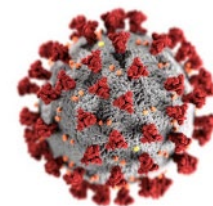


Welcome to the 5th Annual NNCI Conference 1st Virtual Annual NNCI Conference



National Nanotechnology
Coordinated Infrastructure



Welcome and Thank You

Welcome:

- External Advisory Board Members
- NSF Program Directors
- Invited Speakers
- NNCI Site Leadership and Staff
- Guests

Thank You:

- NNCI Coordinating Office Staff
- NSF for funding NNCI for another 5 years (2020–2025)

2020 NNCI Conference: Monday, October 26

12:15 – 12:30	Dr. Larry Goldberg (NSF)
12:30 – 12:45	Dr. Lisa Friedersdorf (NNCO)
12:45 – 1:15	NNCI Coordinating Office Report (Oliver Brand)
1:15 – 2:00	Site Reports: MANTH, SDNI, TNF, NNF, RTNN, MONT, CNS, SHyNE
2:00 – 2:30	<i>Break (sorry, no refreshments)</i>
2:30 – 3:00	Invited Speaker: Dr. Christine Grant, NC State University Creating NNCI Inclusion – From Ideas to Action
3:00 – 3:30	NNCI Associate Director Reports <ul style="list-style-type: none">• Societal and Ethical Implications (Jamey Wetmore)• Education and Outreach (Quinn Spadola)• Computation (Azad Naeemi)
3:30 – 4:30	Breakout Sessions <ul style="list-style-type: none">• Measuring NNCI's Impact (Jan Youtie, David Berube)• Operations during the Pandemic (Mary Tang, Ron Olson)• Ideas for International Collabs (Steve Koester, Vinayak Dravid)
6:30 – 8:00	Networking & Social Event: Hosted Trivia Contest

2020 NNCI Conference: Tuesday, October 27

12:00 – 12:15	Presentation of NSF Staff Awards (Amy Duke)
12:15 – 1:00	Site Reports: CNF, nano@stanford, SENIC, NNI, NCI-SW, MINIC, KY-Multiscale, NanoEarth
1:00 – 1:30	Invited Speaker: Dr. Celia Merzbacher, SRI International The Nano-Quantum Superposition
1:30 – 2:00	<i>Break (sorry, still no refreshments)</i>
2:00 – 3:00	Breakout Sessions <ul style="list-style-type: none">• NNCI Beyond 2025 (Trevor Thornton, Mark Allen)• Diversity, Inclusion and Equity (Líney Árnadóttir, Chris Ober, Heather Rauser)• Staff Professional Education and Training (Angela Hwang, Maria Huffman)• NNCI Advisory Board Meeting
3:00 – 4:00	Plans for NNCI Research Communities Nanotechnology Convergence; Nano Erath Systems; Nano-Enabled IoT; Quantum Leap; Understanding the Rules of Life
4:00 – 4:30	Advisory Board Oral Report

NNI Strategic Planning

- **Request for Information: NNI Strategic Planning**

- The Nanoscale Science, Engineering and Technology (NSET) Subcommittee seeks public input to inform the development of the 2021 National Nanotechnology Initiative (NNI) Strategic Plan. A restructuring of the [NNI](#) is under consideration, and the NSET Subcommittee seeks feedback from the community to help identify effective mechanisms, strategies for communication, and priority topics to shape the future directions for the initiative. Full information on the Request for Information (RFI), including detailed instructions, is available [here](#).
- Responses are requested by **Nov. 9, 2020 at 11:59 pm ET**. Please submit responses via email to NNIStrategicPlanning@nnco.nano.gov and include “RFI Response: NNI Strategic Planning” in the subject line.

- **2021 NNI Strategic Planning Stakeholder Workshop: Charting the Path Forward**

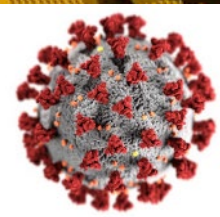
- **SAVE THE DATE!** The National Nanotechnology Initiative (NNI) will hold a virtual stakeholder workshop on **Jan. 11–13, 2021**. Over the past 20 years, the NNI has supported nanotechnology discovery, development, and deployment, and has nurtured the strong ecosystem that exists today. Building on this foundation, nanoscience will underpin a wide range of advanced technologies and enable solutions to challenges into the future. As the NNI enters its third decade, conversations at this workshop will identify effective mechanisms to advance research and development, strategies for communication, and priority topics to shape future directions.
- More information is available at: <https://www.nano.gov/2021stakeholderworkshop>. The workshop will take place virtually, and registration information will be available soon.

