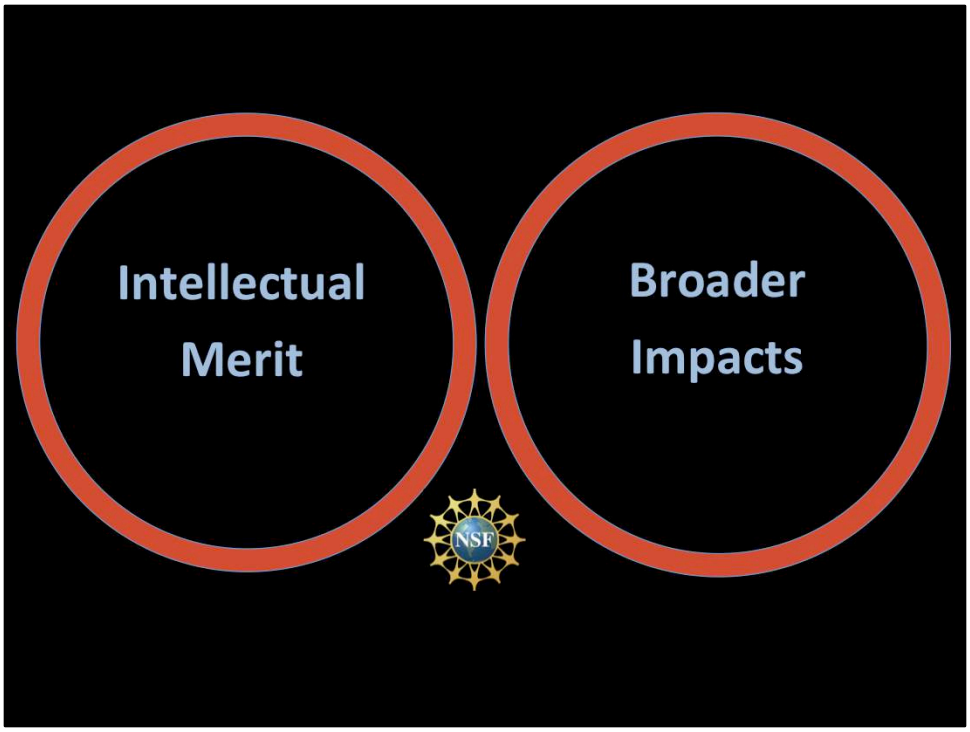
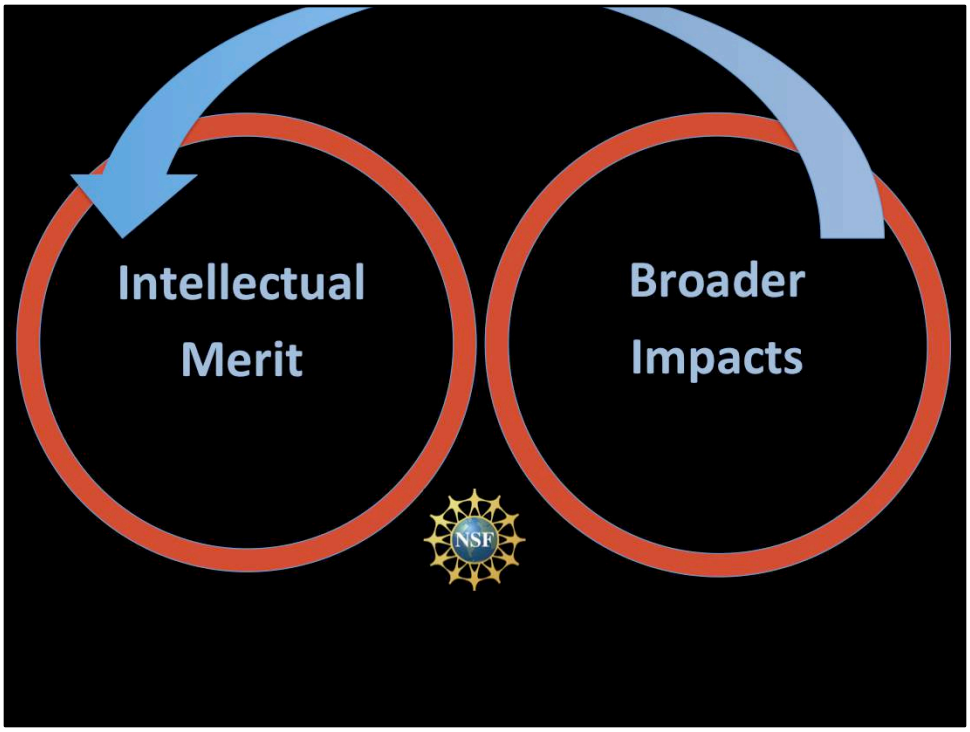
Good morning. It's a pleasure to be here among so many people who love science and are passionate about engaging our broader communities in the culture of science…. and fostering continued public support for research and education.

While I'm based at a science museum, during the past 15 years I've also served as a PI and Co-PI with several NSF –funded research centers - based at Harvard, MIT, and Howard University; Northeastern, UMass-Lowell, and Ohio State, and I have collaborated with many researchers and education and outreach directors.

