

## Staff Scientists

The MAF employs a group of full-time staff scientists to help you design, perform, and troubleshoot your experiments. Users are encouraged to contact the MAF with questions about instrumentation or to see if we have the right tool for your job.

**Liam Bradshaw** *XRD, XANES, TA/TRPL, GDOES, Ellipsometer*

Expertise: Spectroscopy, nanoparticles, optics, inorganic chemistry, metalloenzymes

**Scott Braswell** *SEM, FIB, EDS*

Expertise: Electron microscopy, FIB imaging/milling/lift-out, image processing, education, x-ray microanalysis

**Micah Glaz** *AFM, Raman, Confocal Microscope, Profilometer*

Expertise: AFM, physical chemistry, organic/inorganic semiconductors, solar materials, microscopy, spectroscopy

**Dan Graham** *ToF-SIMS, XPS*

Expertise: Surface analysis of polymer and biological materials, 2D and 3D imaging, multivariate data analysis methods

**Gerry Hammer** *XPS, UPS*

Expertise: Surface and interface analysis, metals, films, polymers, fibers, composites

**Ellen Lavoie** *TEM*

Expertise: Electron microscopy, TEM, including preparation of materials, biological, and polymer samples

## Facility Directors

**David Castner** *Director*

**Lara Gamble** *Associate Director*

ToF-Sims of patterned polystyrene

20  $\mu$ m

Vibrational SFG setup

AFM image of amyloid fibers

300 nm

Confocal microscope image of zebrafish embryo

Profilometer image of GDOES crater

## Molecular Analysis Facility

The Molecular Analysis Facility (MAF) is a fully staffed instrumentation facility located in the new Molecular Engineering and Sciences building for users from the University of Washington, other universities, and industry. Capabilities include microscopy, spectroscopy, and surface science. Users can be trained to independently perform experiments, or an experienced staff member can perform experiments for you.

**For more information visit:**

[www.moles.washington.edu/maf](http://www.moles.washington.edu/maf)  
[UWMAF@uw.edu](mailto:UWMAF@uw.edu)



**Molecular Engineering  
& Sciences Institute**

UNIVERSITY of WASHINGTON



**Molecular  
Analysis Facility**

**RESOURCES  
FOR MICROSCOPY,  
SPECTROSCOPY,  
AND SURFACE  
SCIENCE**



## Microscopy

### Transmission Electron Microscopy (TEM)

- FEG TEM/STEM with various sample holders for atomic resolution imaging, diffraction, tomography, and elemental analysis
- A full suite of sample preparation tools for materials, polymer, and biological samples

### Atomic Force Microscopy (AFM)

- Measures surface topography with sub-nanometer resolution in air or under liquid
- Images electrical and mechanical properties such as conductivity or Young's modulus

### Profilometer

- Rapidly measures topography and surface roughness
- Often used to measure film thicknesses

### Confocal and Light Microscopes

- Images fluorescently labeled samples
- Optical upright, inverted, and dissecting microscopes available

### Scanning Electron Microscopy (SEM/FIB)

- Images of sample surface morphology to 3 nm
- Compositional information from Z-contrast imaging and EDS element mapping
- Uses a beam of Gallium ions to image, pattern, sculpt structures, expose cross-sections, or lift out thin slices for TEM observation

2  $\mu$ m

## Spectroscopy

### 2D X-Ray Diffraction (XRD)

- Gives information about crystal phase, mixture composition, crystallite orientation, and residual stress
- Has a high intensity collimated spot to measure powder spectra in one-tenth the time of a traditional XRD from only a few milligrams of sample

### Raman Spectroscopy/Microscopy

- Measures vibrational information from molecules on a surface
- Can differentiate chemically similar molecules
- Sub-micron imaging capability

### X-ray Absorption Near Edge Spectroscopy (XANES)

- Measures core electron adsorption energies and intensities to determine element specific oxidation state and coordination environment

### Ultrafast Transient-Absorption and Photoluminescence

- Excite samples with 50 fs pulses of tunable light from UV to IR
- Transient absorption kinetics and spectra (broadband probe Vis to IR) from 150 fs to 1 ms
- Streak-camera detected PL with 2 ps resolution

### Ellipsometry

- Measures the optical properties (e.g., n and k) of materials and thin films
- For thin film applications, non-destructively measures film thickness

## Surface Science

### X-Ray and UV Photoelectron Spectroscopy (XPS/UPS)

- XPS measures the energy of core electrons from elements on the surface of a sample for quantitative elemental analysis and identification of oxidation states
- XPS imaging with lateral resolution down to 5  $\mu$ m
- UPS to measure work functions and Band potentials
- Can be used with frozen/biological samples

### Time of Flight-Secondary Ion Mass Spectrometry (ToF-SIMS)

- High-resolution mass spectra for analysis of surface modifications, contamination, or immobilized biomolecules
- Imaging with lateral resolution down to 1  $\mu$ m
- Fingerprint identification of polymers

### Glow Discharge Optical Emission Spectrometry

- Plasma etches a crater up to 1 mm into a sample while measuring atomic emission
- Gives depth resolved elemental analysis with depth resolution down to 7 nm

### Vibrational Sum Frequency Generation

- Surface specific vibrational spectroscopy at solid/air, solid/liquid, liquid/air, and liquid/liquid interfaces

For more information on our techniques, capabilities, or how to use the facility, please visit [www.moles.washington.edu/maf](http://www.moles.washington.edu/maf)

