Becoming a Canadian Professional Geoscientist After Studying at Acadia as a Geology or Environmental Geoscience Major

&

Getting an Earth Ring

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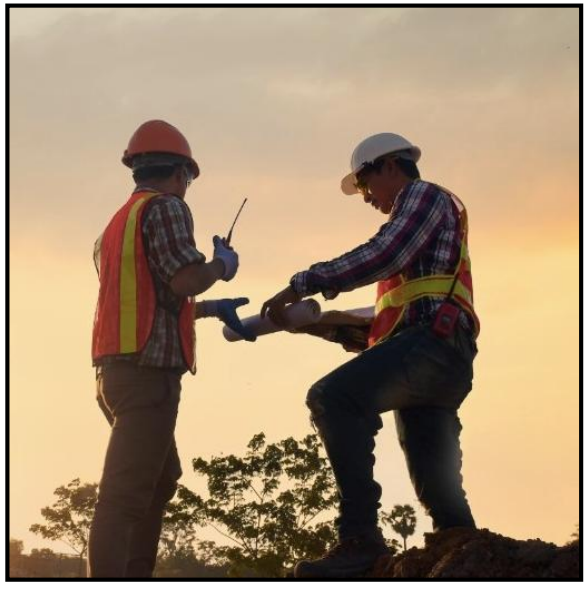
GEOSCIENTISTS NOVA SCOTIA

GEOSCIENTISTS CANADA
GÉOSCIENTIFIQUES

Outline



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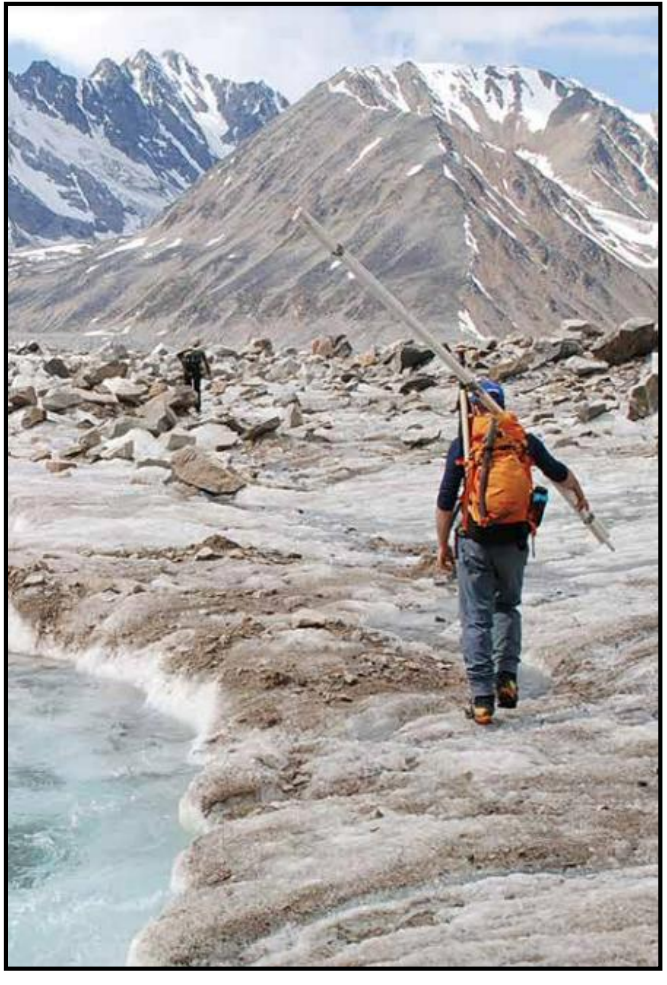
Introduction

- where do Acadia GEOL & ENGO students work after they graduate?
  - Mineral Exploration & Mining
  - Petroleum Exploration & Production
  - Environmental Assessment/Remediation
  - Government Surveys
  - Academic Teaching and Research
- if you intend to work independently in these fields, regulations require that you become a '***Professional Geoscientist***'
- this allows you to:
  - ***practice independently***
  - ***undertake certain, special geoscience tasks (see below)***



Introduction

- If you aren't a professional geoscientist, there are restrictions to the type of service you can provide in your field of expertise
- Your field of expertise is determined by the university courses you have passed, and the type of geoscience experience you have
- thus, at Acadia, you must take the '***right courses***' to allow you to work in your desired field
- obviously, you need to make the proper course selections early in your academic career, so you have the pre-requisites that you need to take for the courses you want to take
- Drs. Van Rooyen and O'Driscoll are aware of this, and will help to guide you though this process when they advise you on course selections each year (*a very important exercise*)

