

# NNCI Mid-Atlantic Nanotechnology Hub (MANTH) for Research, Education, & Innovation, Award 1542153

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## Singh Center for Nanotechnology



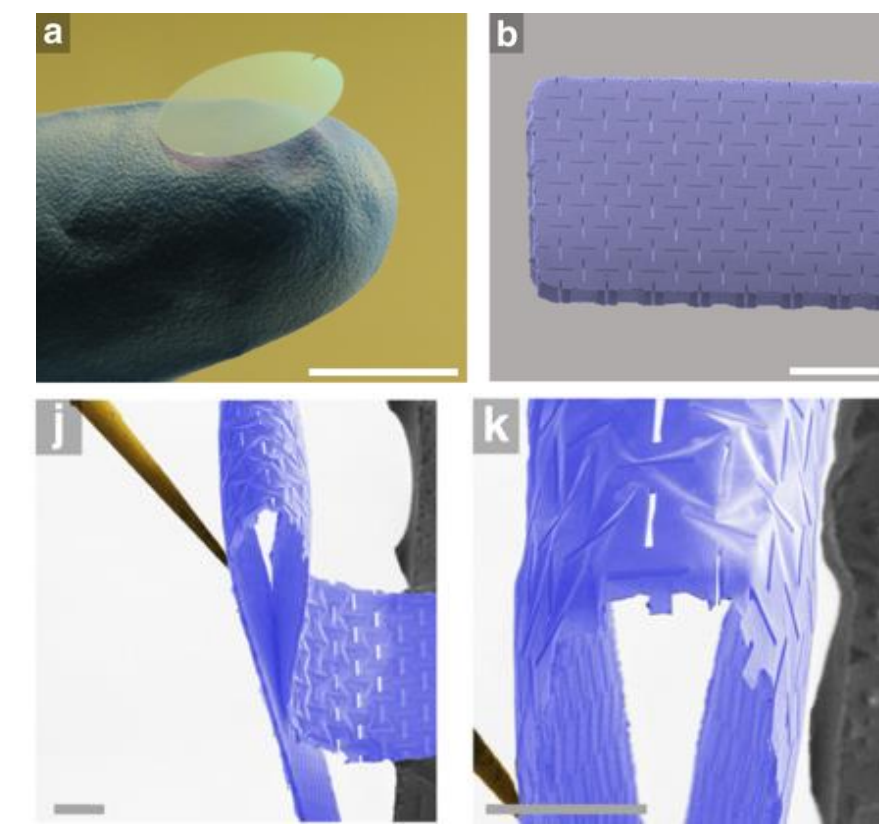
### 4 core facilities

- Quattrone Nanofabrication Facility
- Nanocharacterization Facility
- Scanning & Local Probe Facility
- Property Measurement Facility

- Highly accessible (I-95, public transportation)
- 5 Government labs, 16 Universities