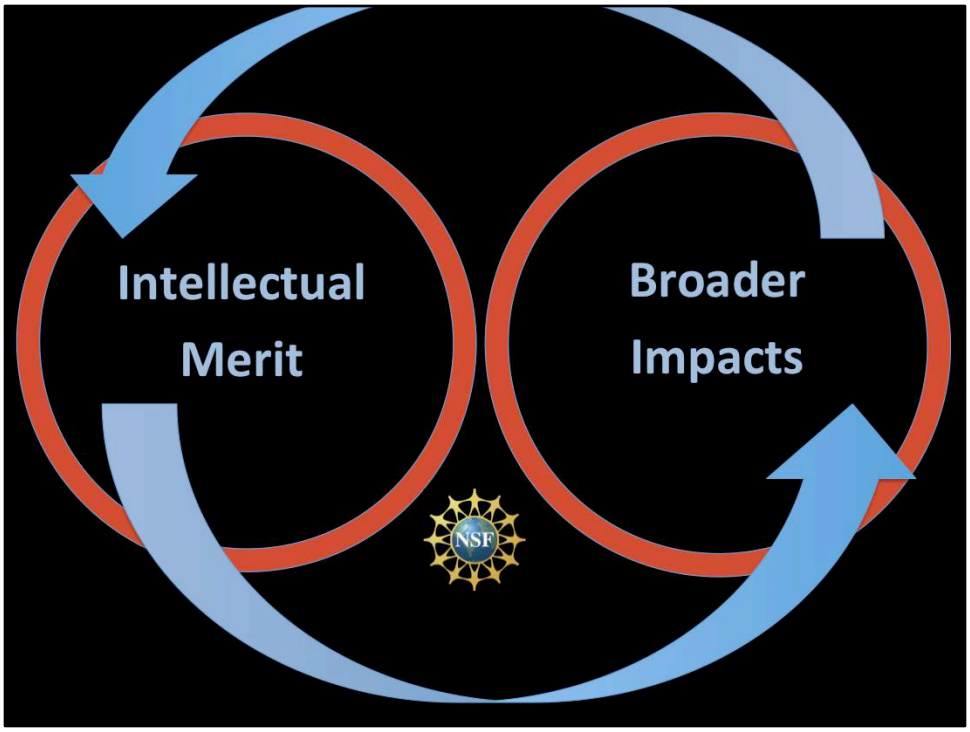
So I know how hard those of you who are education, outreach, and diversity directors work –providing graduate student training and research experiences for undergraduates, managing the diversity, education and outreach portfolios of your centers. I also know that within the culture of a research center, the work you do is sometimes undervalued and sometimes underfunded. There is good news though.



Recently the National Science Board reaffirmed its commitment to the Broader Impact Criterion, and we've seen a subtle shift in NSF program announcements, advising that



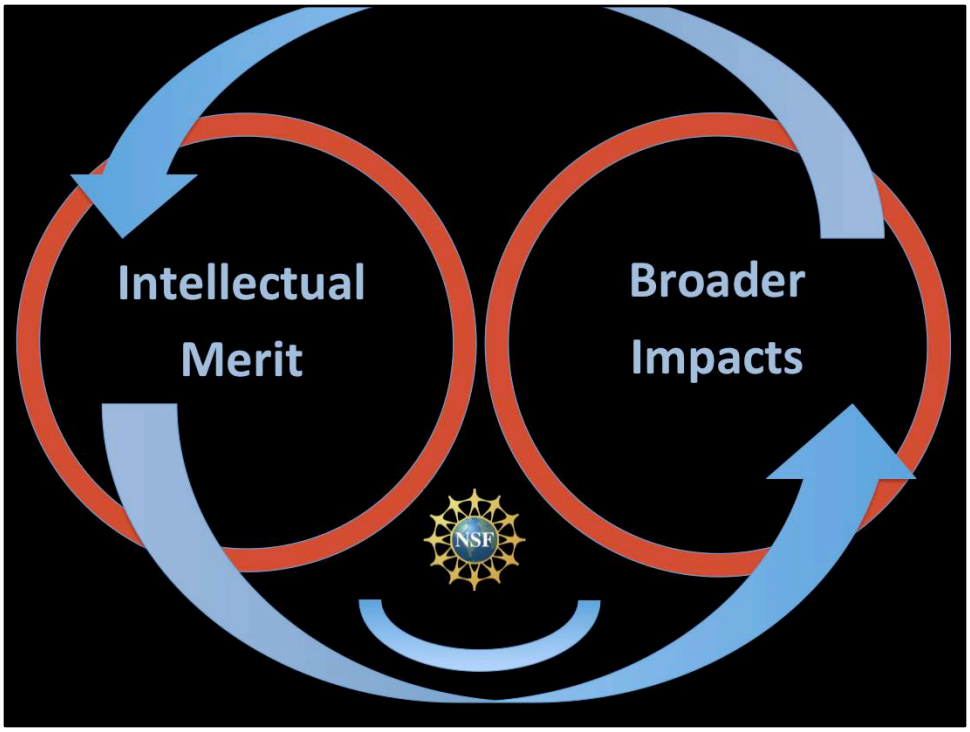
…**Broader Impacts activities should *also demonstrate Intellectual Merit…* …**



… and vice versa.

I've seen an increase in Broader Impacts professionals being included on site review panels

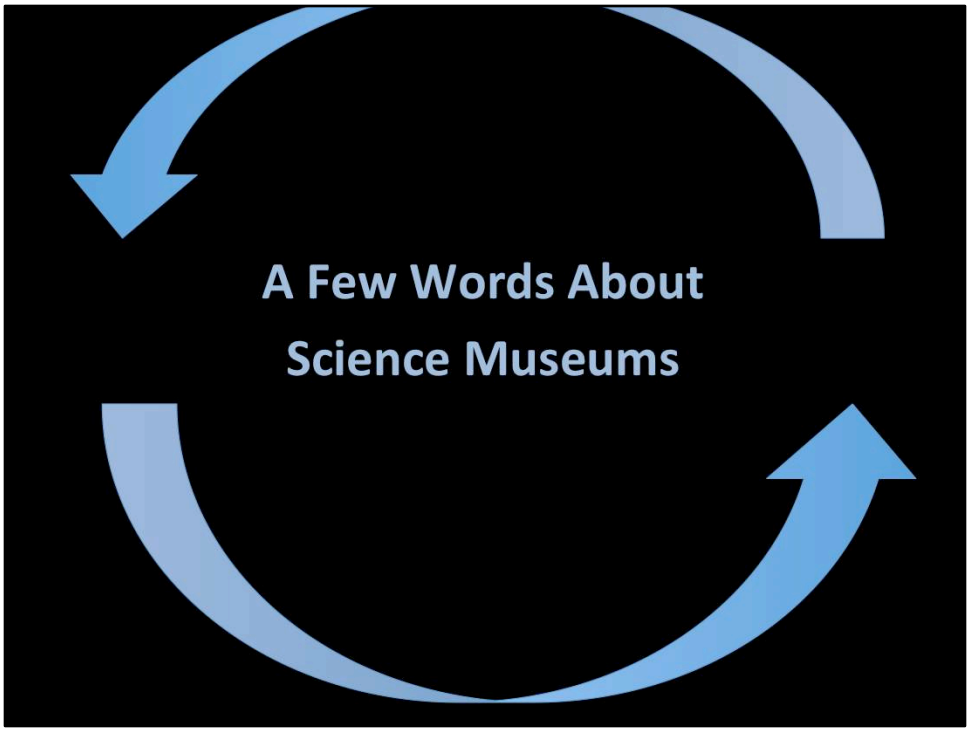
…



Happily, this shift means that what we do is being taken more seriously.
It also means that we will be held more accountable for the ways in which we conceive and carry out our activities, and we will be expected to meet higher evidence-based standards for impact.
Fortunately, we've all begun to share more of our knowledge and experience with each other - in publications and meetings like this one - and I thank CAISE and NSF for convening us here today.