Professional Geoscientists in Nova Scotia

- You must be a ***Professional Geoscientist (P.Geo.)*** to ***"practice geoscience"*** in:
  - *Nova Scotia*
  - *all other provinces and territories in Canada*
  - *most of the United States (~35 states; Assoc. of State Boards of Geology - ASBOG)*
  - *other countries (e.g., UK, Australia, NZ, South Africa, Namibia, Ireland, the EU)*

Professional Geoscientists in Nova Scotia

- you must be a P.Geo. to be considered as a '***qualified person***' and a '***site professional***' (*terms defined in a variety of NS legislative acts involving petroleum and mineral exploration, and the environment*)
- these titles allow you to undertake a variety of tasks

In the petroleum and mining fields, as a qualified person you can:

- plan and manage exploration programs
- write assessment reports, feasibility studies, technical stock exchange exploration & mining announcements

In the geo-environmental field, as a site professional you can:

- perform environmental monitoring & remediation activities
- plan, design (*with an engineer*), and supervise environmental monitoring and remediation activities

If you are not a P.Geo., you cannot do these things; rather, you need a boss who can sign off and take responsibility for your work (*i.e., you cannot work 'alone'*)

Professional Geoscientists in Nova Scotia

- Note that employers will pay a premium to have a geoscientist working for them; they charge a higher rate for their services (***because P.Geo.'s can do more!***)
  - ***Local employers will likely pay you ~ 20 % more if you are a P.Geo.!***
  - ***As a junior geologist, that is ~ $100/day more!***
  - ***This 20 % bonus tends to increase with time and experience!***
- Students and young geologists/environmental geoscientists generally do not consider the life-time value of a P.Geo.
- Geoscientists without a P.Geo. tend to have careers that plateau, and wind up doing the same thing, time after time
- Geoscientists with a P.Geo. tend to get more interesting jobs, can author important documents for the stock exchanges (NI 43-101), with more responsibility, and with opportunities to rise higher within their company (***i.e., management***)
- The value of a P.Geo. over the career of a geoscientist is in the tens of thousands of $ per year and many hundreds of thousands of $ over their career

< this information was provided by a Canadian P.Geo. who heads up geological consulting firm that employs many Geo's >

Professional Geoscientists in Nova Scotia

- As a P.Geo., it is a simple process to become registered in another province, so you can work independently there, too (*I have worked in every province/territory*)

Professional Geoscientists in Nova Scotia

- so who needs to be a ***P.Geo.?***
  - ***Geologists*** – ***we have this degree at Acadia***
  - ***Environmental Geoscientists*** – ***we have this degree at Acadia***
  - ***Geophysicists*** – ***we do not have this degree at Acadia***

[note that Geochemistry is not a recognized stream, except in BC; elsewhere, geochemists register as geologists or environmental geoscientists, depending on their orientation]

- these three streams are recognized nationally by the ***Canadian Geoscience Standards Council*** (*the group that sets the national geoscience standards*)

Definition

- ***What is 'the Practice of Geoscience'?*** ***[Straight from the Act]***

"the performing of any activity that requires application of the principles of the geological sciences, and that concerns the safeguarding of public welfare, life, health, property, or economic interests, including, but not limited to:

Geological Exploration

investigations, interpretations, evaluations, consultations or management aimed at discovery or development of metallic or non-metallic minerals, rocks, nuclear or fossil fuels, precious stones and water resources; and (***note that this does not include rock quarries***)

Public Well-Being & Environment

investigations, interpretations, evaluations, consultations, or management relating to geoscientific properties, conditions or processes that may affect the well-being of the general public, including those pertaining to preservation of the natural environment."