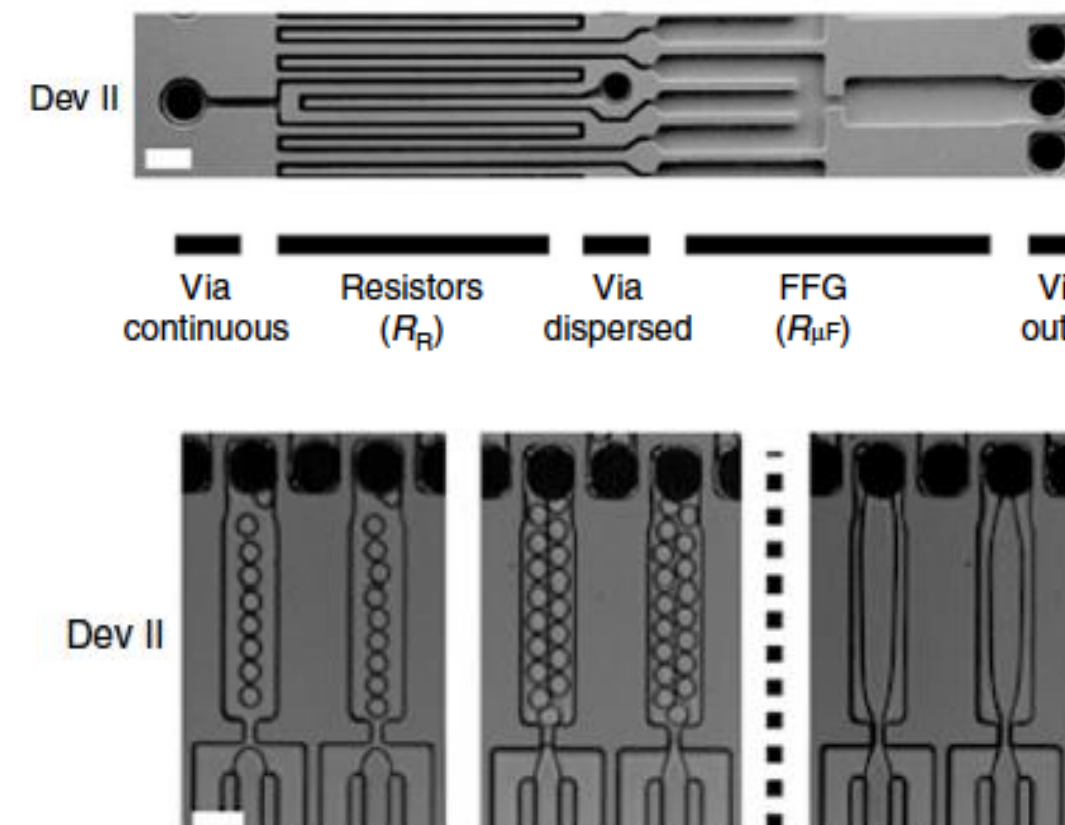
## Key Research

*Academic users*  
Ultra-lightweight flexible cardboard



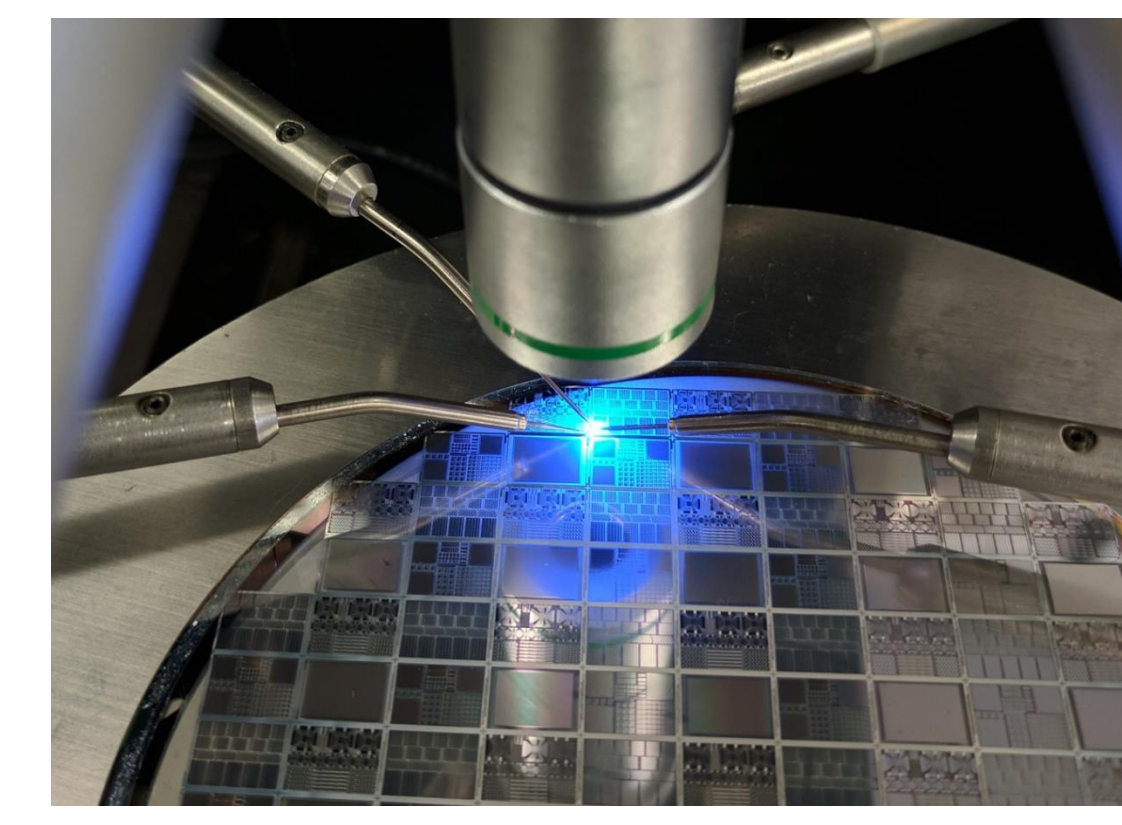
Bargatin Group, UPenn

*Academic & Industry Collaboration*  
Microfluidics devices for pharmaceuticals



Issadore Group, UPenn

*Industry users*  
Next generation LED device



Lumiode

## Tool Acquisitions



- JEOL NEOARM: CS-corrected, STEM, EELS, EDS
- JEOL F200: HR-TEM, STEM,
- Furnace: LPCVD, atmospheric wet/dry oxidation
- Probe Station

## NNCI Network Activities

### Host and Organize

- UGIM 2018 Symposium: +300 participants, 4 days
- MAEBL 2018

### Leadership

- Cost saving by collective purchasing
