

Minnesota Nano Center

NDSU Packaging Center

UNIVERSITY OF MINNESOTA
Driven to Discover™

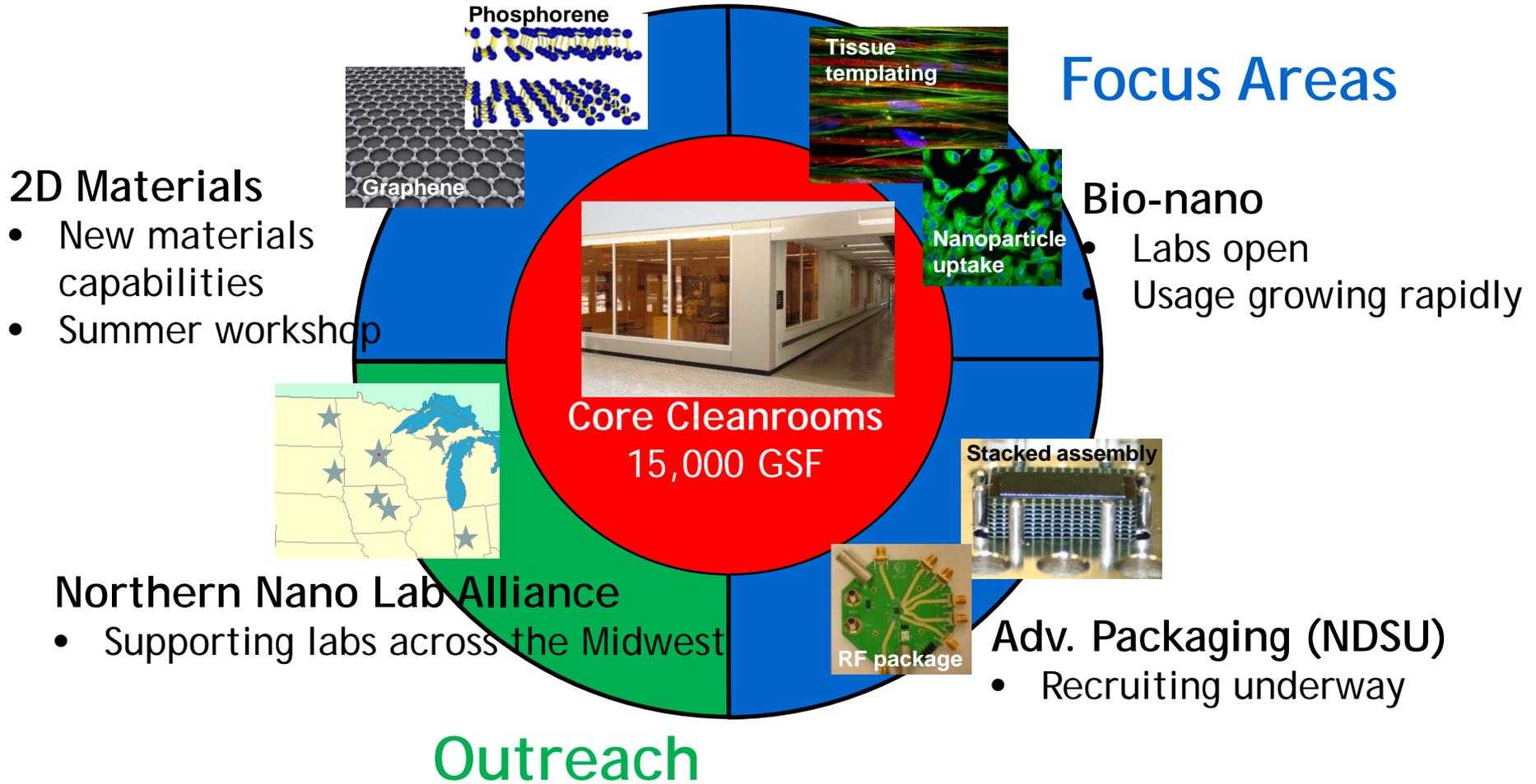
NDSU NORTH DAKOTA
STATE UNIVERSITY

Midwest Nano Infrastructure Corridor