Now….

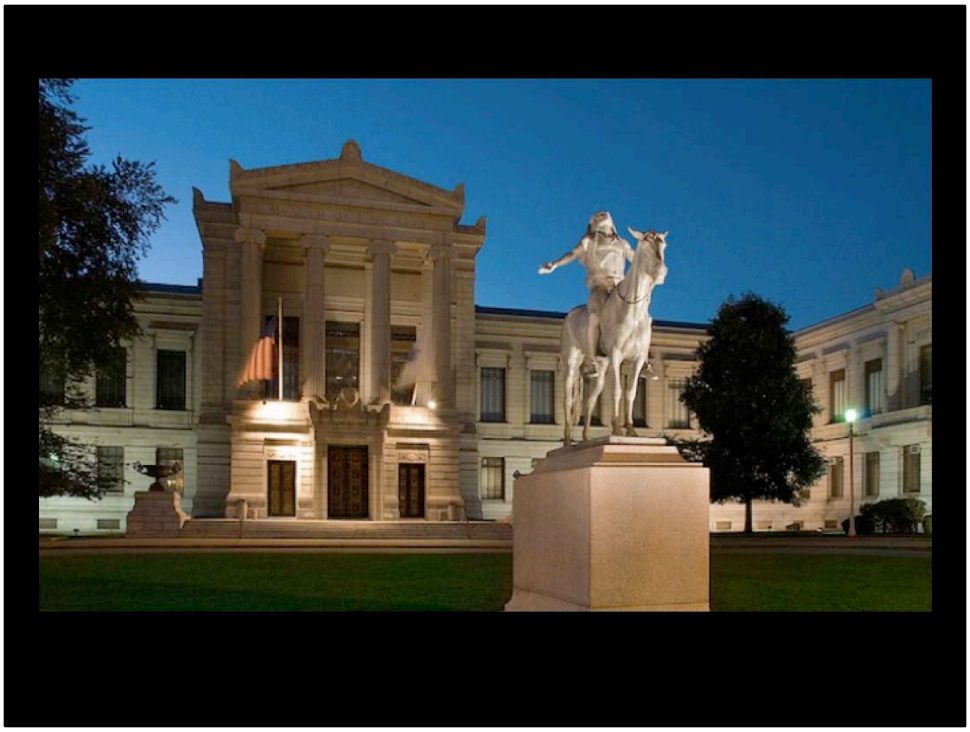
…



A few words about science museums.

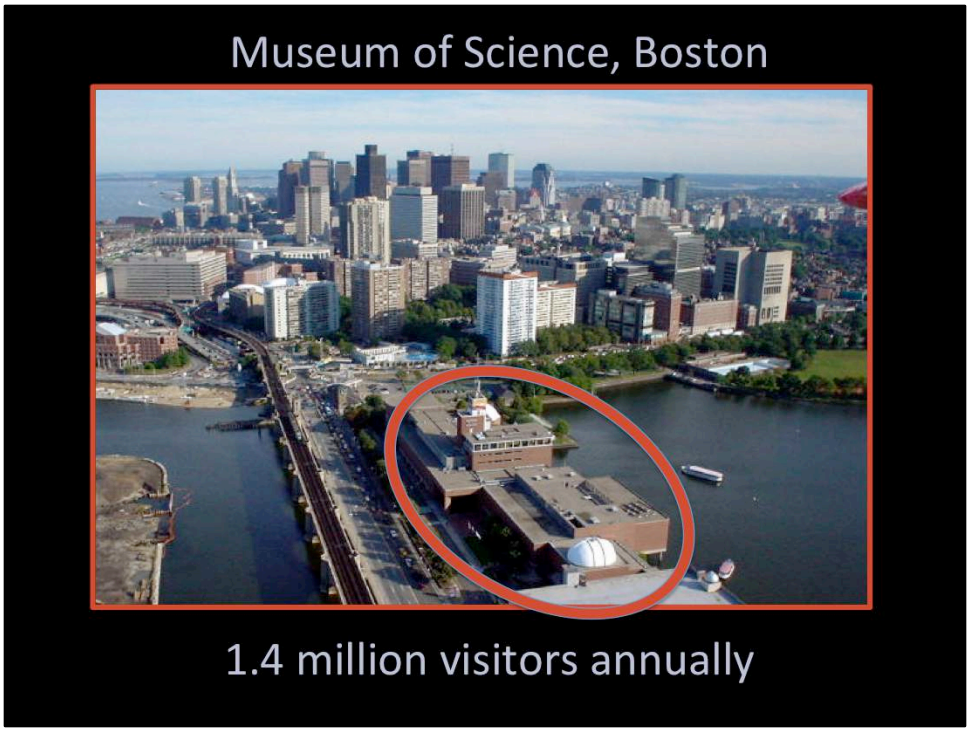
Science museums are fun places.
They celebrate scientists and engineers…

…the way sports stadiums celebrate athletes, and…



… art museums celebrate artists.

…



For instance, the Museum of Science is the most visited cultural institution in New England….outside of Fenway Park - … And there are hundreds more large and small science museums across the nation.

Science museums offer university researchers and educators a chance to get off campus and reach this broader community,

They are already set up for public visitaion – close to mass transit, with parking, food, wheelchairs, restrooms and other family-friendly amenities.

