

SFU

SIMON FRASER UNIVERSITY  
THINKING OF THE WORLD



MINERAL  
EXPLORATION IN  
SFU'S DEPARTMENT OF  
EARTH SCIENCES



**SIMON FRASER UNIVERSITY'S** Department of Earth Sciences started in 1995 as a Program in the Faculty of Science with four full-time and two part-time faculty members. By 1999 the number of faculty had grown to 11, and the Program was granted Departmental status. Since then, the program has grown to 16 full-time faculty including two Canada Research Chairs and a Forest Renewal BC Chair. The addition of a Research Chair in the field of mineral exploration will raise the departmental profile and provide new opportunities in both education and research.

### **Graduate and undergraduate education in the Department of Earth Sciences**

Students in the Department of Earth Sciences can choose between two main undergraduate streams: Geology, and Environmental Geoscience. The Geology stream allows students to specialize in courses related to the minerals and petroleum industries. We anticipate that this academic option will continue to grow in popularity in tandem with industry demand for new personnel.

The Department of Earth Sciences has 66 undergraduate Majors, 24 Master's students, and 14 PhD students. The Department has been graduating Earth Science Majors and Minors for almost a decade. All of our Majors have achieved the academic qualifications for registration in the Association of Professional Engineers and Geoscientists. Our undergraduate and graduate students have been well-received in the mineral exploration industry. Many are working in Canada but others are engaged in exploration programs worldwide, including Mexico, South America, China, Mongolia, Australia and Africa. Other graduates have gone on to do graduate work in various fields including mineralogy, petrology, tectonics and other academic areas broadly related to mineral exploration.

### **Mineral exploration strengths at SFU**

Faculty members in the Department of Earth Sciences have considerable expertise in metallic ore deposits, geochemistry, isotopes, mineralogy, petrology, structural analysis, 3D seismic imaging, fluid inclusions, sedimentology, ore microscopy and microbeam techniques. All tenure-track faculty are active, grant-supported members of the research community, and many have worked cooperatively with exploration companies in various mining camps across Canada. Field-oriented research is a particular strength of the Department. The current Chair of the Department of Earth Sciences, Derek Thorkelson, is a petrologist and field geologist who consults for the mineral exploration industry. Several adjunct faculty members are also active in research related to mineral occurrences.

### **Faculty with expertise in mineral exploration**

**DR ANDREW CALVERT** is Professor of geophysics, and has worked previously for Western Geophysical, Schlumberger and PanCanadian Petroleum both internationally and in Canada. He is an applied seismologist specializing in the use of oil industry seismic imaging methods in different geological environments, including a number of hard-rock mining camps. He has carried out much of his academic research as part of the internationally recognized Canadian Lithoprobe project, and has published over 40 scientific papers in leading geoscience journals. He is currently leading Geoscience BC's Nechako basin oil and gas assessment project, in which he is coordinating collaboration between the oil industry, organizations in the provincial and federal governments, and academia.

**KEVIN CAMERON** is Lecturer in mineralogy, petrology, geochemistry and igneous/metamorphic petrology. His interests include volcanogenic massive sulphide deposits, physical volcanology, gold mineralization and economic deposits related to alkaline/carbonatitic magmatism. He emphasizes the importance of mineralogy in our program and ensures that our students are well-versed in mineral identification and petrologic associations. He also counsels students on course selection and career opportunities, focusing on the Geology stream of Earth Sciences.

**DR DAN GIBSON** is Assistant Professor of structural geology whose research is relevant to syngenetic base metal and intrusion-related mineralization. His research focuses on structural, metamorphic and U-Th-Pb geochronologic analyses of rocks brought up from deep crustal levels during mountain-building events. Dr. Gibson's research is field intensive in areas such as the Selkirk and Monashee Mountains of southeastern British Columbia and the Pelly Mountains of central Yukon Territory. His research contributes to refining metallogenetic models for these regions.

