Welcome to the 4th Annual NNCI Conference

Welcome and Thank You

Welcome:

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

Thank You:

- Bob, Bill and the Harvard Team
- Amy and NNCI Coordinating Office
- Vendors

National Nanotechnology Coordinated Infrastructure

Program Components

- Presentations from the Coordinating Office
  - Overview, Computation & Modeling, Social & Ethical Implications, Education & Outreach
- Site Reports in 4 Panel Sessions
  - Aligning NNCI with National Research Priorities
  - NNCI Impact and How to Measure It
  - Resource Allocation & New Equipment
  - Collaborations Beyond NNCI
- Invited Speakers
  - Klara Nahrstedt, Univ. of Illinois
  - Marko Loncar, Harvard
  - Michel de Labachelerie, CNRS and EuroNanoLab
- Breakout Sessions & Reporting

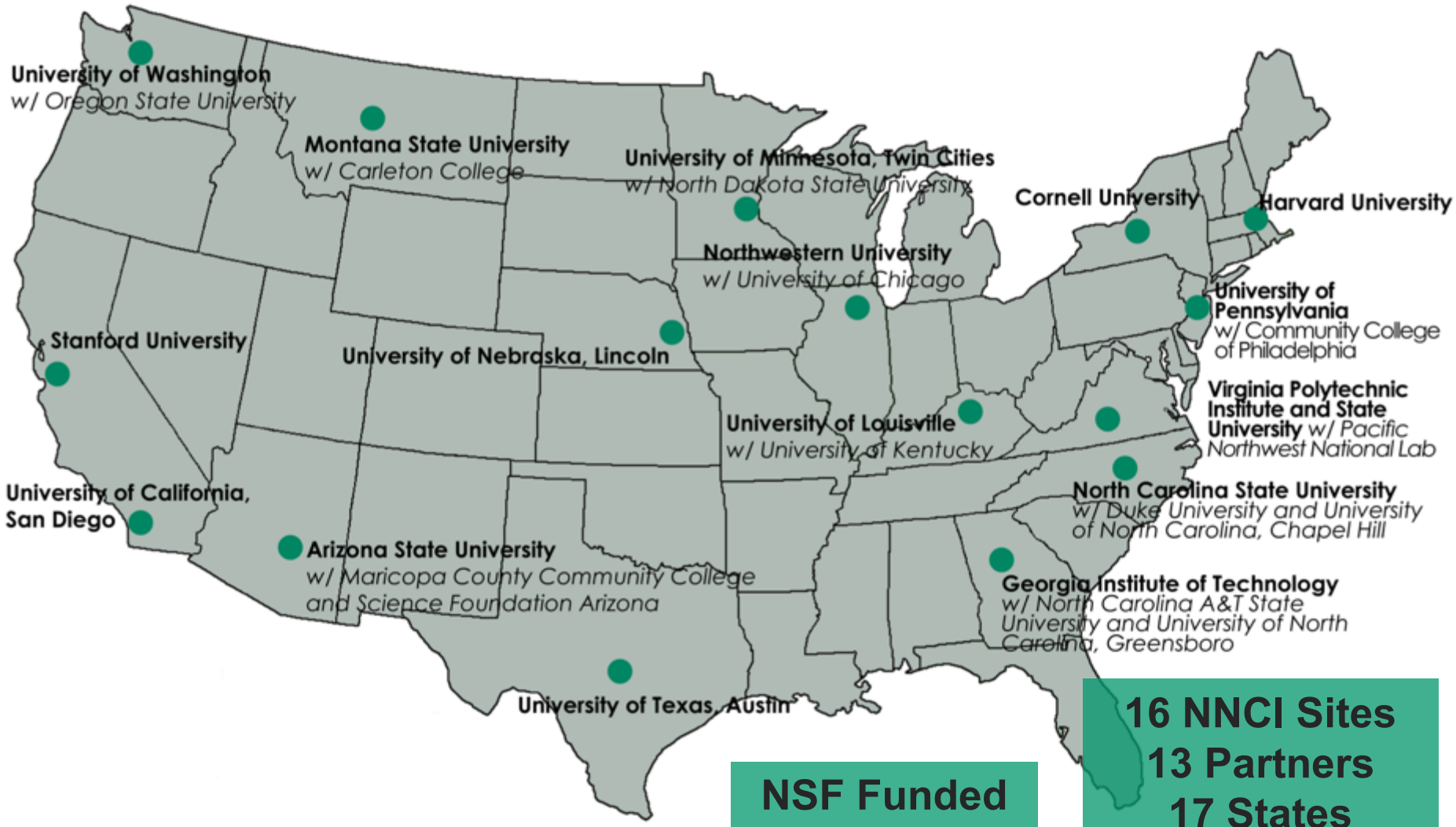
National Nanotechnology Coordinated Infrastructure

National Nanotechnology Coordinated Infrastructure (NNCI)

National Nanotechnology Coordinated Infrastructure

NSF

National Nanotechnology Coordinated Infrastructure (NNCI)



NSF Funded
2015-2020
$81M total

16 NNCI Sites
13 Partners
17 States
69 Facilities
>2000 Tools

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National Nanotechnology Coordinated Infrastructure (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**

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Overall Coordinating Office Objectives

1. Facilitate and promote the NNCI network, rather than trying to direct it
2. Use creative means to incentivize the sites for participation in network activities
3. **Assist in making the network more than the sum of its parts**

NNCI Associate Director Reports

- **Societal & Ethical Implications**
  Dr. Jamey Wetmore

- **Education & Outreach**
  Dr. Quinn Spadola

- **Computation & Modeling**
  Dr. Azad Naeemi

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NNCI User Statistics Year 1 – Year 4

	Year 1	Year 2	Year 3	Year 4 (6 months)
Unique Facility Users	10,909	12,452	13,110	9,581
Unique External Users	2,661 23.8%	3,176 25.5%	3,379 25.8%	2,368 24.7%
Industry Users	1,413	1,669	1,870	1,327
External Academic Users	1,154	1,295	1,365	913
Average Monthly Users	4,429	4,911	5,001	5,139
New Users Trained	4,116	4,563	4,981	2,492
Facility Hours	909,151	939,230	1,006,764	516,733
External Facilities Hours	173,511 19.1%	191,494 20.4%	228,441 22.7%	132,124 25.6%
Hours/User	83	75	77	54
Total User Fees	$34.1M	$37.5M	$40.5M	$20.9M

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NNCI Year 3 (6 month) vs. Year 4 (6 month)

	Year 3 (6 month)	Year 4 (6 month)	Δ
Unique Facility Users	9,149	9,581	+5%
Unique External Users	2,140 23.4%	2,368 24.7%	**+11%**
Industry Users	1,250	1,327	+6%
External Academic Users	801	913	**+14%**
Average Monthly Users	4,915	5,139	+5%
New Users Trained	2,454	2,492	+2%
Facility Hours	468,744	516,733	+10%
External Facilities Hours	101,744 21.7%	132,124 25.6%	**+30%**
Hours/User	51	54	+6%
Total User Fees	$18.7M	$20.9M	+12%

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Note: 6 months data!

