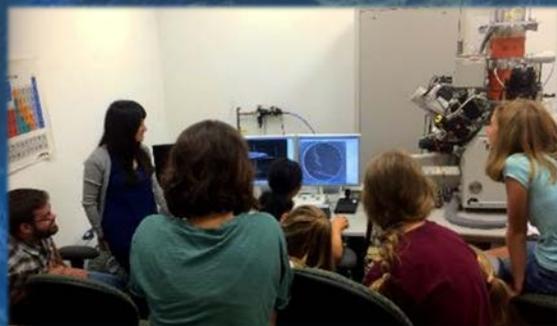
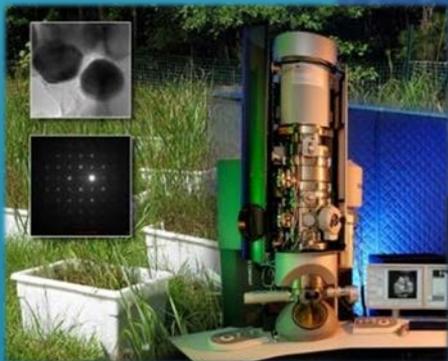


The Virginia Tech National Center for Earth and Environmental Nanotechnology Infrastructure

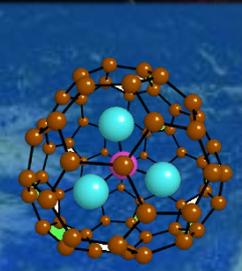


VirginiaTech
 Institute for Critical Technology and Applied Science

National Science Foundation
 National Nanotechnology Coordinated Infrastructure (NNCI)

\$81 Million
16 National Sites
5 Years of Funding

University of Washington with Oregon State University
 Montana State University with Central College
 Stanford University
 University of California, San Diego
 Arizona State University with Maricopa County Community College District and Science Foundation Arizona
 University of Minnesota-Twin Cities with North Dakota State University
 Cornell University
 Northwestern University with University of Chicago
 University of Louisville with University of Kentucky
 Georgia Institute of Technology with North Carolina A&T State University and University of North Carolina-Greensboro
 University of Texas at Austin
 Harvard University
 University of Pennsylvania with Community College of Philadelphia
 Virginia Polytechnic Institute and State University
 North Carolina State University with Duke University and University of North Carolina-Chapel Hill

