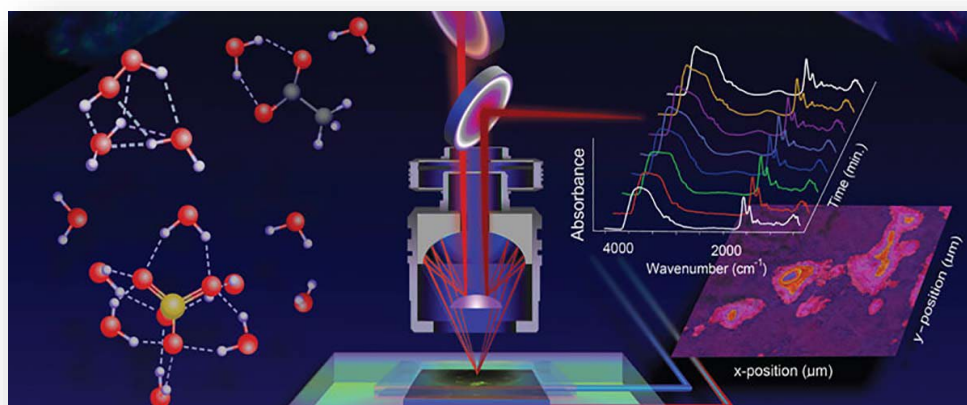


A national resource for Imaging living cells, biological and biogeochemical materials

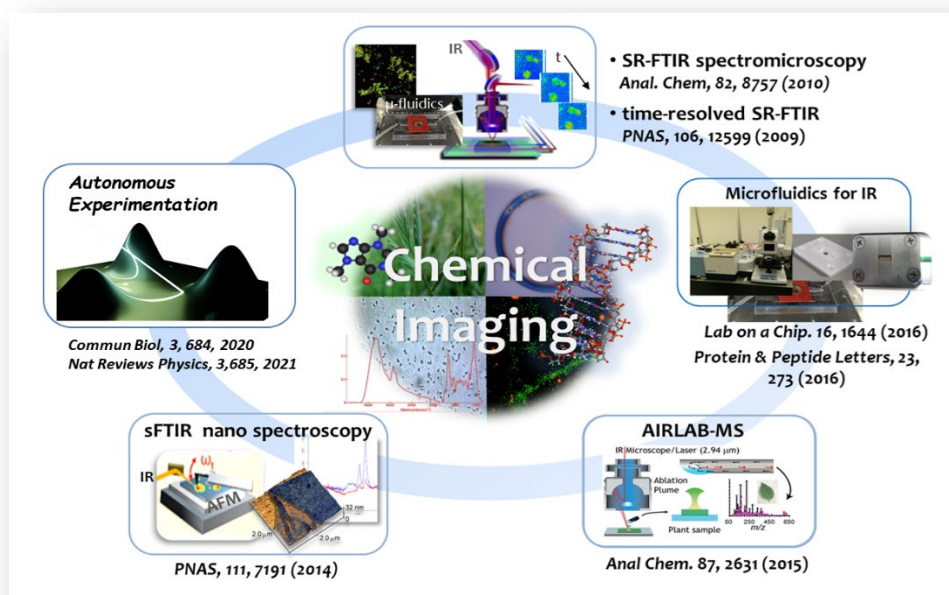
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## Imaging Capabilities and Technologies