- Equipment, maintenance and training working group
- Photolithography working group

### Participate

- Etch working group
- REU convocation

### Node to node research collaboration

- Univ. of Washington
- Cornell Univ.
- Univ. of Minnesota
- etc.

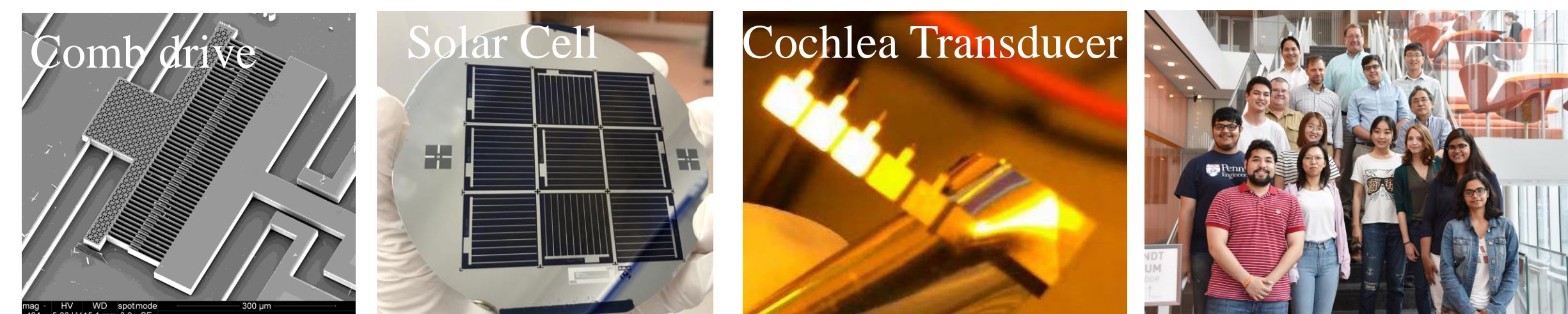
## Education

### Graduate Student Fellow (GSF)

- Project based learning: 1 device project per student
- Device fabrication and Educational component development: ESE 535 and ESE 336
- A total of 15 awardees in FY19
- % of women awardees: 33% (FY18) → 53% (FY19)
- Projects: MEMS, 2D Graphene device, Neural device, Transducer for cochlea, Solar cell, Ink-jet oTFT, Microfluidic valves, etc.

