

Regional Meeting Agenda – Day 2



- 9:00 Improv Activity #3: *Red Ball*
- 9:15 Getting Nano into your building
(exhibitions, signage, partnerships)
- 10:15 Beyond Year 10 Discussion Part 1
- 11:00 Break/List completion
- 11:15 Beyond Year 10 Discussion Part 2
- 11:45 Meeting wrap-up

Improv Exercise – *Red Ball*



More info: nisenet.org/catalog/tools_guides/improv_exercises

Why implement improv exercises ?



Incorporating improv exercises into staff and volunteer training helps create a supportive and upbeat environment for educators to practice and strengthen essential skills.


- **Warm up skills** required for interacting with visitors
- **Encourage conversations:** with visitors (rather than reciting scripts)
- **Be better listeners:** think on your feet and respond in the moment
- **Be responsive:** better tailor content to visitors responses and integrate visitor feedback
- **Be positioned as equals** with visitors not “the expert”
- **Foster teamwork & creativity:** create a fun, supportive, positive work environment to practice skills



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Getting Nano in Your Buidling – Share-outs

- Josh Sarver and Whitney Tippett
COSI
- Dan Steinberg
Princeton University
- Susan Petroulas and Chidi Agostinelli
Newark Museum
- Steve McGorry
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MRSECs: Partnerships

NISE Net

9/18/2013

What is Materials Science?

- Materials science is the making and study of stuff
- Materials scientists and engineers study the properties of materials, try to make new materials and make existing materials do new and interesting things
- Some popular areas of materials science research include:
 - Polymers, flexible electronics
 - Topological insulators
 - Quantum computing
 - Nanoparticles, nanowires
- All Nano!

What is a MRSEC?

- A Materials Research Science & Engineering Center is a National Science Foundation center grant for Materials Science and Engineering Research
- ~30 across the country at universities
- Each has interdisciplinary research groups
- Each aims to improve STEM education and disseminate research to public



Princeton Center for Complex Materials (PCCM)

- Princeton University's MRSEC is called Princeton Center for Complex Materials (PCCM) (DMR-0819860)
- PCCM members are electrical, mechanical and aerospace engineers, chemical, and civil engineers, as well as physicists and chemists
- 4 Interdisciplinary Research Groups, facilities and education outreach

PCCM Research

- Electronic Materials with Triangular Lattice and Dirac Excitations
- Design and Control of Buried Active Molecular Materials Interfaces
- Integrated Self-Assembled Nanostructures
- Quantum Control in Semiconductor Nanostructures
- And various seed projects...
 - Interfaces between Metal Oxide Semiconductors and Crystalline Silicon
 - Thermoviscoelastic Response of Supported Ultrathin Liquid and Glassy Films
 - Microfluidics For Block Copolymers
 - Spin Coherence of Electrons in Strained Si 2DEG's with Isotopically-Enriched ^{28}Si
 - Numerical discovery of frustrated quantum systems
 - Matrix Assisted Pulsed Laser Evaporation of Polythiophene Films
 - Novel Strategies to Prevent Biofouling: Connecting Physiology to Biofilm Material Properties
 - Simulating Quantum Materials with Coupled Circuit Quantum Electrodynamics Systems
 - Electronics in Tissue: Bridging the Materials Gap between Biology and High-Performance Electronics

Advantages

For Museum or Science Center

- Access to many real scientists, especially Nano, properly prepared to engage the public

For University or Research Center

- Self selected audience, primed to meet scientists

These things combined may lead to more meaningful interactions and a deeper understanding of the science



Bringing Scientists to the Public

- We are very successful in facilitating meaningful interactions
- Deep understanding of the spectrum of personalities and abilities of scientists
- Experts in managing scientists' participation for maximum impact
 - Identifying best citizens
 - Avoiding burnout/abuse of those best citizens
 - Drawing out the best in those who need help



Strange Matter Partnership

- Every weekend for 10 weeks, at least one scientist or engineer presented at the exhibit
- LSC prepared a [script](#) with our help
- Some chose not to use the script, but were still prepared by outreach staff
- Exact replica of demos for training (and future use)
- Training – never send them cold!
 - No ppt, figures, jargon
 - Practice, practice, practice!!!
- See MRS paper *A New Kind of Partnership* and ASTC Dimensions *Polymer Power: Partnering to Enrich an Exhibition*
- *“Strange Matter has moved on but the collaboration between the science center and PCCM was so successful that both institutions hope to offer future materials science programs.” – E. Romaneaux*



