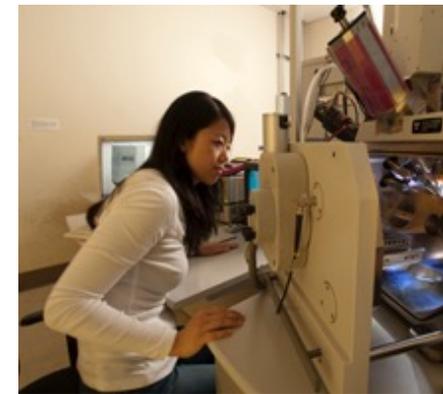
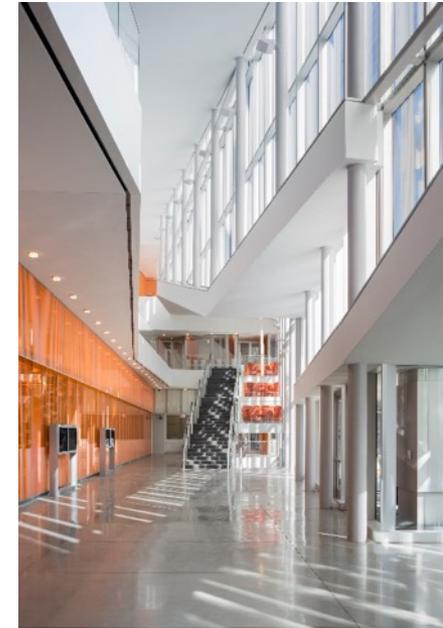


