

# BNEIR NEWSLETTER

Brian P Jackson, Director

(603) 646 1272 | [bjp@dartmouth.edu](mailto:bjp@dartmouth.edu) | <https://sites.dartmouth.edu/bneir/>

Biomedical National Elemental Imaging Resource

# BNEIR

## WHAT'S NEW AT BNEIR?

This first newsletter welcomes you to the BNEIR community, keeps users up to date on everything related to using LAICPMS in biomedical research



### NEW INSTRUMENTATION COMING 2023

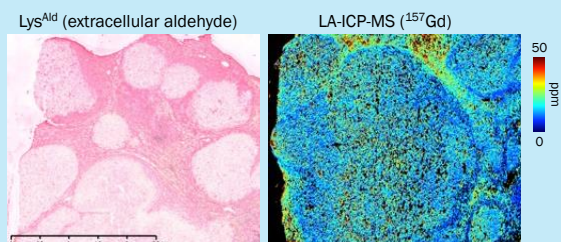


The imageBIO266 laser ablation system (ESI) with the Vitesse (Nu Instruments)

BNEIR was recently awarded a High-End Instrumentation grant from the NIH S10 program, which allows us to upgrade our current laser ablation ICP-MS system to the state-of-the-art ICP time of flight (TOF) detection system, interfaced with the new imageBIO266 laser ablation system. We will be able to image “all of the elements all of the time” in a fraction of the time. Our hope is that the new instrumentation will be installed and running shortly after Christmas break. Watch this space for details of the new instrument open house.



## USER PUBLICATIONS



Human cirrhotic liver. Left: Lys<sup>Ald</sup> stain shows extracellular aldehydes (pink fibrosis band). Right: LAICPMS <sup>157</sup>Gd map of section incubated with fibrogenesis-targeted MRI probe Gd-1,4. Colocalization demonstrates probe specificity.

Yingying Ning from [Peter Caravan's research group at Harvard](#) recently published LAICPMS work conducted at BNEIR in Science Translational Medicine.

The article, “[Molecular MRI quantification of extracellular aldehyde pairs for early detection of liver fibrogenesis and response to treatment](#)”.

This work showed that molecular magnetic resonance imaging (MRI) using an extracellular probe can act as a non-invasive biomarker of fibrogenesis in the liver.

Chronic liver disease can be caused by alcohol, drug abuse, viruses, or metabolic disorders such as nonalcoholic steatohepatitis. It accounts for about 2 million deaths worldwide per year. If unchecked, scarring of the liver can lead to cirrhosis, primary liver cancer, liver failure, or death. Using an extracellular MR probe that targets Lys oxidation products (lysyl oxidase and its paralogs are established markers of fibrogenesis) the group showed proof of concept for an effective non-invasive reporter for liver fibrogenesis.



## COMING SOON: MICROANALYSIS TOOLKIT FOR LAICPMS



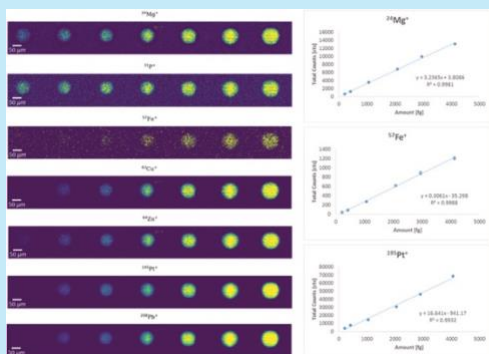
Dr. Sam Webb, SSRL

The **Microanalysis Toolkit** is a software package for X-ray microprobe data that was released in 2011. This free application contains a wide variety of data analysis tools: image maps, correlation plots, simple image math, image filtering, multiple energy image fitting, semi-quantitative elemental analysis, X-ray fluorescence spectrum analysis, principal component analysis, and tomographic reconstructions. The most recent release allows multiple data files to be loaded and compared.

BNEIR have collaborated with its author, **Dr. Sam Webb** of the Stanford Synchrotron Radiation Lightsources to develop a new update of the software that will open LAICPMS data. Users will be able to use the Toolkit's statistical tools and produce publication quality elemental images for free. BNEIR was also recently awarded an administrative supplement to begin software engineering work that will enable the Microanalysis Toolkit software to be launched as a web-based application.



## MULTI-ELEMENT GEL STANDARDS



Quantification in LAICPMS is challenging. Matrix-matched standard reference materials don't exist for many sample types. BNEIR has purchased innovative, **custom-made micro-spotted gelatin standards** from a group led by Dr. Sarah Theiner at the Institute of Analytical Chemistry (Vienna, Austria). Our customized suite includes platinum, gadolinium, and ruthenium to support our biomedical users working on cancer therapeutics and MRI contrast agents in organ tissues such as liver and brain.

## COLLABORATIONS

Dartmouth's and Dartmouth-Hitchcock's Norris Cotton Cancer Center (NCCC) and the Department of Medicine have appointed Linda T. Vahdat, MD, MBA as Deputy Cancer Center Director, Chief of the section of Medical Oncology and interim Chief of Hematology. BNEIR is excited to be collaborating with Dr. Vahdat on her work on metals in cancer. **MORE.**



### NEW TO BNEIR

**Dr. Ramsey Steiner** is a Norris Cotton Cancer Center postdoctoral researcher using LAICPMS and metal-based immunohistochemistry to spatially resolve metal distribution in biological tissue. Ramsey has a B.S. in chemistry from Union College (Schenectady, NY) and a PhD in Bioinorganic Chemistry from University of Georgia.



### UPCOMING EVENTS

**11th Conference on Metal Toxicity and Carcinogenesis**  
**Montreal, Canada**  
**16-19 OCT 2022**

**European Winter Conference on Plasma Spectrochemistry, Ljubljana, Slovenia**  
**29 JAN-03 FEB 2023**

**Gordon Research Conference: Metals in Biology**  
**22-27 JAN 2023**

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**New directions in science are launched more often by new tools than by new concepts. The effect of a concept-driven revolution is to explain old things in new ways. The effect of a tool-driven revolution is to discover new things that must be explained.**

- Freeman Dyson