NNCI Year 4 User Statistics

	NNCI Network	NNCI Sites Mean (Min – Max)
Unique Facility Users	9,581	**599** (114 – 1,292)
Unique External Users	2,368 24.7%	**148** (32 – 477) **25.9%** (11.1% – 45.6%)
Industry Users	1,327	**83** (23 – 231)
Other External Users	1,041	**65** (8 – 353)
Average Monthly Users	5,139	**321** (58 – 805)
New Users Trained	2,492	**156** (24 – 333)
Facility Hours	516,733	**32,273** (3.1k – 96k)
External Facilities Hours	132,124 25.6%	**8,258** (572 – 39k) **25.6%** (4.1% – 42.8%)
Hours/User	54	**50** (27 – 92)
Total User Fees	$20.9M	**$1.31M** (165k – 3.48M)

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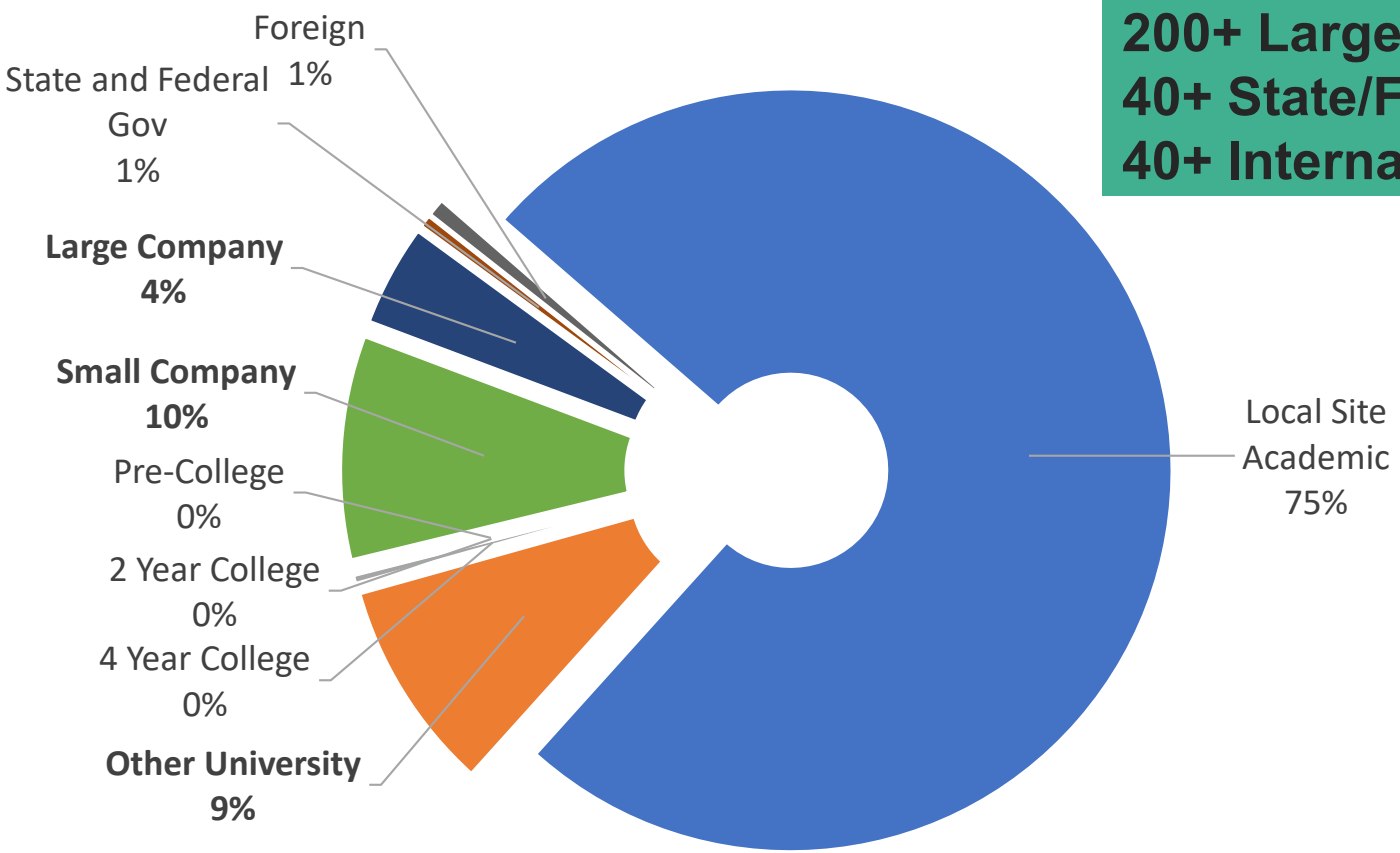
Note: 6 months data!