Time for Some Poll Questions

***National Nanotechnology
Coordinated Infrastructure (NNCI)***



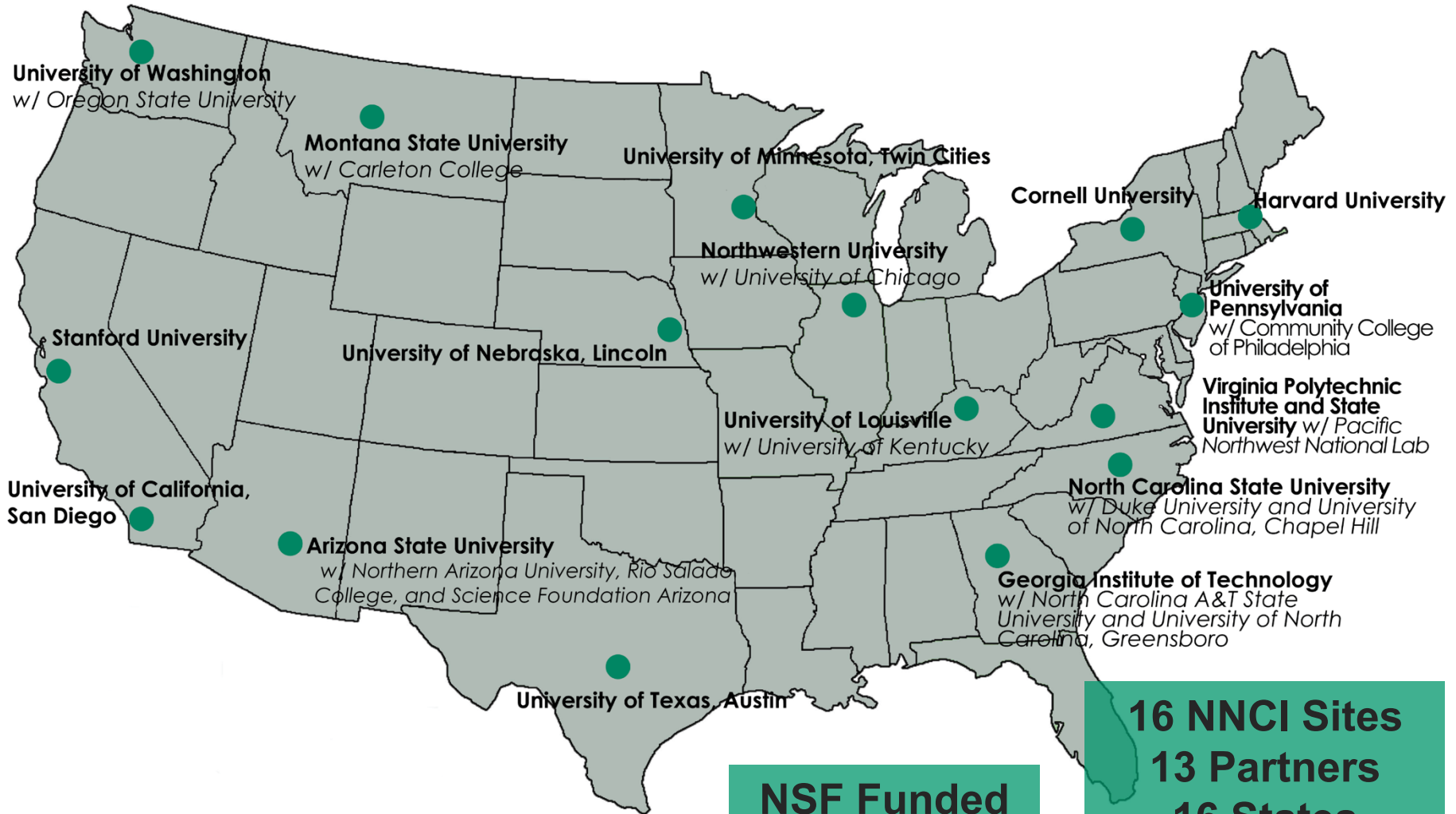
National Nanotechnology
Coordinated Infrastructure



Outline

- What is NNCI?
- NNCI Statistics
- NNCI Impact
- NNCI Outlook Years 6-10
- Q&A

NNCI Network



**NSF Funded
2015 - 2025
\$165M total**

**16 NNCI Sites
13 Partners
16 States
69 Facilities
>2,200 Tools**

NNCI Goals