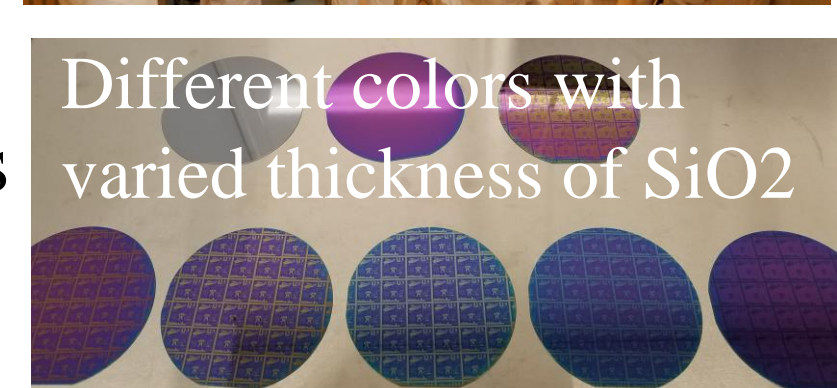
### Research Experience for Undergraduates (REU)

- A total of 6 students



## Outreach

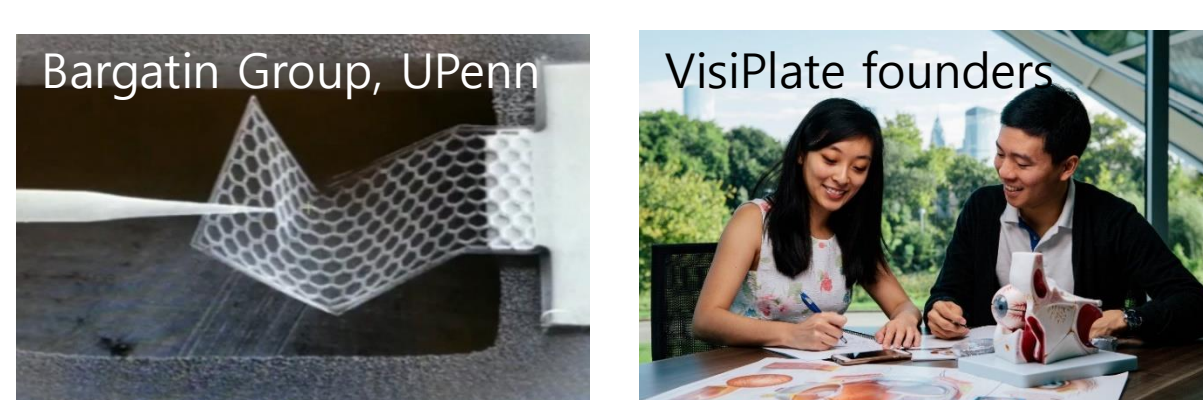
- Hands-on processing experience for local universities and college undergraduates (Villanova, Bryn Mawr, Swarthmore)  
The process consists of PECVD, lithography, and RIE.
- Demo for local middle/high school students
- Nanoday
- Boot Camp
- Career fair for 1K – 8K students
- Summer school
- Microfluidic workshop (Monthly)
- Open forum (Weekly)
- Help desk (Daily)
- More than 900 visitors enjoyed tours, demos or hands-on processing (Apr.2017-Mar. 2018)
- Facebook, Twitter, Newsletter



## Seed Grant & Support for Entrepreneur

- 11 startup and entry-level businesses
- A total of \$17,500 in laboratory and equipment time
- [Example] VisiPlate:  
Remove excess fluid from inside the eye to reduce high pressures that cause open angle glaucoma, a major cause of blindness worldwide.

