BSISB develops facilities, user training, and user support for researchers investigating cellular chemistry and function at infrared beamlines. Our program focuses on synchrotron radiation-based Fourier transform infrared (SR-FTIR or sFTIR) spectromicroscopy, time-resolved sFTIR spectromicroscopy, synchrotron Infrared Nano-Spectroscopy (SINS), and 3D synchrotron FTIR micro-tomography (sFTIR µTomography). Other complementary microscopy and spectroscopic imaging methods include fluorescence microscopy, Raman microscopy, simultaneous optical hyperspectral sample imaging, and spatially-resolved AIRLAB mass spectrometry.

Technology Available at the BSISB Program Facility

- **sFTIR SM**
  *Anal. Chem., 82, 8757 (2010)*
- **time-resolved sFTIR SM**
  *PNAS, 106, 12599 (2009)*

- Microfluidics for infrared spectromicroscopy of live cells
- Spatially-resolved AIRLAB-MS

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Current Resolution Range

- **Label-free sFTIR microscopy** can reveal biogeochemical processes in specimens with a spatial resolution from 2 to 15 µm.
- Broadband **Synchrotron Infrared Nano Spectroscopy (SINS)** can reveal chemical distribution in single cells with a spatial resolution of <20 nm.
- **Time-resolved sFTIR imaging** can monitor the dynamics of biogeochemical processes in live microbes and biofilms over the course of seconds to hours and days.
- **sFTIR spectro-microtomography** is a technique in development for visualizing the 3D chemical distribution in samples of interest with a spatial resolution between 2 and 15 µm.

Selected BSISB User Publications

2. **Exploring biogeochemistry and microbial diversity of extant microbialites in Mexico and Cuba.** Valdespino-Castillo PM, Hu P et al. Frontier in Microbiology, accepted, 2018
3. **Human age and skin physiology shape diversity and abundance of Archaea on skin.** Moissl-Eichinger C, Probst AJ et al. Nature Scientific Reports, 7 (1) DOI: 10.1038/s41598-017-04197-4, 2017.
6. **Belowground Response to Drought in a Tropical Forest Soil. II. Change in Microbial Function Impacts Carbon Composition.** Bouskill NJ, Wood TE et al. Frontiers in Microbiology, 7, 2016
13. **Metagenome, metatranscriptome and single cell genomics reveal functional response of active Oceanospirillales to the Gulf of Mexico oil spill.** Mason OU, Hazen TC et al. ISEM, 6, 2012.

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