Steve Campbell, Greg Cibuzar, Jim Marti
University of Minnesota

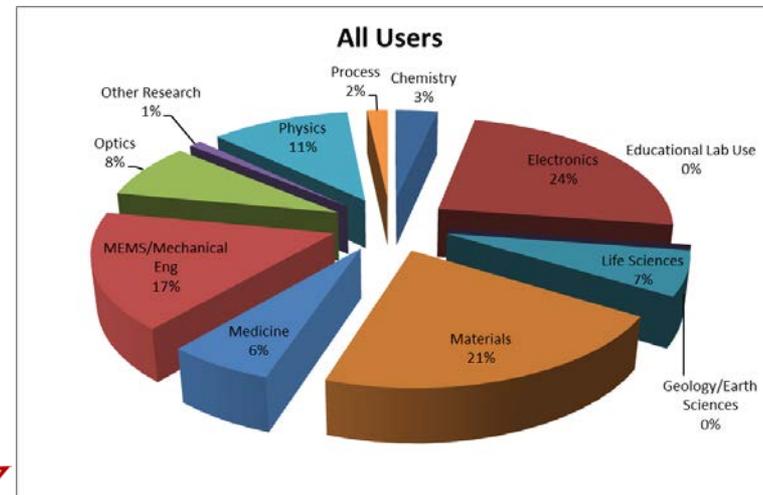
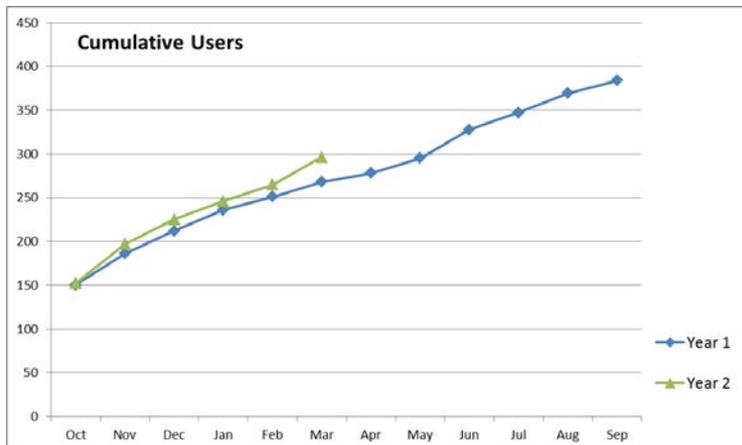
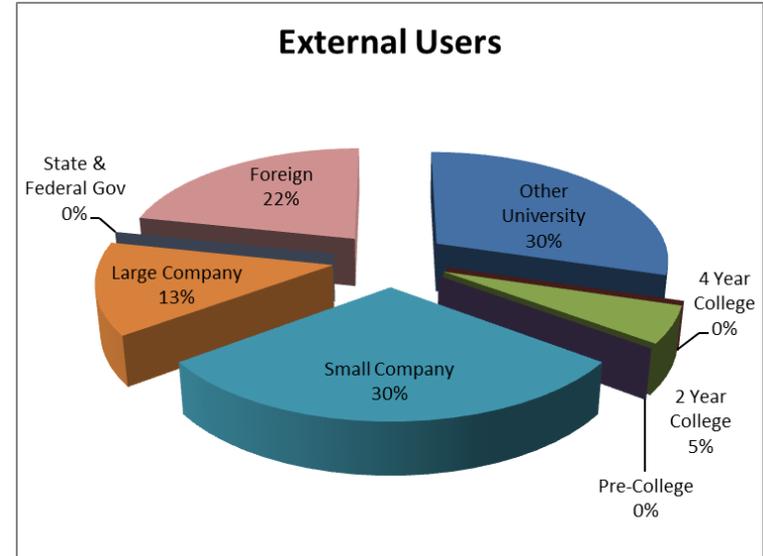


