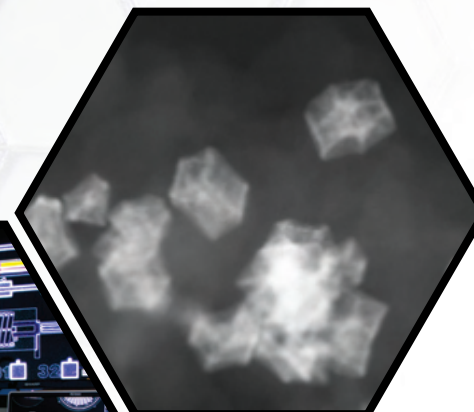
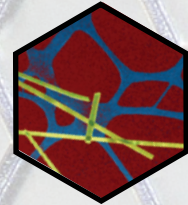


# UTAH NANOFAB





## INNOVATE

Our researchers are world leading innovators of nanophotonic devices, plasmonic materials, neural prosthetics, biomedical microfluidic systems, microsensors/actuators and biosensor chips.

## FABRICATE

The Utah Nanofab provides the equipment, processes, and expertise necessary to design, build and package revolutionary micro and nanoscale devices. Our facilities include device modeling, design layout, mask fabrication, thin film deposition and patterning.

## EVALUATE

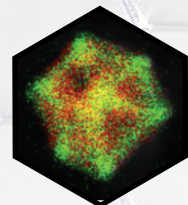
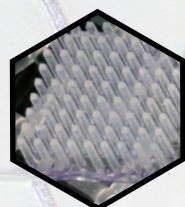
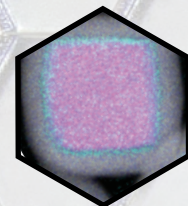
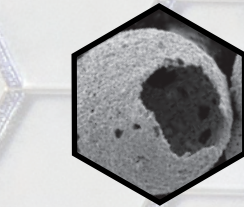
We provide complete surface analysis and nanoscale imaging, including multi-scale, correlative analytical microscopy: creating contextually-intact analyses on a specific location of interest, spanning the dimensional range from 10's of cm to 10's of Å. Our scanning transmission electron microscope is the first of its kind in the country, with the ability to simultaneously image atomic lattices, while in the same scan collect meaningful, nm-resolution compositional maps of distributed elements.

## EDUCATE

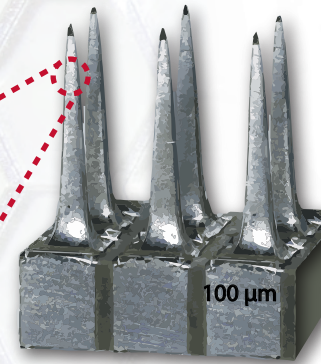
Every year, we teach 8 to 12 formal lab-based courses inside our facility, beginning with freshman-level courses taught each semester. We also deliver hands-on demonstrations and curriculum support modules for use in STEM programs to help students gain intuition for the dominant physical phenomena that must be accounted for when designing in the micro- and nanometer scale. Our professional staff provide short courses to our interns and researchers in specific analysis techniques as well as in statistical experimental design techniques.

## CREATE

The discoveries made in the Nanofab help create life-saving medical devices, faster microchips and more efficient energy systems, resulting in scientific publications, new companies and improved quality of life.



Optical (mm)

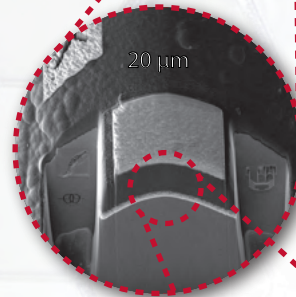


*We helped a local company (Blackrock Microsystems) solve an important metalization problem and create a more robust product through the use of multi-scale analysis.*

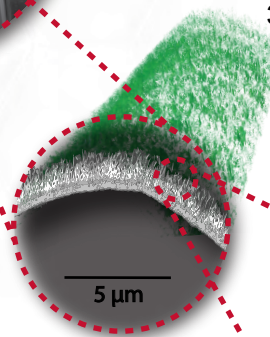
FIB cut



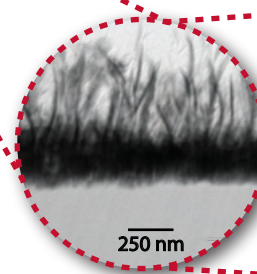
SEM (µm)



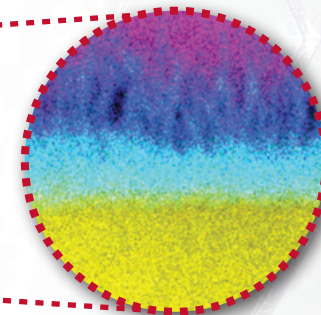
3D FIB slices (nm)



HRTEM



S/TEM EDS (nm)



## TECHNICAL EXPERTISE & CAPABILITY

### MULTI-SCALE, CORRELATIVE ANALYTICAL MICROSCOPY

- Fluorescence mapping of elements in mm resolution over 10's of cm ( $\mu$ Spot XRF)
- Stitch-montage imaging of samples in  $\mu$ m resolution over mm-cm scale (Keyence VHX5000, ESEM-FEG/EBSD/EDS, Zygo)
- Surface chemistry with mono-layer resolution in depth, 10  $\mu$ m lateral pixel resolution (XPS, Auger)
- 3D tomographic reconstruction of 5 $\mu$ m x 5 $\mu$ m x 5 $\mu$ m volumes in nm resolution (dual-beam FIB)
- Surface morphology and roughness at the atomic scale (atomic force microscopy)
- Lattice resolution imaging concurrent with fast, nm-resolution EDS elemental mapping. 3D EDS Tomography. (JEM 2800 S/TEM with dual EDS)

