ANALYTICAL RESOURCES CORE

COLORADO STATE UNIVERSITY

ARC MONTHLY BULLETIN

MAY 2023

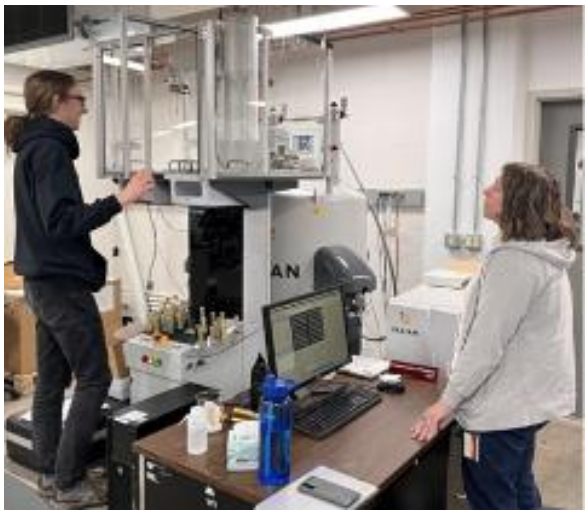
Welcome to the ARC Bulletin, a monthly newsletter to keep you informed about the latest happenings in the ARC. Here you will find information about our team, job opportunities, equipment and facilities, upcoming seminars, and other exciting news!

DID YOU KNOW?

The ARC is a training facility offering researchers hands-on learning on almost all analytical technology available in the Core. In any given month, we typically receive over 20 new training requests and train both CSU and external users. Our training program consists of pre-training education via introductory movies and knowledge-check quizzes, followed by in-person training on standard operating procedures, safety, specialized applications and method development. Users can independently run research samples on the instrument after demonstrating proficiency in various operational aspects.

"Training students is one of the most fulfilling parts of our jobs – to contribute to the education of CSU students and their professional development in analytical techniques!"

"It is really a highlight of my day when I can see the 'light bulb' go on when a student understands the analytical technique and how it can be applied to their research."



ARC ON THE GO

May and June are busy learning months for ARC staff with many of us attending conferences or workshops to acquire new skills in our areas of expertise, stay up to date with the latest technology, network with peers, and ultimately provide better services to our users. Here is a snapshot:

- Indrani Bhowmick attended the virtual **2023 Materials Research Society (MRS) Spring Meeting & Exhibit**, to expand her knowledge on characterization techniques for nanomaterials, quantum materials, structural and functional materials.
- Bradley Guilliams attended the **NIH Common Fund Annual CryoEM Centers Meeting in Portland**, which brings together NIH-funded EM centers to share progress and how to improve facilities, methods, outreach, output, etc.
- Karolien Denef and Brian Newell attended the **Association for Biomolecular Resource Facilities (ABRF) conference in Boston**. This conference brings together Core staff to share best practices and discuss possible solutions to common issues/challenges around Core facilities management, operations and administration.
- Claudia Boot, Paul Mathews, Corey Broeckling, Gustavo Diaz, Alyssa May and Nathan Montgomery will attend the **American Society for Mass Spectrometry (ASMS) conference in Houston** to present and learn about the latest developments and applications in mass spectrometry.
- Brian Newell will attend the **Neutron Scattering Users Meeting at Oak Ridge National Lab** to expand his skills in data processing of total neutron scattering, single crystal data processing, and magnetic structure determination.
- Karolien Denef will participate in the **Leadership and Management in Core Facilities** course of Northwestern Kellogg School of Management in Chicago.

NIH SHARED INSTRUMENTATION GRANT S10 EFFORTS

We are working together with Chemistry professor Andy McNally and collaborators on an NIH-SIG S10 proposal for a new high throughput Bruker AvanceNEO 400MHz NMR with Heliosmart Recovery to add much-needed capacity to the oversubscribed NMR spectrometers in the Chemistry Research Building. Direct access to state-of-the-art NMR spectrometers is critical to many of the NIH-funded synthetic research programs at CSU as researchers need quick molecular structure information to guide their next steps in the synthetic process.

Deadline June 1.