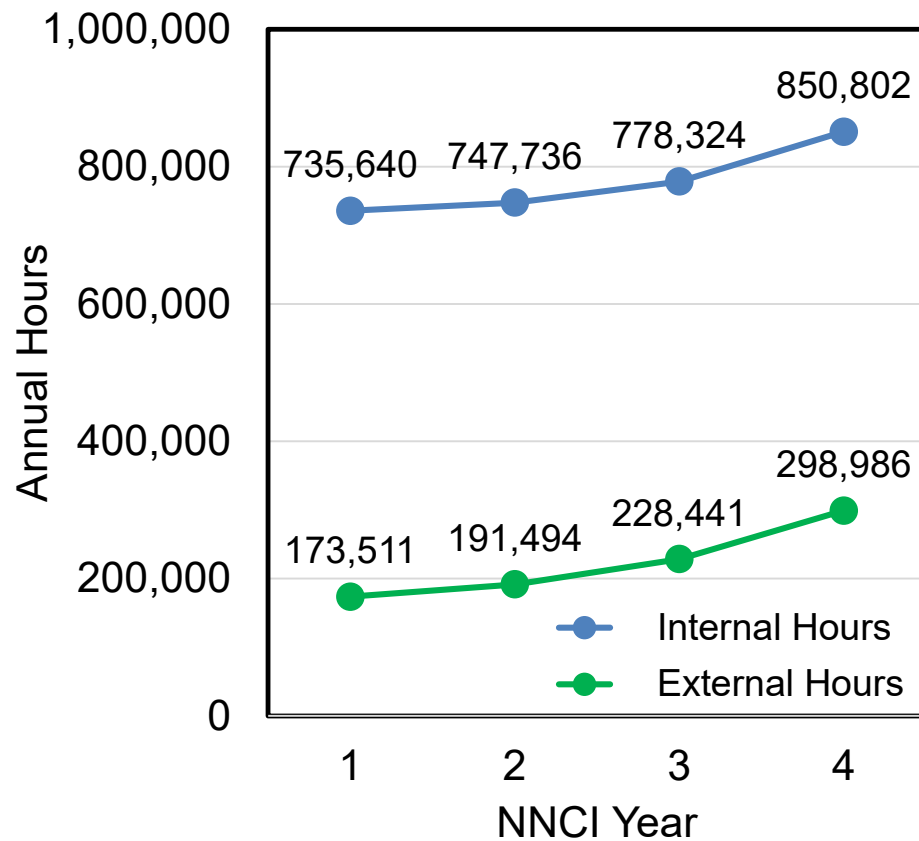
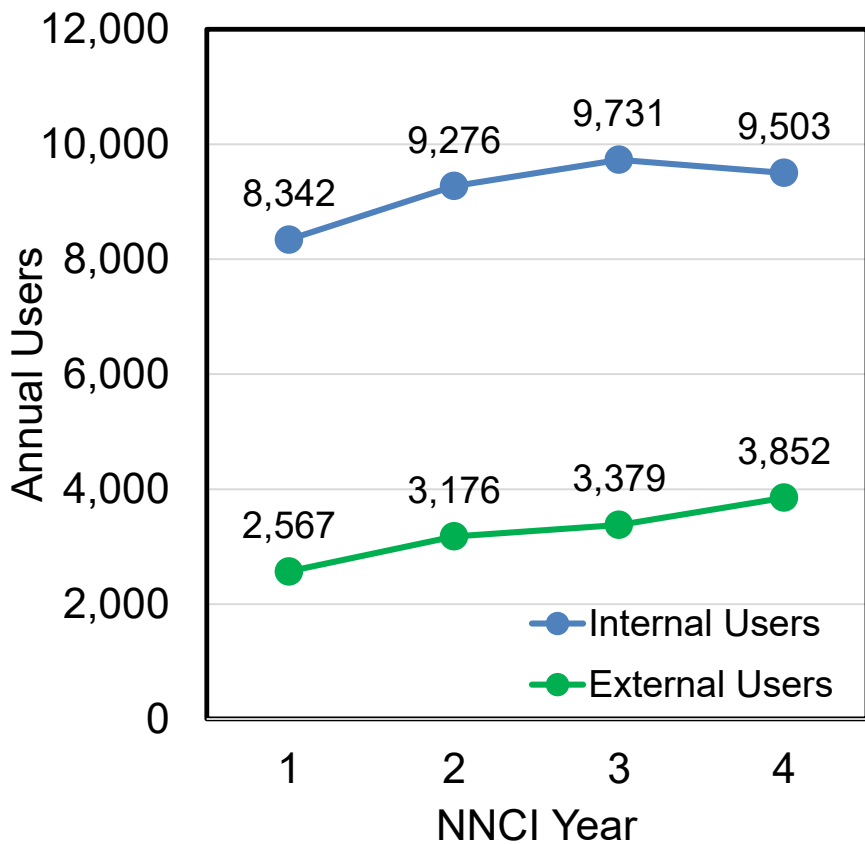
- Provide open access to **state-of-the-art nano-fabrication & characterization facilities** and their tools across US and **staff expertise**
- Use these resources to support **education & outreach (E&O)** as well as **societal & ethical implications (SEI)** in/of nanotechnology
- **Network approach to make whole more than the sum of its parts**



