NNCI Education and Outreach

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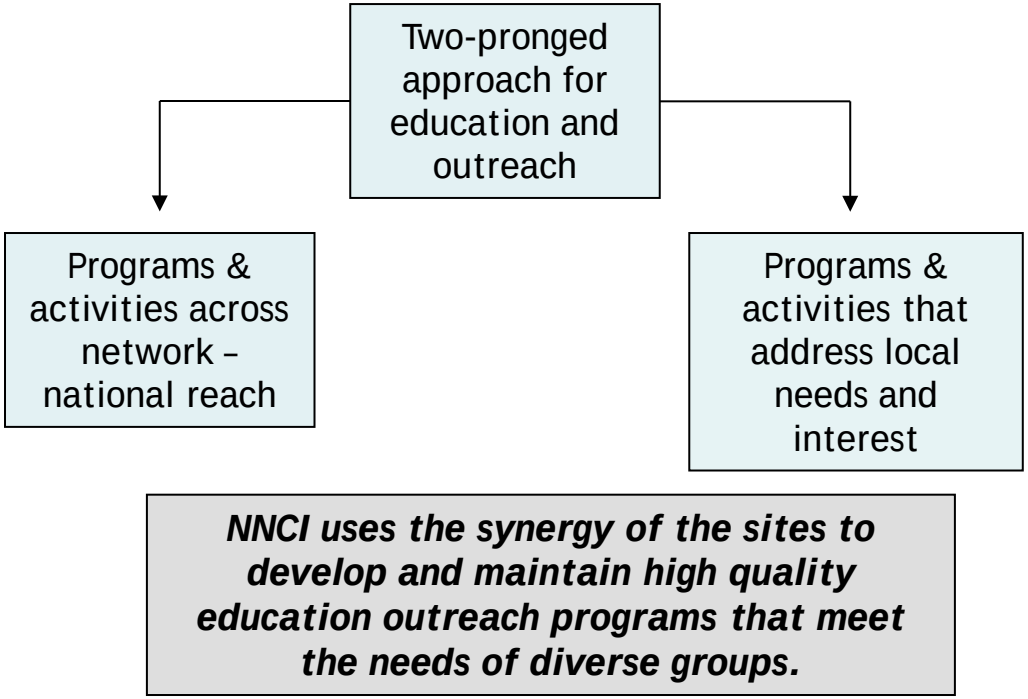
NNCI Education and Outreach Mission

- Offer education and training to address the growing need for a skilled workforce and informed public
- Provide resources, programs, and materials to enhance knowledge of nanotechnology and its application to real-world issues
- Believe that a strong US economy requires a STEM-literate workforce ready to meet the technological challenges of a nano-enabled economy as well as an informed citizenry that supports continued and safe growth of nanotechnologies.

NNCI E&O

- 16 sites with 16 individual E&O programs
- Common themes across the site programs which lend themselves to collaboration and support



