Characterization @ UBC Fall School

Program Booklet

Oct 20-22 | Fred Kaiser 2020/30

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THE UNIVERSITY OF BRITISH COLUMBIA
Characterization @ UBC
Research Excellence Cluster

CONTENT

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Day 1 - Monday, October 20, 2025

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9:00 - 9:40 am	**Thematic Seminar I - µXRF Imaging and Approaches for Predicting Mineralogy** | *Dr. Cassady Harraden (UBCV)*
9:40 - 9:50 am	Break
9:50 - 10:30 am	**Thematic Seminar II - Powder X-ray Diffraction - Quantitative Methods** | *Dr. Cole Mauws (UBCV)*
10:30 - 11:00 am	Break/ Poster Set Up
11:00 - 11:40 am	**Thematic Seminar III - TEM and Ptychography** | *Dr. Arthur Blackburn (UVic)*
11:40 - 11:50 am	Break
11:50 - 12:30 pm	**Thematic Seminar IV - Focused Ion Beam Machining and 3D Electron Tomography |** *Dr. Ruth Birch (UBCV)*
12:30 - 1:30 pm	Lunch/ Poster
1:30 - 3:00 pm	**Lecture I - TEM and Microanalysis I** | *Dr. Karen Kavanagh (SFU)*
3:00 - 3:30 pm	Break/ Poster
3:30 - 5:00 pm	**Lecture II - EM and Microanalysis II - EELS: the Swiss Army Knife of Electron Microscopy** | *Dr. Juan Carlos Idrobo (UW)*
5:00 - 6:00 pm	**Lab Tour** - MTRL/AMPEL/EOAS

Schedule

Day 2 - tuesday, October 21, 2025

8:00 - 8:30 am	Breakfast + Networking
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10:30 - 11:00 am	**Research Talk I - Measuring GaN Nanowire Junction Potentials** | *Dr. Karen Kavanagh (SFU)*
11:00 - 11:30 am	**Research Talk II- Atom Probe Tomography: Visualizing Materials at the Atomic Scale** | *Dr. Renelle Dubosq (UBCO)*
11:30 - 12:00 pm	**Research Talk III - Direct Electron Detector (DED) And Their Application To Electron Microscopy** | *Tianbi Zhang (UBCV)*
12:00 - 1:30 pm	Lunch/ Poster
1:30 - 3:00 pm	**Lecture III - Electron Microscopy and Microanalysis III - In Situ Analytical Electron Microscopy - Seeing Is Believing** | *Dr. Ben Britton (UBCV), Dr. Ismail El- Baggari (Rowland Institute)*
3:00 - 3:30 pm	Break/ Poster
3:30 - 5:00 pm	**Lecture IV - 4D-STEM and Ptychography |** *Dr. Arthur Blackburn (U of Victoria***)**
5:00 - 6:00 pm	**Lab Tour** - BioImaging/ CHEM (NMR)

Schedule

Day 3 - wednesday, October 22, 2025

8:00 - 8:30 am	Breakfast + Networking
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9:10 - 9:20 am	Break/ Poster
9:20 - 10:00 am	**Thematic Seminar IV - Reimagining Petrography: Digital Access and Scalability with the Zeiss Axioscan Slide-Scanning Microscope** | *Dr. Sarah Milne (UBCV)*
10:00 - 10:30 am	Break/ Poster
10:30 - 12:00 pm	**Lecture V - Light, Fluorescence, Confocal and Advanced Fluorescence Microscopy Techniques** | *Dr. Miki Fujita (UBCV)*
12:00 - 1:00 pm	Lunch/ Poster
1:00 - 2:30 pm	**Panel Discussion - Sample Preparation; Image Quantification & Analysis** | *Dr. Anette von der Handt (UBCV), Dr. Ismail El-Baggari (Rowland Institute), James Drummond (UBCV), Dr. Mark Martinez (UBCV)*
2:30 - 3:00 pm	**Research Talk IV - The Beauty of Vitreous Ice: High Pressure Freezing for Electron Microscopy** | *Dr. Lacey Samuels (UBCV)*
3:00 - 3:30 pm	**Research Talk V - Tissue Imaging: The Contrast Conundrum** | *Dr. Nancy Ford (UBCV)*
3:30 - 4:00 pm	**Research Talk VI- Characterizing Biological Samples In Situ Using Cryo-FIB and Electron Tomography** | *Dr. Claire Atkinson (UBCV)*
4:00 - 5:00 pm	Closing + Prizes

