RESEARCH FOCUS: Development of next-generation imaging mass spectrometry technologies to elucidate the molecular basis of health and disease.

- Developing novel MS technologies that maximize sensitivity, specificity, and spatial resolution for imaging applications.
- Combining imaging MS with a variety of other biomedical imaging technologies to provide a systems biology view of tissue at cellular resolution.

CURRENT & FUTURE RESEARCH PROJECTS: IMS Instrumentation, Spatial Proteomics, Spatial Transcriptomics, MSI Microscopy, Ion Mobility IMS, Data Integration & Mining, Host-Pathogen Interactions, Gut Microbiome, Osteomyelitis, Human Molecular Tissue Atlases, Diabetes, Kidney Disease

TECHNOLOGY DEVELOPMENT

IMAGING Mass Spectrometry

1. Tissue sectioning/fixing
2. Matrix application
3. MALDI data acquisition
4. Spectral analysis
5. Spectral analysis
6. Spectral analysis

High Spatial Resolution & Specificity Imaging

Spatial Proteomics

MALDI & Spatial Transcriptomics

Multimodal Data Integration & Mining

BIOMEDICAL RESEARCH APPLICATIONS

Gut Microenvironment

- Fecal Imaging
- Breath Imaging
- Small Intestinal Imaging
- Metagenomic Imaging

Host-Pathogen Interactions

- Bacterial imaging
- Viral imaging
- Parasitic imaging

Osteomyelitis

- Bone Imaging
- Soft Tissue Imaging
- Marrow Imaging

Molecular Atlases of Human Tissues

Diabetes & Kidney Disease

- Pancreatic Imaging
- Renal Imaging

MSRC RESEARCH INSTRUMENTATION

- Bruker Solarix 1ST FT-ICR MS
- Bruker Solarix 9.4T FT-ICR MS
- Thermo Orbitrap Fusion Tribrid MS
- Thermo Orbitrap Elite (TG/MALDI-2)
- Thermo Orbitrap Q-Exactive
- Bruker MALDI timsTOF Prototype
- Bruker MALDI timsTOF Flex (MALDI-2)
- Bruker RapidIlex, MALDI TissueTyper
- Bruker Autoflex TOF-MS
- Bruker Ultraflex TOF-MS
- Bruker Impact II Q-TOF
- Waters Synapt G-2 TWIMS
- Thermo MALDI LTQ XL
- SimulTOF 300 Tandem
- ThermoElement 2 LA-ICP
- Nanosiring GeoMX DSP (Spatial Transcriptomics)
- Zeiss Axio Observer Z1 Fluorescence Microscope
- Zeiss Axio Scan Z1 Fluorescence Slide Scanner
- Akoya CODEX Highly Multiplexed IF Platform
- Leica LMD7 Laser Microdissection System