MANTH: The Mid-Atlantic Nanotechnology Hub

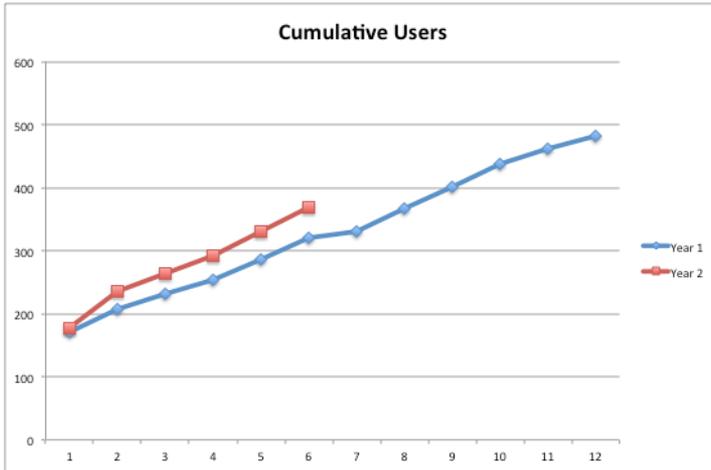
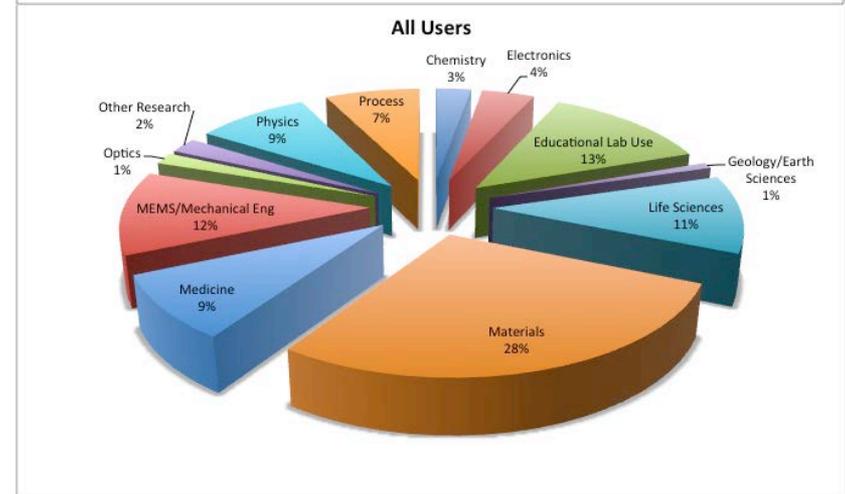
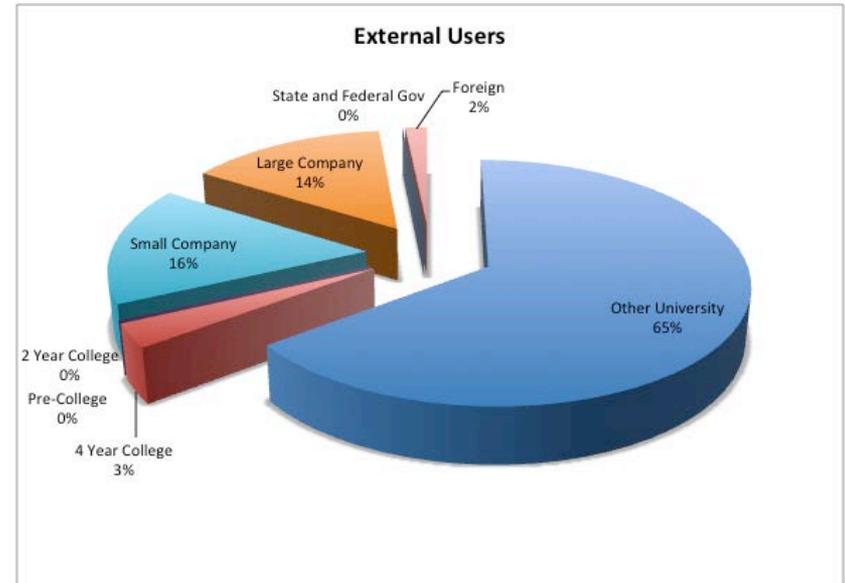
- Vision: To be a catalytic force for nanotechnology in the industry-dense and academically-rich environment of the mid-Atlantic region in a centrally-located Philadelphia hub
- Key Tactics: Providing access to a state-of-the-art, shared user fabrication and characterization facility; access to the deep intellectual expertise of our nanotechnology faculty; and creation of outreach and education experiences to the region through hands-on engagement as well workforce development.
- Philosophy: We are a 'maker space' for nanotechnologists that enables exploitation of fundamental advances in nanoscience to realize nanotech materials, devices and systems
- Organization: We have four core facilities, under one roof:
 - Quattrone Nanofabrication Facility (all aspects of nanofabrication)
 - Nanoscale Characterization Facility (characterization through electron and ion beams)
 - Scanning and Local Probe Facility (characterization through scanning probe)
 - Property Measurement Facility (characterization in extreme environments)
- Staff: We have a professional staff of 14 with deep expertise in fabrication, process development, characterization, user interaction, and nano-related education