MEET THE INSTRUMENT AND EXPERT

Meet our Waters Xevo QTOF Mass Spectrometer

The Xevo qToF-G2 XS is the workhorse instrument for untargeted metabolomics in the ARC. It is able to achieve sub 1 ppm mass accuracy through continuous infusion of a mass calibrant, and in addition to mass resolution over 40,000, and linearity over 4 orders of magnitude enabled. MS/MS data can be acquired using data dependent acquisition, targeted MS/MS, or one of two data independent acquisition (DIA) approaches, called MSE or SONAR. This instrument has been applied to the analysis of plant and animal metabolites, lipidomics, compositional analysis of raw and prepared foods, amino acids, fatty acids, polymers, and DNA adductomics analysis. It is an exceptionally versatile and robust instrument applicable to a wide range of analytical questions.

Meet untargeted metabolomics expert Nathan Montgomery

Nathan has worked in the ARC since August 2022 and brought valuable experience in targeted and bottom-up proteomics. Growing up and educated in the Pacific Northwest, as a graduate student in the Biochemistry Department of Oregon Health and Science University, he first began using mass spectrometry to analyze post-translational modifications of collagen responsible for protein-protein interactions.

In a postdoctoral fellowship at Northwestern University, he developed tandem quadrupole targeted assays for analysis of chemical modifications of human serum, reflecting environmental exposure and in vivo redox environment. Most recently, he worked in the development of parallel reaction monitoring assays for peptides, as an activity assay for small molecule targeted protein degrader at the Tang Lab at the University of Wisconsin Madison. His favorite part about ARC is the opportunity to work with knowledgeable colleagues to learn more about the intricacies of metabolomics and being able to learn about new and diverse projects all the time. Outside of the lab, he enjoys stargazing, playing the piano, hiking, cooking, and collecting retro video games.

TEAM UPDATES

We are super proud to have a CSU Distinguished AP Award this year go to one of our own! Brian Newell manages the Materials and X-ray Diffraction and Scattering laboratories in the ARC and is a master of X-ray diffraction and crystallography at CSU. He is responsible for the maintenance, calibration, and user training of over 10 instruments and supports the chemical and materials science applications for over 30 principle investigators from 13 CSU departments and even industrial users. Brian obtained his BS in Chemistry from Texas State University and a Ph.D. in Inorganic Chemistry from CSU. After graduating, he took a postdoctoral position in the Central Instrument Facility at CSU (now the Analytical Resources Core), collaborating with CSU researchers on projects ranging from small-molecule structure determination to looking at morphological changes in block co-polymers by offering advanced method development and data processing workflows using various X-ray systems in the ARC. Well deserved Brian!!

GOODBYE, KITTY!

We are sad to announce that Kitty Brown will be leaving ARC and CSU in early May. She has been an integral component of the ARC (and PMF) family since 2016, serving Proteomics applications. She has been a great lab mate and colleague all those years and we will miss her persona, knowledge, and experience. We wish her luck in her post ARC life!

ON THE CALENDAR

MAY 15

NMR User Focus Group with Michele Mailhot

Teams meeting
Meeting ID: 232 887 209 148
Passcode: v7iGL5

JUNE TBD

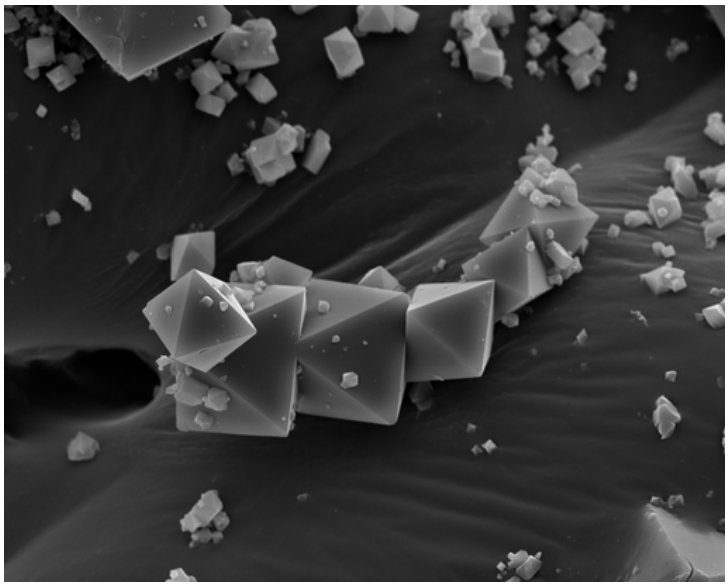
Exploring the future of SEM in the ARC.