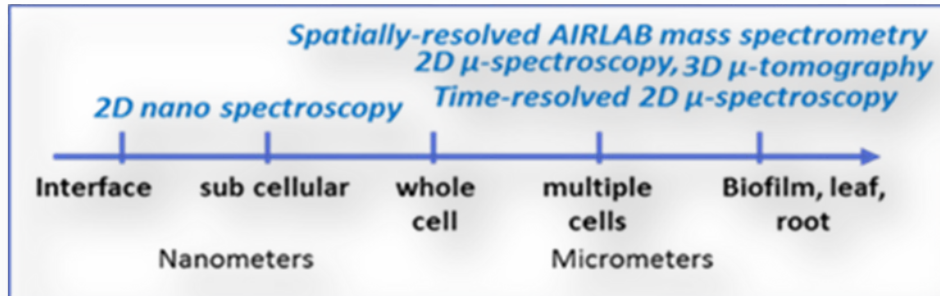
BSISB develops facilities, user training, and user support for researchers investigating cellular chemistry and function at infrared beamlines. Our program focuses on synchrotron radiation-based Fourier transform infrared (SR-FTIR or sFTIR) spectromicroscopy, time-resolved SR-FTIR spectromicroscopy and synchrotron Infrared Nano-Spectroscopy (SINS). Currently the mature SR-FTIR spectromicroscopy begins to benefit from the emerging field of autonomous discovery, enables faster and efficient exploration of multi-dimensional parameter spaces with minimal human intervention.

## Technologies Available at the BSISB Resource



## Current Resolution Range

- **Label-free SR-FTIR microscopy** can reveal biogeochemical processes in specimens with a spatial resolution from 2 to 15  $\mu\text{m}$ .
- Broadband **Synchrotron Infrared Nano Spectroscopy (SINS)** can reveal chemical distribution in single cells with a spatial resolution of  $<20\text{ nm}$ .
- **Time-resolved SR-FTIR imaging** can monitor the dynamics of biogeochemical processes in live microbes and biofilms over the course of seconds to hours and days.



## Selected BSISB Publications

1. **Gaussian processes for autonomous data acquisition at large-scale synchrotron and neutron facilities.** Noack MM, Zwart PH et al. *Nature Review Physics*, 2021.
2. **Interplay of microbial communities with mineral environments in coralline algae.** Valdespino P, Bautista-Garcia A et al. *Science of the Total Environment*, 2021.
3. **Autonomous adaptive data acquisition for scanning hyperspectral imaging,** Holman EA, Fang YS et al. *Communications Biology*, 2020.
4. **Lipid analysis of CO<sub>2</sub>-rich subsurface aquifers suggests an autotrophy-based deep biosphere with lysolipids enriched in CPR bacteria,** Probst AJ, Elling FJ et al. *ISEM*, 2020.
5. **Mechanisms of soft tissue and protein preservation in Tyrannosaurus rex.** Boatman EM, Goodwin MB et al. *Sci reports*, 2019.
6. **Exploring biogeochemistry and microbial diversity of extant microbialites in Mexico and Cuba.** Valdespino-Castillo PM, Hu P et al. *Frontier in Microbiology*, April 9 (510), 2018
7. **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.
4. **High-spatial-resolution mapping of catalytic reactions on single particles.** Wu CY, Wolf WJ et al. *Nature*, 541 (7638), 2017.
5. **Direct observation of narrow mid-infrared plasmon linewidths of single metal oxide nanocrystals.** Johns RW, Bechtel HA et al. *Nature Communications*, 7, 2016.
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,
7. **IR-Live: Fabrication of a low-cost plastic microfluidic device for infrared spectromicroscopy of living cells** Birarda G, Ravasio A et al. *Lab on a Chip*, 16, 2016.
8. **Diverse uncultivated ultra-small bacterial cells in groundwater.** Luef, Birgit; Frischkorn, Kyle et al. *Nature Communications*, 6, 2015.
9. **10. Installing extra bicarbonate transporters in the cyanobacterium Synechocystis sp. PCC6803 enhances biomass production.** Kamennaya NA, Ahn SE et al. *Metabolic Engineering*, 29, 2015.
11. **Metabolic phenotyping of the cyanobacterium Synechocystis 6803 engineered for production of alkanes and free fatty acids.** Hu P, Borglin S et al. *Applied Energy*, 102, 2013.
12. **Trackling the minority: sulfate-reducing bacteria in an archaea-dominated subsurface biofilm.** Probst AJ, Holman HYN et al. *ISEM*, 7(3), 2013.
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.
14. **Deep-sea oil plume enriches psychrophilic oil-degrading bacteria.** Hazen TC, Dubinsky EA et al. *Science*, 330, 2010.