NNCI User Data – Users by Affiliation

220+ Academic Inst.
600+ Small Companies
200+ Large Companies
40+ State/Fed/Non-Profit
40+ International



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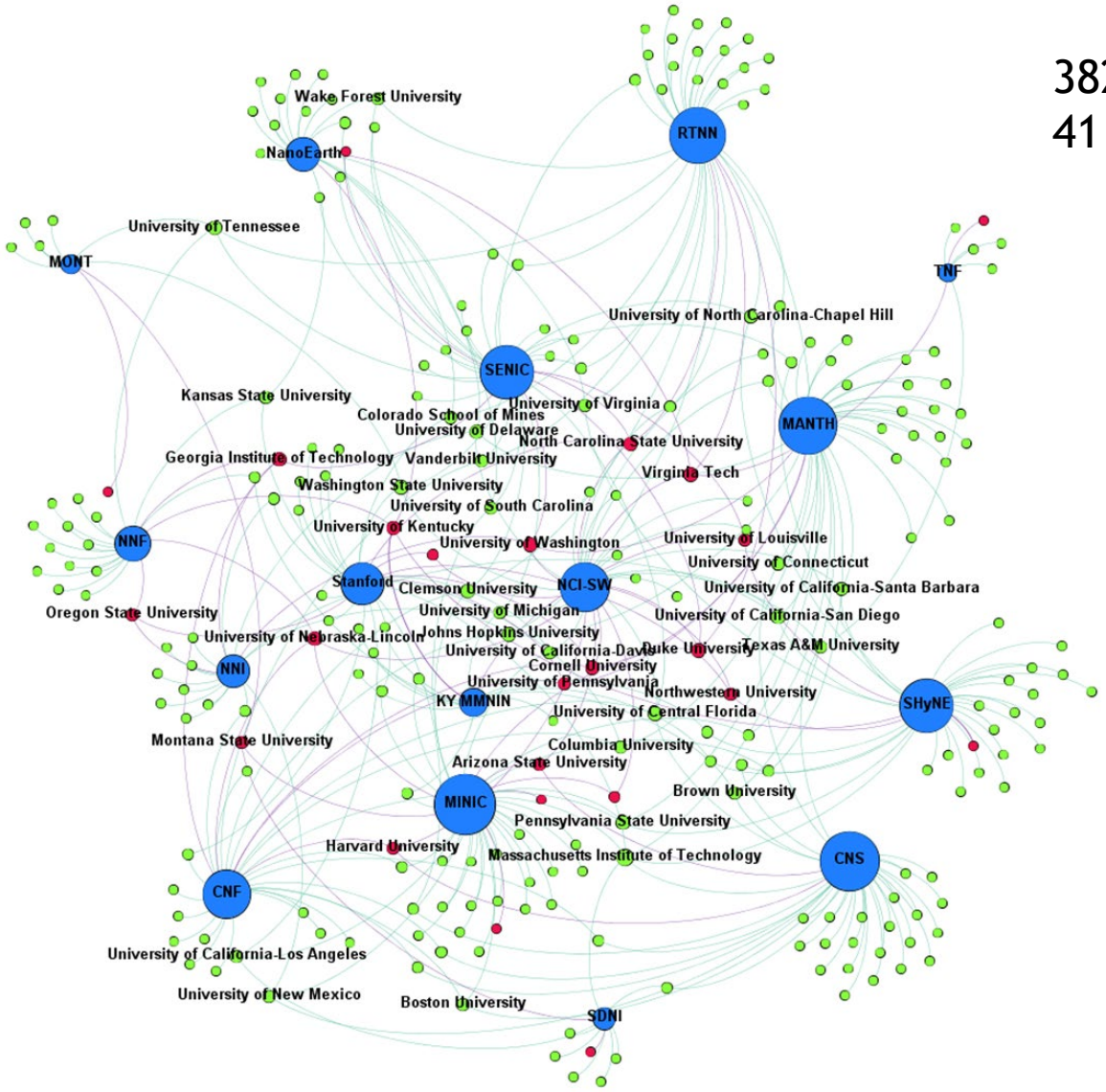
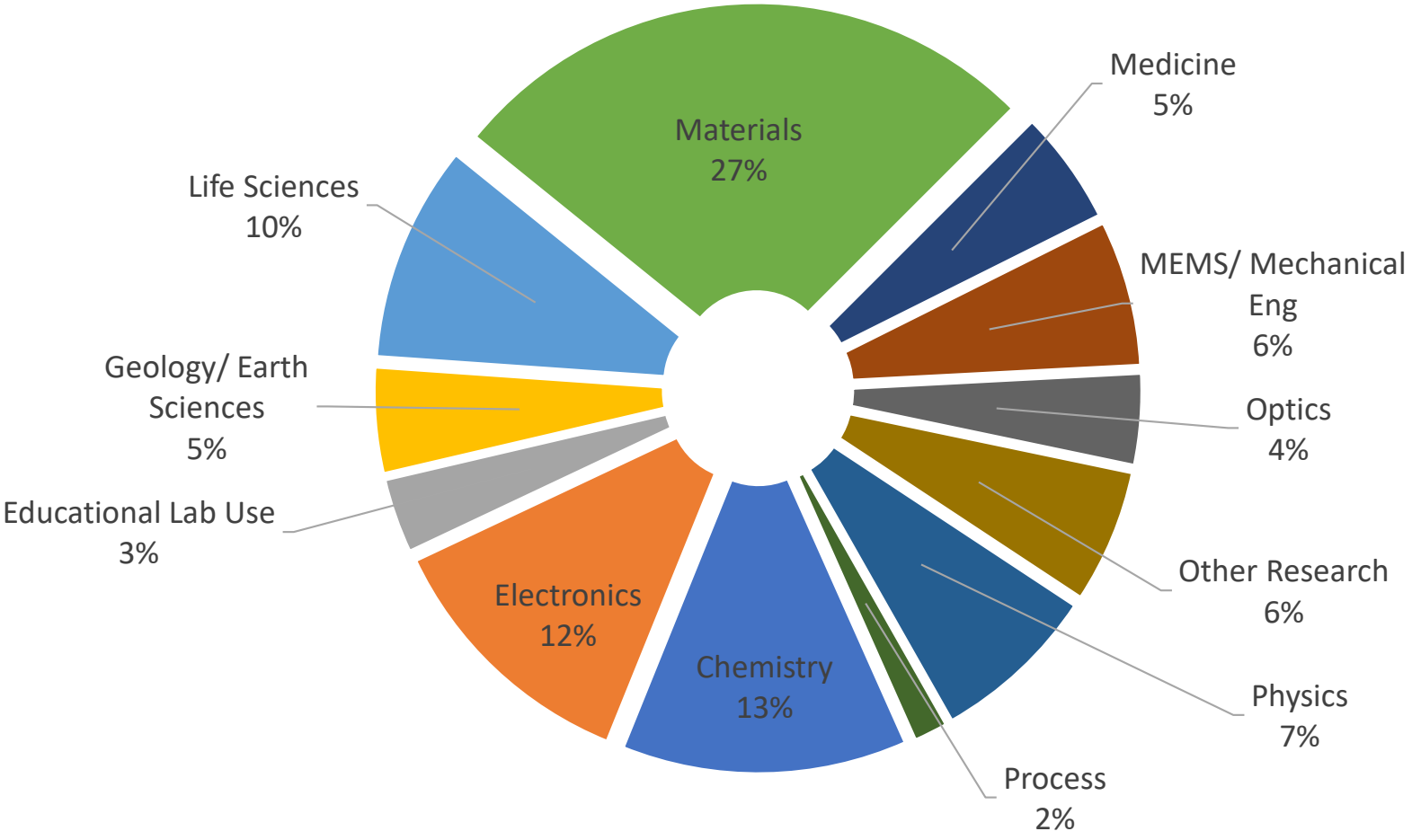
NNCI External Academic Institutions