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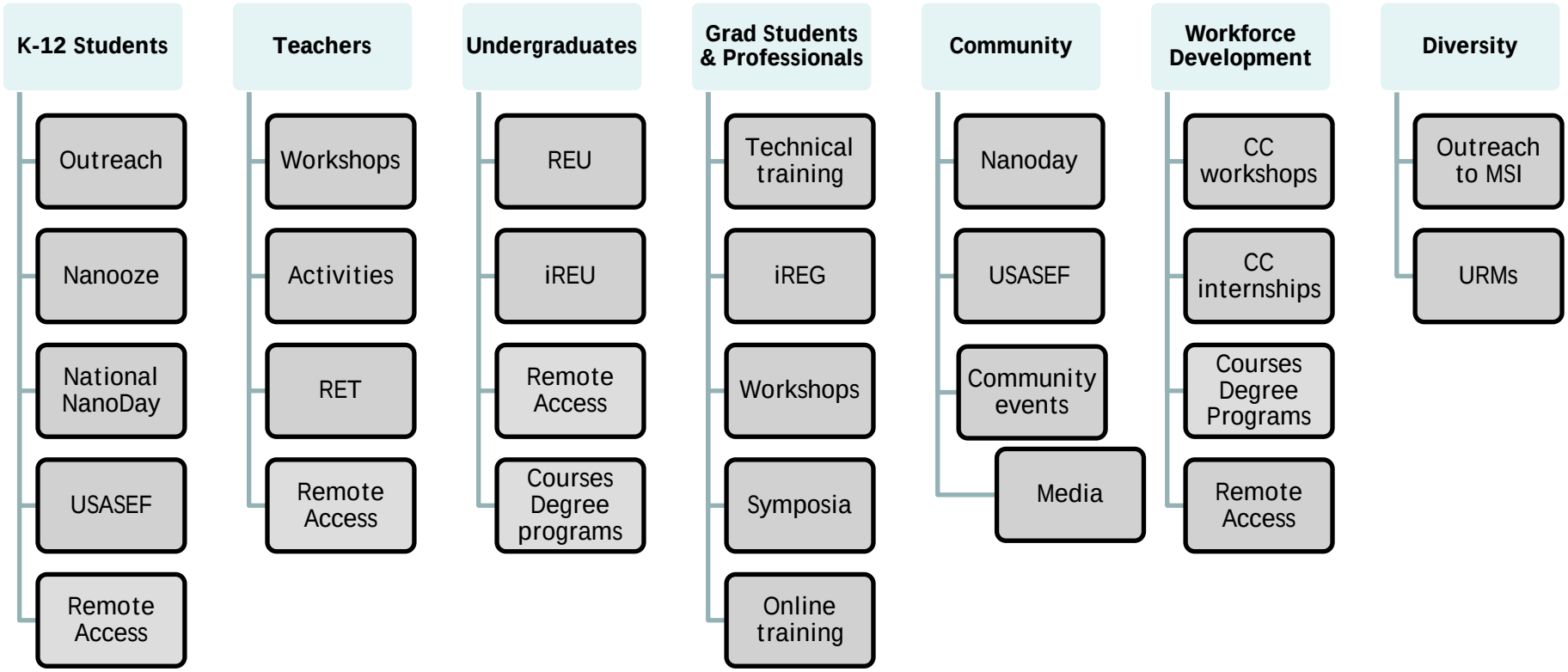
NNCI Education Programs by Audience



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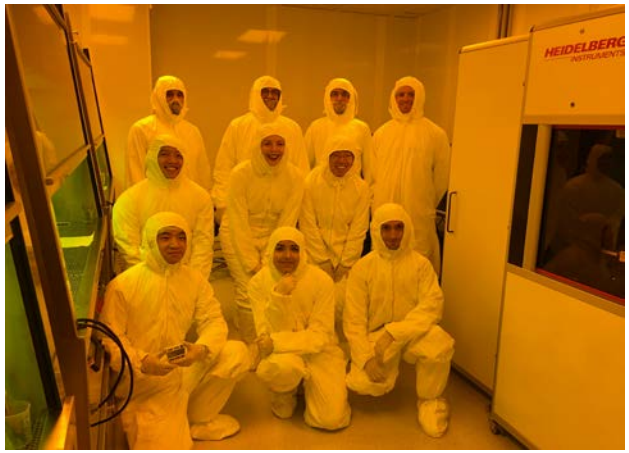
NNCI E&O – Year Two

- September 2016 – September 2017
- VERY busy and productive year
- ~more than 325,00 reached
  - 12 of 16 sites reporting
  - Does not include:
    - 3-5 million who visit Epcot annually
      - *CNF's Nanooze* exhibit
    - *Nanooze* print editions



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Research Experience for Undergraduates

REU Working Group

- 13 of 16 sites – REU programs
- Listed on NNCI.net with link to each site's program and application
- Listed on NSF REU website
- Just added to Pathways to Science

Research Experience for Undergraduates

NNCI Research Experience for Undergraduates (REU) Program in Nanotechnology

Research Experience for Undergraduates (REU) programs are an excellent way for undergraduates to become acquainted with scientific research and graduate student life. REU programs typically consist of an intensive 10 week summer research experience at a university different than your own. Most research centers sponsor REU-like programs as part of their education and outreach efforts.

The NNCI does not offer a network-wide REU program, but many of the NNCI sites conduct their own separate programs and the details for these are listed below. You must apply to each program separately.