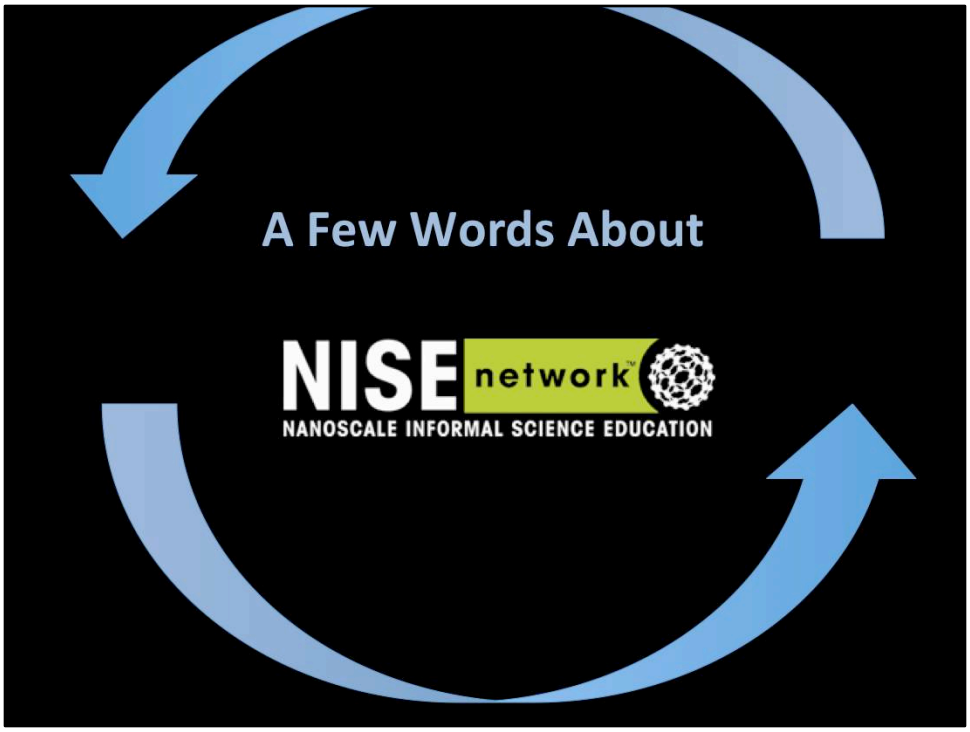
Our audiences thrive on face-to-face interactions with real live scientists and engineers.

We especially love hosting graduate students and early career researchers – who typically provide a greater diversity of role models for our young audiences.

We provide university students and faculty with training and practical experience sharpening both their scientific and public communication skills.

We can be helpful to research centers in brainstorming and designing programs and events that are effective with a broad range of audiences.

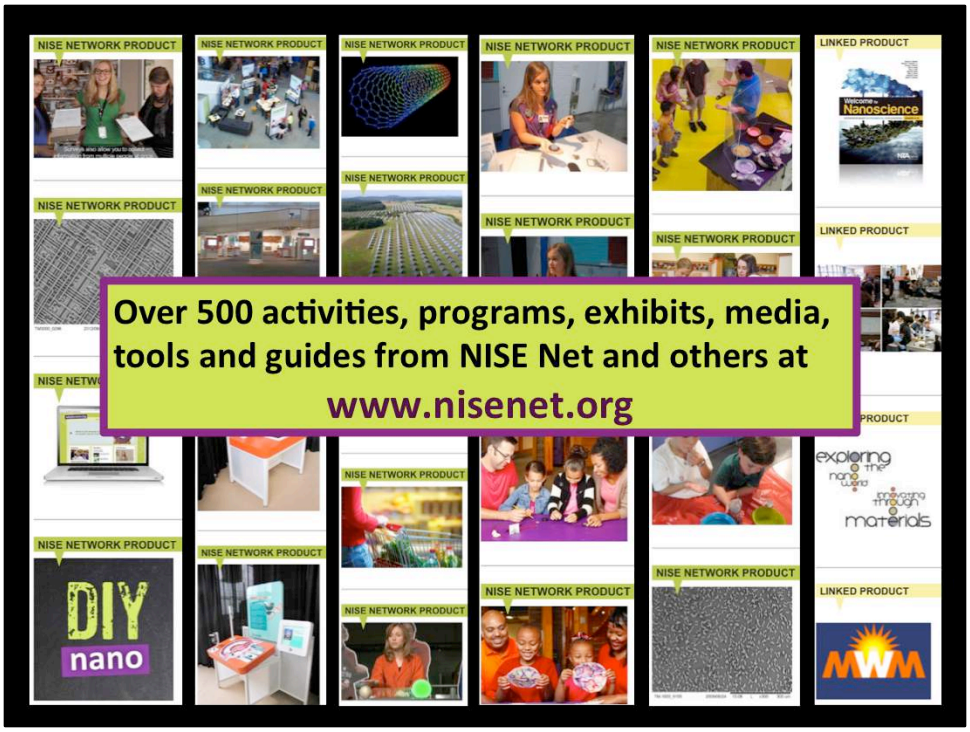
The richness of these kinds of interactions led the National Science Foundation to put out a call to the ISE community back in 2005 to find ways to engage the public in the emerging field of nanotechnology - investing in



the Nanoscale Informal Science Education network.

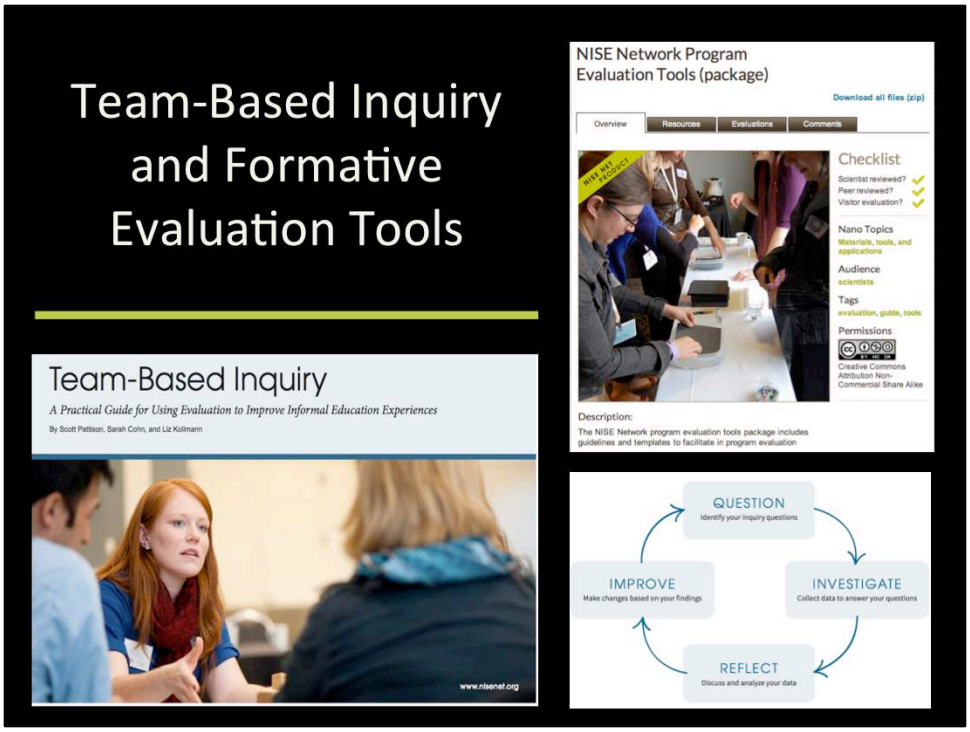
…

Over the last ten years, the NISE Net has brought together dozens of science museums and research organizations in collaboration around materials sciences and engineering education.