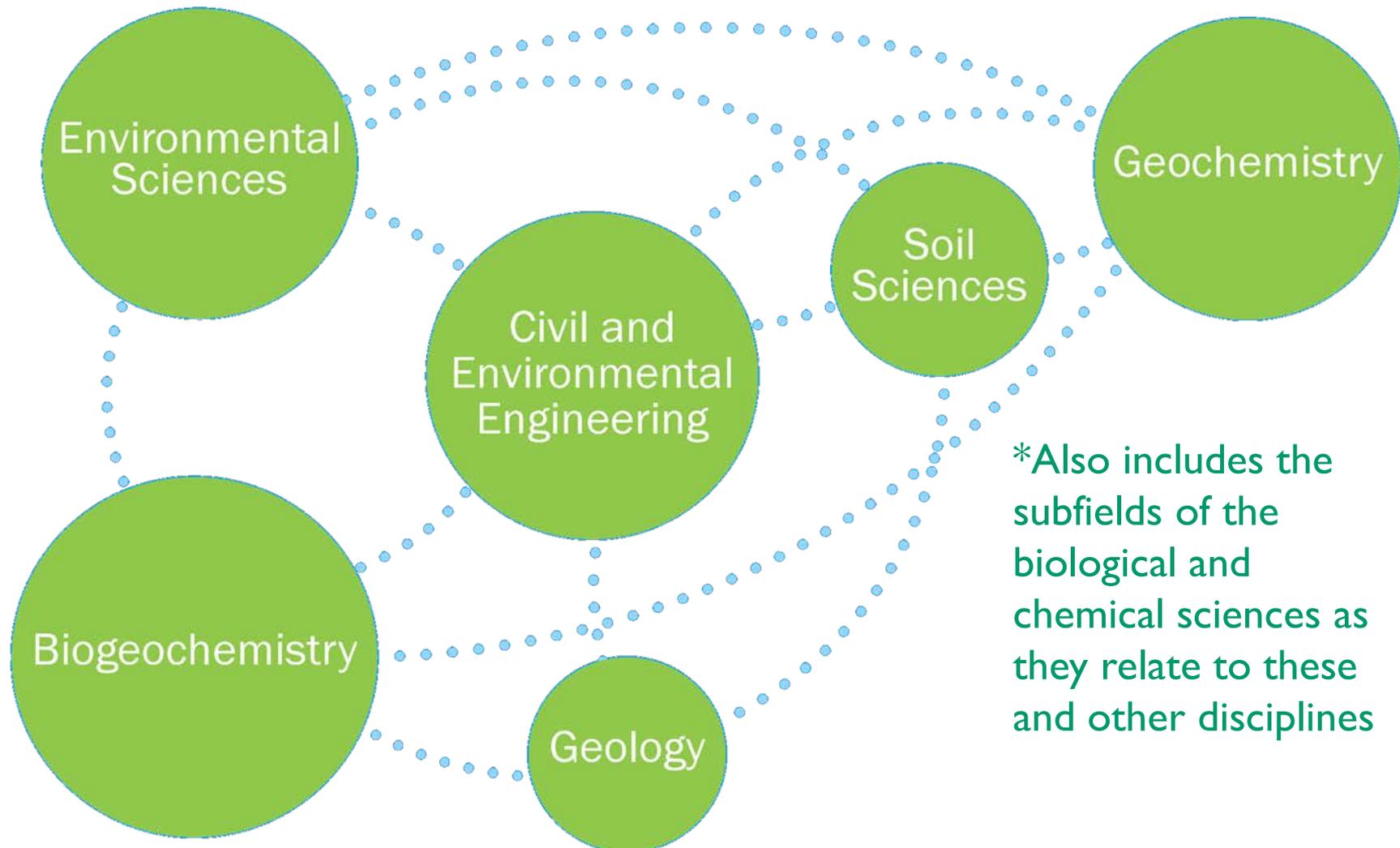


Pacific Northwest
 NATIONAL LABORATORY

www.nanoearth.org

Site Overview

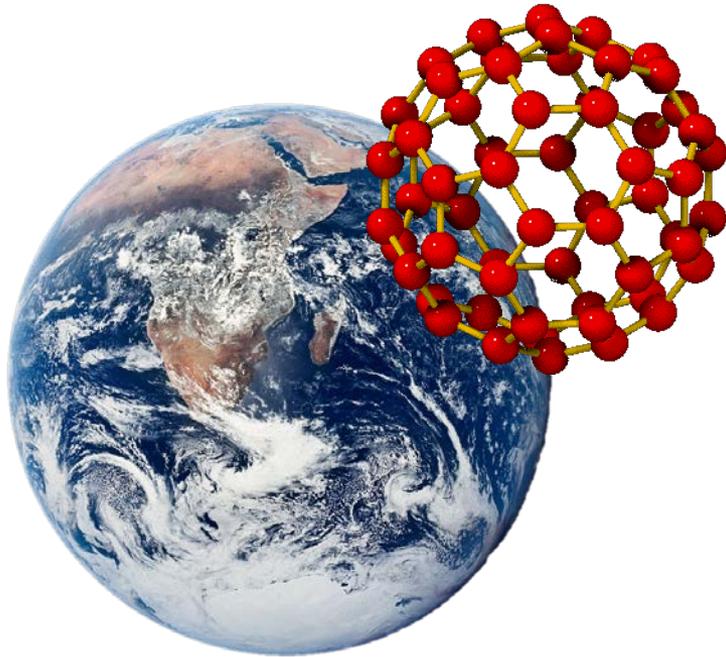
Focus Area: Non-traditional Areas of Study



*Also includes the subfields of the biological and chemical sciences as they relate to these and other disciplines

About NanoEarth

The Virginia Tech National Center for Earth and Environmental Nanotechnology Infrastructure (NanoEarth) is designed to provide a network node that supports external researchers who work with nanoscience- and nanotechnology-related aspects of the Earth and environmental sciences/engineering at local, regional, and



global scales, including the land, atmospheric, water, and biological components of these fields.

NanoEarth is the only NNCI site dedicated to the nanoscience and technology of Earth and its environment.

