSWOOP’s approach to supporting productive collaborations that promote an understanding of scientific research to public audiences and results from a pair of surveys that indicate that both sides of this partnership benefit from extended contact.

### **Findings from participants and presenters on leveraging partnerships**

#### *Participating Scientific Researchers*

iSWOOP Film Team member Ryan Lebar conducted nine semi-structured interviews at the Society for Comparative and Integrative Biology Conference in San Francisco, CA. This convenience sample of academic researchers, undergraduates, grad students, post docs and an informal educator were recruited from the audience members who attended one or more talks.

Lebar asked interviewees to describe their areas of study and why they think it is important to make science accessible to the general public. He asked some or all of the interviewees: “How do you incorporate storytelling and visuals in communicating your research?” and “What does your dream collaborator look like (for making your research more accessible)?”

The scientists spoke passionately about their work and care about fostering connections with the public. They chose purposefully among the sessions with an eye to the outreach projects connected to their current research studies: designing an exhibit or initiating a citizen science project. A recurring theme was their awareness of the importance of clarifying their ideas about why anyone should care.

Of the nine people who were interviewed, eight answered this question: “If you had a dream collaborator to work with to help make your work more accessible to the public, who would that be? A filmmaker, photographer, illustrator, journalist?” Just two interviewees identified particular individuals—Carl Zimmer, Jane Goodall and Rachel Carson. Goodall and Carson came to mind for their charisma as well as their skills in getting a message across, showing people something they might not have thought of before. Zimmer (a journalist) stood out as someone who can translate science in a way “so people can understand what we’re talking about.”

In addition to those two, two more mentioned particular characteristics or skillsets they would value in a collaborator. One interviewee said, “People I’ve worked with for many years are botanical artists and scientific illustrators. They are trained to be scientific communicators.” The other mentioned that

marine biology students learn from community members whose livelihood depends on accumulated rich knowledge and life experience.

None of the interviewees questioned the idea that a collaborator could be useful in making their research more accessible to the public. Nevertheless, for two of those interviewed, the method or medium was prominent. “YouTube is the avenue you’d take to draw in larger audiences,” one told us. Another thought an animation company would be ideal, but the interviewee allowed that “I don’t know a specific person I would ask.”

In identifying desirable collaborators, participants mentioned complementary skillsets. They referenced a type of person who would be a skilled writer or animator, or have name recognition and credibility rather than particular individuals. While SICB symposium participants are open to collaborations, the fact that participants had just a few names in mind (and one of them is dead), suggests room for growth in both networks and relationships.

Participants were quite hopeful about the outcome of partnerships to build greater understanding. Artist collaborators would offer “new ways of thinking, of viewing reality, new ways of getting to know the world and the environment.” Community partners could increase knowledge in specific and general ways. One interviewee spun out the possibilities:

*When we talk in our crazy science language, that’s a major turn off. .... [Once] you put it in a way that people can have a dialogue with you, then they become more interactive. Then they’ll probably go searching for the science, searching for the research, and they’ll probably be up with everything that’s going on.*

#### Participating intermediaries

As mentioned above, opportunities for scientists and interpreters to connect are welcome and also relatively rare. Furthermore, when they do occur, the format is often a formal talk. When possible, the iSWOOP project keeps a bi-directional information flow going among interpreters, informal education researchers, and scientists. Thus we organizers invited interpreters from the Bay Area, California state parks, and national park units to join us. We spread the word through the Pacific region of the National Park Service, made phone calls to California state park leaders, and let iSWOOP partners know about the conference. Six interpreters attended the symposium and made plans for implementing new approaches based on what they gleaned from the presentations, workshops, and symposia.

Following a day of symposium presentations, the iSWOOP team led a workshop dedicated to design and debriefing for interpreters. To evaluate their participation we addressed the following questions:

- a) What professional goals and needs did interpreters who applied express?
- b) Did participation in the SICB conference and the Sunday workshop result in interpreters acquiring new knowledge, insights, and strategies for the deliberate selection of visualizations to share scientific process and findings with park visitors?
- c) In what ways did participation in SICB spark or enrich interpreters' ideas for moving communication about park-based (or relevant) science forward?

While the number of participants was small (six interpreters representing three different parks and one aquarium), we had multiple data sources to draw from to assess the interpreters' experiences. The data sources include:

- ✓ Applications to attend SICB conference
- ✓ Workshop Plan with goals and objectives
- ✓ Two sets of notes (one set from a convener and the other from an observer)
- ✓ Worksheets, journal entries, and reflections from interpreters gathered both during the workshop and roughly six weeks after the conference.