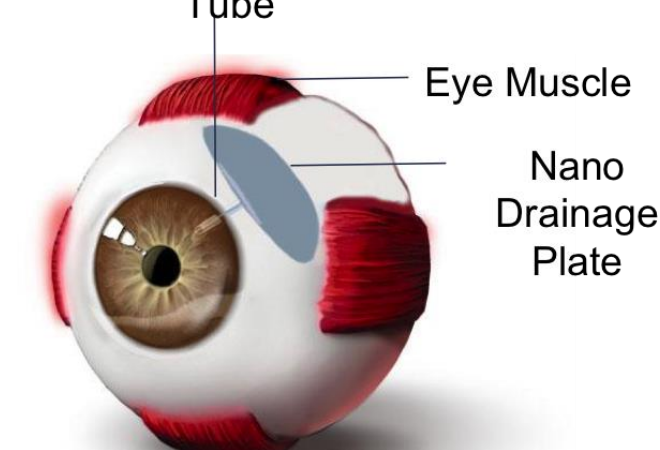
Big Ideas through Small Technology



Previous technology

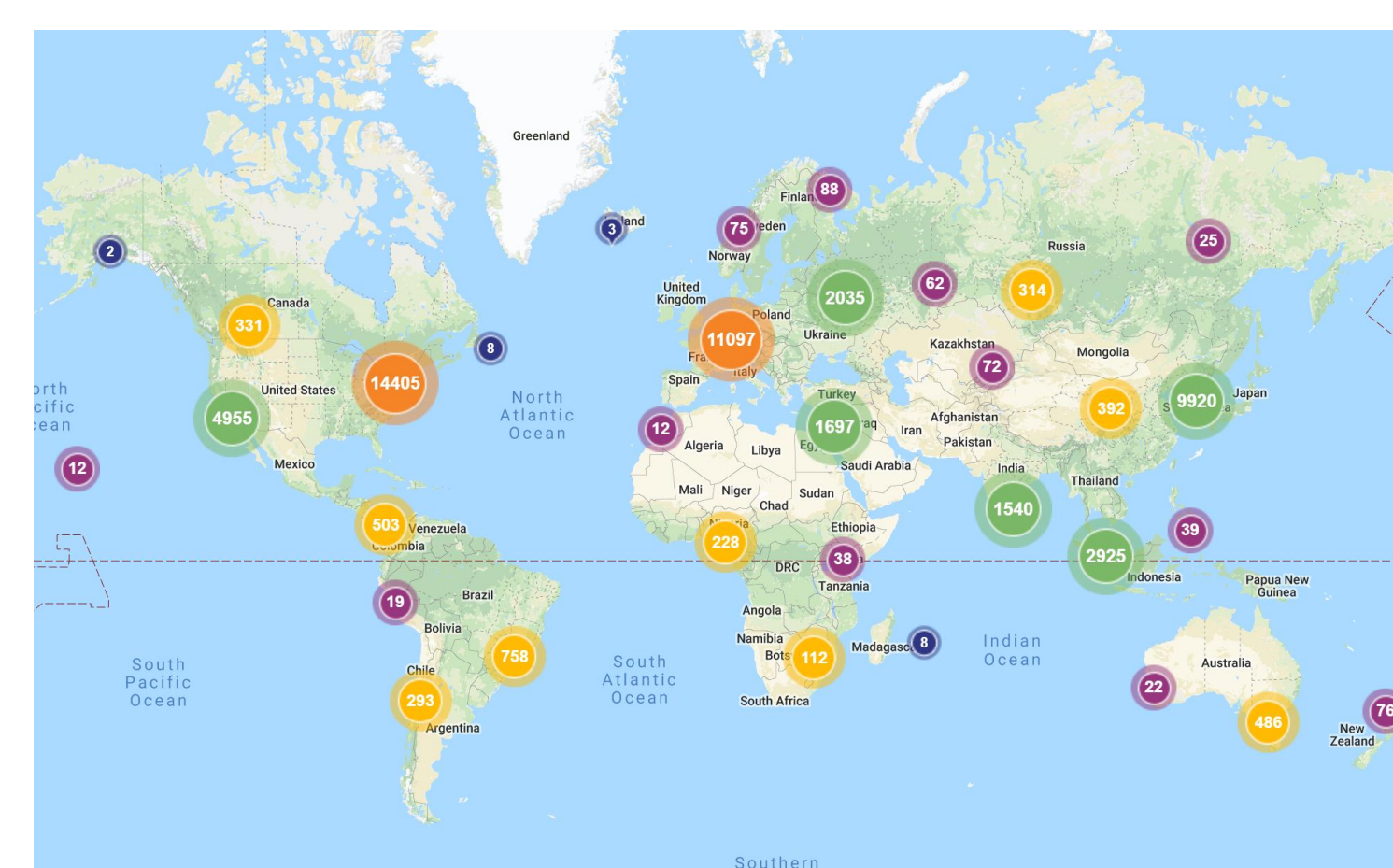


New concept by VisiPlate



Flexible mesh developed by Penn faculty.  
Application tried by Penn students.