Strange Matter Partnership

- Partners were nervous that we didn't "get" the issues of scientists presenting to the public (We do... trust us... we do.)
- Scientists and engineers from physics; chemistry; chemical, mechanical, and electrical engineering



Strange Matter Partnership

- Preparing scientists is difficult (shown by increasing difficulty)



- All without losing their identity as a scientist or engineer

Holiday Science Lecture

- Science lecture for families each December at both Harvard and Princeton University
- Partners include Physics, Community and Regional Affairs, and Harvard partners with MOS
- Partnerships between organizations on campus are important



Making Stuff

- PCCM won a grant for Making Stuff, a national education effort to support the NOVA series
- Nearly 60 scientists and engineers reached more than 450 middle school students
- Partners included WGBH/NOVA, MRS, NJN, Franklin Institute, LSC

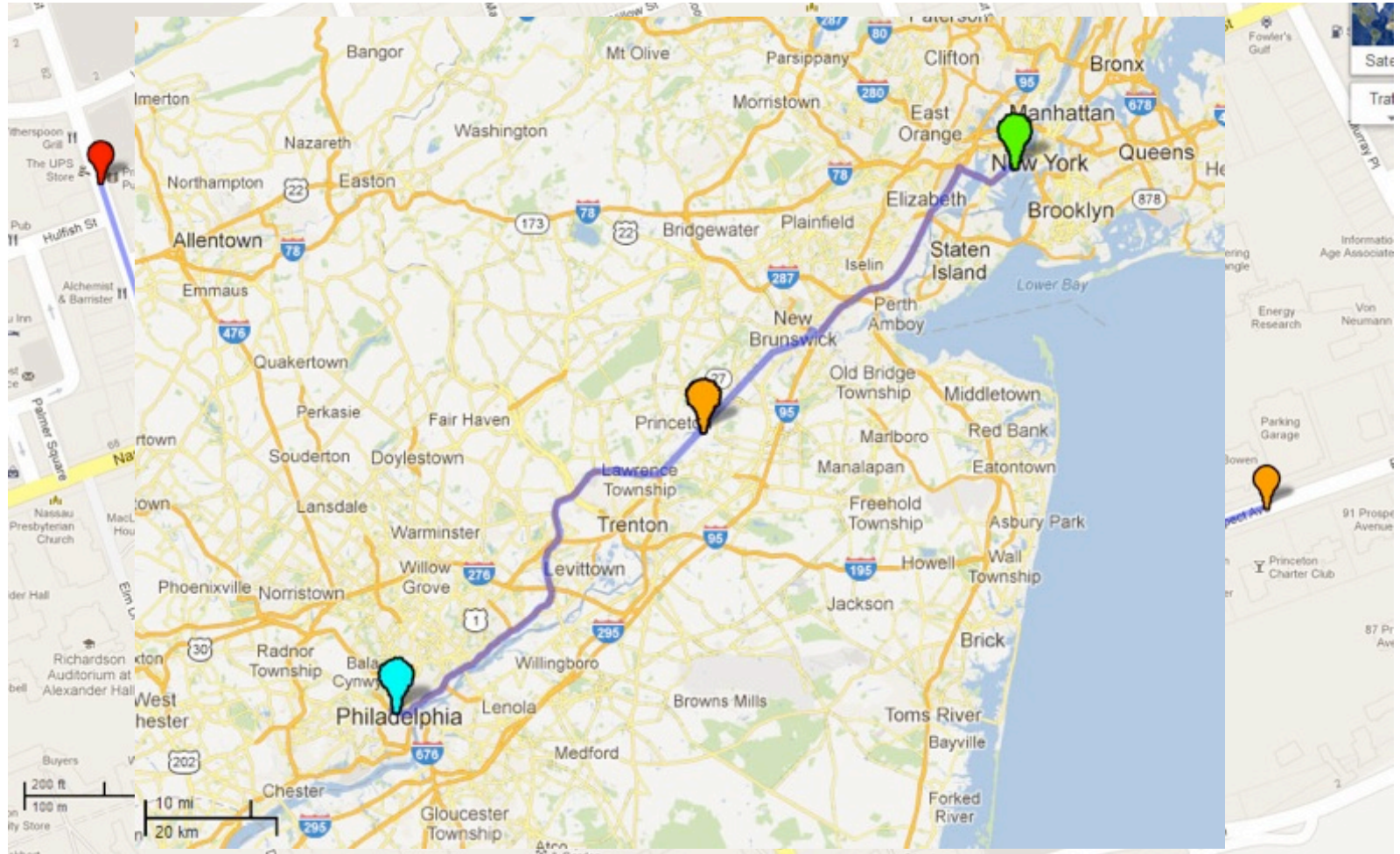


Princeton Public Library Partnership

- Huge audience
 - 31,570 cardholders
 - 807,295 visitors in 2011, 40% children
- Literacy and even science literacy is part of their mission
- 3rd floor dedicated to kids and teens
- Dedicated kid and teen outreach staff
- Closer than any science museum or science center



Princeton Public Library Partnership



Princeton Public Library Partnership

- Diversity
 - Reaches Princeton's minority population, walking distance from a largely African-American and Latino neighborhood
 - Sizeable minority population in Princeton (near 17%)
 - Princeton school district has 10% eligibility for free or reduced price lunch (significantly higher than neighboring towns)
 - Achievement gap is an issue in Princeton (ask the folks at Community House)
 - PPL has a bilingual staff to serve the Hispanic community



PPL NanoDays

- Dozens of scientists and engineers shared their research with the public using original and NanoDays activities
- Held at Princeton Public Library



Nano Mini-Exhibit