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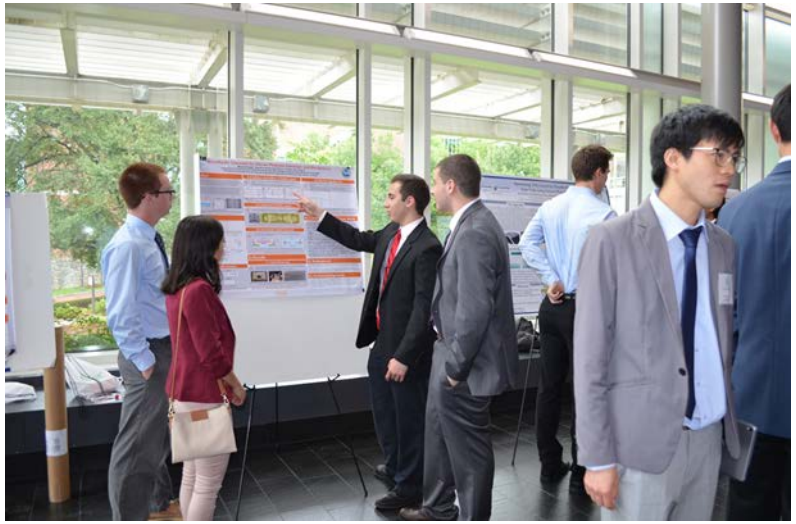
NNCI REU Convocation

- Georgia Tech August 6-8
- 10 sites participated
  - CNF; CNS; KY-MMNIN; MANTH; MONT; NCI-SW; RTNN; SENIC; SHyNE; TNF
  - 56 REUs
  - 6 iREUs
  - 4 iREGs
  - Unable due to scheduling conflict
    - NNF, SDNI, NNI
- Oral presentations
  - Archived at: http://nnci.net/reu-convocation-2017
- Poster Sessions



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REU Convocation – Overall rating: 4.1 (n=32)

Question	Poor	Somewhat	Good	Very Good/ Excellent	Superior	Weighted Average
The convocation as a TECHNICAL experience.	0.00%	3.13%	25.00%	56.25%	15.63%	3.84
The convocation as a Social/ Professional Networking experience	0.00%	21.88%	21.88%	34.38%	21.88%	3.56
Was the NSF Fellowship presentation useful/interesting?	0.00%	0.00%	25.00%	46.88%	28.13%	4.03
Was the Career Panel session useful/interesting?	0.00%	15.63%	21.88%	37.50%	25.00%	3.72
Was the Societal session by Dr. Wetmore useful/interesting	0.00%	9.38%	31.25%	43.75%	15.63%	3.66
Did you find the international presentation interesting/informative	0.00%	3.13%	37.50%	31.25%	28.13%	3.84
Was the poster session useful?	0.00%	12.50%	34.38%	34.38%	18.75%	3.59

REU Convocation

- **A good (if nerve-wracking) experience overall**.
- **Enriching experience and very organized**. Enjoy a great networking and activity that will help me establish my career.
- **I enjoyed the wide breadth of research topics** which were presented and the variety of types presentations like the cultural discussion of those who went to Japan. Yes, listening and staying engaged with so many presentations on subjects I was not familiar with took some endurance, but I have learned this comes with the territory if I desire to be an expert in my field. However, this gave a **great opportunity to meet make new friends and network.**

REU Convocation

- Despite the fact that I got tired and burnt out by the end of the program, **I really enjoyed the presentations, planned activities, and the organization of the program**.
- **The conference was great**, very full and busy, but a good introduction to conferences.
- **Conference was awesome**, great food, well organized, good to meet a lot of the other REU's. Very cool opportunity to see the campus and the city.
- **I really enjoyed the experience**! I love events like this - meeting like minded people sharing about going through a similar experience.

Workforce Development (post-secondary)

TNF: ***Undergraduate internships***

- 8 hourly UT undergraduates since 2014. Three current workers
- Paid with cleanroom usage fee
- Participate in the Equipment Training effort
- Increase the graduation rate (70% in 4 years) by supporting the goal of the UT University Leadership Network (ULN).
- Unparalleled work experience of 2-3 years: highly employability either in the workforce or to join graduate school

ADRIAN VELEZ 	*ULN- training staff*	*Hourly traning staff in 2016*
AALiYAH HUBBARD 	*ULN- training staff*	*Hourly traning staff in 2016*
OFELIA TIJERINA 	Technical Staff Asst I	Hourly traning staff: Ellispometer, optical microscope, data managing
MARIA O NIETO 	*Technical Staff Asst I*	*Hourly traning staff in 2016: TA at UT*
SAMUEL ETKIND 	*Technical Staff Asst I*	*Hourly traning staff: MIT Grad school*
ARGUELLO, NOEL R JR 	*Technical Staff Asst I*	*Hourly traning staff: Graduated, Engineer in Austin*
SANIA RAZZAK 	Technical Staff Asst I	Hourly traning staff: AFMs, Etchers, furnaces Cleanroom supply restock
PHUOC HUYNH THINH NGO 	Technical Staff Asst I	Hourly traning staff: furnaces, Profilometer, Cleanroom supply restock