It has fostered the collaborative development of materials, tools, kits, physical and online resources, opportunities for professional development, and perhaps most importantly, an ethic of sharing educational products and expertise across multiple institutions. And the majority of these professional development resources are *not specific to nanoscience*.

There are resources for engaging under-represented audiences….



Team-based inquiry and formative evaluation tools

Technology and society tools

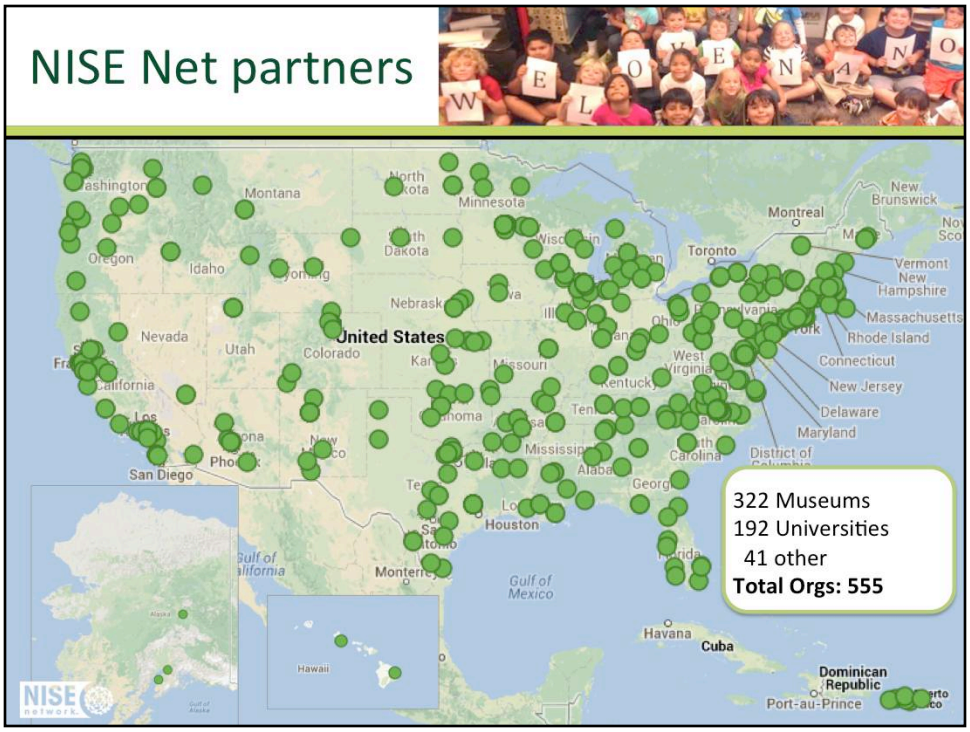
Forum guides

Science communication and training tools-

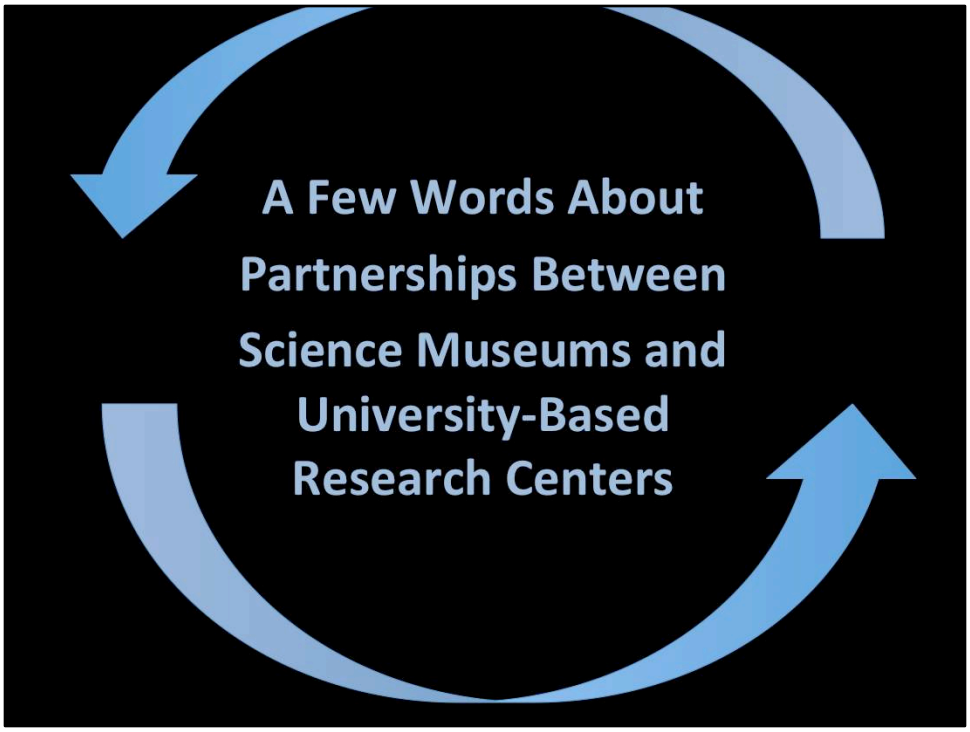
And of course, hundreds of Nanodays kits and celebrations….across the country.

By the end of 2015, it is estimated that 30 million people will have participated in NISE Net programs, events, and exhibitions…

But perhaps the greater legacy of the NISE Net is that



hundreds of new relationships have been formed between university STEM professionals and informal science professionals, and
there is new capacity across all these organizations to make the most of these kinds of partnerships –
This capacity goes beyond the subject matter of nanotechnology – many of the same strategies and experience can apply to any area of research.
If you go to nisenet.org, it's quite possible you will find a potential local ISE partner with experience working with univerisities…and you can begin a conversation about a new collaboration in your center's area of research.