382 pairwise linkages
41 universities with 3+ linkages

NNCI User Data – Users by Discipline



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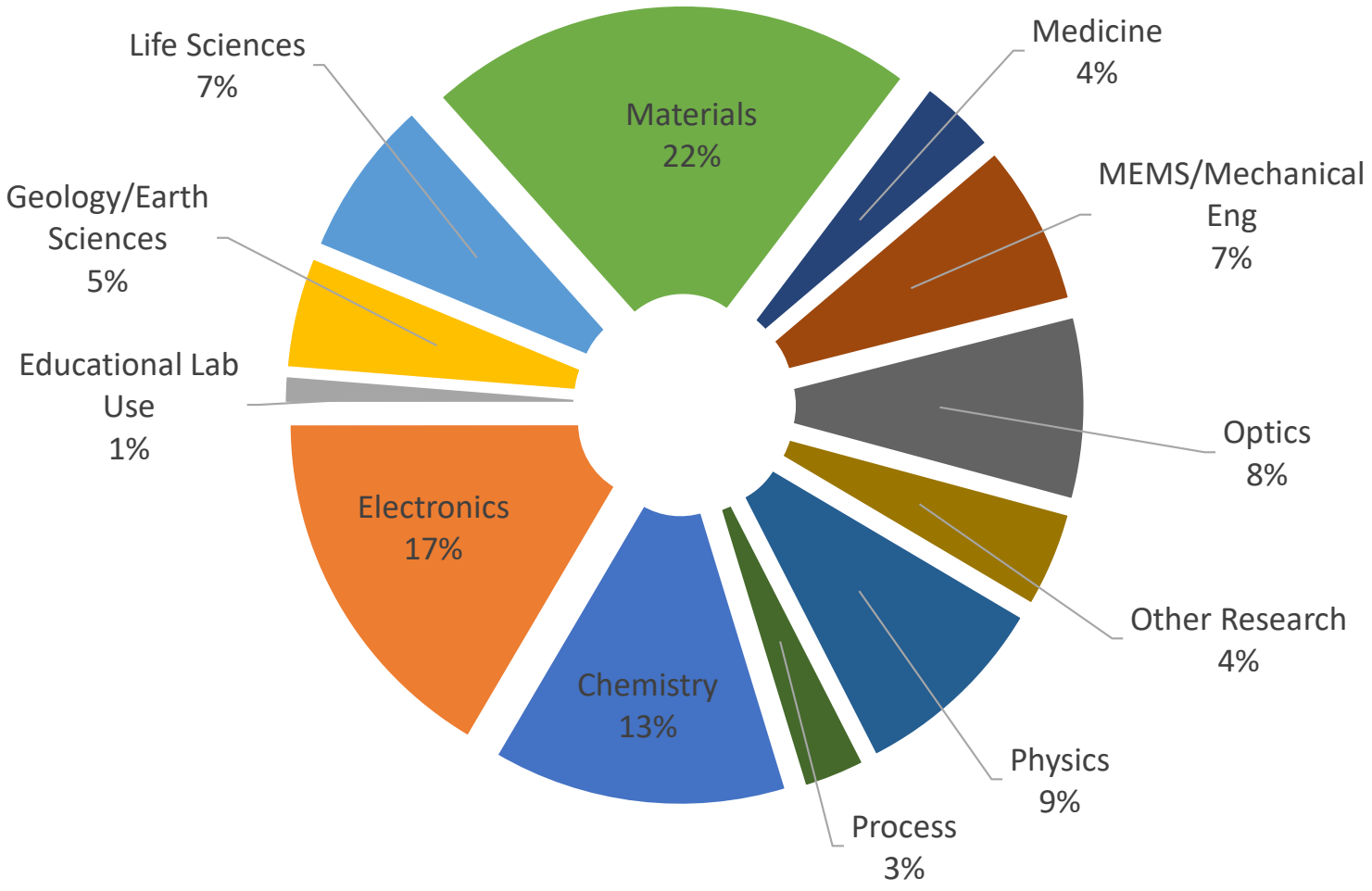
NNCI User Data – Hours by Discipline