Node Overview

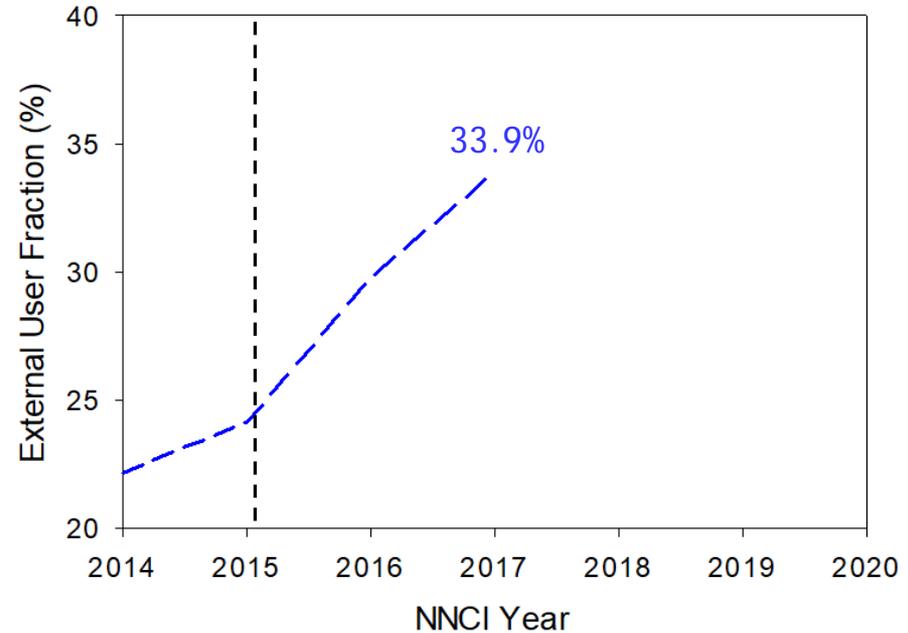
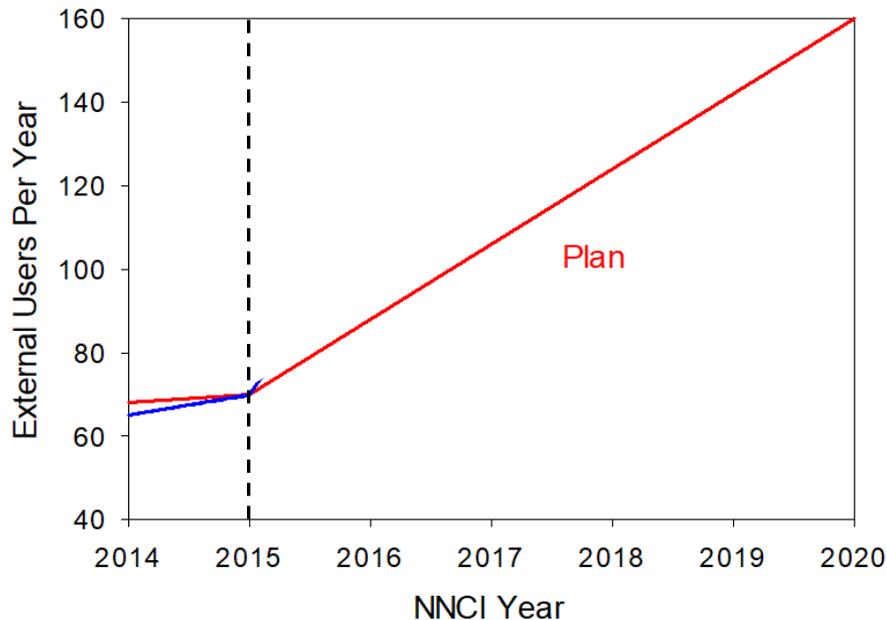


Site User Data

Yearly User Data Comparison		
	Year 1 (12 months)	Year 2 (6 months)
Total Users	384	296
Internal Users	271	222
External Users	113 (29%)	74 (25%)
Total Hours	27002	12733
Internal Hours	20496	9571
External Hours	6506 (24%)	3162 (25%)
Average Monthly Users	156	152
Average External Monthly Users	26 (17%)	29 (19%)
New Users	75	151
New External Users	33 (44%)	78 (52%)

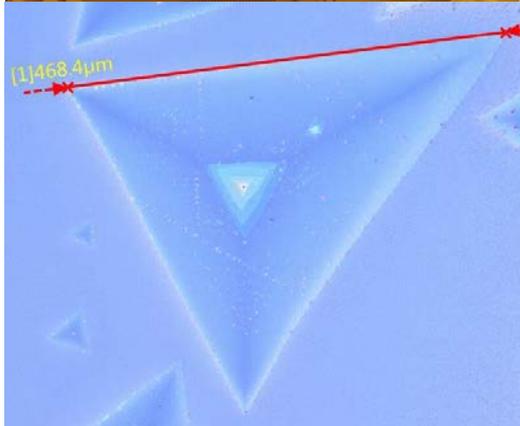


External User Site Data (through 24 months)