NNCI User Statistics Year 1 – Year 5

	Year 1	Year 2	Year 3	Year 4	Year 5 (9 months)
Unique Facility Users	10,909	12,452	13,110	13,355	9,585
Unique External Users	2,567 23.5%	3,176 25.5%	3,379 25.8%	3,852 28.8%	2,558 26.7%
Industry Users	1,413	1,669	1,870	1,961	1,370
External Academic Users	1,060	1,295	1,365	1,531	967
Average Monthly Users	4,429	4,911	5,001	5,292	3,579
New Users Trained	4,116	4,563	4,981	5,194	2,253
Facility Hours	909,151	939,230	1,006,764	1,149,788	568,125
External Facilities Hours	173,511 19.1%	191,494 20.4%	228,441 22.7%	298,986 26.0%	147,741 26.0%
Hours/User	83	75	77	86	59
Total User Fees	\$34.3M	\$37.5M	\$40.5M	\$43.7M	\$21.5M

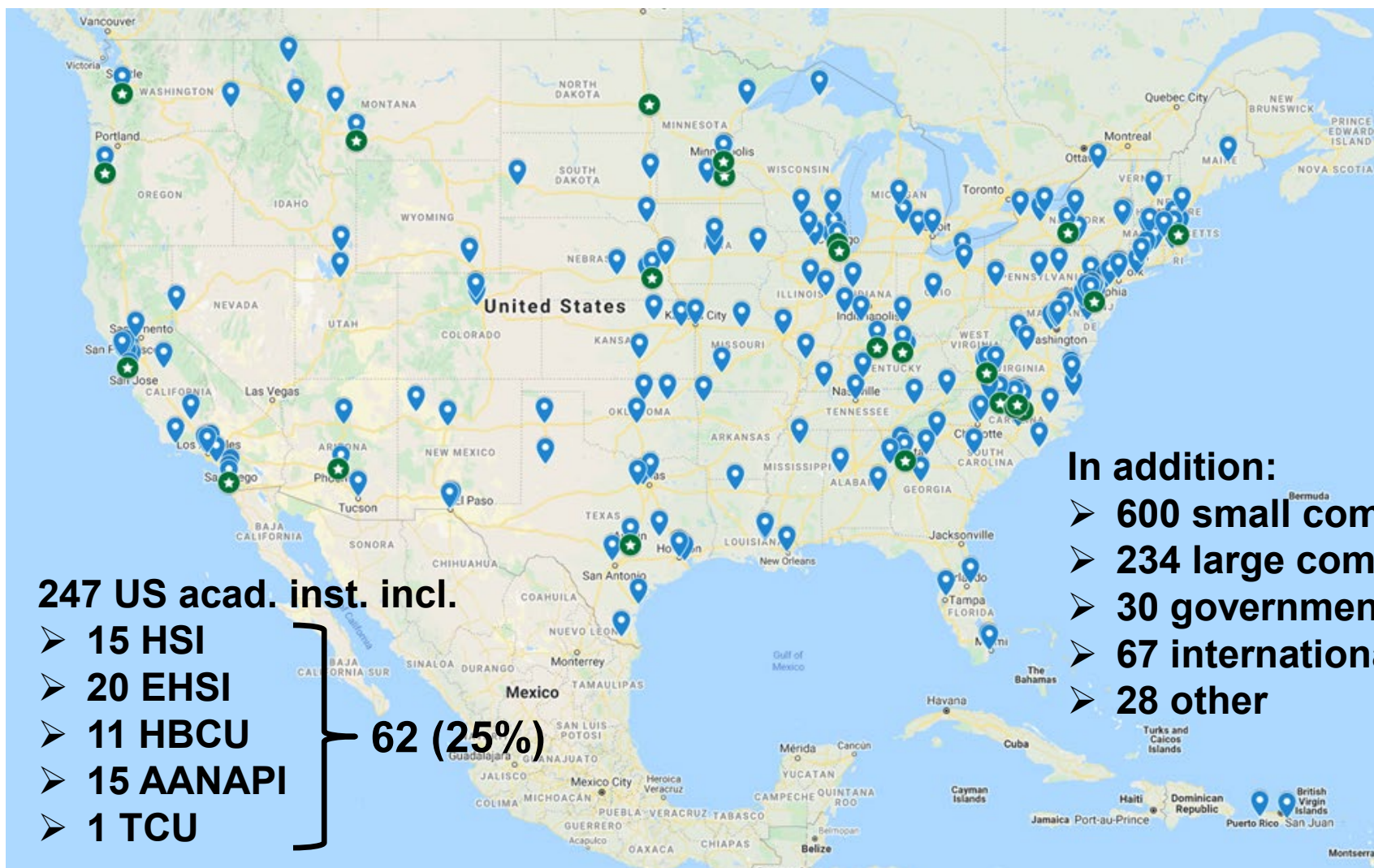
NNCI Users & Hours Growth Year 1-4



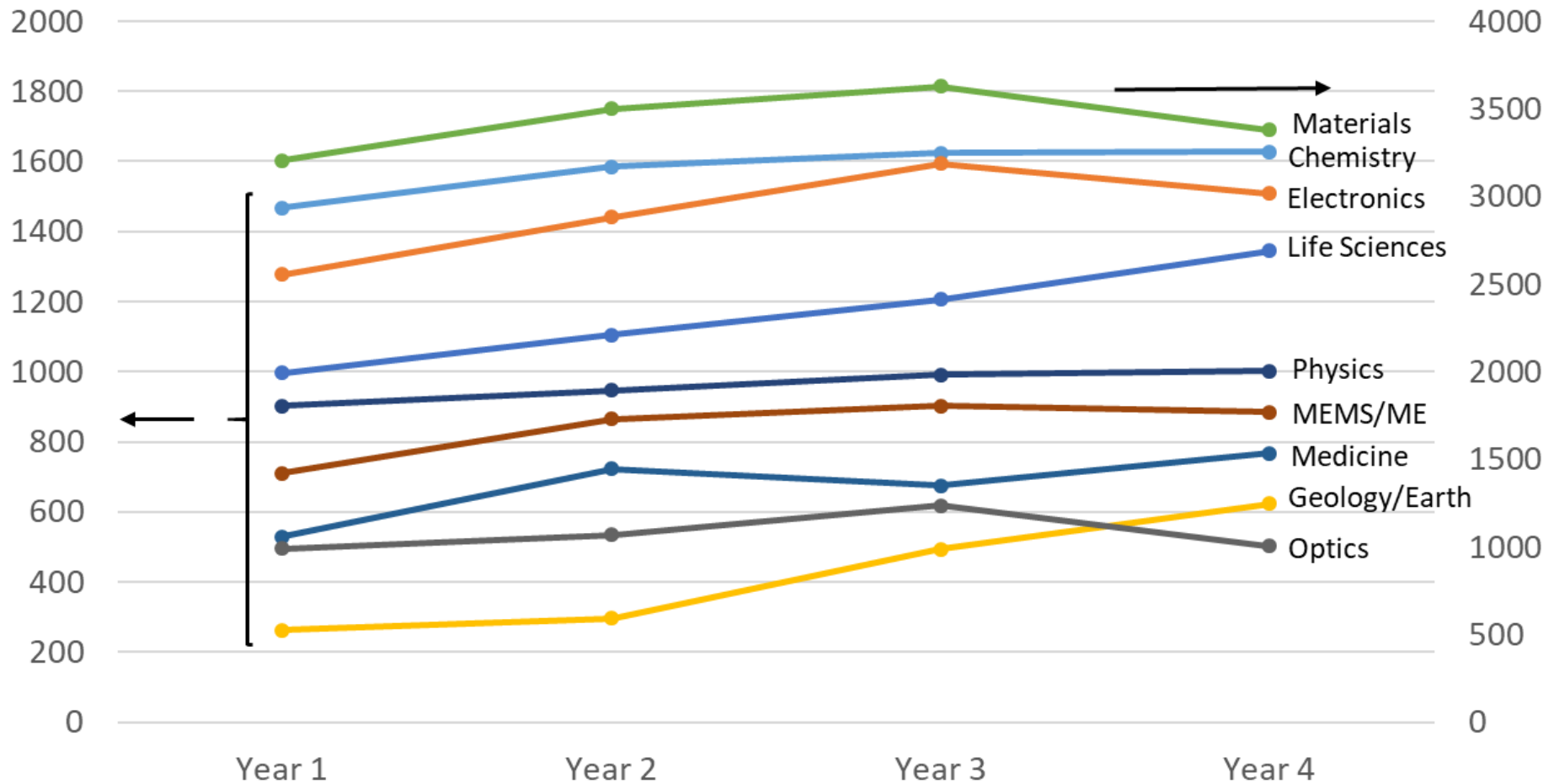
NNCI Year 1 – Year 4 Growth

	Year 1	Year 4	Δ
Unique Facility Users	10,909	13,355	+22%
Unique External Users	2,567 23.8%	3,852 28.8%	+50%
Industry Users	1,413	1,961	+39%
External Academic Users	1,060	1,531	+44%
Average Monthly Users	4,429	5,292	+19%
New Users Trained	4,116	5,194	+26%
Facility Hours	909,151	1,149,788	+26%
External Facilities Hours	173,511 19.1%	298,986 26.0%	+72%
Hours/User	83	86	–
Total User Fees	\$34.1M	\$43.7M	+28%

NNCI Year 4 US Academic Institutions (247)