### CLEANROOM FABRICATION

- For biomedical and implantable micro systems, nanophotonics, environmental monitoring sensors and micro machines:
- A full portfolio of thin film deposition and patterning tools
  - Industry experienced staff (statistics, SPC, DOE, process development, product development, facilities and safe materials handling)
  - 12 dedicated sputtering cathodes (cryo-pumped with load locks)
  - 3 user-configurable sputtering cathodes (cryo-pumped)
  - 3 e-beam evaporators
  - Specialty materials (parylene, TEOS, LTO, PSG)

### INTEGRATION ENGINEERING

- Conceptualization from function to device
- Process and architecture design
- Advanced packaging
- Electrical testing

### BACK-END PROCESSING & PACKAGING

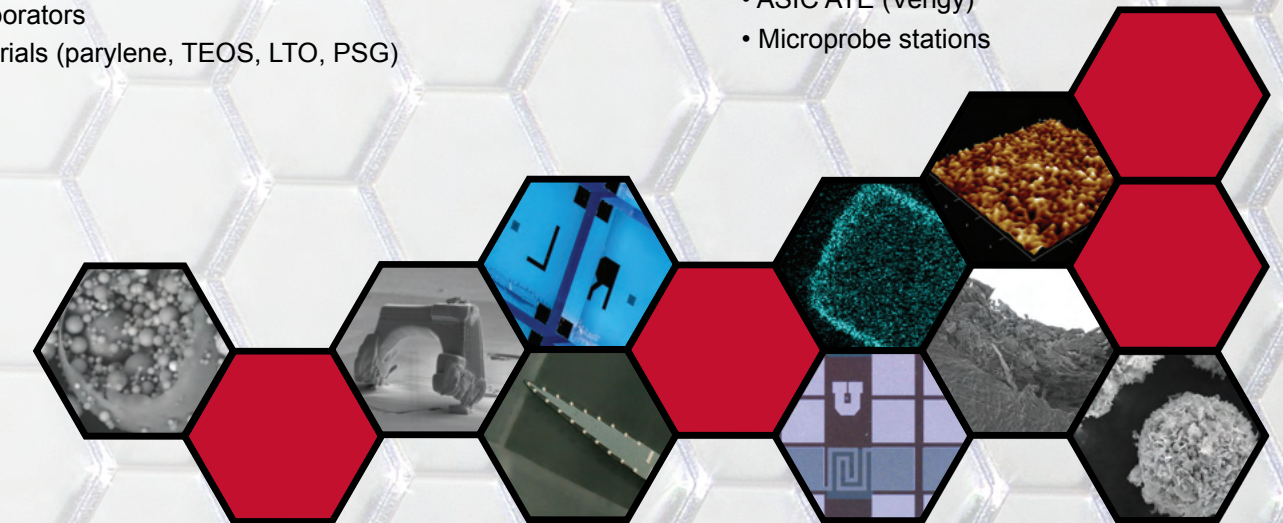
- CMP/planarization
- Dicing/singulation
- Wire bonding
- Wafer bonding/hermetic sealing
- Wire  $\mu$ EDM
- Laser micro welding

### MICROFLUIDICS PROTOTYPING

- Laser micro machining
- PDMS & SU-8 processing and molding
- 3D patterning

### ELECTRICAL CHARACTERIZATION

- Vibrating Sample Magnetometer
- Advanced O-scope, network analyzer user lab
- ASIC ATE (Verigy)
- Microprobe stations





## UTAH NANOFAB

Sorenson Molecular Biotechnology Building  
A USTAR Innovation Center  
36 S. Wasatch Drive  
Salt Lake City, UT 84112

### FACILITIES

- 18,000 ft<sup>2</sup> clean space with 7,000 ft<sup>2</sup> under ULPA filter
- ISO 5/6/7
- 5,300 ft<sup>2</sup> microscopy and materials characterization suite
- Member of the NSF Materials Research Facilities Network
- Host of UGIM, an international conference of peer research cleanroom administrators

### ECONOMIC IMPACT

- Supporting more than \$100 million in research funding across campus
- Providing technical services to more than 75 companies, national labs and universities
- Training engineers and scientists for employment in semiconductor, research and biomedical device companies

### INDUSTRY SUPPORT AND SERVICES

- Industrial and academic access
- R&D facilities and equipment
- Consulting and engineering assistance and training
- Design, fabrication and characterization services
- 24/7 operation
- Funding programs available for reduced rates and prototype development
- Preliminary data seed fund for competitive grant writing

### MISSION

The Utah Nanofab advances leading edge research and facilitates economic growth by providing world-class nanofabrication facilities, infrastructure and expertise to academia and industry.

### VISION

The Utah Nanofab will become a premier nanotechnology center with an interface to biomedical sciences. Outcomes of our efforts include expanding the frontiers of nanotechnology research, educating the next generation of engineers and leaders and supporting economic growth by the sustainable transfer of technology into meaningful commercialization outcomes.

### NAMING SPONSOR

 Micron Technology Foundation Inc., Microscopy Suite

### EXTRAMURAL RESEARCH SPONSORS



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U.S. DEPARTMENT OF  
**ENERGY**