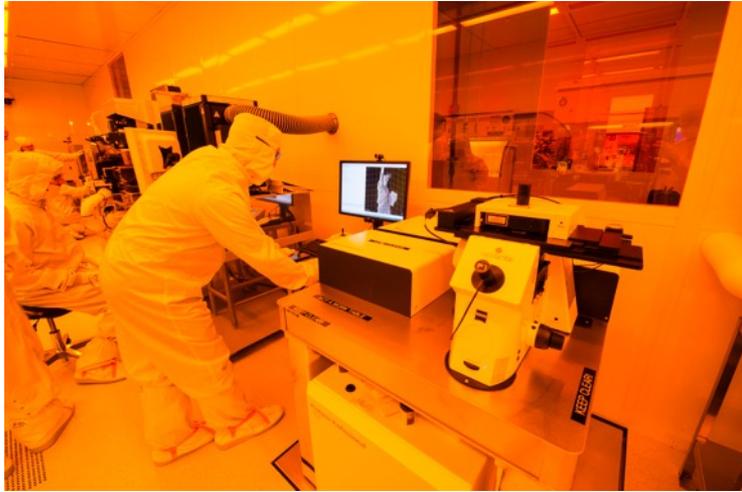
MANTH - Site User Data

Yearly User Data Comparison

	Year 1(12 months)	Year 2 (6 months)
Total Users	482	368
Internal Users	368	243
External Users	114 (24%)	125 (34%)
Total Hours	36970	16744
Internal Hours	34545	14884
External Hours	2425 (7%)	1860 (11%)
Average Monthly Users	171	173
Average External Monthly Users	28 (17%)	31 (18%)
New Users	270	142
New External Users	73 (27%)	78 (55%)



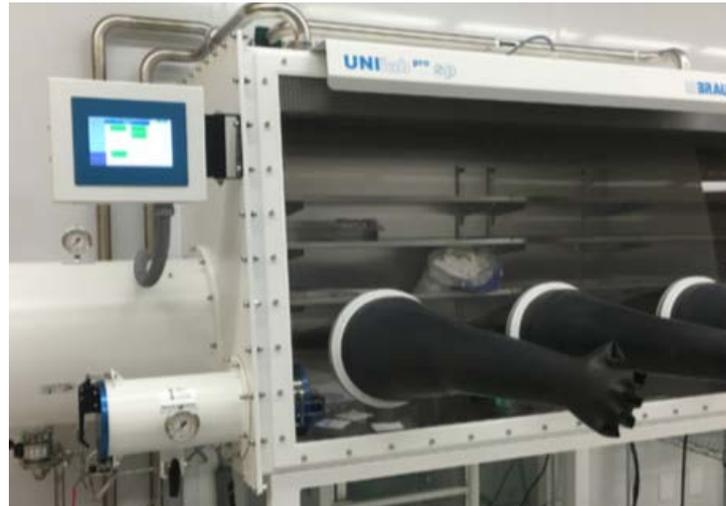
Facility Upgrades and New Tool Capabilities



NanoScribe
Photonic
Professional GT



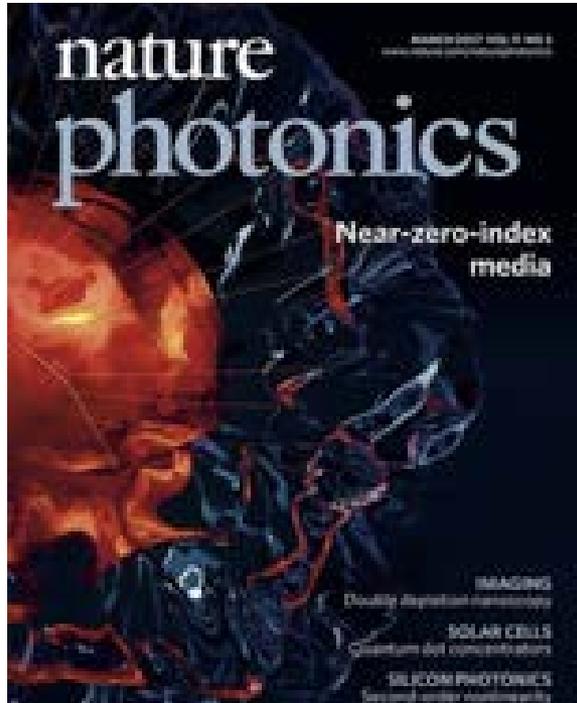
Oxford Instruments
PlasmaPro 100 Cobra RIE



Ultratech Fiji 200
Gen 2 Plasma ALD

Research Highlights

Near-Zero-Index Media
(Penn)



Nanomechanics of the Pericellular Matrix of Cartilage (Drexel)