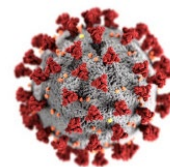
NNCI Yearly Users By Discipline



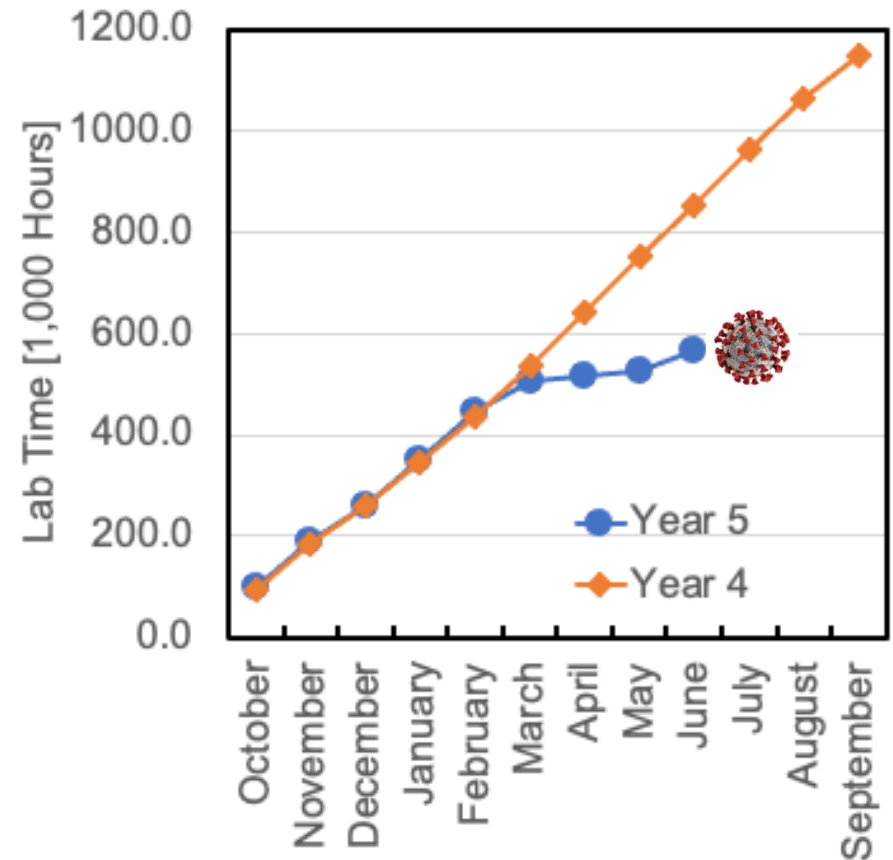
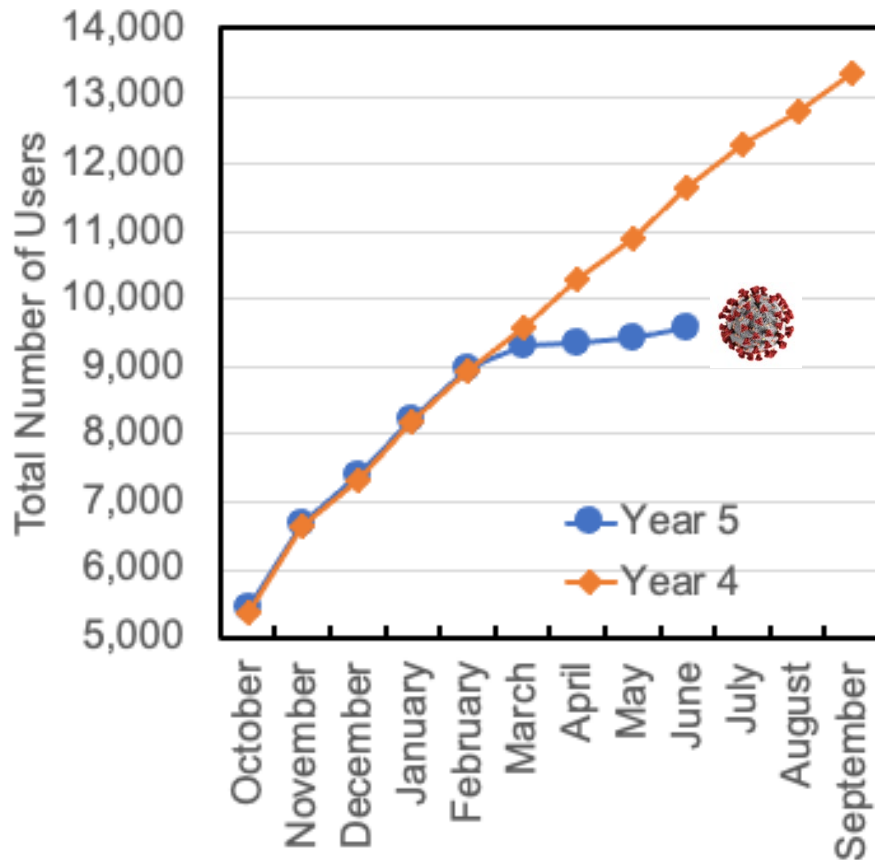
NNCI Year 5 (9 months) vs. Year 4 (9 months)

	Year 4 (9 months)	Year 5 (9 months)	Δ
Unique Facility Users	11,650	9,585	-18%
Unique External Users	3,202 27.5%	2,558 26.7%	-20%
Industry Users	1,644	1,370	-17%
Other External Users	1,558	1,188	-24%
Average Monthly Users	5,134	3,579	-30%
New Users Trained	3,831	2,253	-41%
Facility Hours	849,868	568,125	-33%
External Facilities Hours	222,137 26.1%	147,741 26.0%	-33%
Hours/User	73	59	-19%
Total User Fees	\$32.7M	\$21.5M	-34%