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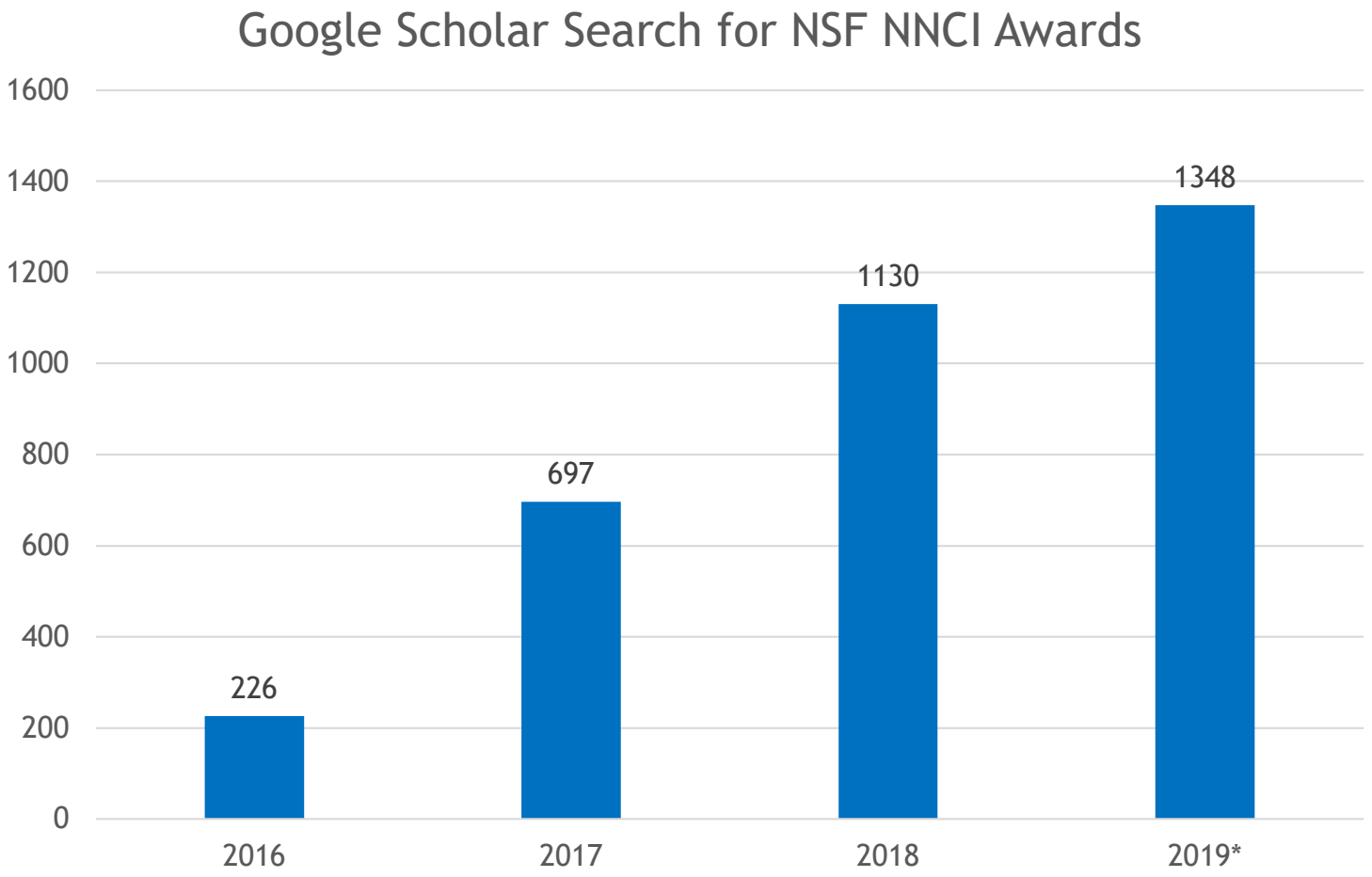
Scholarly Impact

Publication Type (CY 2017)	
Internal User (Site) Papers	2743
External User Papers	222
Internal User Conference Presentations	1247
External User Conference Presentations	151
Books/Book Chapters	38
Patents/Applications/Invention Disclosures	486
Total	**4887**

Scholarly Impact



*Through Oct. 15, 2019

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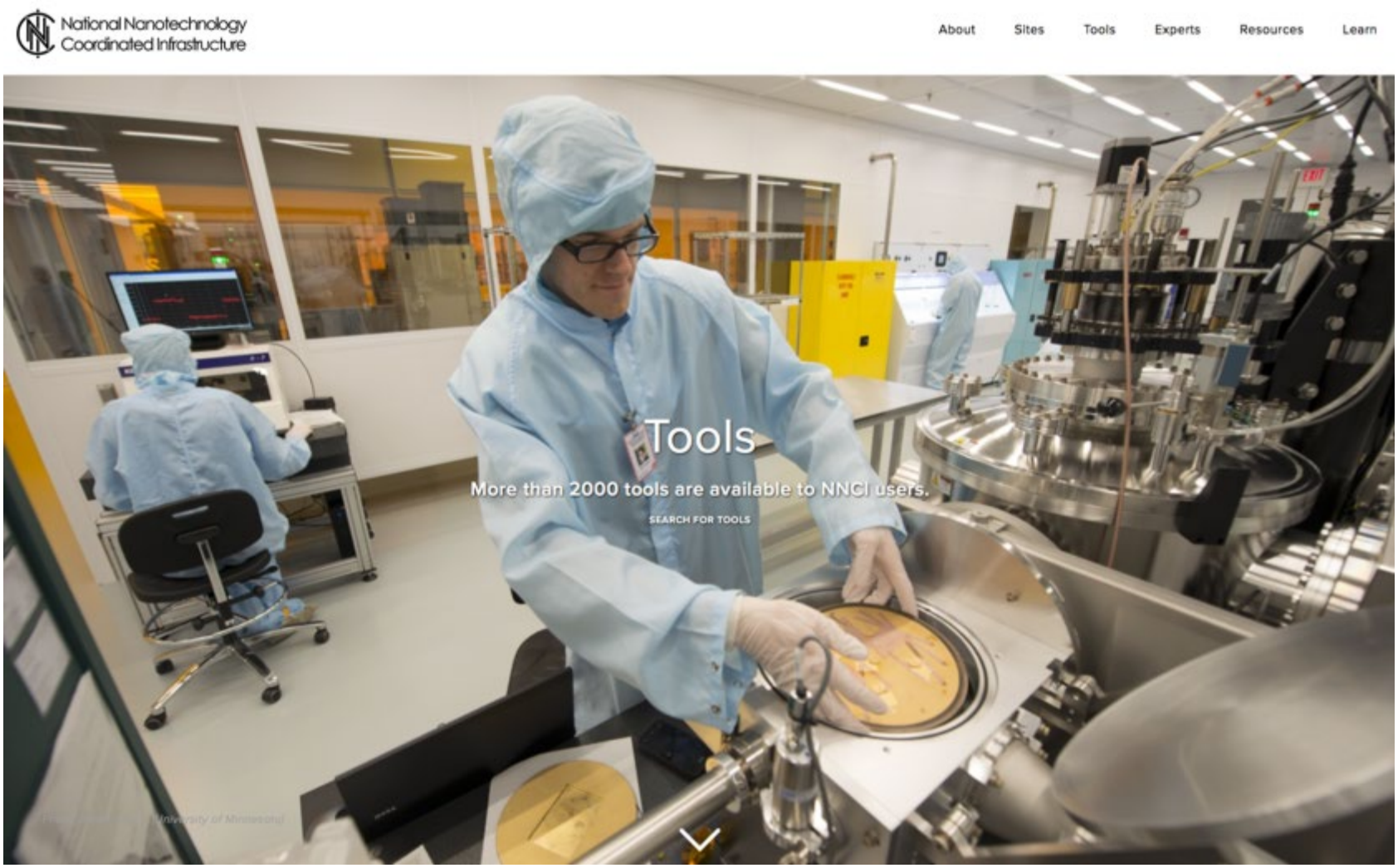
www.nnci.net



