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

*by: Dr. Clifford R. Stanley, P.Geo.(N.S.)*

*January 2020*

# Introduction

- what do Acadia GEOL & ENGO students do after they graduate?
  - *exploration & mining industry*
  - *exploration & petroleum industry*
  - *environmental industry*
  - *government*
  - *academia*
- if you '***practice***' as a geoscientist in these fields, the law requires you to become a 'Professional Geoscientist' (P.Geo.)
- this allows you to:
  - practice independently in the field of your expertise (*determined by the university courses you have taken and the experience you have*)
  - undertake certain 'specialized geoscience tasks'
- You must be a professional geoscientist to practice in:
  - *Nova Scotia and all other provinces and territories in Canada*
  - *~35 of the United States*
  - *other countries (UK, Australia, New Zealand, South Africa, Namibia, Ireland, Britain, European Union, et al.)*

# Professional Geoscientists in Nova Scotia

- so who needs to be a Professional Geologist?
  - ***Geologists***
  - ***Environmental Geoscientists***
  - ***Geophysicists***
  - *Geochemists (only in British Columbia; elsewhere are Geologists)*
- *Acadia offers Geology & Environmental Geoscience programs*
- *larger universities (e.g. MUN, UBC) offer Geophysics programs*
- these are the three P.Geo. entry streams recognized nationally by the **Canadian Geoscience Standards Council** (***CGSC***; a committee of representatives from each province that establish national geoscience standards)

# Specialized Geological Tasks

- you must be a P.Geo. to become a '**qualified person**' and a '**site professional**' (*terms defined in legislative acts involving petroleum and mineral exploration, and the environment*)
- this allows you to undertake a variety of tasks in:

**the petroleum and mining fields:**

  - *writing assessment reports, feasibility studies, technical stock exchange exploration & mining announcements*

**the geo-environmental field:**

  - *performing environmental monitoring & remediation activities*
  - *planning, designing and supervising environmental monitoring and remediation activities*

- being able to perform these tasks makes you more valuable to your employer or client (***providing you a higher salary***)

# Definition

- ***What is 'the Practice of Geoscience'?***

"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

***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

- the Nova Scotia Professional Geoscientist Act establishes the **Association of Professional Geoscientists of Nova Scotia** (***APGNS, Geoscientists Nova Scotia***)
- it gives the APGNS the authority to:
  - admit members (Professional Geoscientists) using guidelines established by the **Canadian Geoscience Standards Council**
  - investigate, judge and discipline members for malpractice
  - keep a public record of disciplinary actions *(unlike doctors, lawyers, etc. - which don't make their disciplinary records public)*
- other provinces have similar professional geoscience acts and associations (*our constitution says that regulation of the professions is a provincial responsibility*)
- sometimes these associations are joined with the engineers, but they all have a similar purpose and operate in a similar manner

# P.Geo. Admission Requirements

- to become a member of the ***APGNS***, you are required to satisfy five requirements
  - **achieve knowledge** (*pass the curriculum equivalent to a 4-year honours geology program*)
  - **achieve experience** (*4 years as a member-in-training; MIT*)
  - **present four references** (*must be practicing geoscientists/engineers*)
  - **adequately speak English/French**
  - **pass a professional practice/ethics exam** (*have knowledge of relevant laws in your province, and be able to recognize ethical issues; a textbook covering this curriculum is provided in advance by the* ***APGNS***)
- the first two requirements comprise the **General Knowledge and Experience Requirements** (***GKE***) defined by the CGSC
- obviously, Acadia students need to know what the ***GKE*** requirements are!

# Knowledge Requirements

*common to all streams*

***(Geologist, Environmental Geoscientist, Geophysicist)***

- **3 Compulsory Foundation Science EU's**
  - Mathematics
  - Physics (not Astronomy)
  - Chemistry
- **6 Additional Foundation Science EU's** - *1 or 2 from each subject*
  - Mathematics
  - Physics (not Astronomy)
  - Chemistry
  - Biology
  - Statistics
  - Computer Programming

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

***Note:*** *courses have lab (or equivalent) and must be 1st year university or higher AND acceptable for credit toward a degree in science, applied science or engineering*

# Knowledge Requirements

*common to all streams*

***(Geologist, Environmental Geoscientist, Geophysicist)***

- **4 Compulsory Foundation Geoscience EU's**
  - 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; these courses must be acceptable for credit toward a degree in geoscience*