**DR DIRK KIRSTE** is Assistant Professor of geochemistry. He has applied hydrogeochemistry and biogeochemistry in mineral exploration by conducting case studies, developing sampling methods and strategies, conducting laboratory experiments and developing numerical reactive transport models. He is currently participating in a number of collaborative projects abroad dealing with mineral exploration in areas of regolith cover and carbon geosequestration. Dr. Kirste has worked in Australia as part of the Cooperative Research Centre for Landscape Environments and Mineral Exploration through the Australian National University and Geoscience Australia and is supported by grants from a variety of sources.

**DR DAN MARSHALL** is Associate Professor of geochemistry, specializing in economic geology and fluid-rock interaction. He has worked on and published on a variety of gold and silver deposits world-wide. He has co-authored the recently published *Ore Mineral Atlas* and co-authored short course volumes on fluid inclusions and gem stones. His current research projects include precious metals and associated copper mineralization on Vancouver Island and emerald exploration in the newly-discovered Wenshan emerald deposit in Central China. He has participated in a number of collaborative projects within Canada and abroad, publishing in a number of internationally recognized journals. He is the recipient of the Mineralogical Association of Canada's Hawley Medal and is currently an associate editor for the *Canadian Mineralogist*.

**DR PETER MUSTARD** is Associate Professor of sedimentology, tectonics, and basin analysis, with a research emphasis on the evolution of sedimentary basins of the Canadian Cordillera. He has extensive experience in both regional mapping projects and detailed sedimentologic studies and applies aspects of clastic sedimentology, stratigraphy, structural geology, isotope geochemistry and field geologic relationships to reconstructing the tectonic and depositional evolution of sedimentary basins and their association to tectonic models for the evolution of the Canadian Cordillera. His research is supported mainly through NSERC, the BC Government, the Geological Survey of Canada and Geoscience BC. His work has been published as journal articles, government publications, government maps, fieldtrip guidebooks and a book.

**DR DOUG STEAD** is Professor and FRBC Chair in Resource Geoscience and Geotechnics. His areas of specialization include the application of the principles of soil and rock engineering in the safe and economic extraction of Canada's mineral resources. Dr. Stead has worked in a wide variety of surface mining environments including surface coal mines, quarries and large open pits. He also has extensive experience

in underground mining environments in Canada and internationally. He is actively collaborating in mining-based geomechanics research with international mining companies (Rio Tinto, Diavik, Kennecott), academia (UBC Mining, McGill Mining, Camborne School of Mines, UK) and government institutions (CSIRO Australia).

**DR DEREK THORKELSON** is Professor of petrology and tectonics with current research interests in iron oxide-copper gold deposits in northern Yukon, and a variety of other topics relevant to the minerals industry. He previously worked for the Yukon Geological Survey as a regional and mineral deposits geologist. His models of mineralization and geological evolution have stimulated millions of dollars of exploration in northern Yukon over the past decade. Dr Thorkelson maintains strong ties with the mineral exploration community through his work as a consulting geologist. He has published over seventy articles and maps, and has been supported by NSERC, the US Geological Survey, the Geological Survey of Canada, the Yukon Geological Survey, Lithoprobe and the private sector.

**DR BRENT WARD** is Associate Professor in Quaternary and environmental geology. He has worked extensively in the characterization of kimberlite indicator mineral and till geochemistry signatures in support of diamond, gold and base metal exploration programs. He and his students have applied these methods to large areas of the Northwest Territories, Nunavut and Alberta. He presently has a graduate student working on an area of lead-zinc mineralization in the Howards Pass area, Yukon Territory.

### **Adjunct Faculty with expertise in mineral exploration**

**DR LAURENT GODIN**, Queen's University (structural geology and continental tectonics)

**DR JOHN MOORE**, consultant (evolution of deformed belts, volcanic processes)

**DR MAURICE COLPRON**, Yukon Geological Survey (Cordilleran tectonics, bedrock mapping)

**DR JIM MONGER**, Geological Survey of Canada [Emeritus] (geology of the North American Cordillera)

**DR KIRSTIE SIMPSON**, Geological Survey of Canada (volcanology, hazard assessment, economic geology)



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