- Aggressive recruiting has dramatically increased external user count
- Expecting to approach 40% external usage by 2020

Facility Upgrades and New Tool Capabilities



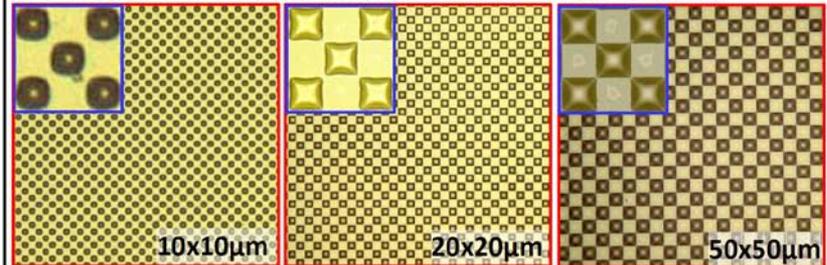
- DI-5000 AFM
- JEOL 6700 FE-SEM
- 2D Material System
- Glovebox for 2D
- Parylene Deposition
- Disco 552 Saw
- Film Sense Ellipsometer
- Westbond Wire Bonder



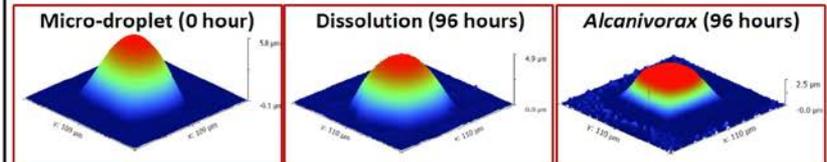
Research Highlights: Ecology-on-a-chip

C. Mechanistic study on degradation of a micro-oil droplet

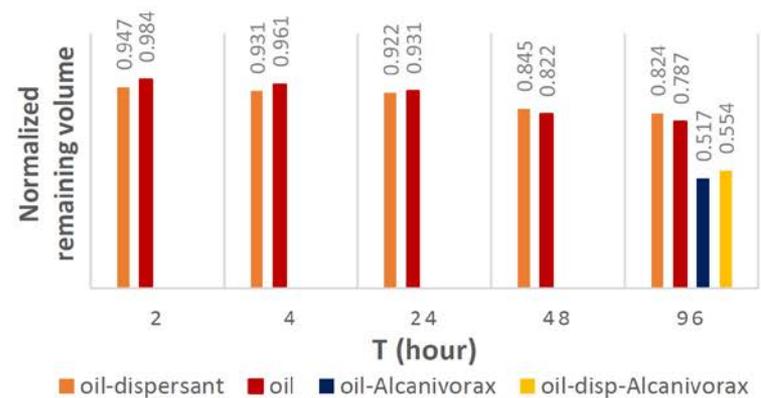
C1. Bioassay patterned with oil droplet array using micro-Printing



C2. Assess degradation of oil droplet by dissolution and bio-consumption with Atomic Force Microscopy (AFM)