The majority held permanent, year-round jobs and played a role in training others. The majority held degrees in science fields. For four of the six, the symposium and follow-up workshop was their first formal introduction to iSWOOP.

*a) Describing the professional goals and needs of participating interpreters*

Interpreters gave voice to their goals and needs in their application statements. All six applicants expected to learn how to better communicate science directly to visitors (or to relay what they gained to interpreters who work with visitors).

*In this day and age, we need to be able to express to the public why the sciences are important and how it can help us learn to better take care of our planet. By integrating research with storytelling strategies and informal science programs, we can inspire the current and next generation to be inspired to take care of our natural world for future generations to enjoy. Conservation messaging is a big part of presentations we give at the aquarium.*

Half specifically stated that they wanted to learn about science research topics as well. Half were explicit about wanting to be better trainers for interpreters they supervised.

*I am a life-long learner of science and am always looking for opportunities to build my knowledge.... Attending this conference can help me learn how to better present interpretive programs about these science topics. This conference can build my science knowledge, which will allow me to be a better instructor and supervisor. It will also allow me to bring back ideas on how to better present seasonal interpretive training, so that we can train our seasonal interpretive staff on how to present effective science-based programming.*

*b) Gauging the acquisition of new knowledge, insights, and strategies for the deliberate selection of visualizations to share scientific process and findings*

Interpreters do not bear sole responsibility for graphic design in exhibits or interpretive signs on trails. At parks, these are multi-year initiatives that go out to bid. And for park newspapers, someone with layout experience is usually in charge, but interpreters are generally on their own for the day-to-day images they want to use with visitors or want to include in a training for peers, (personal communication, D Kish, Death Valley, Dec. 22, 2016).

Interpreters collected images from the poster session which represented satisfying and unsatisfying examples of visualizations. As we discussed these, and iSWOOP's design principles, some of the pitfalls to using visualizations became apparent. In particular, interpreters recognized the dangers of diluting the message with competing elements.

*The need for less text in visuals and to allow for the image to stand alone for itself ... More careful consideration in the process of putting a visual together. In terms of text how many images are being used to convey story.*

*[My] thoughts on visuals have changed significantly. Reducing the static is so important. So if a visual is worth 1,000 words, it's important to consider whether all 1000 of them are relevant to your message.*

*It's more of a powerful tool than I originally thought but more thought and care should go into adding them. It can help guide a person's attention toward/away from particular things.*

*I am thinking about graphics in in my work more. Before, I mostly thought of just words.... I am learning how to use graphics more efficiently.*

Beyond the individual use for rangers in their visuals for the public, one participant expressed interest in adopting the design principles in her coaching of others.

*I never considered trying to use the language of design theory in my feedback on interpreters' visualizations. The vocabulary will be useful when people have questions and want to explore suggestions I make or potential solutions to problems I find.*

Interpreters' reflections indicated that they had acquired new insights and strategies for sharing scientific process and findings with park visitors through the deliberate selection of visualizations.

*c) Enriching interpreters' ideas for moving communication about park-based (or relevant) science forward*

Before concluding the workshop and symposium debrief, workshop leaders asked interpreters to pick an area of focus based on their original applications and to draft a plan with steps and dates for moving forward. These action plans were therefore specific to individuals' jobs and parks. Interpreters could choose any area for their draft plan, but they stuck close to the needs they expressed in their original applications. Their work plans reflected an appreciation for the examples and recommendations offered during the symposium and workshop. Responses referred to expectations, expertise, visualizations, and artifacts that would be needed to establish effective partnerships. For example, in her initial application, a ranger wrote that "attending [the SICB conference] can help our division move forward toward integrating the ongoing research that is occurring in our park." By the end of the conference, she had specific plans for connecting with researchers, finding an artist and cultivating that connection, as well as forming relationships with one or two resource management personnel.

Participants were inspired to make connections with artists-in-residence, making stories relatable and using compelling video for the purpose of engaging visitors. One interpreter was planning to adopt a strategy designed to build the public's connection and concern for Joshua trees to the Cottonwood trees in her park. Another had plans for integrating art, science, and communication in her visitor center with the assistance of an artist in residence.