- PCCM awarded NISENet *Nano!* Mini-Exhibit
- NJ State Museum and Princeton Public Library will host
- Almost constant use
- PCCM scientists and engineers will present on weekends



Acknowledgements

- National Science Foundation
- Nanoscale Informal Science Education Network
- Prof. N. Phuan Ong, PCCM Director
- Shannon Greco, PCCM Education Coordinator
- Our partners: PPL, NJ State Museum, LSC, and others

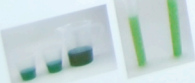


NanoDays

Exploring Properties—Surface Area

Try this!

1. Pour about 50 mL of colored water from the pitcher into each cup.
2. Break the two identical tablets from their wrapper into two 1/2" x 1/2" x 1/2" cubes. Drop one cube into each cup. Break the other tablet into eight equal pieces. Add the same break, pour the water from each cup and stir.
3. At the same time, pour the water you broke on first into a graduated cylinder. Do the same with the water you broke on second. Observe the colored tablet. That's because it has a greater surface area to break into smaller pieces. The smaller tablet has more surface area to break into even smaller pieces. The smaller pieces of the tablet, representing the nanoscale, break into even smaller pieces. You can't see them, but you can't easily





Make it / Take it Saturdays

Workshops for
kids & families
EVERY 3RD SATURDAY
OF THE MONTH



If you can
think it,
you can **make it.**

Invent, Design and Make at the Newark Museum,
a leader in the Maker Movement!

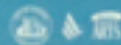
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NOON-4:30 PM

Nano Day: Exploring the Science of the Super Small

Fun, hands-on
activities for all ages:

- Twisted and Bent: The Properties of "Memory Wire"
- Nano Fabrics: Learn how stains are repelled
- Liquid Crystal Diodes: Examine how the display on your calculator works

Presented by
Star-Erger
19



NEWARK
MUSEUM
always exciting.

newarkmuseum.org
45 Washington Street, Newark, New Jersey
973.596.6550
On-site parking available