Details to come.

ELECTRON MICROSCOPY IMAGE CONTEST

The winner of the 2023 EM Imaging Contest is **Dr. Jon Thai**, a former member of the Reynolds research group in Chemistry. The image was taken on the JEOL JSM-6500F SEM in the ARC, and it features CuBTC metal-organic frameworks. You will soon see this image featured on the wall outside the ARC EM laboratory in Yates. Awesome job, Jon!!

We received over 30 amazing images from many of our SEM and TEM users. They will all be displayed soon on our website and on a poster at the EM lab entrance.



RESEARCH CONTRIBUTIONS

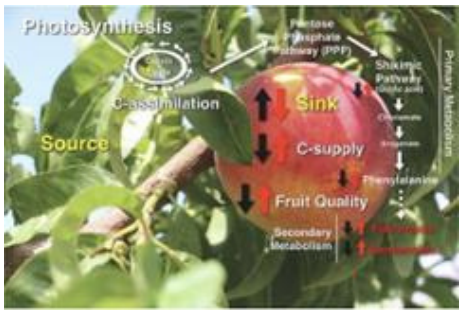
Check out recent publications co-authored by ARC scientists:

Crystallite Tuning of Magnetic Properties in S = 1/2 Ni(III) Cyclam (Bi)sulfate Complex Salts.
Thomas L. Morrison, Indrani Bhowmick, and Matthew P. Shores. Crystal Growth & Design. March 2023.

A study that explores how to manipulate the magnetic properties of S = ½ Ni(III) complexes through molecular-level crystallographic tuning, which is of particular interest in recent years because these types of molecules represent the simplest electron-based quantum bits (qubits) for developing molecular quantum computers.

Carbon sufficiency boosts phenylpropanoid biosynthesis early in peach fruit development, priming superior fruit quality.
Brendon M. Anthony, Jacqueline M. Chaparro, Jessica E. Prenni, and Ioannis S. Minas. Plant Physiology and Biochemistry, March 2023.

The paper discusses the impact of manipulating crop load on the carbon supply of peach trees and how this affects the quality of the fruit through non-targeted LCMS metabolomics.



Other recent publications using the ARC:

Polyoxidovanadates V9Mo and V9Pt interact with CHO cell plasma membrane lipids causing aggregation and activation of a G proteincoupled receptor. Frontiers in Chemical Biology. April 2023. By Kateryna Kostenkova et al. (CSU)

Toward Imaging Defect-Mediated Energy Transfer between Single Nanocrystal Donors and Single Molecule Acceptors. Chemical and Biomedical Imaging. April 2023. By Danielle R. Lustig et al. (CSU)

Decellularized Liver Nanofibers Enhance and Stabilize the Long-term Functions of Primary Human Hepatocytes In Vitro. Advanced Healthcare Materials. March 2023. By Jennifer S. Liu et al. (CSU)

Rapid and facile preparation of nanocomposite film heaters for composite manufacturing. Frontiers in Materials. March 2023. By Iman Naseri et al. (CSU)

A comprehensive material study of CdSeTe films deposited with differing selenium compositions. Thin Solid Films. January 2023. By Adam Danielson et al. (CSU)

Structure–Property Relationships in High-Rate Anode Materials Based on Niobium Tungsten Oxide Shear Structures. ACS Applied Energy Materials. January 2023. By Luke D. Salzer et al. (CSU)

Improved synthesis of deoxyalpinoid B and quantification of antileishmanial activity of deoxyalpinoid B and sulforaphane. Bioorganic & Medicinal Chemistry. January 2023. Emma Leary (Fort Lewis College)

GOOGLE SCHOLAR LIST

Using the ARC?

Please cite or acknowledge us by our Research Resource ID

RRID: SCR_021758

in publications that include any data generated in or by our facility