Now a few words about partnerships between science museums and research centers… I wrote a guide for ISE folks

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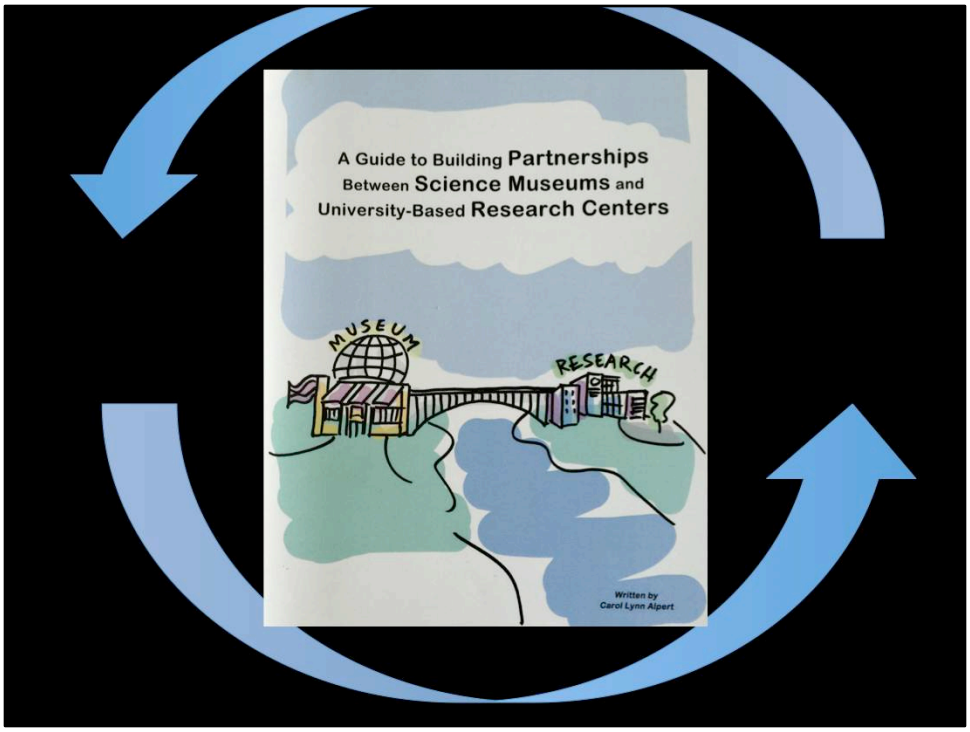
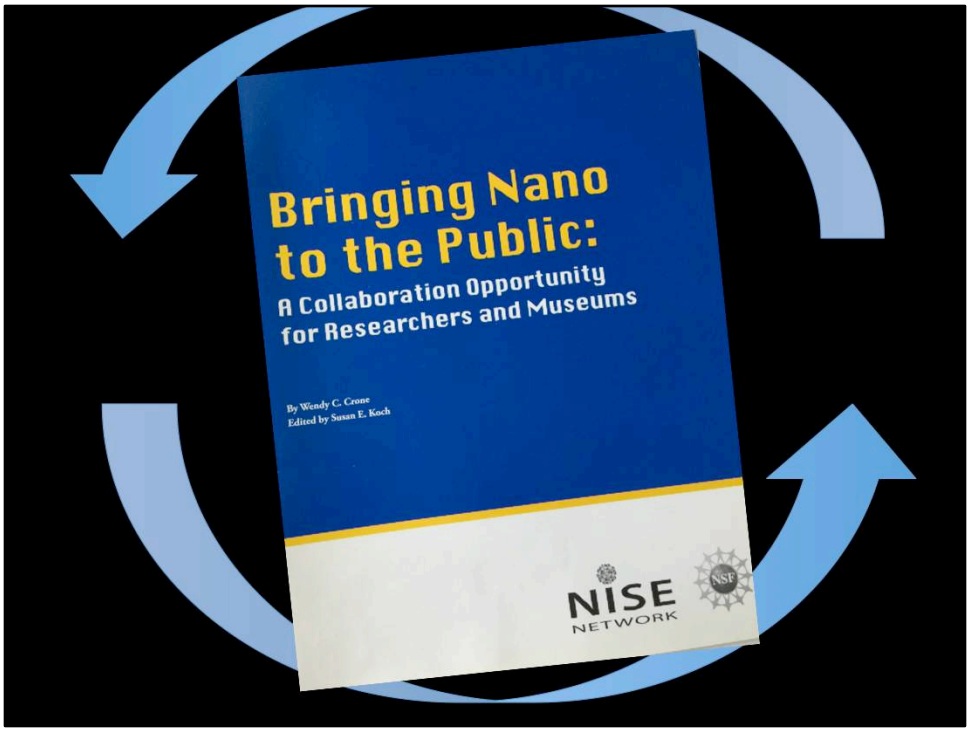


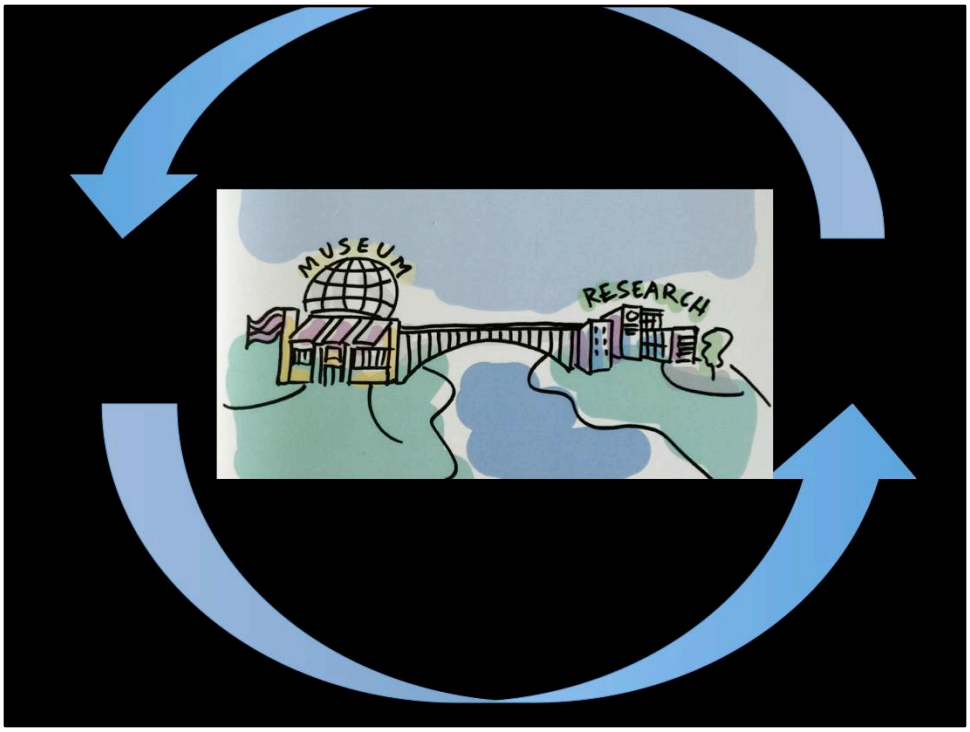
On building these sorts of partnerships

…



..and there's also an earlier one that was written specifically for scientists…- and is useful beyond nano - and I have a few copies of these here and you can get pdfs of both of these for free online at nisenet.org.