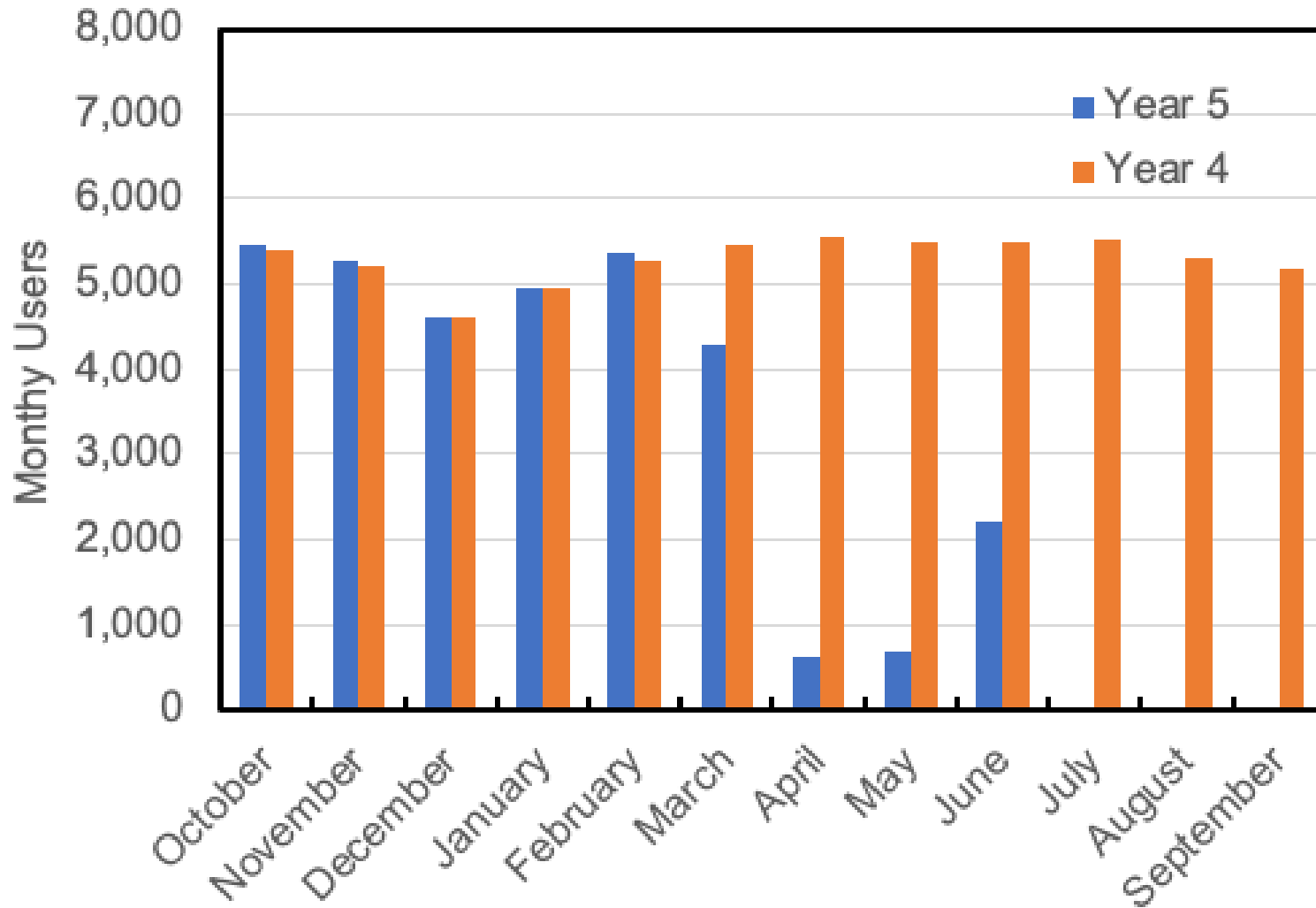
Note: 9 months data!



NNCI Users & Lab Time: Year 5 vs Year 4



NNCI Monthly Users: Year 5 vs Year 4



NNCI Site Activities during Pandemic

- Donation of PPE
- Webinars & online seminar series
- Online education, training & user outreach activities
- Online office hours & project consulting
- Sharing of best practices for safe core-facility ramp-up & operation
- Core facility support for COVID-19 research
- Expert advice on pandemic related issues (spread, protection, testing, etc.)
- Sharing of information:
<https://www.nnci.net/blog/nnci-during-covid-19-pandemic>

 NanoTech at GA Tech @IEN_GATech · Mar 25
.@GeorgiaTech the IEN cleanrooms have collected and prepared a donation of #PPE for GA #healthcare workers. We are so glad to be able to help our 1st responders! GO JACKETS #TogetherWeSwarm #WeCanDoThat #NSFfunded #nanotechnology



The New York Times

The Scientist, the Air and the Virus

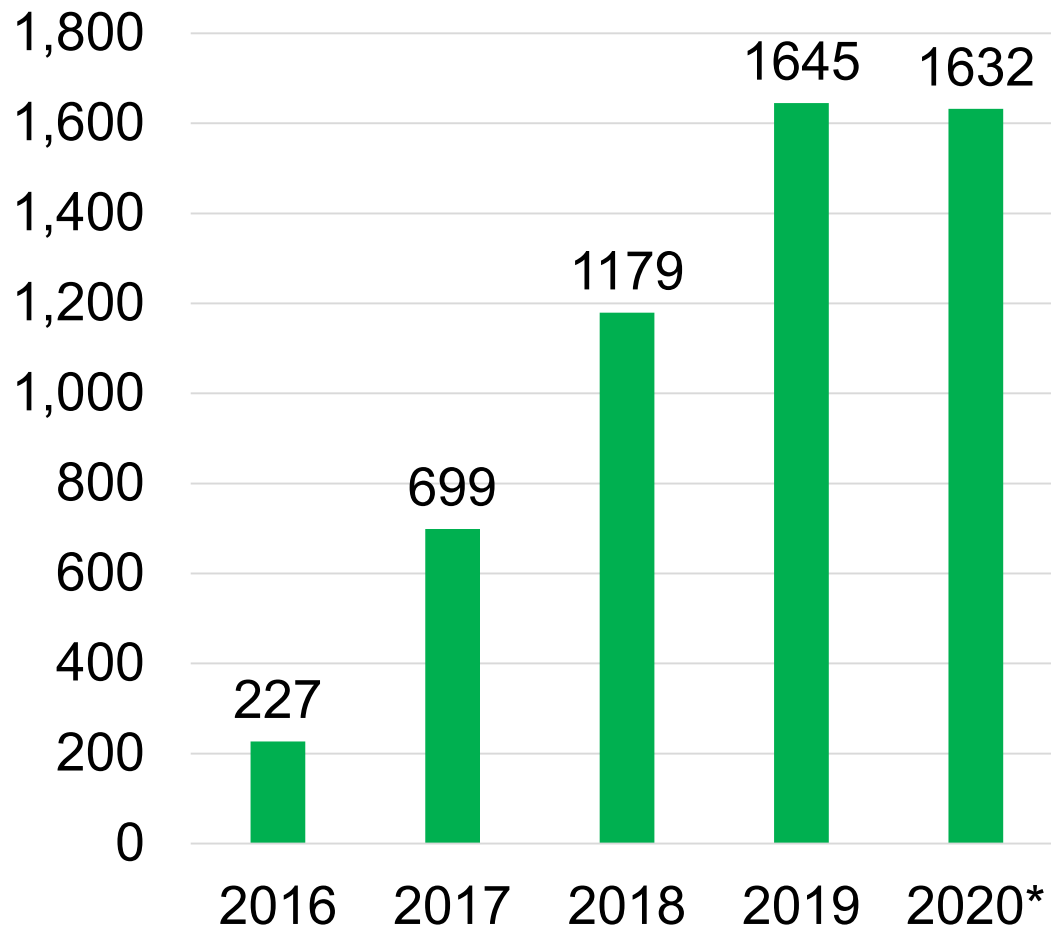
Most of us had never heard of aerosol science before the pandemic. Then Virginia Tech's Linsey Marr showed up and became our tour guide to the invisible world of airborne particles.