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NNCI Website – Year 4 Update

- Home page news spotlights and re-design of news items on home page
- Pages for NNCI technical working groups (news, forums)
- Added content:
  - Testimonials page
  - Commercialization Resources page
  - Technical Resources, including Remote Work Contractors and Seed Grant Opportunities
- Backend improvements and changes
- Updates to experts and tools databases (ongoing)
- Searchable education resources database (planned)

Analytics: Already surpassed 27,000 visitors in 2019 through Oct. 15 (more than all of 2018)

Contact forms: Approximately 1 inquiry/week, usually referred to site or education

NNCI Intro Video: ~1,200 views

NNCI User Survey (2019)

- How did you find out about the NNCI facility? (N=1027): website, referral, current facility relationship
- Would you recommend this NNCI facility to a colleague? (N=1029): Yes=97.4%
- Overall Satisfaction (N=1029): 4.60/5, with 94.8% somewhat or extremely satisfied
- >200 new tools/services recommendations
- >80 additional comments

NNCI User Survey (2019)

	EXTREMELY DISSATISFIED	SOMEWHAT DISSATISFIED	NEITHER SATISFIED NOR DISSATISFIED	SOMEWHAT SATISFIED	EXTREMELY SATISFIED	N/A	TOTAL	WEIGHTED AVERAGE
Ease of gaining access	0.78% 8	1.86% 19	3.13% 32	23.75% 243	69.99% 716	0.49% 5	1,023	4.61
Tool training	0.88% 9	2.64% 27	3.91% 40	26.56% 272	63.77% 653	2.25% 23	1,024	4.53
Ease of tool scheduling	0.69% 7	2.85% 29	5.10% 52	25.12% 256	64.38% 656	1.86% 19	1,019	4.53
Cost of the usage	1.86% 19	4.70% 48	17.32% 177	29.26% 299	40.22% 411	6.65% 68	1,022	4.08
Time it took to complete the project	0.88% 9	3.62% 37	9.39% 96	29.55% 302	46.48% 475	10.08% 103	1,022	4.30
Safety within the facility	0.68% 7	1.27% 13	2.93% 30	17.40% 178	76.64% 784	1.08% 11	1,023	4.70
Quality of available services and tools	0.39% 4	1.86% 19	4.59% 47	27.17% 278	65.49% 670	0.49% 5	1,023	4.56
Courtesy and attentiveness of the staff	1.07% 11	1.85% 19	4.00% 41	16.96% 174	75.63% 776	0.49% 5	1,026	4.65
Skill and knowledge of the staff	0.49% 5	1.07% 11	2.83% 29	18.03% 185	76.80% 788	0.78% 8	1,026	4.71

Sub-Committees

- **Diversity**
  Jacob Jones (RTNN)
- **Metrics**
  Stephen Campbell (MINIC)
- **Global and Regional Interactions**
  Vinayak Dravid (SHyNE)
- **New Equipment and Research**
  Kevin Walsh (KY MMNIN)
- **Commercialization**
  Mark Allen (MANTH)
- **Building the User Base**
  Shyam Aravamudhan (SENIC)

"***Subcommittees*** of the Executive Committee will be formed to tackle high-level issues related to the NNCI network as a whole"

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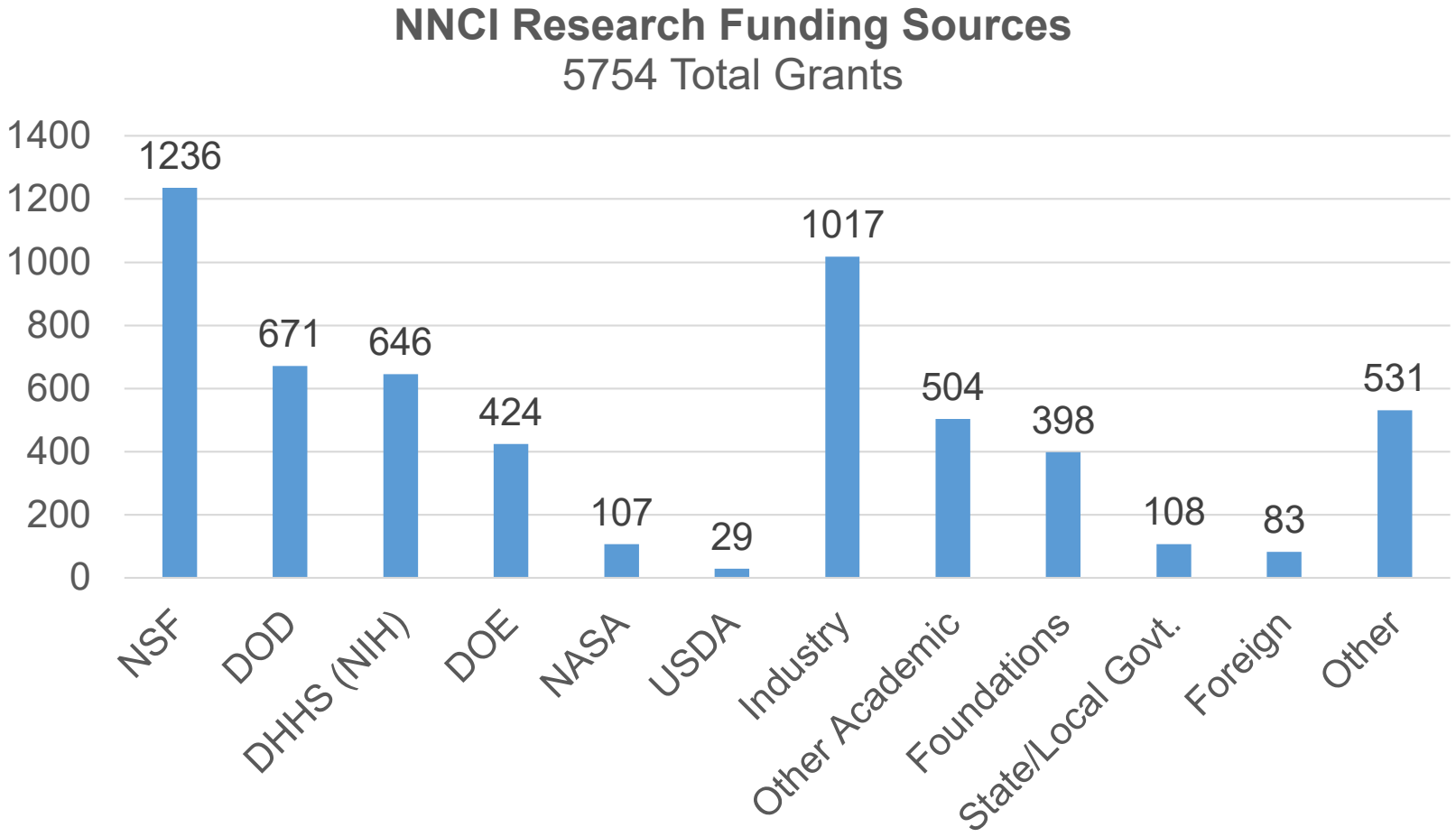
Metrics (Lead: Steve Campbell)