…



The gist of the advice is this:

Most science museums operate on tight budgets funded through admission fees, grants, and donations. Everyone is enthusiastic about potential synergies, but no one is sitting around with nothing to do. So take a long term approach to developing collaborations with museums– don't come to them seeking a letter of support the week before the grant proposal is due.
The best time to plan for a collaboration is in the months leading up to a new grant proposal, when the partners can meet and discuss ideas, and come up with an evidence-based plan and a budget to support the collaboration.

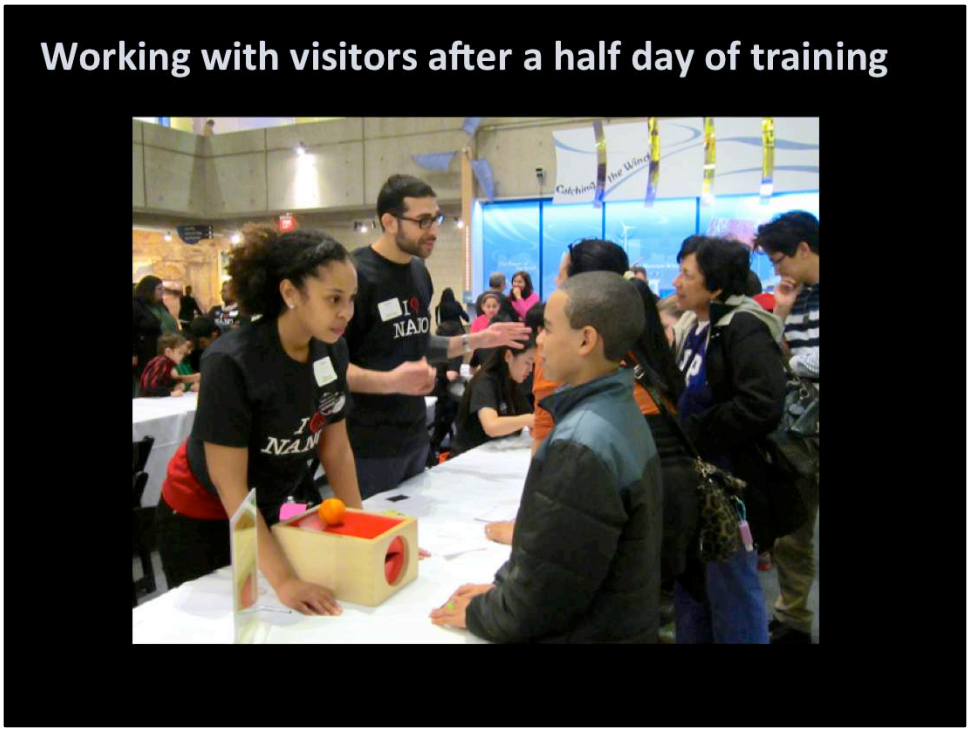
The Amazing Nano Brothers Juggling Show

Total Audiences: 75,000 + including 12,000+ at schools…

Better to focus on creative events like programs, hands-on activities, and science theater, that can engage a broader audience.

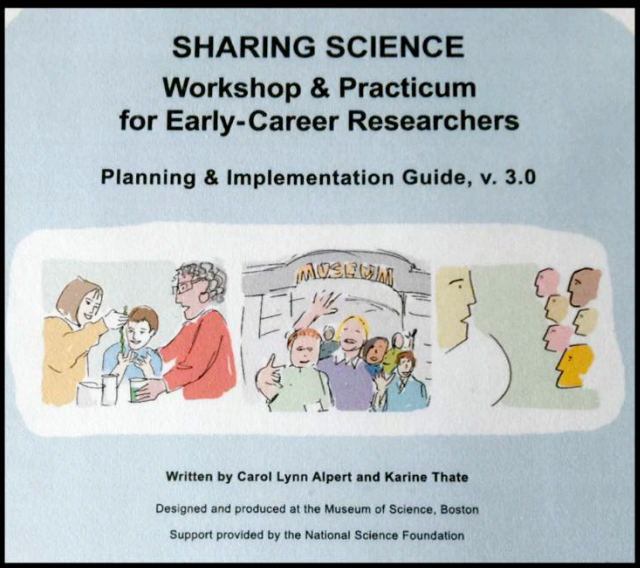
Or, you may be able to fit your collaboration into a theme around which the Museum already has gathered some resources– such as National Chemistry Week, NanoDays, Earth Day –

You can work with the ISE organization to prepare your faculty and students for these types of engagements
Our pedagogy is focused around learning by doing, and we have developed the Sharing Science workshop and practicum for early career researchers….



It gets them out working with visitors after just half a day of training.

Implementation guide and materials
free on nisenet.org

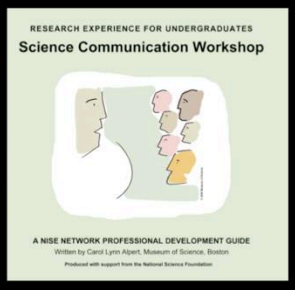


The Sharing Science implementation guide and materials are being used at several science museums aroud the country, and they are available for free on nisenet.org.

For university education and outreach providers, we've developed the REU Science Communication Workshops…

tailored to students participating in undergraduate research programs. The focus here is on professional scientific communication skills – helping undergraduate students gain confidence that they can succeed in graduate school. This set of workshops has now been implemented by a network of

Sci-Comm Scale-Up: 10 Universities



MRS EDUCATION SYMPOSIA:

C.L. Alpert, K. Thate, **Can a Nat. Network of Undergrad. Research Prog. Directors Validate a Set of Prof. Skills-Building Sci. Comm. Wkshps?** *MRS Online Proc. Library* (2014).