Abstracts

Day 1

Session Host: Dr. Ismail El-Baggari (Rowland Institute; incoming faculty, UBCV PHAS)

8:35-9:00 am - Keynote - What We Cannot Measure, We Cannot Understand: Bridging the Gap with STEM | *Juan Carlos Idrobo (UW)*

Electron energy-loss spectroscopy (EELS) has evolved from a tool for elemental mapping into one of the most versatile probes in electron microscopy. Today, advances in monochromation, cryogenic stability, and fast detectors are pushing EELS beyond established boundaries and into domains once thought inaccessible. For the first time, we can directly measure thermal transport at the nanometer scale and to track the momentum-resolved dynamics of phonons and excitons. Even more ambitiously, with EELS may enable direct probing of superconducting gaps, integer and fractional quantum Hall effects, the detection of individual magnetic moments and the polarization of electron orbitals with unprecedented spatial and momentum resolution. This talk will explore how STEM is becoming a true quantum laboratory — a platform where quantum materials can be interrogated at their fundamental scales — and will highlight both the promise and the challenges that define this unfolding frontier.

9:00-9:40 am - Thematic Seminar I - µXRF Imaging and Approaches for Predicting Mineralogy | *Cassady Harraden (UBCV)*

Micro X-ray fluorescence (µXRF) analysis provides in situ elemental information on small, discrete portions of a sample. Like conventional and handheld XRF analysis, the technique uses X-rays directed at sample surface to eject inner shell electrons, and the resulting electron transitions emit characteristic X-rays used for elemental identification. Conventional and handheld XRF systems typically have an analysis spot size ranging from 1 to 10 mm, but the specialized optics used in µXRF focus the X-ray beam resulting in spot size of 20–1000 µm. By combining this focused beam with stage movement, µXRF captures pixel-by-pixel elemental information and converts energy dispersive spectra into quantitative elemental maps (via a fundamental parameter model) across the sample surface. These maps capture elemental distributions that reveal textural relationships within the sample. The method is rapid, low-cost, and requires minimal preparation, making it adaptable to a wide range of materials. This presentation explores µXRF imaging across scales and geological sample types, with a focus on approaches for predicting mineralogy directly from the elemental maps.

Abstracts

Day 1

Session Host: Dr. Ismail El-Baggari (Rowland Institute; incoming faculty, UBCV PHAS)

9:50-10:30 am - Thematic Seminar II - Powder X-ray Diffraction - Quantitative Methods | *Cole Mauws (UBCV)*

Powder x-ray diffraction is a method for elucidating the crystal structures of materials. The various applications of pXRD can give a wide variety of information on the chemical, physical and morphological properties of materials, and some variations of pXRD are used in any discipline of materials science. We will give a brief overview of the fundamentals of powder x-ray diffraction and its various applications. Then we will take a focused look at the methods for quantitative phase analysis. There are a variety of quantitative methods using calibrant and calibration-free methods. It is worth discussing the advantages and pitfalls of the various methods, but we will focus on the application of the most robust method – Rietveld full pattern decomposition with examples from geological samples.

11:00-11:40 am -Thematic Seminar III - TEM and Ptychography | *Arthur Blackburn (UVic)*

A Transmission Electron Microscope (TEM) directs a high-energy electron beam at a thin section or piece of an object and creates an image from the electrons that are transmitted through it. The technique offers exceptional spatial resolution, allowing structures to be resolved at the atomic scale. It is used in the analysis of materials, biological specimens, and nanostructures, providing insights into, for example, microstructure and chemical composition. Conventional TEM, which uses a broad electron beam to illuminate the sample, has a resolution that is limited by lens aberrations. To give truly atomic, sub-Ångström (<10-10 m), resolution, methods to reduce or mitigate lens aberrations have been made. In particular, electromagnetic lens aberration correctors have been developed, through remarkable advances in precision electronics, control systems and engineering design. Significant advances in electron detectors along with increased availability of high-performance computational facilities, has also ushered in new computational methods of deconvolving the electron probe and lens aberration effects from the underlying electron scattering behavior of the sample. Ptychography is one of these deconvolution methods, which in the most usual form involves scanning a focused (or slightly defocused) electron beam over the specimen to collect diffraction data at many partially overlapping illumination patches. From the collected diffraction data, a high-resolution model of the sample is computationally reconstructed, which can overcome the aberrations present in the microscope and provide further resolution and information advances. In this brief thematic review, I will give an overview of the above techniques, their implementations and example application cases.