Professional Geoscientist Act

- to be a ***Professional Geoscientist*** in Nova Scotia, you must be a member of the ***Association of Professional Geoscientists of Nova Scotia*** ***(APGNS; AKA Geoscientists NS)***
- the ***APGNS*** admits ***P.Geo.s*** using the guidelines and procedures for professional registration established by the ***Canadian Geoscience Standards Council***
- other provinces have similar professional geoscience associations, in some cases joined with the engineers, that have a similar purpose and operate in a similar manner (*note that in our federal constitution, regulation of the professions is a provincial responsibility; also note that Quebec's system is a bit different from this, for various legal and historical reasons*)
- The ***Canadian Geoscience Standards Council*** attempts to standardize professional geoscience registration across the country, and thereby allow easy qualification transfer

Professional Geoscientist Act

- The ***Nova Scotia Professional Geoscientist Act*** gives the ***APGNS***, the authority to:
  - *admit members with suitable credentials*
  - *investigate, judge and discipline members for malpractice*
  - *requires the APGNS to keep a **public record** of disciplinary actions (unlike doctors, lawyers, etc. - their disciplinary actions records are not public)*
- The ***NS Professional Geoscientist Act*** allows Nova Scotia P.Geo.s to:
  - *automatically be able to **'practice geoscience'** in Nova Scotia*
  - *allows them to become members of another professional geoscientist association in another province, state or country merely by paying their registration fees; you **HAVE TO** register though; in Canada, it's a simple form, with email confirmation => quick)*
  - *note that there is no such thing as **'incidental practice'**, meaning you can't undertake geoscience work in another province for a 'couple of days'; you **HAVE TO** register in any province/territory you work in!*

Professional Geoscientist Act

- The ***Nova Scotia Professional Geoscientist Act*** does not allow an un-registered geoscientist to:
  - advertise themselves as a ‘geoscientist’, ’geologist’, ‘geophysicist’, ‘geochemist’, ‘mineralogist’, ‘paleontologist’, ‘stratigrapher’, ‘structural geologist’, or any other sub-discipline practitioner or professional
  - work independently in the field of geoscience *(i.e. without a boss who is a professional geoscientist)*
  - submit assessment reports, other government prospecting documents, stock market exploration/mining/petroleum announcements, or feasibility studies *(including preliminary economic assessments and pre-feasibility studies)*

Professional Geoscientist Act

- The ***Nova Scotia Professional Geoscientist Act*** also requires Nova Scotia P.Geo.s to:
  - participate in a professional development program to continue to enhance their abilities and knowledge while on the job
  - practice geoscience in an ethical manner that will maintain public safety and protect the environment

P.Geo. Admission Requirements

- to join the ***APGNS***, you are required to satisfy five requirements
  - **achieve knowledge** (*pass the necessary curriculum approximately equivalent to a 4-year Canadian honours geology program*)
  - **achieve experience** (*usually 48 months of experience, or satisfy 29 competencies, as a member-in-training - MIT*)
  - **have four references** (*4 must be geoscientists/engineers*)
  - **adequately speak an official language of the province**
  - **pass a professional practice/ethics exam** (*ensuring you have local knowledge of relevant laws, ethical issues; the curriculum and text is provided in advance by the* ***APGNS***)
- obviously, Acadia students need to know what these knowledge requirements are!

Knowledge Requirements

common to all streams

(Geologist, Geophysicist, Environmental Geoscientist)

- **3 Compulsory Foundation Science Educational Units (EUs)**
  - Mathematics (*1st year calculus, statistics, matrix algebra, number theory*)
  - Physics (*intro, 1st year, w/lab*)
  - Chemistry (*intro, 1st year, w/lab*)
- **6 Additional Foundation Science EUs** – *up to two from each subject*
  - Mathematics (*1st year calculus, statistics, matrix algebra, number theory*)
  - Physics (*intro, 1st year, w/lab*)
  - Chemistry (*intro, 1st year, w/lab*)
  - Biology (*intro, 1st year, w/lab*)
  - Statistics (*see above*)
  - Computer Programming (*coding in relevant, modern computer language*)

Note: *EU = 'educational unit' is basically a one-semester/one-term course at Acadia*

Note: *except for Mathematics and Statistics, these courses must have lab or tutorial and must be >= 1st year university level AND acceptable for credit in a degree in science or applied science/engineering*

Knowledge Requirements

common to all streams

(Geologist, Geophysicist, Environmental Geoscientist)

- **4 Compulsory Foundation Geoscience EUs**
  - Field Techniques
  - Mineralogy and Petrology
  - Sedimentation and Stratigraphy
  - Structural Geology

Note: *the material in these educational units may be equivalently studied as material in several courses; regardless, these courses must be acceptable for credit toward a degree in geoscience*