C. L. Alpert, **Beyond 'Train-the-Trainer:' A Preliminary Report on a New Scaffolding Strategy for Science Communication Workshop Dissemination,** *MRS Online Proc. Library* **1532** (2013).

C. L. Alpert, E. Levine, C. Barry, J. Isaacs, A. Fiorentino, K. Hollar, K. Thate, **Tackling Science Communication with REU Students: A Formative Evaluation of a Collaborative Approach,** *Mater. Education,* eds. M. Marinho Patterson, D. Dunham, E. Marshall, J. Nucci (*Mater. Res. Soc. Symp. Proc.* **1234** (2009).

education directors on ten campuses across the country, with coordinated data collection.
In fact, one of the unexpected outcomes of this work and what I am most excited about right now…

– is that we are beginning to see transformative impacts going back in the opposite direction – we have begun to find ways to improve the culture and practice of professional science communication within research centers. So that scientists are communicating better with *other scientists.*

For instance, I teach a Research Communication Laboratory at MIT and
…

we've gotten faculty and students at the Center for Integrated Quantum Materials involved in improving their presentations at annual meetings with workshops, coaching, contests and awards.

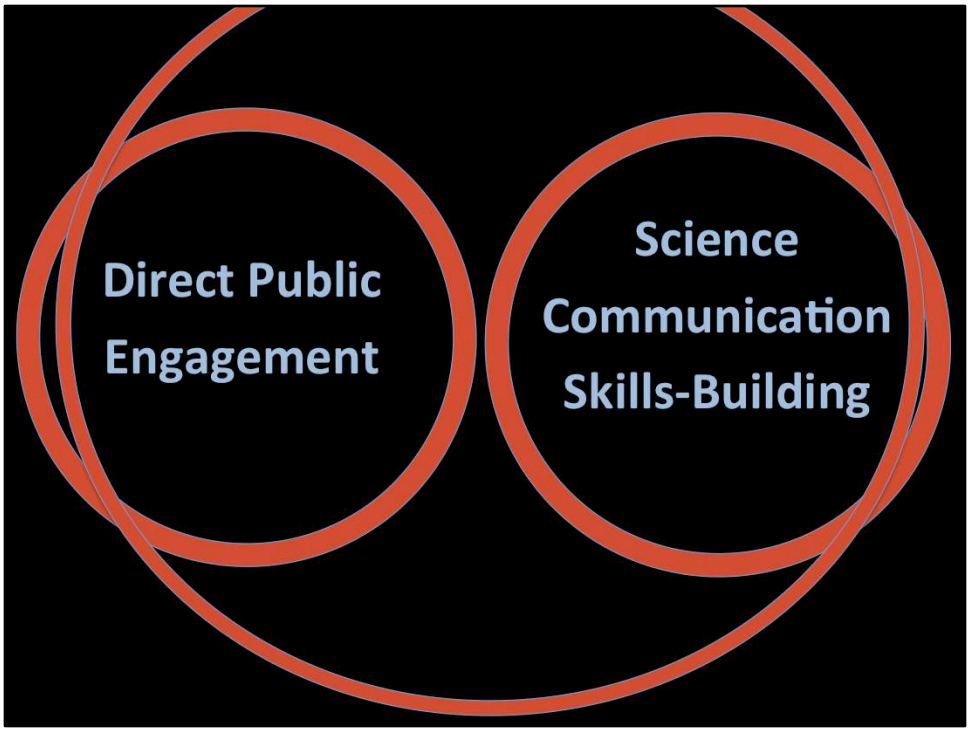
NSF Innovations in Biological Imaging and Visualization
Collaborative Research Project

Two biologists, a physicist, a chemical engineer, and their students
4 campuses in 4 different states & the Museum of Science

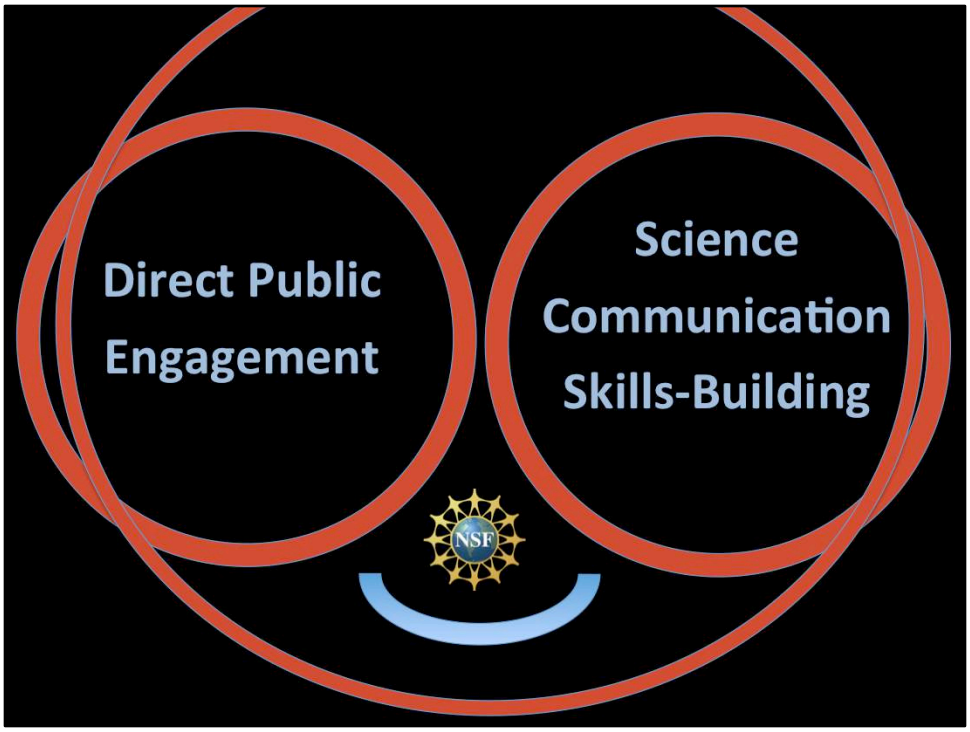
Research team website: team blog, lab notebook, images and visualizations, education resources, and public window on research

We also facilitate communication and research coordination across a multi-disciplinary collaborative research team and their students at 4 different universities.

My 7 minutes is up . I'd like to leave you with one last thought…



Collaborations that focus on both direct public engagement and science communication skills building–are mutually reinforcing and add greater depth of field for all of us.


Direct Public Engagement
Science Communication Skills-Building
NSF

Thank you.