Abstracts

Day 1

11:50-12:30 pm - Thematic Seminar IV - Focused Ion Beam Machining and 3D Electron Tomography | *Ruth Birch (UBCV)*

It is possible to form a focussed ion beam (FIB) and scan it across surface, like the operation of a scanning electron microscope. Repeat scanning of this beam across the surface can be used to remove localized regions, for example to perform sample preparation (e.g. for TEM-lamella), cross-section analysis, or repeat layer removal combined with scanning electron microscopy-based imaging of the newly revealed layer to perform (destructive) 3D tomography. In this talk, I will briefly introduce the FIB-systems, including the use of Ga+ and Xe+ ions, and their accessories including gas injection and nanomanipulation. This will be followed by a workflow of 3D-FIB-SEM analysis of magnesium alloys and steel, including the combined use of FIB and SEM-based microstructural analysis via EBSD.

Session Host: Dr. Anette von der Handt (UBCV EOAS)

1:30-3:00 pm - Lecture I - TEM and Microanalysis I | *Karen Kavanagh (SFU)*

Introduction to the application of transmission electron microscopy (TEM) to the analysis of crystalline materials through a discussion of examples. A basic introduction to contrast mechanisms and analysis of diffraction patterns will be presented. The analysis of common defects important to mechanical, electronic, and magnetic properties will be described.

3:30-5:00 pm - Lecture II - EM and Microanalysis II - EELS: the Swiss Army Knife of Electron Microscopy | *Juan Carlos Idrobo (UW)*

Electron Energy-Loss Spectroscopy (EELS) is a versatile technique for probing the electronic, vibrational, excitonic and magnetic properties of materials across multiple length scales. This lecture will introduce the foundations of EELS, from basic inelastic scattering processes and energy-loss edges to practical aspects of spectral acquisition and analysis. Building on this foundation, we will explore how advances in monochromated scanning transmission electron microscopy (STEM) have enabled sub-10 meV energy resolution, opening the door to momentum-resolved measurements of phonons and excitons with unprecedented spatial precision. We will also discuss the emerging field of electron magnetic circular dichroism (EMCD) and its ability to quantify magnetic properties at the atomic scale. By bridging core principles with state-of-the-art developments, this lecture aims to equip attendees with a comprehensive understanding of how EELS continues to evolve as a key tool for unraveling the quantum behavior of matter.

Abstracts

Day 2

Session Host: Dr. Ben Britton (UBCV MTRL)

10:30-11:00 am - Research Talk I - Measuring GaN Nanowire Junction Potentials | *Karen Kavanagh (SFU)*

The application of GaN nanowires for light emitting diodes requires efficient control of dopant impurities and the measurement of desired junction properties. Transmission electron microscopy provides both structural and electrical characterization through a multiple of different types of probes and in situ detectors. This talk will describe the characterization of axial electrical junctions in GaN nanowires grown by nitrogen-plasma molecular beam epitaxy. We detect the location of junctions from their built-in potentials through phase shifts of transmitted electrons using off-axis electron holography, combined with standard scanning TEM methods for the evaluation of crystallinity, defects, and growth orientations.

11:00-11:30 am - Research Talk II - Atom Probe Tomography: Visualizing Materials at the Atomic Scale | *Renelle Dubosq (UBCO)*

Materials have complex structures spanning from the macroscopic scale down to the sub-nanometer scale. The distribution of elements within a material directly affects its physical and chemical properties. This concept applies to all solid materials — from engineering alloys to natural minerals. Thus, investigating structure–property relationships requires material characterization techniques capable of resolving sub-ppm composition at the near stomic scale. Atom probe tomography is one of the few techniques that can achieve this, providing three-dimensional compositional mapping with sub nanometer resolution. This presentation introduces the method, including sample preparation, the mechanisms of field evaporation, and the reconstruction and visualization of data.