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NanoFabulous

Donna Hammer, Associate Director
MRSEC, University of Maryland



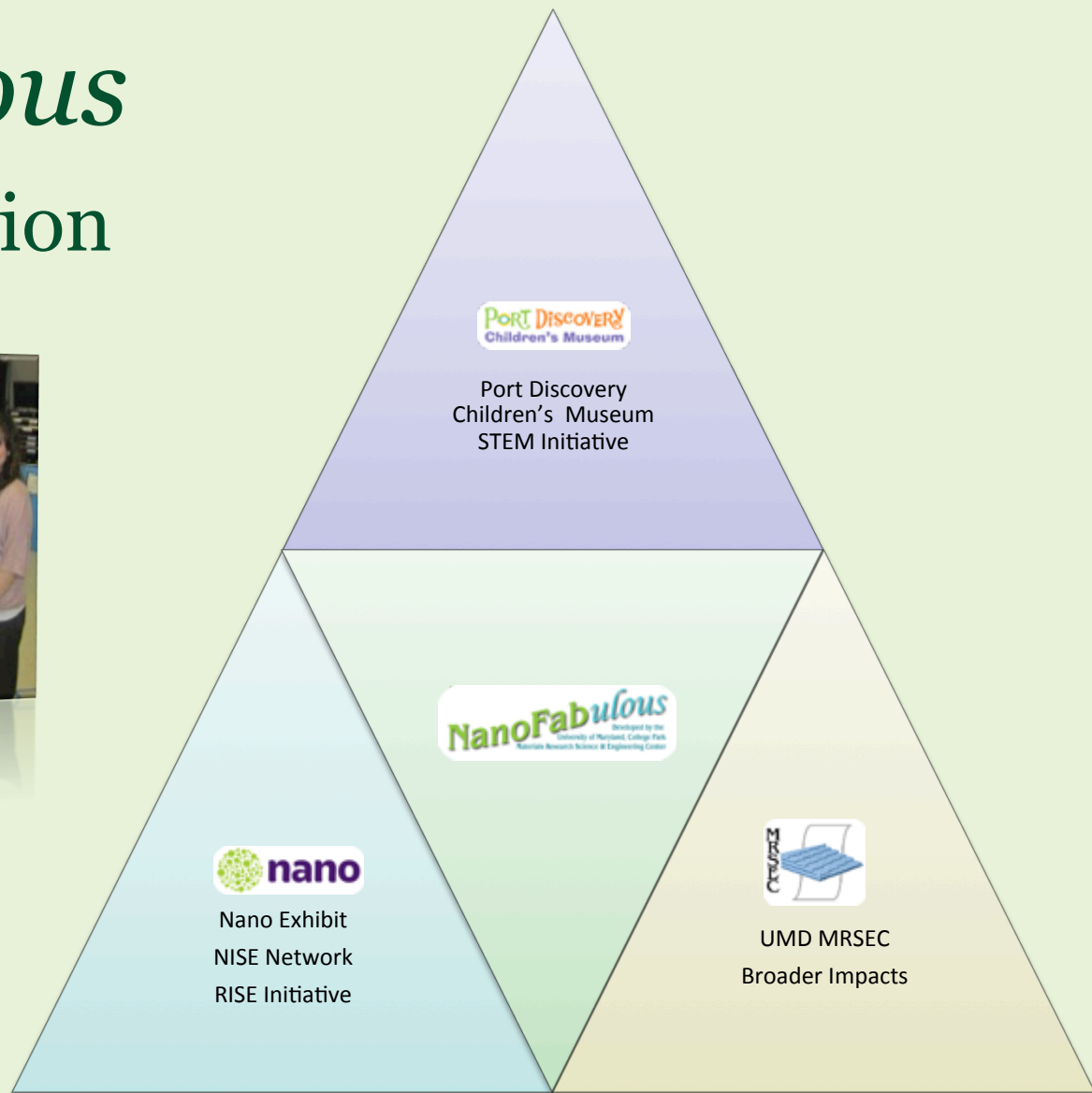
Materials Research Science and
Engineering Center (MRSEC)
University of Maryland, College Park

Port Discovery Children's Museum
Baltimore, Maryland

NanoFabulous Project Foundation



NanoFabulous mission:
Nanoscience research
processes and the
instruments that make
nanoscience and
technology possible.





NanoFabulous

The Exhibition

- LEGO Scanning Probe Microscope
Visitors see how a scanning probe microscope creates an image.
- Contact & Noncontact Probes Table
Visitors have fun understanding how nano-probes function and are used to measure the surface of materials at the nanoscale.
- Magnification Table
Visitors discover the microscopic secrets on the surfaces of objects by using magnifiers of different strengths.