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Workforce Development

- RTNN: *Nanotechnology workshop for community college educators*
  - 9 attendees from across N.C.
  - Each participant:
    - received an overview of nanotechnology tools and techniques
    - analyzed a sample from a research lab with three different characterization tools in the facility
    - Lesson plans and curricula
- NNI: Student internships (UW, CC, HS)
  - Paid internships supported by user fees
  - Multi-year internships support mastery and expanded skillsets
  - Interns work closely with academic and industry users
  - Interns given opportunity to conduct original research
    - 2017 Research Symposium Posters
  - 3 month long internships at OSU
  - Ongoing partnership with North Seattle Community College's ATE (SHINE; DUE 1204279)

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Workforce Development

- ASU *Rio Salado College Nanotechnology AAS program*
  - Provided hands-on lab experiences with characterization and process equipment, Materials, Safety & Equipment, and Basic Nano Processes courses.
  - Lead – Workforce Development Working Group
- MANTH *partnership with Community College of Philadelphia*
  - Focus Group on August 31, 2017 with 12 participants from industry, agency, higher education and a local innovation NGO
    - discuss the need for nanotechnology technicians and what sorts of training and skill sets would be useful. Next steps include determining specifics of Philadelphia-area needs/market that CCP serves and working with the CCP higher administration to asses the appropriate level of programming/curriculum that would meet this need.

Workforce Development

- MINIC Undergrad internships
  - Presented talks at three local universities in Spring 2017 to invite undergrad collaboration in focus areas
  - Carried out second year of an internship program for local community college students.
    - Three interns carried out semester-long research projects in our labs.
  - Ongoing partnership with Dakota County Technical College's ATE Nano-Link
- Nano@Stanford two and four year colleges
  - Cañada College – Intro to Engineering; collaboration on honors research projects
  - Cal State University East Bay (CSUEB) – most ethnically diverse institution in CA
    - Advanced Laboratory course using SNF facilities
    - Educational journal article in preparation: *"Fabrication and Characterization of pn-junction Solar Cells as an Introduction to Semiconductor Fabrication"*

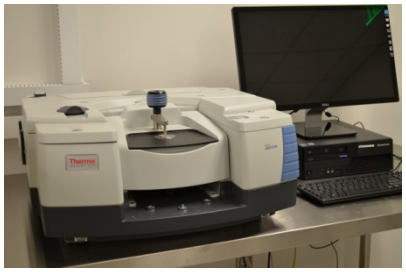
Workforce Development

- CNS and Veterans
  - Continues work with Bunker Hill CC
    - REV and hires part- time technicians. Two to date: one now at northeastern other at BHCC
    - Expanded vet recruitment and working with the Warrior Scholar Program to recruit some of their alumni, and the Posse Veterans Program.
      - Most of NNCI interns coming from these and also from former REVs

Workforce Development

- SENIC
  - JSNN – Forsyth Technical Community College
    - Interns from the Nanotechnology and Biotechnology associate degree programs
      - Four interns per year
        - » receive at least 160 hours of on-site and paid workforce training in one of the JSNN core labs
        - » Three students have been hired to work as technicians at JSNN
  - GT
    - Collaborator: Atlanta Technical College's ATE proposal *STEM Teacher Training Initiative for Bioscience*
      - IEN will provide content support for workshops
    - Undergraduates – Coop, work-study, student assistants
      - Paid through CR fees
      - Hands-on experience and improved employability

Workforce Development



- Penn State's Nanotechnolgy Applications and Career Knowledge (NACK)
  - RAIN network
    - Remote access to tools
    - Promoted to two-year colleges
  - NNI-SW provided demo at January NNCI Conference
- NNCI sites adding equipment
  - SENIC (GT)
  - RTNN
  - NNF

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K-12 Students

- Examples: (not inclusive)
  - Camps at KY MMNIN (UL & UK), NanoEarth, NNF, NNI at OSU, SENIC at JSNN, RTNN,
  - SHyNE - Provost Office, Daughters & Sons to Work Day
  - UNL – Travelling Nanoscience Exhibit
  - RTNN - Science kits distributed to 150 schools across NC by Morehead Planetarium and Science Center.
  - SENIC (JSNN) NanoBus
  - SDNI – STEM activities to area school students
  - NNI (UW) – STEM Career Fairs
  - CNF – *Nanooze*