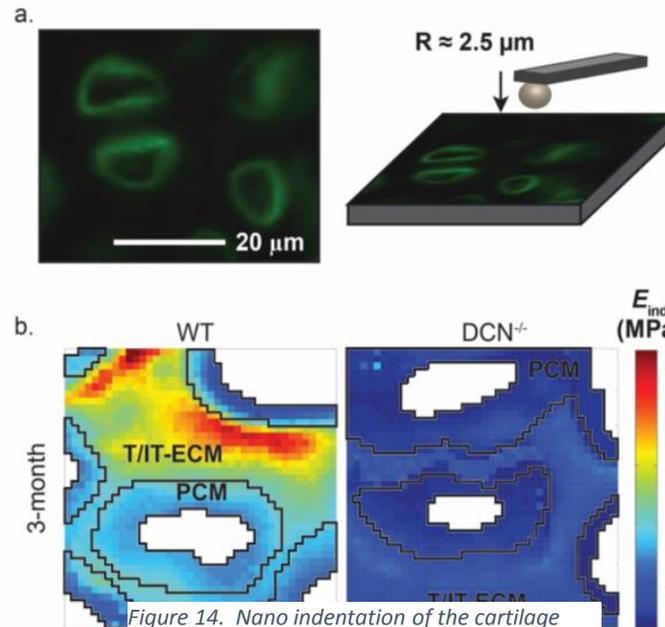


Figure 14. Nano indentation of the cartilage PCM.

Nanolaminated Ferromagnetics (EnaChip)



Education and Outreach Activity



12 representatives of industry, foundry, and academic nano programs from around the Mid-Atlantic and New England convene at the Singh Center to discuss the MANTH/CCP Nanotechnology Technician Training Program

Nano Day: 175 students from 7 Philadelphia schools, together with their teachers, learn about nanotechnology at the MANTH site



Education and Outreach Activity

Name	Project Title	Last - PI	Department
Kelsey DeFrates	Synthesis and Characterization of Protein-Dextran Nanogels for Drug Delivery Applications	D. Eckmann; R. Composto	Bioengineering/Anesthesiology; Materials Science
Lilia Escobedo	Fabrication and characterization of Ti3C2 MXene electrodes for studying neural circuits	B. Litt	Bioengineering/Neurology
Christian Franco	Optimal Resolution of Two-Photon Lithography: A Voxel Study		
Jason Mulderrig	Atomic Force Microscopy-based Mechanical Testing Reveals the Mechanisms of Plasticity in Disordered Nanoparticle Packings		
Katrina Raichle	Decreasing the Defects in Free-Standing Nickel Inverse Opal Cellular Solids		
Sanjana Subramaniam	Constructing Three-Dimensional Microstructures for Enhanced Adhesion		



Our REU Cohort

Knowledge Dissemination

Reader from: 🇸🇰 Tlmace, Nitriansky Kraj, Slovakia

PDMS-Glass Bonding Protocol - Technics

Ravit Dung, Justin Wen



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Total Downloads

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Downloads in the past year

Selected Network Activities

- MANTH-hosted Mid-Atlantic Cleanroom Managers' Meeting (50 attendees, including representatives from the Cornell site)
- MANTH participation in NNCI-ASU Winter School (January) and REU Convocation (August)
- MANTH Staff leadership in significant price reductions for maintenance contract and material cost reduction from preferred vendors (leveraging the network's buying power)

Panel Topic – New Education/Outreach Concepts

- Lab Courses Don't Scale
 - ESE 525: Nanoscience and Nanotechnology
 - Fall '16 – 67 students; Fall '17 – 73 students
 - ESE 536: Nanotechnology Laboratory
 - Spring '16 – 18 slots (dozens turned away); Spring '17 – 18 slots
 - Increasing demand for more courses at the undergraduate level as well as opportunities for training of external users
 - What can we do?
 - More/separate facilities – but it's our philosophy to do the education in the state of the art fab
 - Redefine a laboratory to analysis of experimental data (e.g., 'case studies') – but this is not an experimental laboratory experience
- Technician Training Programs (CCP/Penn activity)
- Preparing Nanotech Graduates for Industry