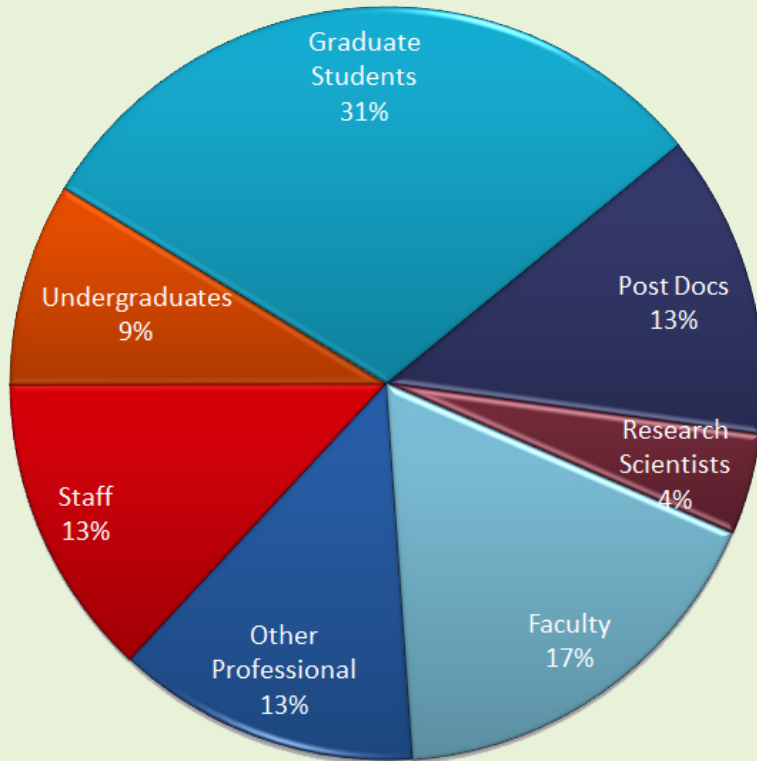
NanoFabulous Cleanroom Facility Includes:

- Booties Station
- Dress-a-Researcher Station
- Filters, Fans, & Floor Tiles
- Facility Support Structure
- Transistors-LEGO Station
- Wafer Inspection Station
- Wafer Washing Station