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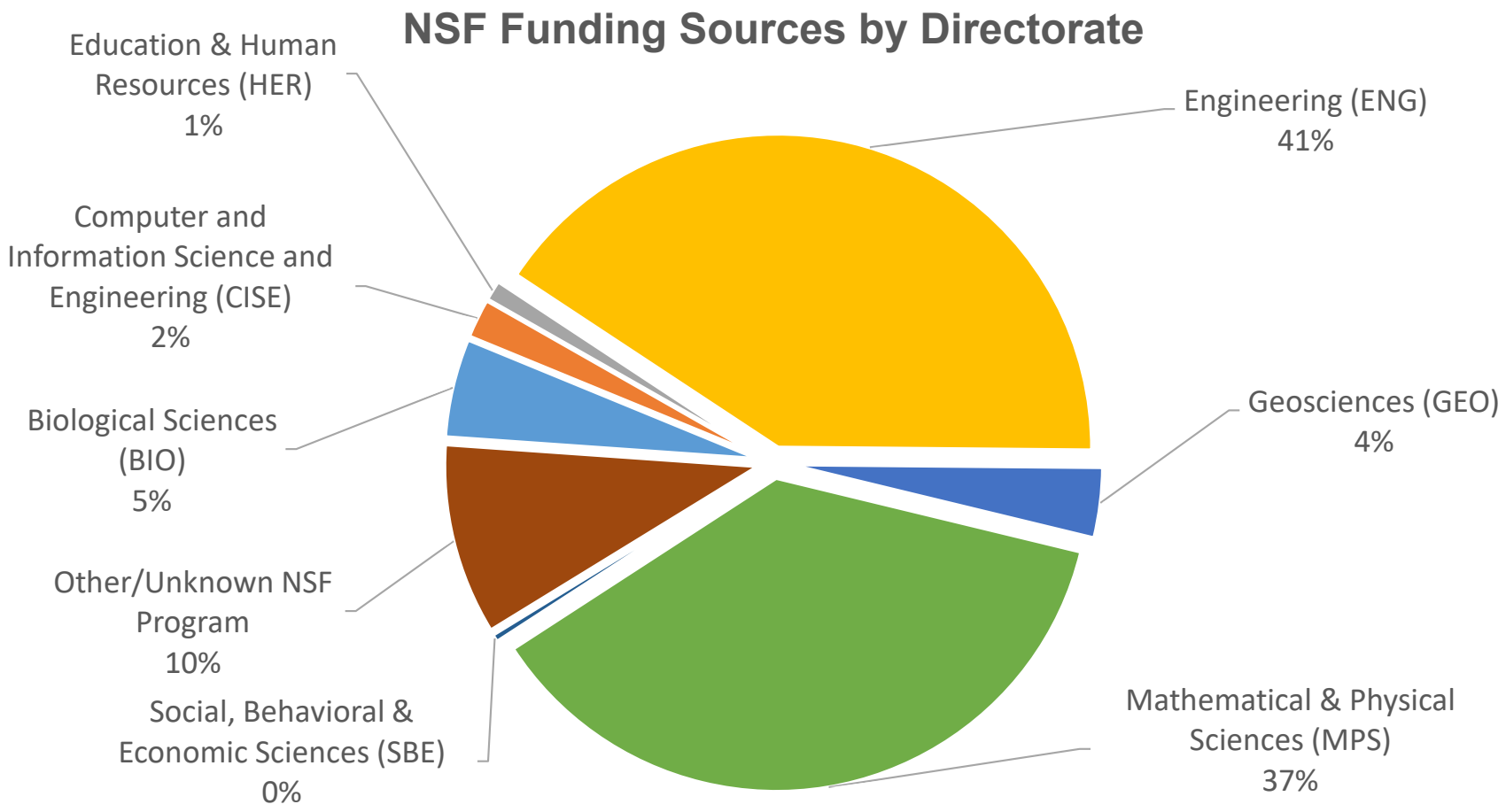
Metrics (Lead: Steve Campbell)



