



# Mineralogical Association of Canada

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## URANIUM–THORIUM SHORT COURSE

### *The Geology and Geochemistry of Uranium and Thorium Deposits*

#### COORDINATORS AND SPEAKERS:

Michel Cuney (CNRS)  
and Kurtis Kyser  
(Queen's University)

SPONSORS: Mineralogical  
Association of Canada  
and Society  
for Geology Applied to  
Ore Deposits

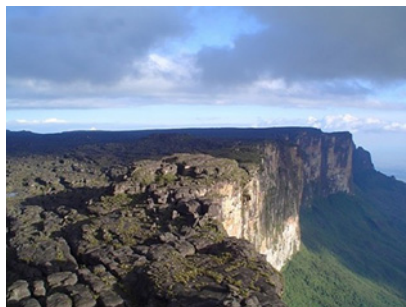
DATE: Fri. and Sat., May 1–2,  
2015, prior to the  
AGU-GAC-MAC-CGU  
Joint Assembly 2015

DURATION: 1.5 days

LOCATION: Palais des Congrès  
de Montréal

CONTACT: Kurtis Kyser; e-mail: [kyser@geol.queensu.ca](mailto:kyser@geol.queensu.ca)

REGISTRATION: Via the Joint Assembly–Montreal 2015  
website, [ja.agu.org/2015/](http://ja.agu.org/2015/)



Roraima Basin, Guyana

#### Overview

Despite the lack of interest in uranium as a commodity during the past few years and the loss of expertise during the previous downturn beginning 30 years ago, new ideas and technologies developed over the past 7 years have resulted in an enhanced understanding of the formation of uranium deposits. These have allowed researchers to quantify models for all types of deposits and, thus, to reclassify deposits in relation to their occurrence and probable genesis. The purposes of this short course are to highlight the research being integrated into refining exploration strategies for uranium and to discuss new developments in thorium deposits as a future energy resource, because thorium will become an increasingly important by-product of REE mining. The short course will consider geotectonic contexts and models of different types of uranium deposits and the mechanisms that control their genesis; the course will relate source, transport, and the forces driving deposition and preservation, and will consider how these factors can be used in more efficient uranium exploration and remediation. Two coffee breaks and lunches are provided. Costs are \$500 for professionals and \$100 for students.

#### Topics

- Nuclear fuel cycles and the economics of uranium and thorium fuels
- New classifications of deposit types
- Distribution and evaluation of global resources and mining techniques
- Geochemistry and mineralogy of uranium and thorium
- Heat production and flux; radiation and natural reactors
- Magmatic processes involved in deposit formation
- Metasomatism and metamorphism in the production of uranium deposits
- Basins and uranium deposits
- Deposits related to low-temperature processes
- New ideas about controls on grade and size of deposits
- Exploration strategies and techniques—what works and what doesn't
- The future of uranium and thorium as energy resources

## BERRY SUMMER SCHOOL

### *Applications of TEM-FIB-SEM Methods to Geomaterials*

ORGANIZERS: Hojatollah Vali  
and Robert F. Martin  
(McGill University), and  
Luiz Morales and  
Richard Wirth (GFZ  
German Research  
Centre for Geosciences)

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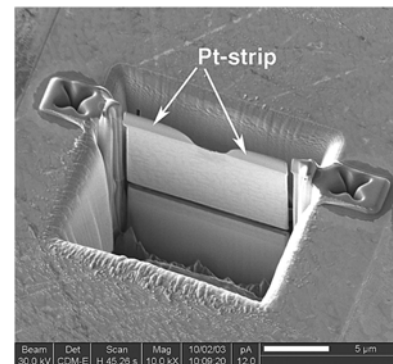
DURATION: Three days

(theory: 3 ½ hours in the morning and 1 hour in the afternoon)  
+ FIB-SEM and TEM demonstrations in the afternoon

LOCATION: McGill University, Facility for Electron Microscopy  
Research, 3640 University Street, Montreal, QC H3A 0C7

CONTACT: S. Kelly Sears; e-mail: [femr@mcgill.ca](mailto:femr@mcgill.ca)

REGISTRATION: Via the Joint Assembly–Montreal 2015  
website, [ja.agu.org/2015/](http://ja.agu.org/2015/)



#### Overview

The latest generation of the focused ion beam–extreme high-resolution scanning electron microscope (FIB-SEM) and the transmission electron microscope (TEM) are the ideal tools to study geomaterials at the micro- and nanoscale in 2-D and 3-D, including chemical composition and crystal structure. The Berry Summer School will provide an overview of the theory and practical applications of FIB-SEM and TEM in the geosciences using state-of-the-art electron microscopes available at the McGill University Facility for Electron Microscopy Research (FEMR). Participants will have the opportunity to discover the latest techniques in sample preparation and imaging relevant to the Canadian geoscience community. The workshop content includes:

- High-resolution SEM imaging using the in-column detector (ICD)
- Serial SEM imaging of FIB-prepared cross-sections of soft and hard materials
- 3-D FIB tomography and reconstruction of materials
- 3-D energy-dispersive spectroscopy
- Direct detection device (DDD) and phase plate (contrast) technology in TEM

#### Instructors and Contributors

Alan Anderson (St. Francis Xavier University, Nova Scotia, Canada); Luiz Morales (GFZ German Research Centre for Geosciences, Potsdam, Germany); Richard Wirth (GFZ German Research Centre for Geosciences, Potsdam, Germany); Hojatollah Vali, McGill University, Montreal, Quebec, Canada)

#### Audience, Capacity, and Requirements

The primary audience will be graduate students, postdoctoral fellows, and senior researchers. We expect students to come mainly from the geosciences and mineral sciences, but students from other disciplines, such as materials science, bioscience, engineering, and other disciplines are welcome to attend. Enrollment is limited to 30 participants. Participants should have a general understanding of electron microscopy. Basic knowledge of crystallography, crystal symmetry, the chemistry of minerals in general, and the interaction between electrons and crystalline matter would also be an asset.