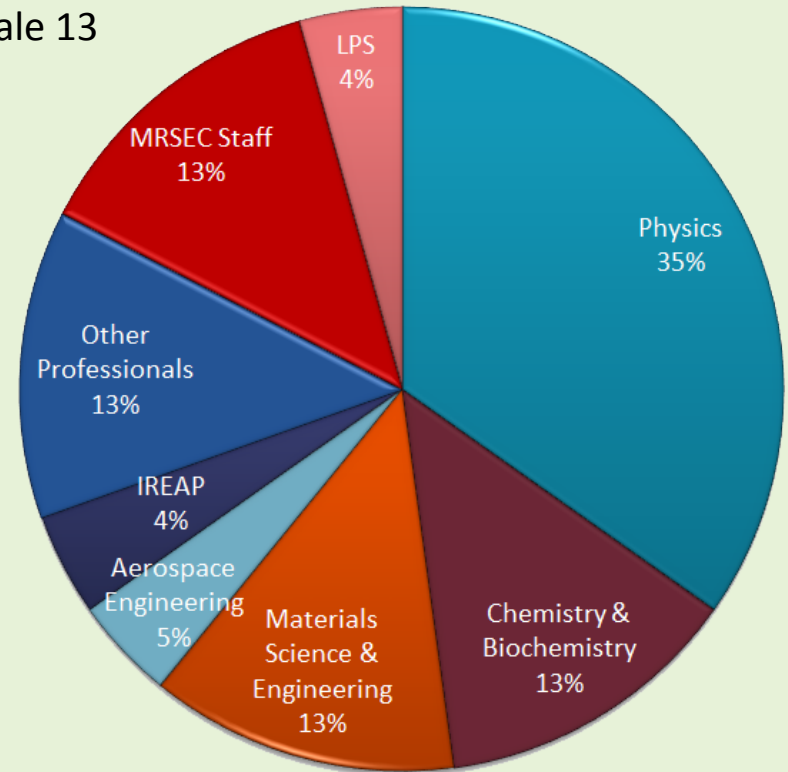


The NanoFabulous Team

Total Participants 23
Female 10 Male 13

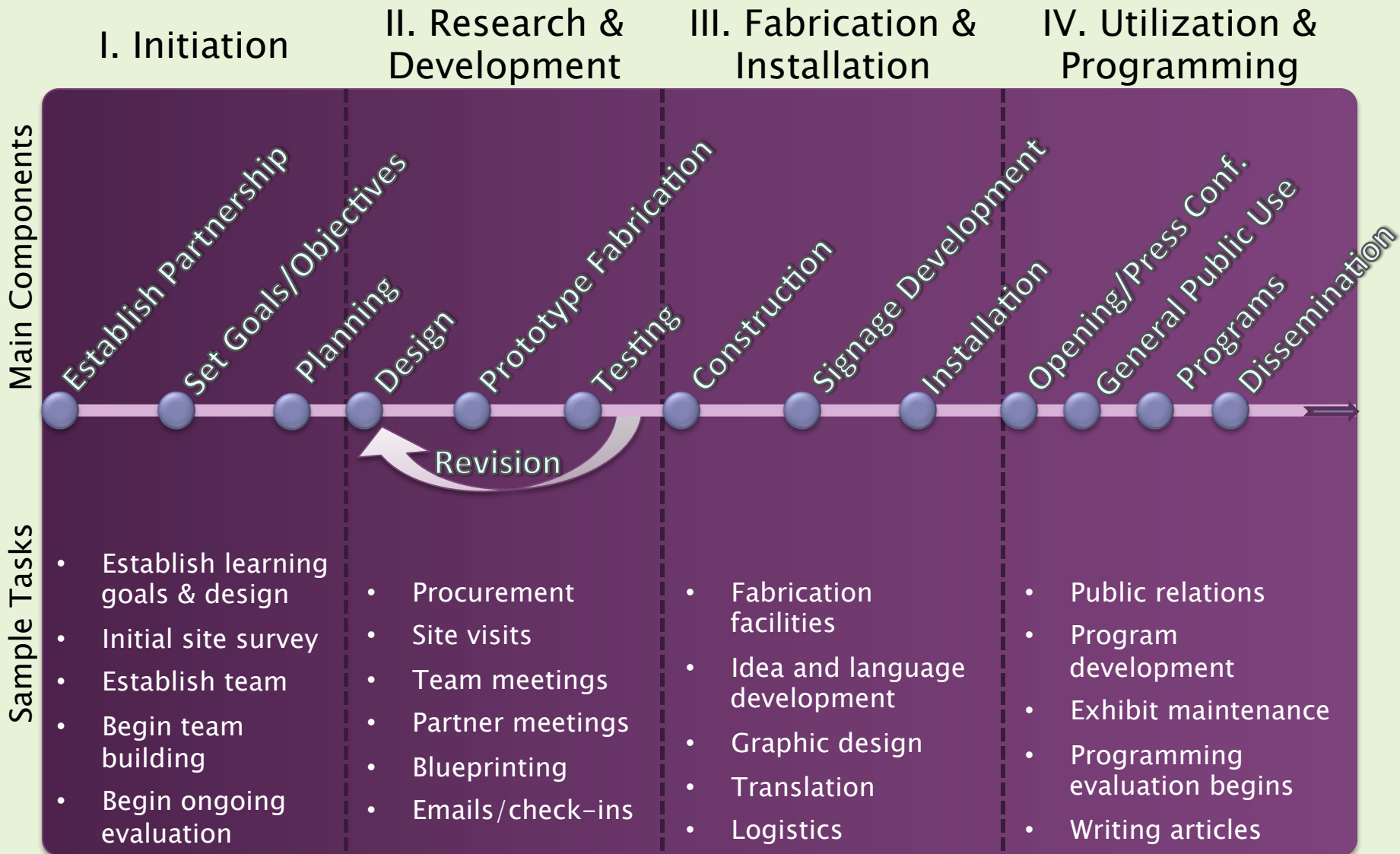


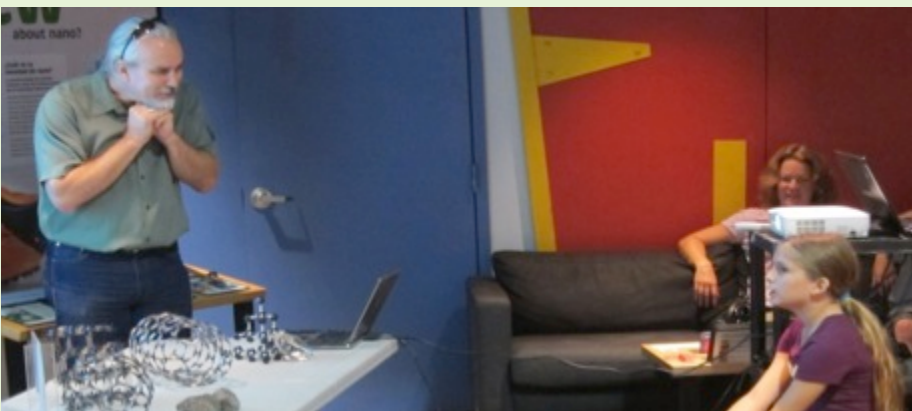
Participant Breakdown



Interdisciplinary Breakdown

Project Flow (7 months)