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K-12 Teachers

- UNL: Title 1 Teacher (15 schools)
  - Free scholarships sponsored for Native American and Title 1 teachers
  - Free NISE Net Nano kits (75)
- SENIC – GT teacher workshops
- Nano@Stanford – Nanoscience Summer institute for Middle School Teachers
- NNI (UW) Educators-in-Residence program
  - Educators into UW labs/CR
  - Develop classroom materials
  - Dissemination to peers
- SDNI – RET High School Teachers
  - 3 per year; develop science curricula & hands-on labs

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K-12 Teachers

- NCI-SW RET
  - Lead on NSF proposal
    - *RET Site: Collaborative Proposal: Research Experiences for Teachers across the National Nanotechnology Coordinated Infrastructure*
    - Partners sites
      - NSI-SW
      - SENIC (GT)
      - MINIC
      - KY MMNIN (UL)
      - NNF

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K-12 and Public

- NanoDay October 9 (10^{-9})
  - NNCO inspired day
  - Numerous events across the network
    - Many listed one the NNCO website https://www.nano.gov/nationalnanotechnologyday
    - Mascot races at: https://www.youtube.com/channel/UCwO7o2ZT-ATkbl0KrJXXhdA and at site websites/YouTube
- Many sites celebrating NISE NET's NanoDays (spring)

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NNCO Challenge *How Fast Can your Mascot Run 100 billion nanometers?*

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Conference and Workshops

- Technical workshops, seminars and symposia
  - All sites providing events
  - Wide range of topics and technical levels (**examples**)
    - NanoEarth - NanoEHS Webinar Series
    - CNF - Technology & Characterization at the Nanoscale
    - TNF - TMI mini-course on TEM
    - NNI (UW) - Nanofabrication Intensive Short Course
    - SENIC (GT) Soft Lithography for Microfluidics
    - SHyNE - hosted 6 major workshops with more than **200** attendees
- Goldschmidt 2017 - Nanoscience in the Earth and Environmental Sciences--Research and Teaching Opportunities
  - MONT, NanoEarth, SENIC (GT)
  - International conference on geochemistry jointly offered by the Geochemical Society and the European Association of Geochemistry
  - 35 enthusiastic attendees
  - http://serc.carleton.edu/msu_nanotech/goldschmidt2017/index.html

Diversity

- NNI (UW) First Nations Engagement
  - Hired member of the Yakama Nation to serve part-time as a program manager and liaison with the American Indian Science and Engineering Society (AISES).
  - booth at national conference,
    - building relationships to recruit students to future REU programs and recruit possible graduate school applicants
- NanoEarth Multicultural and Underrepresented Nanoscience Initiative (MUNI)
  - launched 2/2016 and has supported over 64 visitors from 16 different colleges/universities for research, workshops, and a Virginia Tech hosted HBCU Summit
- ASU recruits REUs from Native American serving CCs

Diversity

- Nano@Stanford - Cal State University East Bay (CSUEB)
  - Most ethnically diverse institution in CA and 5th in US
  - Course support w/ SNF facilities

Professor Ryan Smith and his students are gowned up and prepared to enter the Stanford Nanofabrication Facility.

- SENIC (GT)
  - Atlanta Public Schools
  - Minority majority district
    - 82% black; 11% white; 3% Hispanic
    - High School interns
    - APS Pipeline event

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Evaluation and Assessment Working Group

- Collected survey instruments
  - NNCI sites and NNIN
- Grouped into categories
- Shared with all sites
  - Invited others to upload
- Categories:
  - Evaluation plans/logic models
  - Facility Satisfaction Assessment
  - Outreach Assessment
  - REY/Teacher Workshops
  - REU
  - K-12 Student Nano Content
  - Workshop Assessment

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Online Learning

- RTNN: *Nanotechnology: a Makers Course* free online course recently launched on Coursera.
- New Working Group - Stanford and RTNN
  - Nano@Stanford
    - develop a library of technical content for existing & potential users
    - provide foundational knowledge on general techniques and Stanford-site specific instruments
    - https://lagunita.stanford.edu/courses/course-v1:Engineering+NanoFab01+Ongoing/about
  - WG plans:
    - use NNCI facility network to expedite content development
    - and share resources and training materials.
    - expand modules to include process recipes, background information about a fabrication or characterization technique, or operation or process

Questions?

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