Facilities



VTSuN

VT Center for Sustainable
Nanotechnology

21, 300 sq. ft. (up to 38,000 sq. ft.) of laboratory, instrument, & office space



NCFL

Nanoscale Characterization and
Fabrication Laboratory



U.S. DEPARTMENT OF
ENERGY



Pacific Northwest
NATIONAL LABORATORY

EMSL

 National Nanotechnology
Coordinated Infrastructure

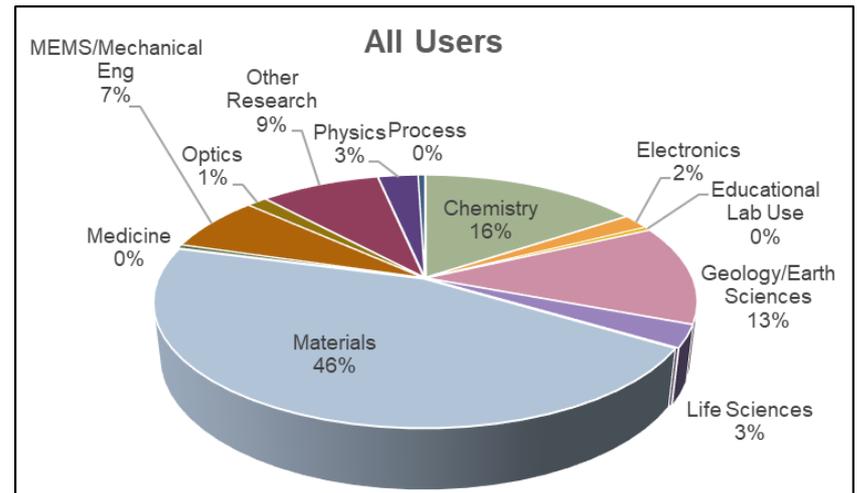
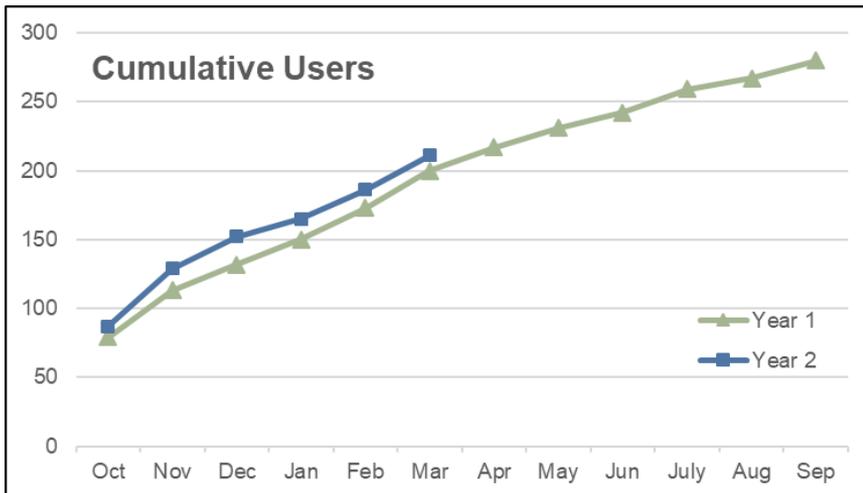
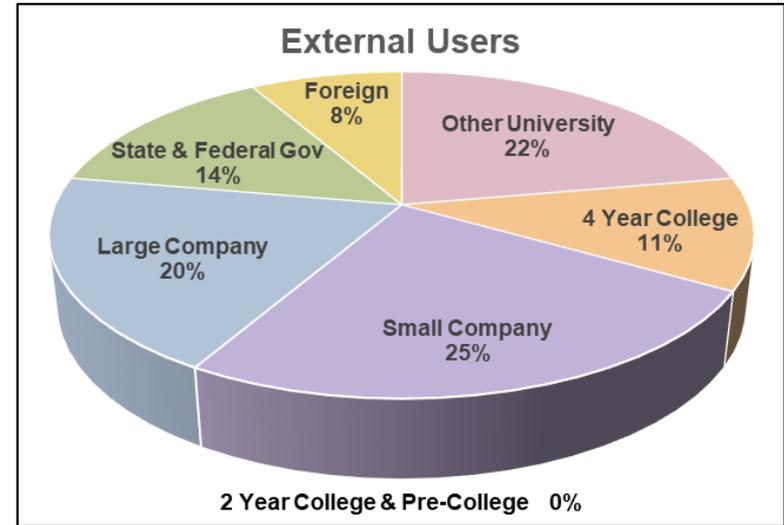


 NanoEarth

User Statistics

Site User Data (Year 2: October 2016-March 2017)