# Knowledge Requirements

## *different for each stream*

## *(Geologist, Environmental Geoscientist, Geophysicist)*

- **5 Additional Foundation Geoscience EU's**

| ***GEOLOGY*** | ***ENV GEOSCIENCE*** | ***GEOPHYSICS*** |
|---|---|---|
| Geochemistry } *sub-group* | Geochemistry | Digital Signal Processing |
| Geophysics } *sub-group* | Geophysics | |
| | | Global Geophysics & Physics of the Earth |
| Igneous Petrology | Hydrology | |
| Metamorphic Petrology | Hydrogeology | |
| Sedimentary Petrology | Engineering Geology | Seismology & Seismic Methods |
| Sedimentology | Geomorphology/Soil Science | Exploration Geophysics |
| Glacial Geology/Geomorphology | Glacial Geology | |
| Remote Sensing/GIS | Remote Sensing/GIS | Potential Fields & Radiometrics |
| | | Electric & Electromagnetic Methods |

***Note:*** *Geology and Env Science require 1 or 2 EU's from each sub-group; Geophysics requires 1 EU from 5/ 6 sub-groups*

# Knowledge Requirements

## *different for each stream*

## *(Geologist, Environmental Geoscientist, Geophysicist)*

- **9 Other Geoscience/Science EU's**

  an extensive list is available at:

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

  *any GEOL or ENVS **science** course offered at Acadia, or other science courses that relate to geoscience, qualify (e.g. CHEM 2853 - Environmental Analytical Chemistry; CHEM 2103/APSC 2113 - Thermodynamics; BIOL 2033 - Ecology; APSC 3413 - Environmental Engineering)*

***Note:** these courses must be at 2nd year level or higher **and** acceptable as a science credit toward a degree in science, applied science or engineering **and must be relevant to geoscience;** the vast majority of these courses are expected to have a lab/exercise/field trip component (i.e. complementary education beyond lecture)*

***Note:** the introductory geology courses (GEOL 1013, 1023, 1033, and 1073 ) are expected to be expanded on in subsequent core courses, and so do not qualify*

# Knowledge Requirements

*common to all streams*

***(Geologist, Environmental Geoscientist, Geophysicist)***

*Geoscience Courses for GEOL or ENGO degree = 18*

*Introductory (First Year) Geoscience Courses = 2*

***(don't count toward GKE)***

**Total Geoscience Courses = 20**

**Other Science Courses = 9**

***(29 science courses in all)***

*How do these match up with Acadia*

***Geology & Environmental Geoscience***

***Major & Honours Degrees****?*

# 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)
- Structural Geology (3603)
- Sedimentary Petrology (3303)
- Igneous Petrology (3403)
- Metamorphic Petrology (3503)
- Global & North American Geology (4013)

## PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023, 2233 & 2243, or 1323, 1333, 2313)
- 4 Other Science Courses (from GEOL, MATH, PHYS, CHEM, BIOL, COMP, APSC; *including four science courses making up minor*)

## 5 ELECTIVES

Atmosphere, Weather & Climate (2753)
Hydrogeology (3723)
Energy Systems (3843)
Mineral Deposits (4803)
Env. Impact Assessment (ENVS 3423)
Advanced Field School (4083/4303)

***offered every other year***

Geochemistry (3103)
Geophysics (3823)
Quaternary Geology (4713)

***when the parallel grad course is taught***

Mineral Exploration (4813)
Applied Geochemistry (4833)
Geochemical Material Transfer (4853)

# 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)
- Structural Geology (3603)
- Sedimentary Petrology (3303)
- Igneous Petrology (3403)
- Metamorphic Petrology (3503)
- Global & North American Geology (4013)
- Honours Thesis (4996)

## PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023, 2233 & 2243, or 1323, 1333, 2313)
- 4 Other Science Courses (from GEOL, MATH, PHYS, CHEM, BIOL, COMP, APSC; *including four science courses making up minor*)

## 5 ELECTIVES

Atmosphere, Weather & Climate (2753)
Hydrogeology (3723)
Energy Systems (3843)
Mineral Deposits (4803)
Env. Impact Assessment (ENVS 3423)
Advanced Field School (4083/4303)

***offered every other year***

Geochemistry (3103)
Geophysics (3823)
Quaternary Geology (4713)

***when the parallel grad course is taught***

Mineral Exploration (4813)
Applied Geochemistry (4833)
Geochemical Material Transfer (4853)

# Totals

## Geology Major

- *17 Geology Courses*
- *10 Other Sciences*
- *27 Science Courses Total*

**Need to:**

**Take two Geology courses as university (free) electives**

**Take either Geochemistry or Geophysics as one of your Geology electives**

## Geology Honours

- *18 Geology Courses*
- *10 Other Sciences*
- *28 Science Courses Total*

**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 (10$^{th}$) science course required for your degree is relevant to geoscience, making it satisfy the GKE's Other Geoscience/Science requirement*