Abstracts

Day 2

11:30-12:00 pm - Research Talk III - Direct Electron Detector (DED) And Their Application To Electron Microscopy | *Tianbi Zhang (UBCV)*

Detectors play an important role in electron microscopy. The evolution from photographic films to digital detectors based on scintillators enabled computer-based control, live images and automation of scanning techniques. However, due to lower conversion efficiency, higher noise and optical distortion, such indirect electron detectors (IED) may limit the capabilities of both imaging and diffraction techniques.
Direct electron detectors (DED) can be synergistic for several electron microscopy techniques thanks to their reduced noise and higher detection efficiency, especially counting DEDs, earlier applications of DED to electron microscopy have greatly advanced techniques such as the Nobel Prize-winning cryo-EM method, and more recently DEDs have been applied to electron diffraction and diffraction imaging.
In this talk, working principles of IED and DED, and applications of DEDs to selected electron microscopy techniques will be introduced. A particular focus will be given to techniques based in the scanning electron microscope (SEM) and (scanning) transmission electron microscope (STEM) for materials science, such as Kikuchi diffraction ("4D-SEM") and 4D-STEM. Examples of improvements of existing experimental routines and development of new modalities using DEDs will be given, such as energy filtering, energy measurement and data-driven readout.

Session Host: Dr. Anette von der Handt (UBCV EOAS)

1:30-3:00 pm - Lecture III - Electron Microscopy and Microanalysis III - In Situ Analytical Electron Microscopy - Seeing Is Believing | *Ben Britton (UBCV), Ismail El-Baggari (Rowland Institute; incoming faculty at UBCV)*

Advanced materials enable future technological changes, for example new materials in electronics, biotechnologies, transport and health. To achieve optimal material performance in these demanding environments, we must characterize the structure and chemistry of materials to understand how this ultimately influences their performance. Scanning electron microscopes (SEM) and scanning transmission electron microscopes (STEM) enable such insights down to nanometer and atomic scales. Typically, these approaches are performed ex situ, including before and after they have been used in service (or in a lab-scale test). However, this can miss key details and a full understanding of device performance requires characterization materials while they are subjected to operating conditions – such as high temperatures, cryogenic temperatures, mechanical stress, electrical bias, and more. This lecture will focus on the development and application of advanced in situ capabilities in the SEM and STEM that have enabled a deeper understanding of material responses under external stimuli. To illustrate these approaches, we will share examples that include high-performance structural metal alloys, ceramics, ferroelectrics, and quantum materials.

Abstracts

Day 2

3:30-5:00 pm - Lecture IV - 4D-STEM and Ptychography | *Arthur Blackburn (UVic)*

In 4D-STEM (Scanning Transmission Electron Microscopy) a focused electron beam is scanned across a 2-dimensional (2D) grid of positions on a sample. At each scan position, a 2D diffraction pattern is recorded, thus forming a 4D dataset. This dataset can then be analyzed to produce images in various modalities, such as for mapping strain, electric or magnetic fields, and forming virtual detector images such as tilt corrected bright field images or virtual dark field images. Furthermore, a 4D-STEM dataset collected under the appropriate conditions can be used to form a ptychographic reconstruction, whereby a high-resolution and quantitative model of phase shift imparted on the impinging beam at multiple planes within the model can be determined.

In this session I will present and demonstrate some open-source software tools available for processing 4D-STEM data and give some example applications, highlighting the imaging modalities described above. I will also describe and demonstrate the steps behind ptychographic reconstructions, using both local and remote compute resources, such as on Digital Research Alliance of Canada High Performance Computing facilities. Attendees of this session may wish to bring their own computer to join some of the remote online demonstrations.

Abstracts

Day 3

Session Host: Dr. Mark Martinez (UBCV CHBE)

8:30-9:10 am - Thematic Seminar III - Raman Microscopy Characterization of (Geo)Materials | *Matt Tarling (UBCV)*

Raman spectroscopy is an analytical technique that uses laser light to probe how molecular bonds scatter light in characteristic ways. The resulting Raman spectra can fingerprint phases and potentially reveal information about crystallinity, structural order at different scales, grain size, orientation, stress, and crystal defects (amongst other characteristics). In this seminar, I will introduce the fundamentals of Raman microscopy as a tool for materials characterisation, supported by examples drawn from geological applications.