Knowledge Requirements

different for each stream

• 5 Additional Foundation Geoscience EUs

GEOLOGY

Geochemistry
Geophysics

Igneous Petrology
Metamorphic Petrology
Sedimentary Petrology

Sedimentology
Glacial Geology/Geomorphology
Remote Sensing

ENV GEOSCIENCE

Geochemistry
Geophysics

Hydrology/Hydrogeology
Engineering Geology

Geomorphology/Soil Science
Glacial Geology
Remote Sensing

GEOPHYSICS

Digital Signal Processing

Global Geophysics

Seismology & Seismic Methods

Exploration Geophysics

Potential Fields & Radiometrics

Electrical/Electromagnetic Methods

Note: *Geology and Environmental Geoscience Stream require 1 or 2 EUs from each sub-group, but only one from each subject*

Note: *Geophysics requires 1 EU from 5 of the 6 sub-groups*

Knowledge Requirements

common to all streams

(Geologist, Geophysicist, Environmental Geoscientist)

- **9 Other Geoscience/Science EUs**

An extensive list is available on pages 7-9 and 12-21 in the Canadian Geoscience Standards Council's ***General Knowledge and Experience*** (***GKE***) document:

https://geoscientistscanada.ca/wp-content/uploads/2019/02/GC-Knowledge-Requ.BKLT-.REV-.EN-.web-.final-.pdf

Basically, any geoscience or environmental science course offered at Acadia, and many other science courses that relate to geoscience, will qualify

(e.g., CHEM 2853 - Environmental Analytical Chemistry; ENVS 3423 – Environmental Impact Assessment; BIOL 2033 - Ecology; APSC 3413 - Environmental Engineering)

Note: *these courses must be 2nd year or higher* ***and*** *acceptable as a science credit toward a degree in science or applied science/engineering* ***and must be relevant to geoscience***

Note: *GEOL 1033 (Oceanography), GEOL 1073 (Natural Disasters), CHEM 1053 (Chemistry in the Modern World), PHYS 1513/1523 (Astronomy), PHYS 1543 (Energy), PHYS 1553 (Physics of Music), PHYS 1563 (Physics in the Environment)* ***do not satisfy these requirements***

Knowledge Requirements - Summary

common to all streams

(Geologist, Geophysicist, Environmental Geoscientist)

Geoscience Courses = 18

(*note that the APGNS does not stipulate you need to take introductory geology courses; i.e., GEOL 1013 & GEOL 1023; however, you will need to have taken them as pre-requisites for the 18 advanced Geoscience courses you do need to take*)

Introductory (First Year) Geoscience Courses = 2

Total Geoscience Courses = 20

+ Other Science Courses = 9

(29 science courses in all)

How do these EUs match up with Acadia ***Geology & Env. Geoscience Major & Honours Degree*** *programs?*

Acadia Major Geology Degree

CORE

- Physical Geology (1013)
- Historical Geology (1023)
- Mineralogy (2133)
- History of Life (2213)
- Petrology & Stratigraphy (2043)
- Geomorphology (2703)
- Field Methods (2083)
- Sedimentary Geology (3303)
- Igneous Petrology (3403)
- Metamorphic Geology (3503)
- Structural Geology (3603)
- Global & North American Geology (4103)

PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023 - *calculus*, 2233 & 2243 – *statistics*, or 1333 & 2313 – *matrix algebra*)
- 4 Other Science Courses (from MATH, PHYS, CHEM, BIOL, COMP, APSC; *must have 4 for minor*)

COMMON ELECTIVES

- Atmosphere, Weather & Climate (2753)
- Hydrogeology (3723)
- Geochemistry (3103; *alternate years*)
- Geophysics (3823; *alternate years*)
- Energy Sources (4843; *alternate years*)
- Quaternary Geology (4713; *alternate years*)
- Mineral Deposits (4803)
- Advanced Field School (4083)
- Geochemical Material Transfer (4823)
- Mineral Exploration (4813)
- Applied Geochemistry (4833)

< blue courses only taught with parallel grad course >

Acadia Honours Geology Degree

CORE

- Physical Geology (1013)
- Historical Geology (1023)
- Mineralogy (2133)
- History of Life (2213)
- Petrology & Stratigraphy (2043)
- Geomorphology (2703)
- Field Methods (2083)
- Sedimentary Geology (3303)
- Igneous Petrology (3403)
- Metamorphic Geology (3503)
- Structural Geology (3603)
- Global & North American Geology (4103)
- Honours Thesis (4996)

PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023 - *calculus*, 2233 & 2243 *statistics*, or 1333 & 2313 – *matrix algebra*)
- 4 Other Science Courses (from MATH, PHYS, CHEM, BIOL, COMP, APSC; *must have 4 for minor*)

COMMON ELECTIVES

- Atmosphere, Weather & Climate (2753)
- Hydrogeology (3723)
- Geochemistry (3103; *alternate years*)
- Geophysics (3823; *alternate years*)
- Energy Sources (4843; *alternate years*)
- Quaternary Geology (4713; *alternate years*)
- Mineral Deposits (4803)
- Advanced Field School (4083)
- Geochemical Material Transfer (4823)
- Mineral Exploration (4813)
- Applied Geochemistry (4833)

< blue courses only taught with parallel grad course >

Course Totals

Geology Major

- *17 Geology Courses **(20)***
- *10 Other Sciences **(9)***
- *27 Science Courses Total **(29)***

Need to:

Take three Geology courses as university (*free*) electives
Take either Geochemistry or Geophysics as one of your geology electives

Geology Honours

- *19 Geology Courses **(20)***
- *10 Other Sciences **(9)***
- *29 Science Courses Total **(29)***

Need to:

Take one Geology course as a university (*free*) elective
Take either Geochemistry or Geophysics as one of your geology electives

***Note:** you can reduce (by one) the # of Geology courses you must take as free electives by ensuring that the extra (10th) science course required for your degree is relevant to geoscience, making it satisfy the Other Geoscience/Science requirement*

Acadia Major Environmental Geoscience Degree

CORE

- Physical Geology (1013)
- Historical Geology (1023)
- Environmental Science I (1013)
- Environmental Science II (1023)
- Mineralogy (2133)
- History of Life (2213)
- Petrology & Stratigraphy (2043)
- Field Methods (2083)
- Geomorphology (2703)
- Geochemistry (3103; *alternating yearly with 3823*)
- Geophysics (3823; *alternating yearly with 3103*)
- Hydrogeology (3723)
- Sedimentary Geology (3303)
- Structural Geology (3603)
- Legal Issues (3113)
- Environmental Impact Assessment (3423)

PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023 - *calculus*, 2233 & 2243 - *statistics*, or 1333 & 2313 – *matrix algebra*)
- Biology (1113 & 1123)
- 4 Other Science Courses (from MATH, PHYS, CHEM, BIOL, COMP, APSC; *must have 4 for minor*)

COMMON ELECTIVES

- Atmosphere, Weather & Climate (2753)
- Contaminants in the Environment (3613)
- Energy Sources (4843)
- Quaternary Geology (4713)
- Global & North American Geology (4103)
- Mineral Deposits (4803)
- Advanced Field School (4083)
- Geochemical Material Transfer (4823)
- Mineral Exploration (4813)
- Applied Geochemistry (4833)

< blue courses taught with parallel grad course >

Acadia Honours Environmental Geoscience Degree

CORE

- Physical Geology (1013)
- Historical Geology (1023)
- Environmental Science I (1013)
- Environmental Science II (1023)
- Mineralogy (2133)
- History of Life (2213)
- Petrology & Stratigraphy (2043)
- Field Methods (2083)
- Geomorphology (2703)
- Geochemistry (3103; *alternating yearly with 3823*)
- Geophysics (3823; *alternating yearly with 3103*)
- Hydrogeology (3723)
- Sedimentary Geology (3303)
- Structural Geology (3603)
- Legal Issues (3113)
- Environmental Impact Assessment (3423)
- Honours Thesis (4996)

PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023 - *calculus*, 2233 & 2243 - *statistics*, or 1333 & 2313 – *matrix algebra*)
- Biology (1113 & 1123)
- 4 Other Science Courses (from MATH, PHYS, CHEM, BIOL, COMP, APSC; *must have 4 for minor*)

COMMON ELECTIVES

- Atmosphere, Weather & Climate (2753)
- Contaminants in the Environment (3613)
- Energy Sources (4843)
- Quaternary Geology (4713)
- Global & North American Geology (4103)
- Mineral Deposits (4803)
- Advanced Field School (4083)
- Geochemical Material Transfer (4823)
- Mineral Exploration (4813)
- Applied Geochemistry (4833)

< blue courses taught with parallel grad course >

Course Totals

Environmental Geoscience Major

- *19 Geology Courses (20)*
- *10 Other Sciences (9)*
- *29 Science Courses Total (29)*

Need to:

Take three Geology or Environmental Science courses as a university (*free*) electives

Environmental Geoscience Honours

- *21 Geology Courses (20)*
- *10 Other Sciences (9)*
- *31 Science Courses Total (29)*

Need to:

Take one Geology or Environmental Science course as a university (*free*) elective

Note: *you can reduce (by one) the # of Geology courses you must take as free electives by ensuring that the extra (10th) science course required for your degree is relevant to geoscience, making it satisfy the Other Geoscience/ Science requirement*

P.Geo. Admission Requirements

- **During your time at Acadia:**
  - *make sure (w/Drs. O'Driscoll or Van Rooyen) you take the right courses to satisfy the appropriate knowledge requirements*
- **Then, after completing your degree:**
  - *apply for status as an MIT in the APGNS (**preferred for Acadia BSc & MSc students, including Fleming transfers**) or other provincial equivalents (**resume booster!**); apply in your graduation year & avoid the APGNS $100 application fee*
  - *get a job in the geology/geo-environmental field*
  - *be 'mentored' by a professional geoscientist and keep a log of the work & responsibilities you undertake, **including what you learned on the job***
  - *after 48 months of geoscience experience that is cumulative and progressive in responsibility and technical achievement, you can apply for full membership to the APGNS and become a **professional geoscientist***
  - *if you are a NS MIT and working in another province at that time, you should become a P.Geo. in NS first, and then transfer your membership to the professional geoscience association in that province **(MITs can't transfer their membership)***

Questions ?

- **for more information regarding the Canadian P.Geo admissions requirements, see the Geoscientists Canada website containing the CGSC recommendations:**

https://geoscientistscanada.ca/wp content/uploads/2019/02/GC-Knowledge-Requ.BKLT-.REV-.EN-.web-.final-.pdf

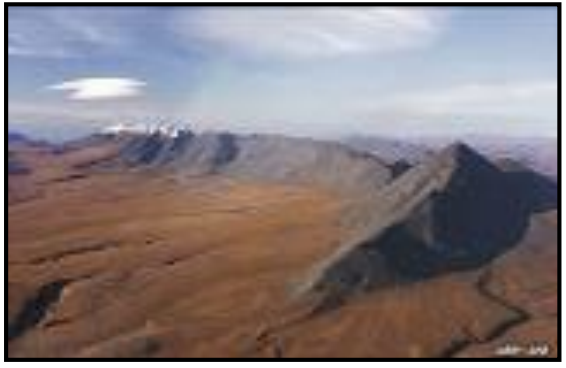
or the APGNS website containing province-specific information:

http://www.geoscientistsns.ca/

- **for more information about the Nova Scotia Geoscience Act, see the NS government website at:**

https://nslegislature.ca/sites/default/files/legc/statutes/geosprof.htm





Questions ?

- **if you have any additional questions about this presentation, please contact:**

  Dr. Cliff Stanley, P.Geo. – *NS CGSC member, member of the APGNS Admissions Board*
  - *HSH 335, 585-1344, cliff.stanley@acadiau.ca*

  Dr. Deanne VanRooyen – GEOL Advisor
  - *HSH 325, 585-1163, deanne.vanrooyen@acadiau.ca*

  Dr. Nelson O'Driscoll – ENGO Advisor
  - *KCIC LL 55, 585-1679, nelson.odriscoll@acadiau.ca*

- **if you have any questions about registration, the registration process, eligibility, *etc*. please contact:**

  Steve Olmstead – APGNS Registrar
  - *902-229-5434, registrar@geoscientistsns.ca*

Thank You !

Earth Rings (*Covenant of the Earth Ring Society*)

- if you are graduating and have followed the standard program to obtain the educational units necessary to become a GIT, either as a GEOL or ENGO major, or if you are a graduate student, you will likely be eligible to obtain an Earth Ring (*which is worn on the pinkie finger of your 'working' hand*)
- The ring ceremony takes place at the end of the winter term at Dalhousie University (***you have to attend to get a ring***), and involves a swearing-in ceremony (*originally written by Rudyard Kipling*), some speeches, and a 'business casual' dinner
- Rings are sterling silver, titanium, white gold, or yellow gold, have a matte or polished finish, come in any size, and can have an inscription on the inside of the ring
- To obtain a ring, contact: Dr. Cliff Stanley @ 902-670-0817, cliff.stanley@acadiau.ca, or see the sign-up sheet in the student lounge