POSTDOCTORAL POSITION: THE IMPACTS OF ATMOSPHERIC DUST DEPOSITION ON THE SPECIATION OF TRACE ELEMENTS IN SNOWMELT AND PEATLAND SURFACE WATERS

Position Description

Open pit bitumen mining in northern Alberta generates considerable volumes of dust. The dusts are derived not only from the mines, but from wind erosion of dry tailings and gravel roads, construction activities, and quarries, in addition to natural sources such as riverbanks and sand bars. The dusts themselves consist mainly of mineral particles, some of which are chemically reactive (e.g. calcite) whereas others are effectively insoluble (such as quartz). There are also ongoing concerns about potentially toxic "heavy metals" being released to the atmosphere from bitumen mining and upgrading, but the extent of these emissions, and their ecological significance, is unclear. Most environmental impact studies to date have not clearly distinguished between heavy metals (such as cadmium and lead) from the combustion of fossil fuels needed for bitumen upgrading versus heavy metals which are hosted within the crystal lattice of the mineral particles themselves. Heavy metals which are emitted to the air during combustion at high temperatures tend to be very small (< 1 micron) and in soluble form (such as oxides), whereas mechanically-generated mineral dusts tend to be rather large (10 to 100 microns) and much less soluble (e.g. silicate minerals such as quartz and feldspar). Very small, soluble, metal-containing particles may represent a threat to biota, depending on the pH of soil and water, and other factors, but large, insoluble particles most likely do not. The main goal of this study is to clearly distinguish between these two sources of heavy metals to the air, using size-resolved analyses of snow and Sphagnum moss from bogs. The secondary objective is to understand what impact, if any, the two sources of heavy metals may have for the chemical composition of meltwater and peatland surface waters (from bogs, fens and swamps) which drain into the Athabasca River.

Field activities will involve annual trips to the Ft. McMurray area with the research team to collect snow samples in winter and peat and water samples in the autumn. Laboratory activities will focus on the analysis of trace elements using ICP-MS in snow (total, coarse and fine fractions), but include support of on-going research on trace elements in moss (acid-insoluble ash and acid-soluble ash fractions) and trace elements in aqueous extracts of plant materials.

Under the direction of the PI, the successful candidate will supervise and mentor two PhD students working on the project, and will interact with a number of support staff, under/graduate students, and other PDFs in the lab. Collaboration and reporting to industry partners will also be expected.

This post-doctoral appointment will be for an initial 2-year term.
**Key Qualifications**
- PhD in Analytical Chemistry, Soil Chemistry, or Environmental Geochemistry
- Ability to engage in complex data analyses and syntheses, and interpretation of findings
- Demonstrated skills and eager to complete literature reviews, original manuscript writing and publication process in peer-reviewed journals in English
- A teamwork aptitude — ability to work independently but also to help organize research activities with others
- Proactive, flexible, dedicated, well-centered, responsible
- Strong numerical, statistical and computer skills

**Sought-After Assets and Abilities**
- Ability to propose and undertake innovative analytical SOPs
- Hands-on and theoretical experience with ICP-MS and ‘clean lab’ procedures and protocols for trace elements research
- Experience writing research proposals and technical reports

**Additional Information**
University of Alberta is consistently rated as one of the top 5 universities in Canada, and one of the top 100 universities worldwide. Located in Alberta’s capital city, Edmonton (population one million), University of Alberta provides a dynamic mixture of a large research intensive university, urban culture and recreation. More than 39,000 students from across Canada and 144 other countries participate in nearly 400 programs and 18 Faculties. Within the University, the Department of Renewable Resources consists of 30 faculty members, over 200 graduate students, numerous postdoctoral fellows and support staff, and offers significant research support through sophisticated laboratories and multiple field facilities.

**Website Links**
https://swamp.ualberta.ca/
https://people.ales.ualberta.ca/williamshotyk/
http://www.rr.ualberta.ca

**Keywords**
atmospheric dust deposition, trace elements, peatlands, ombrotrophic bogs, pore water, redox chemistry, dissolved organic matter, speciation, colloids

**Timeline for beginning the position**
As soon as possible.
PhD thesis must have been completed, submitted and deposited with the home university prior to initiation of this position

**To Apply:**
Please by e-mail to include CV, transcripts (scanned unofficial copy), a letter describing research experience and interests (one or two pages), an example of a scientific publication
(preferably written by the candidate as a first author and published in peer-reviewed journal),
contact information for three references to:
Dr. William Shotyk, Professor and Bocock Chair for Agriculture and the Environment,
University of Alberta,
Dept. of Renewable Resources,
3-48 South Academic Building,
Edmonton, Alberta, Canada
T6G 2H1.
Contact email: shotyk@ualberta.ca

Closing date:
The position will remain open until filled.

We thank all applicants for their interest; however, only those individuals selected for an
interview will be contacted.

The University of Alberta is committed to an equitable, diverse, and inclusive workforce. We
welcome applications from all qualified persons. We encourage women; First Nations, Métis
and Inuit; members of visible minority groups; persons with disabilities; persons of any sexual
orientation or gender identity and expression; and all those who may contribute to the further
diversification of ideas and the University to apply.