C3. Degradation effects assessment by quantifying volume reduction

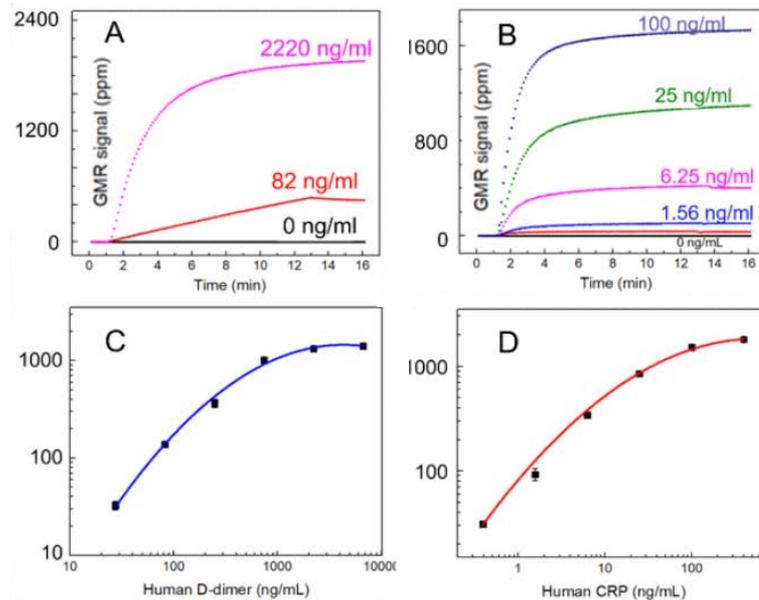


Research Highlights: GMR Based Bio Sensing

Zepto Life Technology is building a handheld protein biomarker detection platform with integrated microfluidics. This has great potential for the development of simple, rapid, automatic and cost-effective point-of-care testing (POCT).

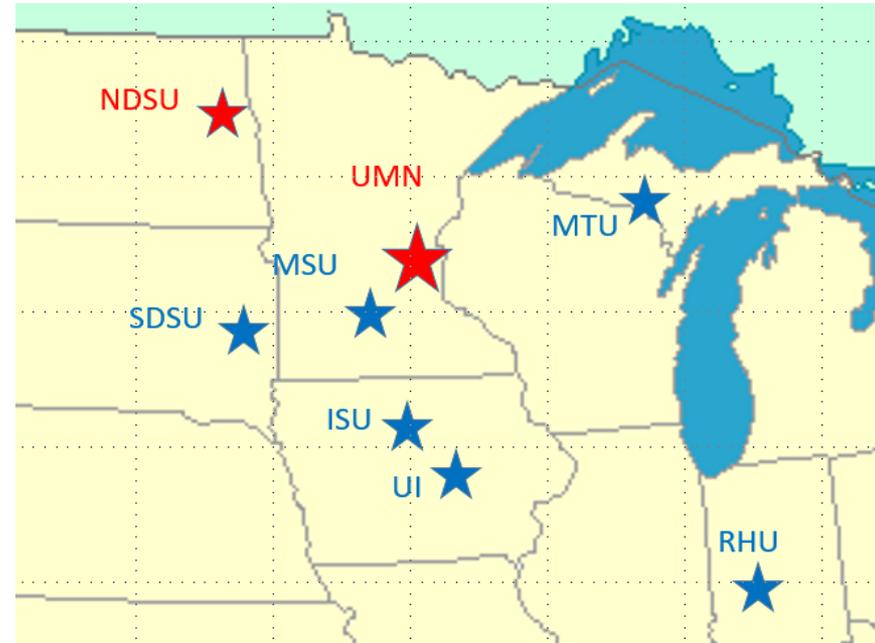
Biologically functionalized GMR sensors paired with biologically functionalized magnetic nanoparticles detect protein biomarkers.

Goal: multiplex detection of protein biomarkers at medically relevant sensitivities in a hand-held battery-powered format



Outreach (12 months)

- Presented nanotechnology classes and lab tours to 115 undergraduate students, 86 high school students, and 280 middle school students.
- Summer programs served over 200 students (ages 13 to 17) with guided hand-on activities that demonstrated nanoscience concepts.
- Partnered with organizations like the Minneapolis YWCA and Hennepin County 4-H to broaden our reach to minority and female students.



- Northern Nano Lab Alliance
 - Working with schools to reduce operating costs and to promulgate best practices
 - Providing real-world support



“Our tool is now working well. This would not have been possible without the assistance and support from MINIC and the NNLA network... I look forward to our continued support from the NNLA.”
Aju Jugessur, Ph.D.
Director, Univ of Iowa Microfabrication Facility (UIMF)

Future Research Directions

- Traditional (2D, spintronics, plasmonics, ...)
- Nontraditional areas (Medicine, agriculture, energy storage, ...)

General interest but few
bridges and little funding
Drain on resources

Bridge builder; provides
proof of concept
Usage limited, but essential

Serial success; major
impact on funding sources
Creates change in fields



Acceleration Mechanisms

- Tours, talks, workshops, ...
- Lunches, social experiences, ...
- Internal project support
- Internally funded centers