9:20-10:00 am - Thematic Seminar IV - Reimagining Petrography: Digital Access and Scalability with the Zeiss Axioscan Slide-Scanning Microscope | *Sarah Milne (UBCV)*

The Zeiss Axioscan is a fully automated, high-throughput slide-scanning microscope designed to generate high-resolution digital slides. It can process up to 50 standard thin sections or 100 histology slides at a time and supports multiple imaging modes. The latest model, the Axioscan 7 Geo (installed in the MDRU laboratory in 2021), delivers consistent, high-quality scans in brightfield, fluorescence, circular and linear polarization, and phase-contrast (TIE) imaging, using objectives from 2.5× to 40× magnification.
For geological thin sections, images are typically acquired in reflected light (RFL) and in six orientations of plane-polarized light (PPL) and crossed-polarized light (XPL), spanning 360° of digital stage rotation to aid mineral identification. These datasets can be viewed, annotated, and shared using the free ZEISS ZEN Lite software. Beyond visualization, the internally consistent, high-resolution imagery provides raster datasets suitable for machine-learning approaches to modal mineralogy, texture, and grain-size analysis—offering a powerful platform for geological research, long-term archiving, and teaching.

10:30-12:00pm - Lecture V - Light, Fluorescence, Confocal and Advanced Fluorescence Microscopy Techniques | *Miki Fujita (UBCV)*

This lecture covers the principles and applications of optical microscopy, including light, fluorescence, confocal and advanced fluorescence microscopy techniques. By the end of the lecture, attendees will be able to evaluate principles and applications of various optical microscopy techniques, and select appropriate microscopy techniques and equipment based on the nature of the research inquiry.

Abstracts

Day 3

Session Host: Dr. Ben Britton (UBCV MTRL)

1:00-2:30 pm - Panel Discussion - Sample Selection and Preparation for Microscopical Imaging and Analysis | *Mark Martinez (UBCV), James Drummond (UBCV), Anette von der Handt (UBCV), Ismail El-Baggari (Rowland Institute; incoming faculty UBCV)*

Sample selection and preparation for imaging and analysis by various microscopical methods is an important and often challenging aspect of research. There are many questions to be answered. What specific morphologies, structures, phases or components do I need to visualize/analyze in my samples? What level of detail do I need to see to answer my research questions? What are the appropriate instruments that can provide the needed detail and analytical information? What are the sample requirements and constraints for the instruments and analytical technologies to be used? How can I select and prepare appropriate and representative samples, as free of artefects as practical/possible, for imaging and analysis via those instruments/methods?
The panelists in this session have a broad spectrum of experience and knowledge in various microscopical and analytical techniques with a range of materials. Some introductory slides will be shown and then there will be an open discussion where we can all ask questions and share experiences and ideas.

2:30-3:00pm - Research Talk IV - The Beauty of Vitreous Ice: High Pressure Freezing for Electron Microscopy | *Lacey Samuels (UBCV)*

Biological or materials samples rich in water can pose a challenge for conventional electron microscopy sample preparation. Conventional chemical fixation or air-drying introduce artifacts, such as swelling, shrinking, or collapse. Cryofixation techniques such as plunge freezing are useful, but it is limited to samples less than one micron thick. High pressure freezing is an alternative cryo-fixation method for electron microscopy sample preparation, where pressure is applied at the moment of freezing. This suppresses ice crystal formation, solidifying the cellular or sample water into an amorphous non-crystalline solid called vitreous ice. Importantly, this immobilizes all of the molecular components in place within milliseconds. High pressure freezing can be followed by freeze substitution, where the sample water is replaced by acetone and a chemical cross linking agent at low temperature, stabilizing the immobilized structure. Alternatively, frozen samples can be milled and imaged with focused ion beam-scanning electron microscopy. UBC Bioimaging Facility has a Leica EM ICE High Pressure Freezer and a Leica Automatic Freeze Substitution (AFS) machine, and we provide training for new users in how to perform high-pressure freezing. One limitation of the technique is that samples must fit into a 3 mm or 6 mm diameter carrier.

Abstracts

Day 3

Session Host: Dr. Ben Britton (UBCV MTRL)

3:00-3:30 pm - Research Talk V - Tissue Imaging: The Contrast Conundrum | *Nancy Ford (UBCV)*

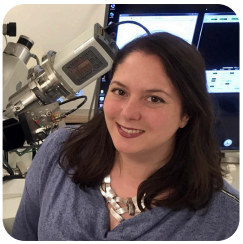
For a number of biomedical and basic science research areas, tissue imaging is necessary to understand the structure of tissues and organs and to identify damage or disease. However, the difference between different cell types or between diseased and normal tissue can be subtle. In this talk, we will consider ways to improve contrast for tissue imaging using micro-computed tomography and scanning electron microscopy.