Yearly User Data Comparison		
	Year 1(12 months)	Year 2 (6 months)
Total Users	280	211
Internal Users	232	175
External Users	48 (17%)	36 (17%)
Total Hours	7,627	7,666
Internal Hours	6,196	6,271
External Hours	1,431 (19%)	1,395 (18%)
Average Monthly Users	79	87
Average External Monthly Users	9 (11%)	13 (15%)
New Users	280	79
New External Users	48 (17%)	19 (24%)



Important NanoEarth Considerations & Statistics

- As the research area options are limited, environmental researchers must classify themselves in another area.
 - While the hope is for researchers to select “Geology/Earth Science”, many choose based on the research methodology employed (e.g. materials, chemistry)
 - “Other Research” is also common, but can be viewed as a negative choice
- Nearly 60% of external clients who use our nano-facilities come to perform Earth and environmental science at the nanoscale.
- 32% of new users (25/79) were recruited through NanoEarth
- At least 63% of hours reported (4,810 hr) are for Earth or environmentally related research

Facility Upgrades and New Tool Capabilities

Instrument Acquisitions (\$700k)



*PANalytical Empyrean XRD
(\$600K)*



*Flow Science
Enclosure (\$10K)*

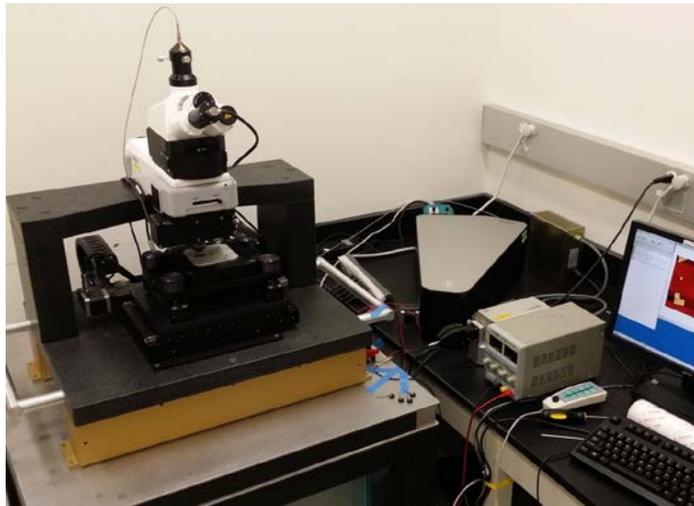


*Beckman Coulter
Ultracentrifuge (\$95K)*

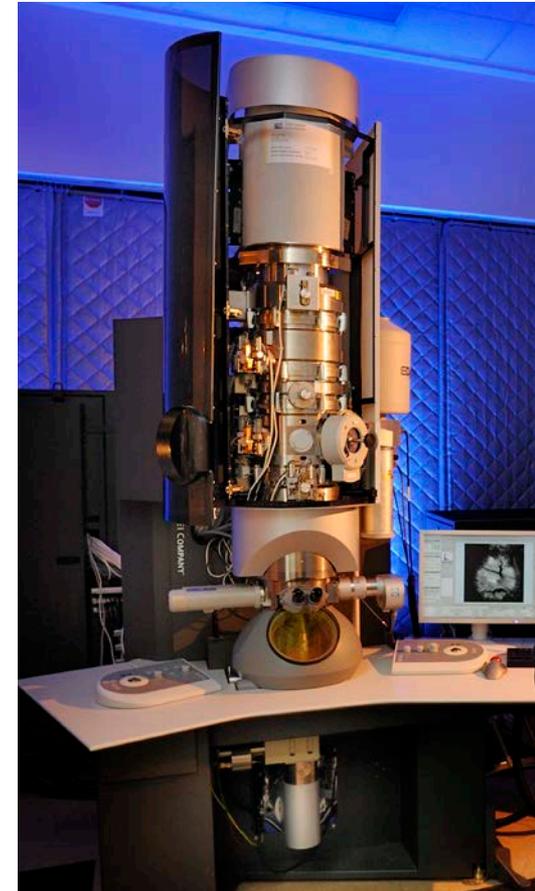
*Scanning Mobility Particle
Sizer Spectrometer (\$85K)*



Instrument Upgrades (\$95K)