*[I'd like to] Try some new dialog board ideas to see what level of structure works best: 1) Start with a scientific finding (a statement) and ask participants to restate it in icons/symbols that are a) free -form ; b) pre-fab; or c) a mix; 2) Start with a picture and ask participants to explain what's happening in it in icons/symbols (as in #1).*

Interpreters expressed enthusiasm for crafting narratives and tapping into artistic representations as ways to increase their effectiveness in building emotional connections for visitors. Thus new strategies centered on leveraging connections with artists. Interpreters began considering narrative and partnerships with artists among their options for science communication, as one stated, to “make the ordinary extraordinary.”

### **Participating symposium presenters**

A subset of presenters was asked the following questions during semi-structured phone interviews four to eight weeks after the symposium. The interviewer spoke to one scientist, one exhibit designer, one scientific researcher/practicing artist, and one leader from higher education. Below we have grouped responses to the interview questions:

a) What were your biggest take aways from the conference? What session(s) was helpful and if so why?

b) What are some of the possible challenges you see in implementing the ideas discussed during the sessions? What are you wishing you could hear more about?

*a. What were your biggest take aways from the conference? What session(s) was helpful and if so why?*

The following quotes speak to three different types of reactions: 1) the importance of a focus on visualizations; 2) the novelty and rewards of hosting a symposium on informal learning in the midst of a biology conference and 3) the importance of a symposium to motivate writing and publishing for the field.

*It was inspiring to see different ways people are working to take visuals and connecting it to research.*

*The workshops were especially helpful, because people had time to look at visual communication examples and discuss what makes them work more or less well.*

*It was refreshing to think outside the box. As a biologist I found it to not be a traditional symposium. The talk about landscape architecture helped me think about environment and learning.*

*The final session gave a moment to digest information and talk with others. It was a guided get together. The session helped me realize people love art and science and making connections to recreate science is really interesting.*

*This conference ... shaped my thinking ... . I feel that now my paper provides deeper insights.*

*I appreciate the opportunity to write a paper communicating with scientists about museum exhibits.*

*b. Needs, challenges, and “What are you wishing you could hear more about?”*

The following quotes illustrate that the symposium revealed new areas that need attention.

*I would like to hear more about artists and making artist connections with museum. I would like to see how it is possible to hear how partnerships develop over time.*

*Would like to hear more about how people actually track and measure user experience and experience learning. If you walked into a manufactured play landscape I would like to see how much visitors take away from that experience. Are there commonalities to these measurements?*

*I would like to hear more about integrated next steps. The talks were very broad.*

The feedback and findings have motivated us both to: continue research to understand scientists' outreach preferences and priorities to assist those who can match or broker collaborations and consider how to act on interpreters' useful suggestions for future work by the iSWOOP team.

With resources from our Innovations grant for iSWOOP2.0, we can:

- ✓ Support partnerships among featured parks, scientists, artists, and interpreters to benefit the public, generate ideas for funding partnerships (or supporting partnerships without new funding).
- ✓ Be a resource for conveners of future gatherings where bi-directional communication can be fostered. Consult with conveners of science symposia, to highlight the ways in which two-way dialogue between scientists and interpreters can result in well thought-out science communication for public consumption.
- ✓ Continue to disseminate insights and examples from iSWOOP's experiments with visuals and connecting them to research (and vice versa).
- ✓ Support partnerships among featured parks, scientists, artists, and interpreters to document collaborative work and publish examples and findings.

## **Conclusion**

*As a science educator, I think it is exceedingly important to be immersed in science. Having a solid foundation in science is helpful, but if learning becomes stagnant, so does your interpretation. Frequent learning and stimulation leads to more critical thinking, understanding, and connectivity, which leads to more successful interpretation. [At SICB] I hope to learn a lot! Not just in terms of biology, but also in scientific methodologies.*

At parks and other informal science learning institutions, as well as at conferences, points of entry for visitors, interpreters and scientists tend to be different. While visitors dwell in different areas than do the researchers, interpreters traverse these different spaces. Although researchers and visitors are transient, the workforce of interpreters is a continuous presence. We remain committed to fostering partnerships with them that bring science into the public eye.

Professional organizations like SICB can be allies to informal educators. SICB's 2018 annual meeting attracted a forward-thinking, outreach-oriented audience of organismal biologists, a natural audience of prospective partners for communicating science to the public. This symposium was a springboard that built confidence among many of its participants—presenters had the impetus to write and found new audiences for their work; iSWOOP conveners found affirmation and enthusiasm for their vision of more direct contact among intermediaries and scientists with attention to shared visualizations and visual

language; interpreters found principles and their voice in terms both of brokering relationships with artists and being more discerning consumers of visualizations.

We look forward to carrying this work forward.