3:30-4:00 pm- Research Talk VI - Characterizing Biological Samples In Situ Using Cryo-FIB and Electron Tomography | *Claire Atkinson (UBCV)*

Cryo-electron microscopy can be used as a powerful technique to characterize biological samples in their biological context, without need for chemical fixation. Cryo-electron tomography (cryo-ET) is used to generate 3D volumes from biological samples, from which the structures of biological molecules can be determined. Here, we show the structure of the Type III secretion system from E.coli determined by cryo-ET. Cryo FIB milling can be used to thin biological samples to make them amenable to cryo-ET. The cryo-FIB workflow will be discussed, along with its applicability to other bacterial secretion systems.

SPEAKERS

The speakers are listed in alphabetical order by first name.



Dr. Anette von der Handt

Dr. Anette von der Handt is Director of the Electron Microbeam and X-ray Diffraction Facility (EMXDF) in the Department of Earth, Ocean and Atmospheric Sciences at UBC Vancouver. She has over 15 years of experience in quantitative microanalysis, specializing in electron microprobe analysis (EPMA) and scanning electron microscopy. Her research interest focuses on developing and applying advanced EPMA techniques for both scientific and industrial applications, including ultralight element analysis, beam-sensitive materials, and quantitative X-ray mapping. She is an active council member of the Microanalysis Society and is part of the management team of the Characterization @ UBC GCRC cluster.

Dr. Arthur Blackburn

Arthur Blackburn holds the Hitachi High-Tech Canada Research Chair in Advanced Electron Microscopy at the University of Victoria, where he directs the Advanced Microscopy Facility and is an Assistant Professor in the Department of Physics and Astronomy. Prior to joining the University of Victoria, he was a Senior Research Scientist in the Hitachi Cambridge Laboratory, embedded with the Cavendish Laboratory of the University of Cambridge, working on topics related to electron microscope since around 2007. He progressed to this role after completing his PhD within the University of Cambridge, Department of Physics. His research group's goal is to develop and extend the understanding and techniques of charged particle microscopy, to allow the most complete and accessible set of atomic scale information to be gained on the widest possible variety of materials. This encompasses improving fundamental understanding of charged particle beam – sample interactions; creating improved charged particle optics arrangements for microscopes; enhancing and making the most use of charged particle detector technologies; and developing the means and methods of processing the vast amounts of data now produced in charged particle microscopes.

SPEAKERS

Dr. Ben Britton

Dr. Ben Britton is a Professor in the Department of Materials Engineering, Faculty of Applied Science at UBC. He heads the "Experimental Micromechanics and Characterization" Group, where his team develops new ways to analyze and understand the mechanical behavior of engineering materials, especially metals and ceramics. Dr. Britton is a leading expert in electron microscopy, known for advancing innovative techniques such as in situ heating, deformation and micro-mechanical testing, and correlative microscopy and microanalysis. He leads and collaborates on multiple research projects at UBC, including the Characterization @ UBC GCRC cluster, and plays a key role in guiding electron microscopy activities at the EMLab within the Department of Materials Engineering. He is also the 2nd Vice President of the Microscopy Society of Canada.

Dr. Cassady Harraden

Cassady is an Assistant Professor in the Department of Earth, Ocean, and Atmospheric Sciences at the University of British Columbia. Her interdisciplinary research focuses on sustainable resource development, integrating mineralogy, geochemistry, spectral geology, and engineering data to improve orebody knowledge and optimize the recovery of critical minerals. Drawing from both industry and academic experience, her work develops advanced analytical and data fusion methods to identify mineral co-products, improve mine design, and reduce environmental impact. She collaborates widely across academia, government, and industry while mentoring the next generation of geoscientists and engineers for a low-carbon future. Before joining UBC, Cassady spent four years at Corescan, where she specialized in hyperspectral data interpretation and advanced geometallurgical and geotechnical applications of automated core logging. Her postdoctoral research focused on advancing critical mineral exploration, including porphyry vectoring in British Columbia using integrated mineralogical and laser-induced breakdown spectroscopy (LIBS)-based approaches. She earned her PhD in geometallurgy with the CODES group at the University of Tasmania in 2018, developing new methods for geotechnical rock mass and grain size assessment using multi-sensor systems and microanalytical techniques.

