Department of Geological Sciences & Geological Engineering
Distinguished Speaker Program
presents:

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Lead – Geophysics,
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"Mineral Exploration using Natural EM Fields"

Friday, October 27, 2017
3:30 pm – 4:30 pm
Miller Hall, Room 105

All Welcome!
**ABSTRACT:**
The understanding of the geological processes behind the formation of mineral systems has advanced remarkably over the past two decades and has initiated a re-think with respect to the optimal geophysical methods required to both target and delineate economic ore bodies. The mineral system concept of McCuaig and Hronsky (2014) proposes four critical elements that must combine in various scales over space and time: whole lithosphere architecture, transient favourable geodynamics, fertility, and preservation of the primary depositional zone. They conclude that “[the mineral system concept] focuses mineral exploration strategies on incorporating primary datasets that can map the critical elements of mineral systems at a variety of scales, and particularly the regional to camp scales needed to make exploration decisions.”

With exploration evolving to take a holistic view of the complete mineral system in targeting, geophysics has adapted to making greater use of techniques that can explore scales ranging from deposit to lithospheric. While the geophysical toolbox is filled with many techniques, only a few of them are capable of the depth investigation required to expand our view past the deposit scale: active- and passive-seismics, and methods that make use of the Earth’s natural gravitational, magnetic, and EM fields. Gravity and magnetics are ubiquitous in datasets ranging from continental to prospect scales and the use of seismic techniques in mineral exploration is growing. But nothing compares to natural field EM methods if the goal is 3D conductivity imaging to kilometres depth combined with ease of data collection. Over the past decade, these have become mainstream in mineral exploration, and recent advances in the joint inversion of ground and airborne data are making natural field EM methods an even more powerful tool for resolving complete mineral systems.

Examples of natural field EM techniques applied to a variety of mineral systems over the past decade are presented, beginning with a crustal scale MT transect across the Gawler Craton and the super-giant Olympic Dam IOCG deposit of South Australia, and followed by illustrations from porphyry systems (Collahuasi, Pebble, El Salvador, Los Bronces, Cobre Panama, Resolution, Santa Cecilia, and Morrison) that dominate this paper owing to the economic significance of porphyry copper-gold deposits globally and because of their amenability to large-scale conductivity imaging. Further applications to sedimentary copper (Frontier and Kansanshi), magmatic polymetallic sulphide (Voisey’s Bay), and unconformity-related uranium (McArthur River) deposits are also presented. Together these examples demonstrate the value that natural field EM geophysics can bring to the exploration decision making process when interpreted in context of mineral systems.

**SUMMARY:**
I’ve been a mining geophysicist for almost 19 years, and have field experience in Canada, USA (Red Dog Mine in Alaska), Mexico, Argentina, Brazil, Chile, Peru, Ireland, Turkey, PNG, and Tonga. Of that time, I’ve spent over 8 years living abroad in Mexico, Chile, and Australia. During my two years in Australia I was involved in seafloor exploration for massive sulphide deposits and gained familiarity with marine geophysical operations.

Recently I moved from Teck Resources Limited to Anglo American plc in order to broaden my expertise and gain more exposure to production- and operation-oriented geophysics in the mining environment.

Specialties: Technically speaking, I specialize in Geophysical data processing and interpretation, mostly in potential fields, IP/Resistivity, and EM (including AMT/MT), with tertiary knowledge of reflection seismics. I’m always interested to learn about and investigate new geophysical techniques related to both exploration and mining.