*WITec Raman – laser
polarization upgrade (\$15K)*



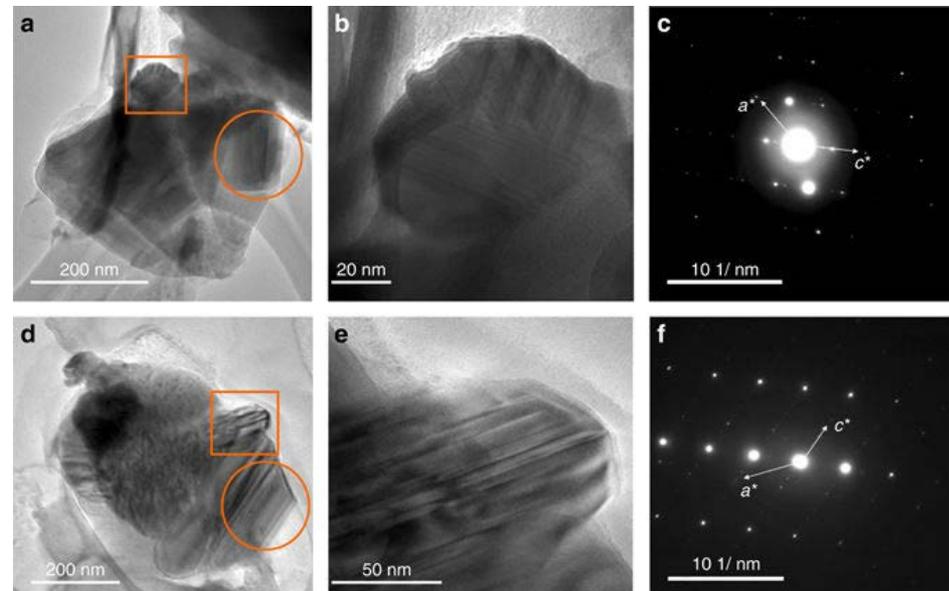
*FEI Titan TEM – EELS
upgrade (\$80K)*

Research Highlight

Research Highlight

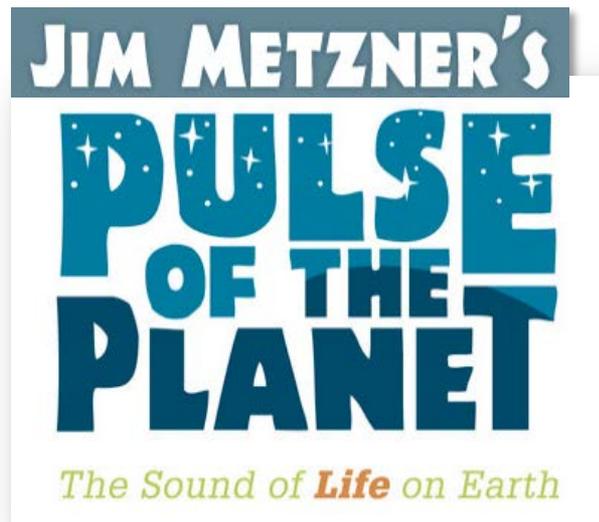
Yang, et al. (2017) *Nature Communications*, 8 (194), doi:10.1038/s41467-017-00276-2

- Titanium suboxide, Magnéli phases ($\text{Ti}_x\text{O}_{2x-1}$), produced during coal burning
 - Provides a new tracer for tracking solid-state emissions worldwide from industrial coal-burning
- Potential human lung toxicity pathways that are active without photo-stimulation



Education & Outreach

Pulse of the Planet: 19 NanoEarth Sponsored Shows



*Heard over 270 radio stations
by 1.1M listeners per week;
podcasts downloaded 1M/month*



Multicultural & Underrepresented Nanoscience Initiative (MUNI)

64 visitors: research, workshops, HBCU Summit (Year 2: 33)
NanoEarth MUNI users and visitors to date have come from the following 13 colleges/universities:

- Brooklyn College
- Florida International University
- Georgia State University
- Hampton University
- Howard University
- Kingsborough Community College of CUNY (City College of New York)
- Queens College
- Rutgers University
- University of Alabama
- University of New Mexico
- University of South Carolina
- University of Texas at El Paso
- Washington and Lee University



Georgia State MUNI visitors prepare for demonstrations and discussions at the NCFL

Network Activity

Network Activity

- Mitsuhiro Murayama (NanoEarth) is working with Lynn Rathburn (Cornell) in support of a joint REU program with the National Institute for Materials Science in Tsukuba, Japan
- Working with Arizona State University to begin our inaugural SEI activities
- Leadership and Membership among 8 NNCI Working Groups and Committees

Panel Topic: Redefining Traditional Users

Panel Topic: Redefining Traditional Users

- Non-traditional users often require:
 - Expertise
 - Additional support
 - Unique facilities
 - Specialized instrumentation