Dr. Claire Atkinson

Claire is the manager for the facility for high resolution macromolecular cryo-electron microscopy, located in the life sciences centre. She received her PhD from Rockefeller university, and did post-doctoral work at the University of Chicago before coming to UBC in 2017.

SPEAKERS

Dr. Cole Mauws

Cole Mauws obtained a BSc. in chemistry from the University of Winnipeg. He studied frustrated magnetism in charge disordered materials for his PhD in chemistry at the University of Manitoba. He was a postdoctoral researcher in condensed matter physics at the University of Oxford. He is now a Sr. Research Scientist managing X-ray diffraction in the Electron Microbeam and X-ray Diffraction Facility (EMXDF) in Earth Ocean and Atmospheric Science at the University of British Columbia.

Dr. Ismail El-Baggari

Ismail El-Baggari is an incoming (Jan 2026) Assistant Professor in Physics & Astronomy at UBC. At present, he is Principal Investigator and Fellow at the Rowland Institute at Harvard. He obtained his Ph.D. and M.S. in Physics from Cornell University and a Bachelor of Science in Applied Physics from Yale University. His research focuses on the development of in situ and ultra cold cryogenic electron microscopy to visualize order and disorder in quantum materials. He is a member of the management team of the Characterization @ UBC GCRC cluster.

James Drummond

James graduated from UBC a long time ago, with a B.Sc. in Wood Science. He gained many years of experience as a technologist in light and scanning electron microsopy at Paprican and FPInnovations. He has been a microscopy technician at the Pulp and Paper Centre, working with Mark Martinez, since fall 2020. At UBC, his primary role is operation of and protocol development for the Zeiss Xradia 520 Versa X-ray microtomograph. When James is not in the lab, you will find him wandering around outside with a camera in his hand—images are a big part of his life.

SPEAKERS

Dr. Juan Carlos Idrobo

Juan Carlos Idrobo is an Associate Professor in the Department of Materials Science & Engineering at the University of Washington and holds a dual appointment as a Research Scientist at the Pacific Northwest National Laboratory. His research focuses on developing and applying analytical techniques in electron spectroscopy using monochromation and aberration-corrected scanning transmission electron microscopy to study material properties at the atomic scale. Idrobo holds degrees in Physics from Universidad de Los Andes in Colombia (B.Sc., 2000), the University of Illinois at Chicago (M.S., 2003), and the University of California, Davis (Ph.D., 2004). He was named a Fellow of the Microscopy Society of America in 2023.

Dr. Karen L. Kavanagh

Karen L. Kavanagh is a Professor of Physics and an Associate Member of the Department of Chemistry and School of Engineering Science at Simon Fraser University. She received a B.Sc. degree in Chemical-Physics from Queen's University, Kingston, Canada and then worked for 3 years in the Advanced Technology Lab at Bell Northern Research, Ottawa where she was introduced to electronic materials and devices. She received her Ph.D. in Materials Science and Engineering in 1987 from Cornell University and then worked for a year at IBM T. J. Watson Research Labs, and Massachusetts Institute of Technology (postdoctoral fellowships), moving to the University of California, San Diego (Dept. of Electrical and Computer Engineering) in 1988, before returning to Canada in 2000 to her current position. She is a Fellow of the UK Institute of Physics, the Materials Research Society, and the Canadian Association of Physicists and has published over a hundred refereed scientific papers. Her research is focused on atomic interfaces and nanostructures with recent interest in and two-dimensional materials for biosensors, helium ion microscopy, nanowire heterostructures, and imaging junctions using electron holography.