NNCI Impact – Publications CY 2018

Publication Type (CY 2018)	
Internal User (Site) Papers	2,775
External User Papers	357
Internal User Conference Presentations	1,160
External User Conference Presentations	124
Books/Book Chapters	41
Patents/Applications/Invention Disclosures	563
Total	5,020

NNCI Impact – Pubs with NNCI Acknowledgement



*Through Oct. 22, 2020

NNCI Impact – Research Centers

- NSF ERC, STC & MRSEC



CENTER for INTEGRATED QUANTUM MATERIALS

Quantum Information Science and Technology



- NIH Centers



- Regional Centers



NNCI Impact – Economic

800+ companies in Year 4



PACIFIC
BIOSCIENCES®

*Founders from Cornell – now CA
Used CNF facilities*

SILA
NANOTECHNOLOGIES

*Co-Founder from GT – now CA
Used SENIC facilities*

illumina®

Uses SDNI facilities

MONOLITH

*Carbon Black & Hydrogen
Uses NNF facilities*



LASER
COMPONENTS

Uses NCI-SW facilities



Smart
Material
Solutions

*Graduate of RTNN Kickstarter
Uses RTNN facilities*

MicroOptx™



beacon®

*Microshunt
Uses MINIC facilities*

Roswell
BIOTECHNOLOGIES®

*Uses SDNI & SENIC
facilities*



2020 Quadrennial Review of the NNI

Key Recommendations

1. align the efforts of the NNI to deliver responsible and sustainable nanotechnology-based solutions that address the federal research and development priorities
2. strengthen and expand the lab-to-market innovation ecosystem in support of the transfer of nanotechnologies from bench research to products
3. New investments ... are required to strengthen the U.S. network of fabrication and research facilities
4. increase recruitment and train the best students to advance nanoscience/nanotechnology science, technology, engineering, and mathematics disciplines to ensure a diverse world-class workforce
5. The NNI, through the NSET Subcommittee and the National Nanotechnology Coordination Office (NNCO), should continue to perform its important coordinating role



NNCI is a Key Resource for KR 1-4

<https://www.nationalacademies.org/our-work/quadrennial-review-of-the-national-nanotechnology-initiative>

Sub-Committees & Working Groups

- 1. Diversity**
Jacob Jones (RTNN)
- 2. Metrics**
Stephen Campbell (MINIC)
- 3. Global and Regional Interactions**
Vinayak Dravid (SHyNE)
- 4. New Equipment and Research**
Kevin Walsh (KY MMNIN)
- 5. Commercialization**
Mark Allen (MANTH)
- 6. Building the User Base**
Shyam Aravamudhan (SENIC)
- 1. Equipment, Maintenance and Training**
Meredith Metzler (MANTH)
- 2. Environmental Health & Safety**
Nasir Basit (SHyNE) and Greg Cibuzar (MINIC)
- 3. Vendor Relations**
Charles Veith (MANTH)
- 4. EBeam Lithography**
Devin Brown (SENIC)
- 5. Etch Processing**
Vince Genova (CNF)
- 6. Photolithography**
Pat Watson (MANTH)
- 7. Atomic Layer Deposition**
Michelle Rincon (Stanford), Xiaoqing Xu (Stanford), and Mac Hathaway (CNS)
- 8. Workforce Dev. and Community Colleges**
Ray Tsui (NCI-SW)
- 9. K-12 and Community**
Jim Marti (MINIC)
- 10. Assessment & Evaluation**
Quinn Spadola (SENIC)
- 11. Online Technical Learning**
Angela An-Chi Hwang (Stanford)

NNCI Research Communities

- Groups of faculty, students, and staff **organized around a particular research topic, national priority, or grand challenge**
 1. Quantum Leap
 2. Understanding Rules of Life
 3. Nano-Enabled Internet of Things
 4. Nanotechnology Convergence
 5. Nano Earth Systems
- Serve as **networking opportunities** and provide an **external facing NNCI component** that benefits the larger scientific and engineering communities
 - What infrastructure capabilities are needed to support the research topic?
 - What are the challenges of current fabrication infrastructure for the specific research area?