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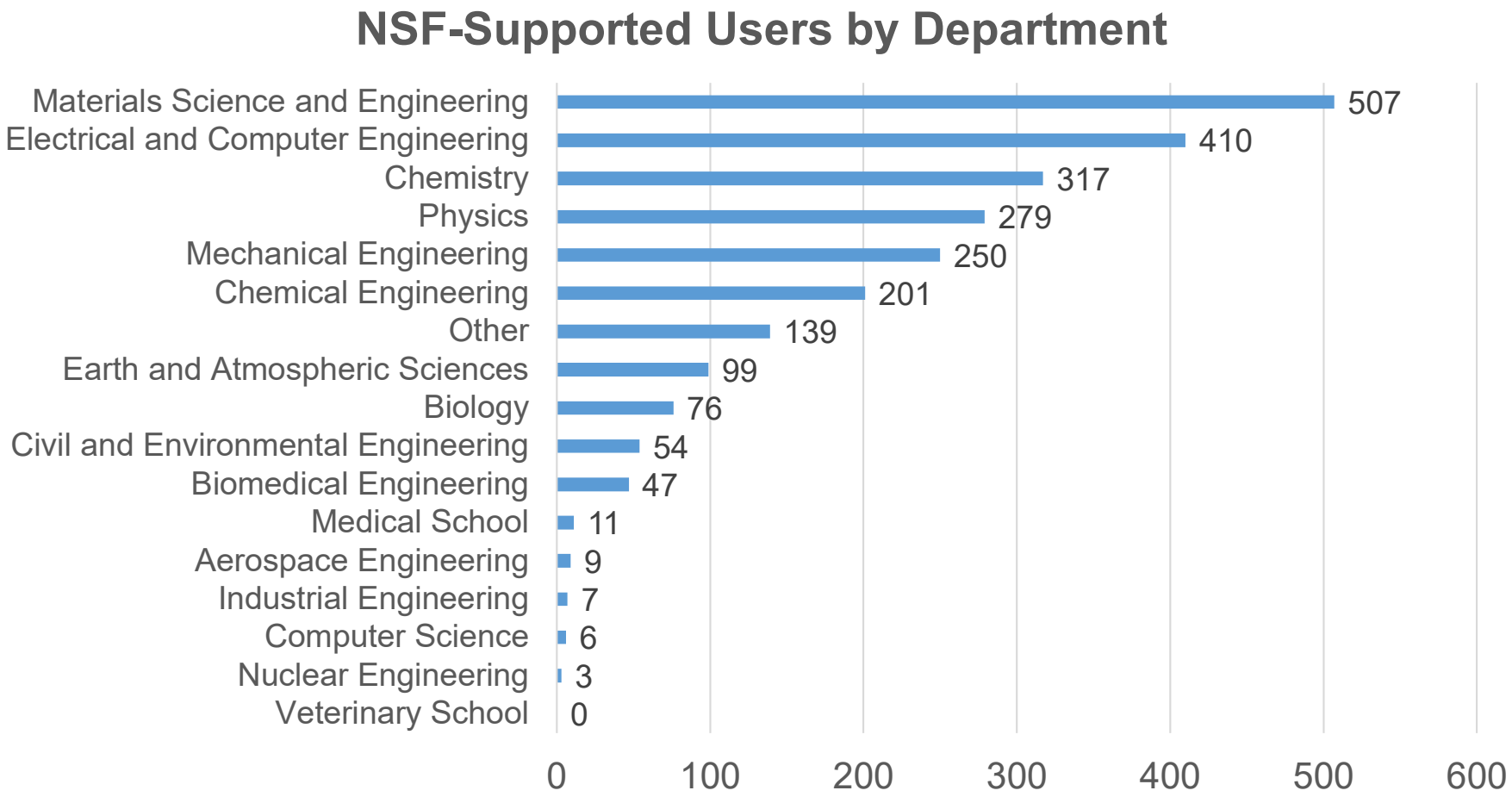

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Diversity (Lead: Jacob Jones)

Network-Wide Staff Climate Survey (262 responses, 54%)

+ Sites/facilities promote interactions between people of diverse racial, cultural, and ethnic backgrounds.
+ Sites/facilities are welcoming environments for persons from all backgrounds.
+ Staff generally know how to seek help against discrimination, though this awareness could be improved.
+ Site/facility leadership is ~16% women, which is comparable to the percentage of women in nano-dominant disciplines. However, this could be improved.
– Initiatives of the NNCI, including diversity and inclusivity, need to penetrate deeper into individual facility and technical staff.
– The percentages of minority and females responding to the survey are lower than the percentages of the same groups in the US population with science/engineering degrees.

Working Groups
Network Support, Technical, Education

- **Equipment, Maintenance and Training**
  Meredith Metzler (MANTH)
- **Environmental Health & Safety**
  Nasir Basit (SHyNE) and Greg Cibuzar (MINIC)
- **Vendor Relations**
  Charles Veith (MANTH)
- **EBeam Lithography**
  Devin Brown (SENIC)
- **Etch Processing**
  Vince Genova (CNF)
- **Photolithography**
  Pat Watson (MANTH)
- **Atomic Layer Deposition**
  Michelle Rincon (Stanford), Xiaoqing Xu (Stanford), and Mac Hathaway (CNS)
- **Workforce Development and Community Colleges**
  Ray Tsui (NCI-SW)
- **K-12 and Community**
  Jim Marti (MINIC)
- **Assessment & Evaluation**
  Quinn Spadola (SENIC)
- **Online Technical Learning**
  Angela An-Chi Hwang (Stanford)

"One of the greatest strengths of the NNCI network is…staff expertise of the individual sites. To leverage this expertise at the network level, we propose the formation of various ***working groups*** composed of staff members from the NNCI sites."

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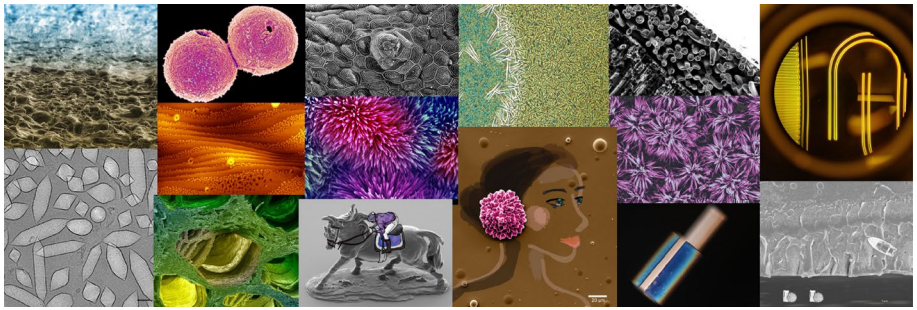
Network Activities

- Multi-Site Proposals
  - AccelNet (NNI, CNF, MINIC, RTNN, SENIC, CNS, NNF, NanoEarth)
  - Research Experience for Teachers (RET) (SENIC, MINIC, SHyNE, NNF)
- MRS User Facility Row (CO, SHyNE, KY MMNIN, RTNN, CNF, CNS, NNF)
- NNCI Staff Awards
- National Nanotechnology Day Image Contest: *Plenty of Beauty at the Bottom*



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Next NNCI Conferences

- 2020 REU Convocation (August 2-4): University of Texas (TNF)
- 2020 NNCI Conference (October 26-28): Northwestern University (SHyNE)

Use NNCI Conference to Discuss Challenges & Opportunities!

At the NNCI Site Level

- How can I maintain a state-of-the-art (evergreen) infrastructure?
- How can I attract (and retain) the required staff expertise?
- How can we best serve our customers?

At the NNCI Network Level

- How can we be more than the sum of our parts?
- How can we help (external) users? Especially from non-traditional areas?
- How can we help each other?
- How can we help/collaborate with other nanotechnology facilities/centers?
- How can we help nanotechnology start-ups?
- How can we educate the general public?
- How can we become the world-leading nanotechnology infrastructure network?

Thank You!

http://www.nnci.net