# Acadia Major Env. Geosci. Degree

## CORE

- Physical Geology (1013)
- Historical Geology (1023)
- Mineralogy (2133)
- Paleontology (2213)
- Petrology & Stratigraphy (2043)
- Geomorphology (2703)
- Geochemistry (3103)
- Hydrogeology (3723)
- Geophysics (3823)
- Field Methods (2080)
- Sedimentary Petrology (3303)
- Structural Geology (3603)
- Intro Environmental Science (1013 & 1023)
- Legal Issues (3113)
- Environmental Impact Assessment (3423)

## PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023, 2233 & 2243, or 1323, 1333, 2313)
- Biology (1113, 1123)
- 2 Other Science Courses (from GEOL, MATH, PHYS, CHEM, BIOL, COMP, APSC; *including four science courses making up minor*)

## 3 ELECTIVES

Atmosphere, Weather & Climate (2753)
Other Petrology (3403, 3503)
Energy Systems (3843)
Mineral Deposits (4803)
Contaminants in the Environment (4613)
Advanced Field School (4083/4303)
***offered every other year***
Quaternary Geology (4713)
***when the parallel grad course is taught***
Mineral Exploration (4813)
Applied Geochemistry (4833)
Geochemical Material Transfer (4853)

# Acadia Honours Env. Geosci. Degree

## CORE

- Physical Geology (1013)
- Historical Geology (1023)
- Mineralogy (2133)
- Paleontology (2213)
- Petrology & Stratigraphy (2043)
- Geomorphology (2703)
- Geochemistry (3103)
- Hydrogeology (3723)
- Geophysics (3823)
- Field Methods (2080)
- Sedimentary Petrology (3303)
- Structural Geology (3603)
- Intro Environmental Science (1013 & 1023)
- Legal Issues (3113)
- Environmental Impact Assessment (3423)
- Honours Thesis (4996)

## PRE-REQUISITES

- Chemistry (1013 & 1023)
- Physics (1053 & 1063)
- Math (1013 & 1023, 2233 & 2243, or 1323, 1333, 2313)
- Biology (1113, 1123)
- 2 Other Science Courses (from GEOL, MATH, PHYS, CHEM, BIOL, COMP, APSC; *including four science courses making up minor*)

## 3 ELECTIVES

Atmosphere, Weather & Climate (2753)
Other Petrology (3403, 3503)
Energy Systems (3843)
Mineral Deposits (4803)
Contaminants in the Environment (4613)
Advanced Field School (4083/4303)

***offered every other year***

Quaternary Geology (4713)

***when the parallel grad course is taught***

Mineral Exploration (4813)
Applied Geochemistry (4833)
Geochemical Material Transfer (4853)

# Totals

## Env. Geosci. Major

- *18 Geology/ENVS Courses*
- *10 Other Sciences*
- *28 Science Courses Total*

**Need to:**

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

## Env. Geosci. Honours

- *19 Geology/ENVS Courses*
- *10 Other Sciences*
- *29 Science Courses Total*

**Need to:**

**No additional steps required**

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

# P.Geo. Admission Requirements

- **During your time at Acadia:**
  - make sure you take the right courses to satisfy the appropriate knowledge requirements
- **Then, after completing your degree:**
  - get a job in geology/environmental field
  - apply for status as a Member-In-Training in the APGNS or equivalent in another province
  - be ‘mentored’ by a professional geoscientist
  - keep a log of the type of work & responsibilities you undertake
  - after 48 months of geoscience experience that is cumulative and progressive in responsibility and technical achievement, you can apply for full membership to APGNS or equivalent provincial geoscience association and become a **professional geoscientist**

# Questions ?

- For more information regarding the:
  - Canadian Professional Geoscientist admissions requirements and procedures, see the Geoscientists Canada and APGNS websites at:

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

    and:

    https://www.geoscientistsns.ca/index.php/become-a-member
  - the Nova Scotia Geoscience Act, see the government website at:

    https://nslegislature.ca/sites/default/files/legc/statutes/geosprof.htm
- If you have other questions regarding how your GEOL or ENGO degree program stacks up against the Professional Geoscientist knowledge requirements, please contact:

Dr. Cliff Stanley, P.Geo. (*NS CGSC member, APGNS Admissions Board Member*)

- *HSH 331, 585-1344, 670-0817, cliff.stanley@acadiau.ca*

Dr. Rob Raeside (*GEOL & ENGO Advisor*)

- *HSH 329.1, 585-1323, rob.raeside@acadiau.ca*