AD for Innovation & Entrepreneurship

- Quadrennial Review of NNI: Create *“innovative mechanisms to realize the transformational societal benefits that flow from faster commercialization of nanotechnologies”*
- Develop **Innovation Ecosystem** to promote Nanotechnology Innovation and Entrepreneurship across NNCI network:
 1. NNCI Nanotechnology Entrepreneurship Challenge (NTEC)
 2. NNCI Industry Seminar Series
 3. NNCI Innovator’s Academy
 4. Research and ENTREPRENEURSHIP Experience for Undergraduates (REEU)
 5. NNCI Entrepreneurs-in-Residence (EiR)

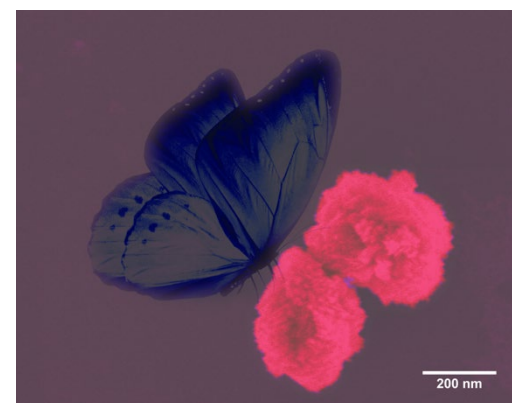
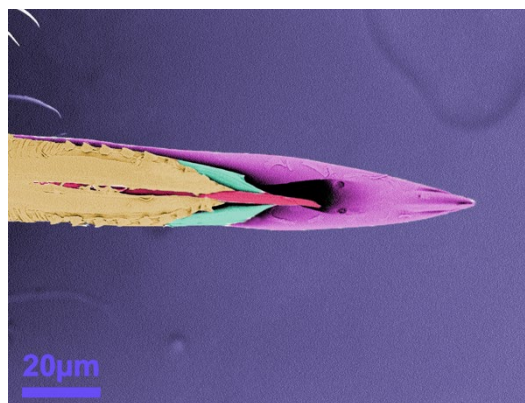
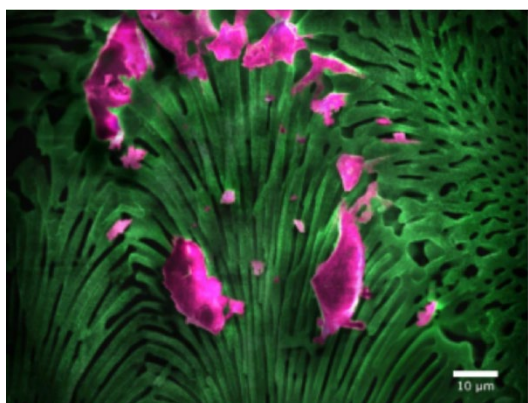
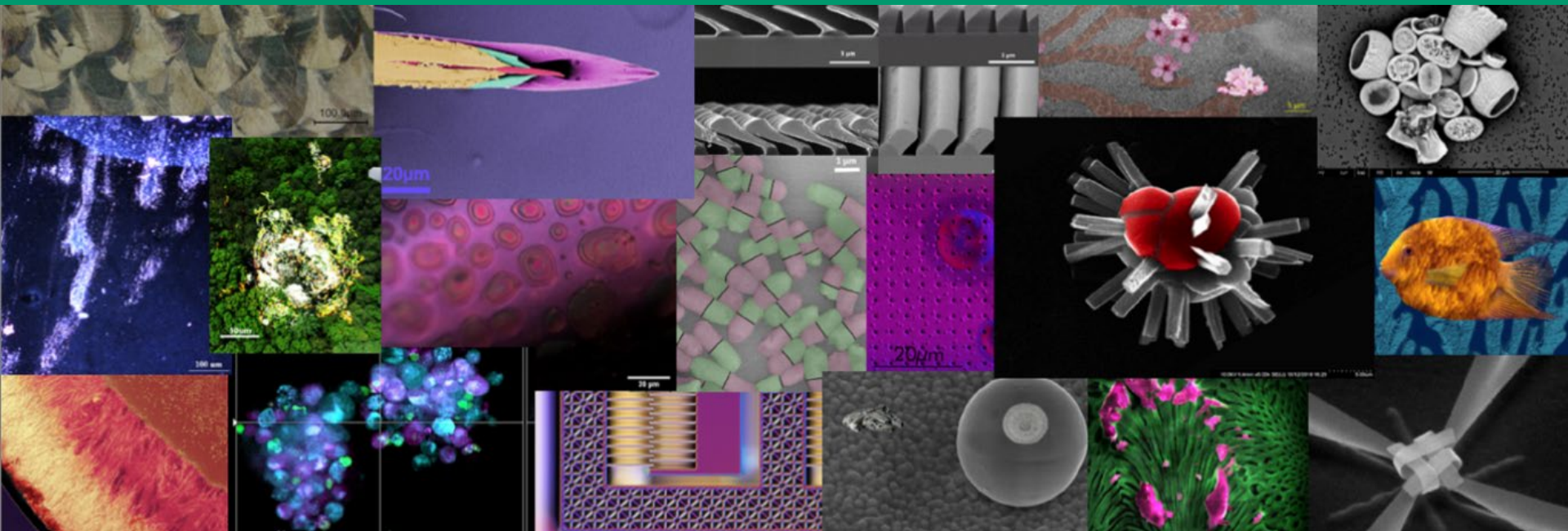


*Dr. Matt Hull
NanoEarth*

Interactions with External Organizations

- **Work with the NNCO and other national nanotechnology infrastructure** to serve our diverse user communities by promoting complementary expertise and strategize on future nanotechnology infrastructure needs
 - DoE Nanoscale Science Research Centers (NRSEC)
 - Center for Nanoscale Science and Technology (CNST) at NIST
 - User facilities as part of the NSF MRSEC program
 - Nanotechnology Applications and Career Knowledge (NACK) network
- **Build connections with international nanotechnology networks** for exchange of best practices and nanotechnology trends
 - Speakers at annual NNCI Conference
 - Participation in EU Horizon 2020 funded projects (SUSNANOFAB and NanoFabNet) to develop hubs for sustainable nanofabrication
 - NSF AccelNet award on the Global Quantum Leap

Plenty of Beauty at the Bottom



Most Stunning (MANTH)

Most Unique (RTNN)

Most Whimsical (SENIC)

Thank You!



<http://www.nnci.net>