



June 1, 2018

## KEGS FOUNDATION: Announcement

### Len and Genice Collett Research Internship in Geophysics

The KEGS Foundation is very pleased to announce the establishment of a research internship in geophysics, designated the *Len and Genice Collett Geophysical Research Internship*, in honour of Len and Genice Collett\* for their exceptional philanthropy in supporting the Foundation and its efforts to advance geophysical education via a transformative legacy gift announced in late 2017.

In view of Len's long and distinguished geophysical career at the Geological Survey of Canada (GSC), it is expected that this internship will be primarily used to advance significant geophysical research at the GSC, although other arrangements may be negotiated in the future.

This internship will primarily be of interest to advanced doctoral candidates and recent post-doctoral researchers who have specialized knowledge and a demonstrated history of effective research in a particular area of geophysics that is closely aligned with the requirements of the GSC or other relevant agency or institution, as will be announced and publicized from time to time. It is expected that this internship will be awarded annually or bi-annually, with the duration of an accepted internship typically four to six months. The successful applicant will receive a research honorarium to be paid by the KEGS Foundation, with compensation comparable to that of an equivalent intern geoscientist employed by the Government of Canada. He/she will also receive support from the GSC or other hosting institution in terms of office space, computational resources, full access to relevant federal facilities and collaboration with colleagues.

Selection of a candidate for a specified research project under this initiative will rest with a panel consisting of several KEGS Foundation Directors and senior geophysicists and program managers from the hosting organization, with possible input from senior faculty closely involved in the candidate's graduate education and research. The selected intern will be encouraged to discuss and present his or her efforts and developments both within the designated federal agency or institution and the wider geophysical community, and, on completion, provide a summary report of accomplishments and recommendations.

An **initial research internship position** of up to six months duration has been proposed by the GSC, which will be directed at developing improved constrained inversion methods for regional potential field data. This project will form a key part of the 'Canada in 3D' program which is intended to portray all relevant geoscience data and expert knowledge and inferences about the geology of Canada in three dimensions. A detailed description of the internship position at the GSC, the research project and its professional requirements, is posted on the KEGS Foundation website and may also be available from the GSC.

Accordingly, qualified researchers with relevant education and research expertise, preferably advanced PhD candidates or recent doctoral graduates, are encouraged to promptly submit their application for this position, accompanied by appropriate documentation and references, to the KEGS Foundation by email to [sreford@kegsfoundation.org](mailto:sreford@kegsfoundation.org), but no later than July 1, 2018. Applicants for the position with the GSC should be Canadian citizens or permanent residents, or PhD students and recent doctoral graduates of Canadian universities with appropriate immigration status. If a fully acceptable candidate is identified, it is expected that a decision will be announced no later than September 30, 2018, with commencement of duties at the GSC in Ottawa at a mutually agreed-upon time in the fall.

Please note that this internship is not expected nor intended to lead directly to full-time employment by the Government of Canada. A selected intern at the GSC or other federal agency will have non-exclusive ownership of the processes or software developed or related intellectual property (shared with the Government of Canada), and will retain the rights to access and utilization of these developments and improvements.

**On behalf of the Board of Directors,**

**Stephen Reford, Acting Chair**  
**Jerry Roth, Director**  
**Luise Sander, Director**

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**\*The KEGS Foundation is greatly appreciative of the major legacy gift by Len and Genice Collett, which has enabled a number of important educational initiatives, including this research internship.**

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#### **Genice and Len Collett ca 1985**



\* Leonard (Len) Collett was an innovative geophysicist who contributed to the early development of Induced Polarization (IP) while working with the renowned Newmont geophysics group in the early 1950s following his graduation from the University of Toronto. He subsequently had a long and distinguished career with the Geological Survey of Canada, where, inter alia, he actively fostered geophysical R&D both within the GSC and with industry partners. He is one of the notable GSC geophysicists honoured by the Foundation by the GSC Geophysical Pioneers Scholarship established in 2007. Len, who died in 2011, was a strong supporter of geophysical education, a commitment that was shared by his wife Genice, a teacher for many years in the Ottawa area, who passed away in 2017. The transformative legacy gift received by the KEGS Foundation was announced in October at a special luncheon of geophysical veterans, which included Collett family members and a number of Len's former colleagues and collaborators.