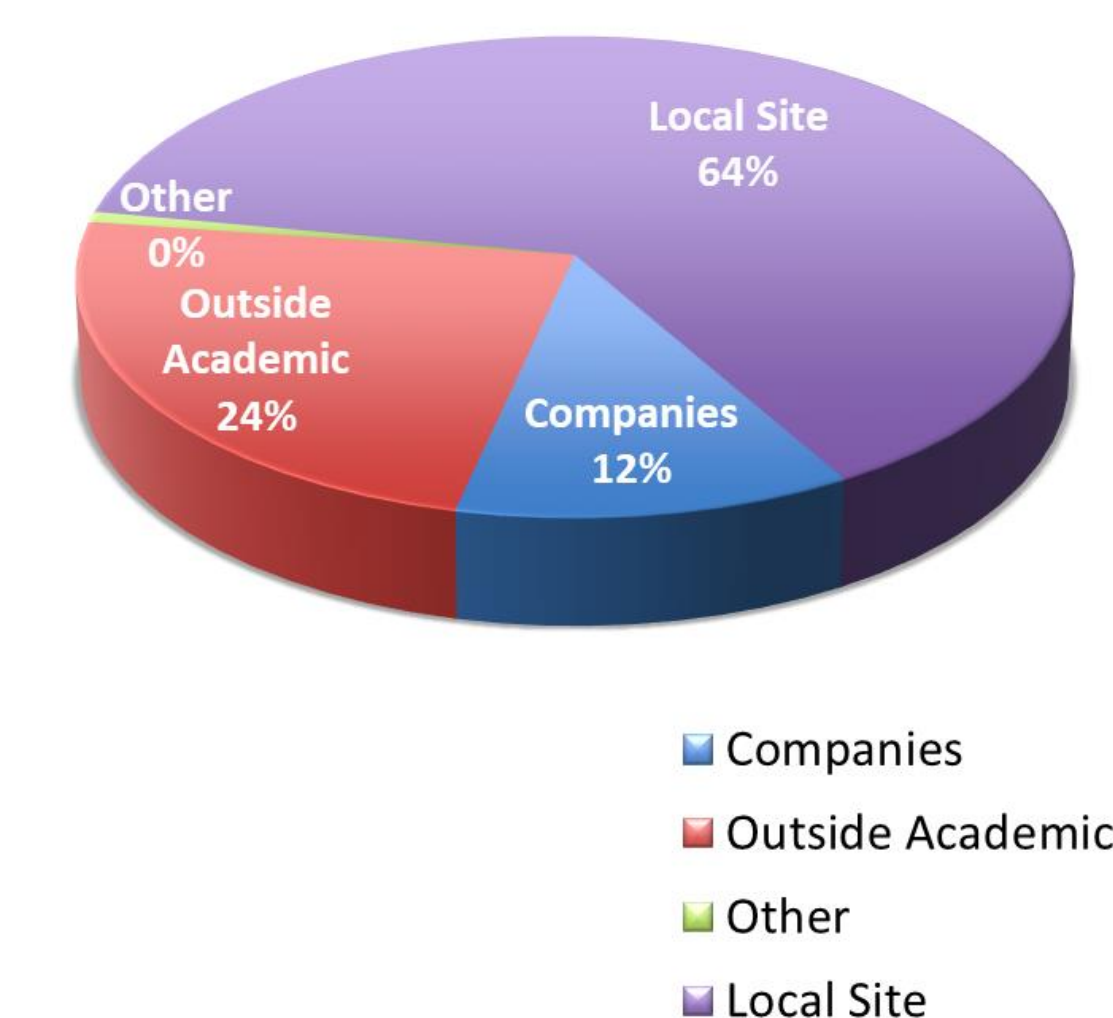
## Scholarly Commons



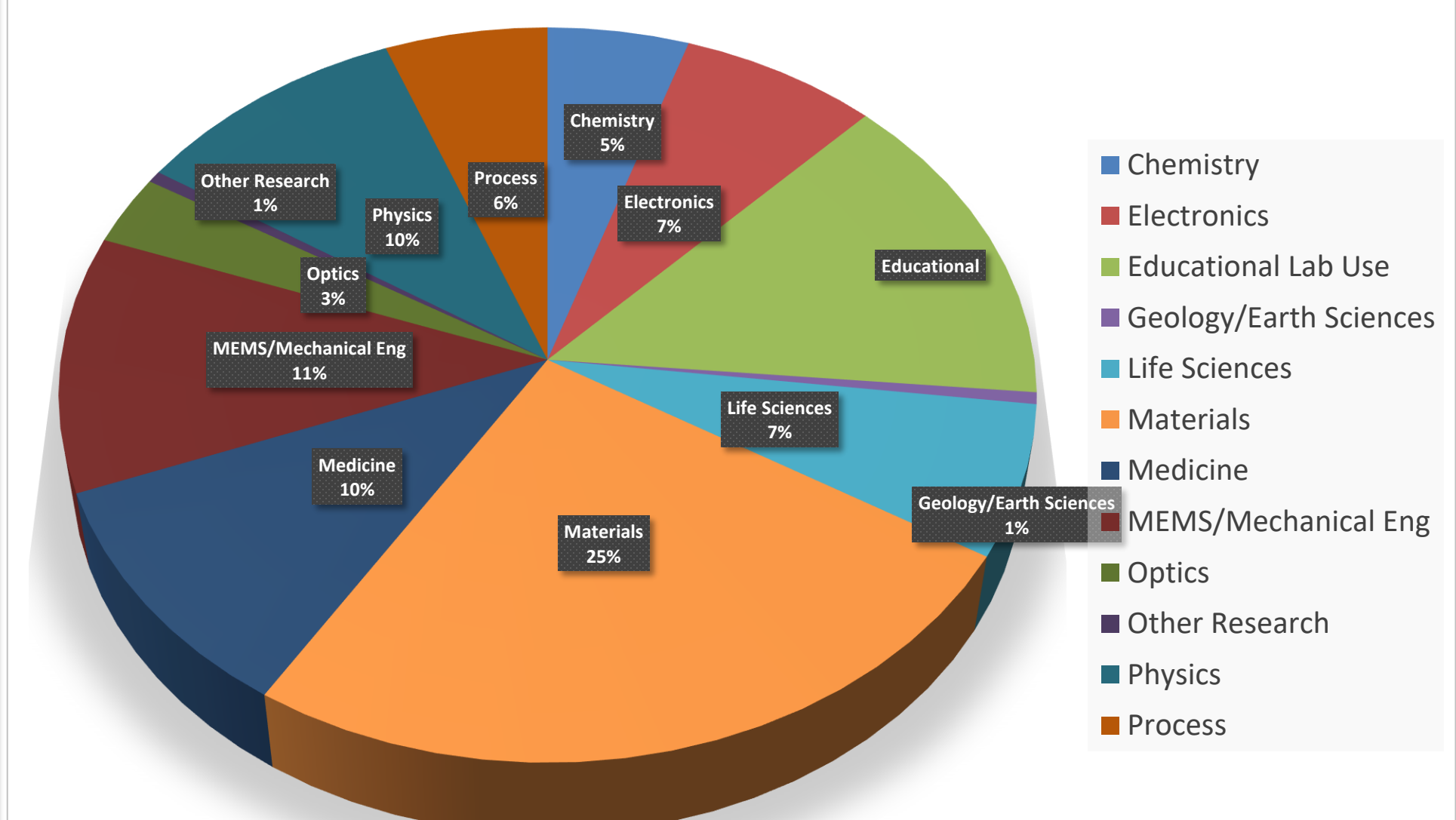
- Over 100 publications
- Open access
- Protocol, Tool data, SOP
- To share knowledge we obtained
- Total downloads since 2015: 54k
- Downloads for last 1 year: 22k
- <https://repository.upenn.edu/qnf/>

## Statistics

Cumulative Distribution of Users' Affiliations for 2017-2018



Cumulative Singh Users by Discipline FY 2017-2018



- Cumulative users in Oct 2017 – Sep 2018: A total of 626 (on-site 577, remote 49)
- We host both traditional users and non-traditional users.