SPEAKERS

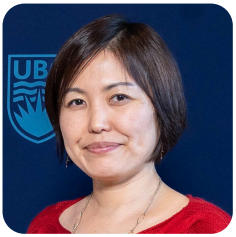
Dr. Lacey Samuels

Professor Samuels has been a faculty member at the University of British Columbia Vancouver since 2000, and currently serves as the Academic Director of the UBC Bioimaging Facility. The Samuels research group studies the intersection of plant cell biology and biochemistry, with emphasis on cellular mechanisms of secondary cell wall production. As a member of the UBC Bioproducts Institute, Professor Samuels is interested in how plant cells produce and coordinate cellulose, xylan, and lignin biosynthesis, as well as how these biopolymers can be useful for rewewable bioproducts. Another goal of Samuels' research is to discover how cannabis plants can produce their valuable metabolites such as cannabinoids and terpenes. Despite its economic importance, how the plant cells can accommodate the large flux of these chemicals is unknown. Discovery of the unique properties of cannabis stalked trichomes, and their highly-expressed genes, is critical information for molecular breeding and targeted engineering of this important plant.

Matt Tarling is a field geoscientist and Assistant Professor in the Department of Earth, Ocean and Atmospheric Sciences at the University of British Columbia. He studies how rocks record deformation, from the scale of mountain belts down to the atomic lattice of minerals. His work centres on the field characterisation of faults and shear zones, supported by high-resolution analyses to better understand rock deformation, fault mechanics, and earthquake processes.

Dr. Matt Tarling

SPEAKERS



Dr. Miki Fujita

Dr. Miki Fujita is a Research manager at the UBC Bioimaging facility. Her responsibilities include providing expert consultation on imaging experiments and techniques, organizing workshops and equipment demonstrations with vendors, overseeing equipment purchases, assisting with grant writing, and coordinating the monthly seminar series, "Focus on Scientific Imaging." She meets every new user to discuss how BIF can help their project and works with staff to ensure users are comfortable using the equipment after completing the training. Throughout her research career, she has received invaluable microscopy training at the UBC Bioimaging facility and the Australian National University. To share her experience of troubleshooting and exploring various imaging tools, she began organizing imaging workshops, which became a microscopy course she taught to undergraduate and graduate students over the past decade.

Dr. Nancy Ford is the Director of the UBC Centre for High-Throughput Phenogenomics and Associate Professor in the Department of Oral Biological and Medical Sciences. Her research area is focused on improvements in conebeam computed tomography images and applying micro-computed tomography imaging to rodent models of oncology and respiratory disease.

Dr. Nancy Ford

Dr. Renelle Dubosq

Dr. Renelle Dubosq is a Principal's Research Chair in Nanogeology and Assistant Professor in the Department of Earth and Environmental Sciences at the UBC-Okanagan campus. She uses a suite of material characterization techniques—including electron backscatter diffraction (EBSD), electron channelling contrast imaging (ECCI), and atom probe tomography (APT)—to investigate the atomic structure and composition of natural geomaterials. Her research explores the feedbacks between element mobility, fluids, and structural defects in minerals, with the overarching goal of extrapolating micro- to nanoscale processes to better understand tectonic-scale phenomena. Dr. Dubosq is also affiliated with the Fipke Laboratory for Trace Element Research (FiLTER) at UBCO, which houses a range of analytical equipment for material characterization.

SPEAKERS

Dr. Ruth Birch

Dr Ruth Birch is a postdoctoral fellow at UBC developing FIB-SEM methods for advanced microstructural analysis, typically applied to high-value engineering alloys including steels for energy applications. Areas of expertise include FIB-SEM, advanced electron backscatter diffraction (EBSD) methods and data analysis, and use of energy dispersive X-ray spectroscopy (EDS/X). Prior to joining UBC, Dr Birch completed her PhD at Imperial College London and developed new in situ understanding of the microstructural evolution of nuclear materials with SEM-based heating experiments. In addition to her academic journey, Dr Birch has 6 years of experience working in industry to ensure systems safety for marine applications.

Dr. Sarah Milne

Sarah Milne is a postdoctoral researcher at the Mineral Deposit Research Unit (MDRU) at the University of British Columbia. She completed her PhD in November 2024 at the University of Alberta and now focuses on analytical method development for economic geology and digital petrography. Sarah manages the micro-XRF (uXRF), Zeiss Axioscan facilities, and scanning electron microscope (SEM) projects, and trains students and researchers in new instruments and techniques. Her work supports innovative approaches to mineral characterization and collaborative research within academia and industry.

Tianbi Zhang

Tianbi Zhang is a PhD candidate in the Department of Materials Engineering at UBC-V. His research focuses on Kikuchi diffraction techniques in the scanning electron microscope (SEM), especially those based on direct electron detectors.

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