May 7, 2018

## COLLETT GEOPHYSICAL INTERNSHIP: GSC PROJECT DESCRIPTION

### **Title: Constrained inversion for regional-scale 3D geomodelling of potential field data**

A research Internship position, designated the *Len and Genice Collett Research Internship*, established and funded by the KEGS Foundation as a result of a major legacy gift by Len and Genice Collett, is currently being offered by the Geological Survey of Canada of Natural Resources Canada (NRCAN), for a computational GEOPHYSICIST (or equivalent) for a duration of up to 6 months.

### **Work Objective:**

This internship is intended to advance efforts by the Geological Survey of Canada to investigate and implement geophysical inversion methods for developing regional-scale 3D geological models of the subsurface. The goal of this research is to support *Canada in 3D*, a multi-scale multi-parameter geoscience modelling effort which will provide the future framework for a knowledge repository for the geology of Canada.

The recipient of this internship will focus on the advancement and development of computationally-efficient algorithms for the inversion of airborne geophysical (magnetic, gravity) and seismic datasets, incorporating constraints from geological data sources such as strike/dip measurements, rock unit contacts, drillhole information and physical rock property measurements. The inversion methods to be developed will be an essential component in generating crustal-scale 3D models of Canada's landmass and offshore regions that will be ultimately reconcilable with Canada's national geological and geophysical data coverage.

Specifically, the research undertaken in this project will focus on upgrading existing and/or developing new geophysical inversion algorithms with the capacity to:

1. Incorporate geological data constraints (e.g. strike/dip measurements, drillhole information, mapped or 3D-modelled lithological contacts and physical rock property measurements)
2. Honour multi-source geophysical datasets (joint or cross-validation inversion schemes)
3. Be computationally efficient (or scalable) so that the inverse methods can be ultimately applied on regional scale datasets (e.g. from a single 1:250 000 map sheet to a tectonic domain, terrain or province)
4. Quantify and represent the uncertainty of the computed inverse models
5. Exploit artificial intelligence and machine learning methods in the development of constrained inversion algorithms and modelling of the relationships between geological formations and physical rock properties
6. Optimally exploit NRCAN's supercomputer and computer cluster architectures to enable efficient implementation in the analysis of large national datasets.

The utility of the improved or newly developed inversion methodology will be tested in case studies, utilizing regional airborne geophysical, seismic and geological datasets, as may prove feasible within the agreed-upon scope and duration of this project. These case study results will provide important subsurface components of the Can3D national geological 3D model.

**Internship Requirements:**

- Relevant education and research expertise, preferably advanced PhD candidates or recent doctoral graduates from a Canadian university in a relevant sector of geophysics
- Extensive background in geophysical inversion, including constrained and joint approaches, preferably in potential fields
- Extensive background in computational methods, including artificial intelligence and machine learning
- Extensive background in algorithm development and programming skills
- Basic understanding of 3D geological modelling methods
- General knowledge of the geological regions and crustal architecture of Canada is considered an asset

Suitably qualified candidates for this internship position are encouraged to submit their C.V.s with summaries of relevant past or current research to the KEGS Foundation, attention Stephen Reford ([sreford@kegsfoundation.org](mailto:sreford@kegsfoundation.org)) no later than July 30, 2018. If an acceptable candidate is identified in timely fashion, it is expected that the internship would be awarded by September 1, 2018, with commencement of research in fall 2018 as may be determined by discussions between the parties.

For further details about the technical aspects of the project, please contact Ernst Schetselaar, Senior Geoscientist at the GSC, Ottawa at [ernst.schetselaar@canada.ca](mailto:ernst.schetselaar@canada.ca).

**GSC18f01.Internship project description**