



**Geology rocks!**

**Geology** (ge- -o-

Tectonics literally *to build* Lithospheric plates are growing today at so-called mid-ocean ridges (also called spreading centers) where new volcanic magma rises to the surface from the underlying mantle and cools to add to the edge of the plate. Addition of new magma and its cooling, results in continuous movement of the plate away from the spreading centre (hence its name).

plate movement is most clearly seen in Iceland today where the mid-Atlantic Ridge is exposed on land and which separates the North American plate from the European plate which are moving in opposite directions away from the spreading centre. The North American continent is embedded in the North American plate and is moving to the west; Toronto is moving 3.7 cm every year. *In the 50 years that UTSC has been in existence it has moved almost 2 m westward from its original position.* Your home is not where it was last night and will be in a different place tomorrow.

The movement of plates leads to collisions between adjoining plates (called *orogeny*) and destruction of some plates by a process called *subduction* where one plate (usually the oldest) is driven down below the other. This is happening along the west coast of the Americas and around the margins of the Pacific Ocean and gives rise to large damaging earthquakes and volcanic eruptions. The *convergent plate margins*

The entire plate tectonic process can be likened to a conveyor belt where new crust is created at spreading centres and eventually destroyed by subduction. In this way, the Earth is neither expanding nor shrinking

The course concludes by looking at the 4 billion years long geological history of Canada and Ontario including reference to modern environmental problems facing Canadians. We will look at the complex causes and impacts of climate change, mineral exploration and mining, the impact of urban development, disposal of a wide variety of wastes, the clean-up of contaminated sites and waters, and the key role that environmental geoscientists play in our society. Some have argued that the influence of mankind on our environment is now so profound that we are now living in a different geological era referred to as the *Anthropocene*.

### **Learning outcomes**

At the end of this course, you will be able to identify and explain the environmental risks and natural disasters, the need to protect the environment and to find ever scarcer resources, especially the minerals needed for a green economy and water, and extract them in an environmentally-sustainable fashion. This knowledge is the key to protecting our complex human world from risks and natural disasters, the need to protect the environment and to find ever scarcer resources, especially the minerals needed for a green economy and water, and extract them in an environmentally-sustainable fashion. This course is a 12-month all-course professional Master of Environmental Science (M. Env.Sc) program within the Department of Physical and Environmental Sciences (DPES) and a 12-month all-course professional Master of Environmental Science (M. Env.Sc) program.

There is a shortage of suitably qualified environmental geoscientists in Canada and abroad. The profession requires well-trained individuals and offers many diverse opportunities for a career. If you are interested in a career in geoscience see the web site of the Association of Professional Geoscientists of Ontario (pgo.ca) and how to become a P.Geo.

Hopefully after this course you will want to do more courses in geoscience and environmental science. If you need advice join us online during office hours or email the instructor.

### **Other notes**

1) The course textbook is *Canada Rocks The Geologic Journey*. It frames the geological history of Canada against what is known of modern global plate tectonics. Relevant chapters for each lecture are shown on the attached weekly schedule. I don't expect you to know or be examined on every detail and term in the textbook it is designed to provide background for what we will discuss.

## Evaluation and marks

The course will be evaluated by:

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| a) <b>Mid-term exam</b> (multiple-choice):                     | 30 marks |
| b) <b>Completion of 10 online modules*</b> :                   | 40 marks |
| c) <b>Final exam</b> ( <i>non-cumulative</i> multiple-choice): | 30 marks |

\*Note that we will drop the lowest 2 module marks for everyone at the end of the course.

**Exams will be based primarily on lectures and the textbook and will be online:** if you miss them for medical reasons all relevant UTSC paperwork must be completed and submitted. *I will give you sample exam questions and specify that material I need you to revise.*

## Things to make your life easier (and ours)

1. Please check Quercus regularly for updates and commonly asked Questions and Answers. I and the TAs will be available during regularly-scheduled office hours which will be announced asap.
2. e exam marks- ever!
3. -term and final exams until we are informed of them by the Registrar

## Enjoy the course planet

Nick Eyles: December 2020

### Module topics and dates and times of availability (Eastern Standard Time)

Each module will be posted on-line on the Monday of the relevant lecture (see lecture schedule) and you will have two *weeks* to review and complete each one with *no extensions*. Note that the last four modules (7 and 8, 9 and 10) are only available for one week only. Once you have completed the module, the material will still be available thereafter for exam revision purposes *but you will no longer have access to the questions/answers*.

1. The Plate Tectonic paradigm (available January 18<sup>th</sup> at 10 am to 5 pm January 31st)
2. How Earth works (available 10 am January 25<sup>th</sup> to 5 pm February 7th)
3. Divergent plate boundaries (available 10 am February 1st to 5 pm February 14<sup>th</sup>)
4. Convergent plate boundaries (available 10 am March 1st to 5pm March 14th)
5. Earth Materials (available 10 am March 8th to 5pm March 21st)
6. Natural Resources (available 10 am March 8th to 5 pm March 21st)
7. Canadian Shield (available 10 am March 22nd to 5 pm April 4th)
8. The Paleozoic (available 10 am March 22nd to 5 pm April 4th)
9. Pleistocene glaciations (available 10 am March 29th to 5 pm April 4th):

*particular module. Submissions of screen shot documentation for multiple modules at the end of the semester will not be accepted.*