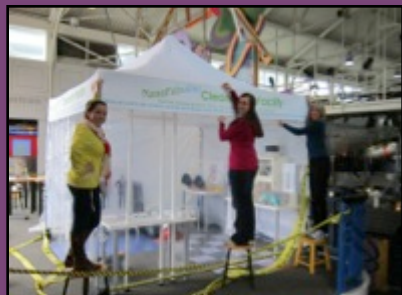
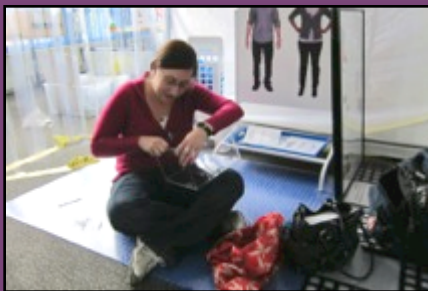




NanoFabulous Programming

- Family Scavenger Hunts
- School Groups
- Summer Camps
- Meet a Scientist
- Educator Workshop
- Discovery Days
- Nano Days Activities
- Conversations about Nano and Society

Effective Infrastructure for Involving Researchers



- Establish a strong partnership
- Identify champions
- Recruit researcher strategically
- Clear leadership – project backbone
- Clear goals & realistic expectations
- Available space, supplies & logistics
- Listen
- Integrate partner support
- Open & ongoing communication
- Only hold meetings/trainings as needed
- Use teachable moments
- Continuous feedback & praise
- Develop teams
- Provide food!
- Celebrate every success
- Be flexible

Redefining Scholarship

The exhibit project is a paradigm for expanding the definition of scholarship to include the critical components of **public engagement** with the practice of research.

LEGO SPM Team Leader




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Future: Beyond Year 10

Project funding
ends in ~ 2 years
(August 2015)

Future: What remains after Year 10



What remains after the funding ends?

- Field-wide capacity to engage the public in nanoscience, engineering, and technology
- Relationships, including collaborations between scientists and museums
- Ongoing use of NanoDays and program materials
- Mini-exhibition copies on museum floors
- Website - online catalog
- Evaluation and research knowledge
- Network lessons shared with field

Future:



How can we sustain the benefits of the NISE Network?

Future - Funding Scenarios After Year 10



Range of Scenarios

Scenario 1:

No additional funding

Scenario 2:

Some additional funding
for a core of activities

Scenario 3:

Funding for a new topic

Future – Individual Reflection & Share out

Scenario 1. No additional funding

- In the absence of any more funding, what would your institution be able to keep doing?
 - Are you taking any actions or pursuing any resources in the next two years to be able to continue nano education work in the years beyond the grant?
-
- How could the partners in this regional hub support each other's work moving forward? Which collaborations do you plan to initiate/continue and how will you sustain them?

What interest you the most?

Snacks & sticky dots

Scenario 2: Some additional funding for a core of activities

- If there was limited funding to support the NISE Network in the future, what activities would be most valuable to you?

- NanoDays physical kits
- NanoDays digital materials
- mini-grants
- exhibits
- regional hub structure
- in-person professional development
- online professional development
- new programs and media
- website with online catalog
- newsletter
- social networking (Facebook, LinkedIn, Twitter)
- other: _____

What interest you the most?

Snacks & sticky dots

Scenario 3:

Funding for a new topic

- If we could repurpose the network for another topic, what topics interest you the most?

- engineering
- climate change
- energy
- synthetic biology
- big data
- computer science
- convergent technologies (nano-bio-info-cogno)
- new emerging technologies
- societal and ethical implications
- nano is the only topic that interests me
- brain and neuroscience
- maker spaces
- other: _____

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Last Minute Logistics



Logistics

- reimbursement forms
- luggage
- airport rides
- swap table

THANK YOU!

To all our partners - we could not do this work without you!

