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UNIVERSITY OF TORONTO AT SCARBOROUGH

EESB15 EARTH HISTORY

FALL 2008

Instructor: Nick Eyles
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Teaching Assistants: Ms. Shannon Carto
Ms. Louise Daurio

Purpose:

This course will provide you with a systematic review of the evolution of environments on planet Earth over the last 4500 million years, and in particular, the geology and history of the North American continent and the Canadian landmass.

The latter part of the course touches on how geology (now termed geoscience by many) and Earth surface processes is fundamental to environmental investigations relating to the disposal of wastes, managing contaminants, finding adequate water supplies, safeguarding natural habitat, dealing with urban development and flood waters, energy sources, earthquakes etc. We will touch on how geophysics is used in environmental geoscience investigations.

In this regard I have included lectures on applied real world use of geosciences. Many of you will wish to pursue a career in Ontario in environmental science perhaps working as part of a team for an environmental consulting company or in a government environmental agency. At the moment there is a great demand for geoscientists in western Canada dealing with the environmental consequences of energy extraction. These are good times for geoscientists and there are more jobs than people. If you like the outdoors and want to pursue a career where there are great opportunities for travel and fieldwork, environmental geoscience could be for you.

Overview of course content:

The course content is summarized in Chapters 1, 2 and 3 of the course text. You should read these by 15th September.

Planet Earth is at least 4500 million years old (4.5 billion or abbreviated to 4.5 Ga meaning giga annum) and a direct geological record (i.e., rocks!) exists for at least the last 3.8 billion years in the form of volcanic, metamorphic and sedimentary rocks. The

oldest fossils of ancient life forms found on planet Earth (simple cyanobacteria) are thought to be 3.46 billion years old.

The changing dynamics of convection deep within the Earth's mantle and associated supercontinent assembly and breakup along with meteorite impacts, are now recognized as the major controls on development of the planet's atmosphere, oceans, biology, climate and geochemical cycles. This course reviews this long history and the methods and techniques used by geologists to identify ancient environments and the nature of the fossil record. We will trace the beginnings of plate tectonics on early Earth and the evolution of the modern continents. Mountain building events such as the Rockies and Appalachians record collisions of the North American continent with other landmasses. We shall look at the major resources (coal, oil, metals, water) in Canada and their origins.

The effects of climate change on the Canadian landmass, especially glaciations of the last few million years will be reviewed.

We will identify the major environmental challenges facing Canada and the type of geological information being collected in assessing and managing these challenges.

Assignments:

1. Weekly in class quizzes (4% each, worth 40% of total marks) are intended to keep you up to date with readings from the course text. The first test will be on 15th September immediately after the lecture. Each quiz will be based on terms and concepts from the previous week's lecture and the respective readings.

3. A Fieldtrip Report (25%: due November 10th by 5 pm); report format will be provided later.

4. Final written exam (35%).

Course outline

Lectures: Mondays 12-4 pm in SW221.

I will lecture for about 2 hours and the remaining time is for discussion and quizzes.

Weekly schedule and readings

Week 1: 8 September

Lecture: Course overview; expectations and objectives:
Beginnings of Planet Earth, evolution of the lithosphere and plate tectonics:

Readings: Chapters 1, 2 and 3 in E and M.

Week 2: 15 September;
Lecture: Con't of lecture 1

Readings: Chapters 1, 2 and 3 in E and M.
Quiz 1

Week 3: 22 September
Lecture: Geological evolution of the Canadian Shield until 1000 million

Readings: Chapters 3 and 4 in E and M.
Quiz 2

Week 4: 29 September:
Lecture: 600 Ma to 200 Ma: Giant seas flood the Shield and the making of central and eastern Canada

Readings: Chapters 5 and 6 in E and M.
Quiz 3

Week 5: 6 October
Lecture: The making of western Canada (200-100 million years)

Readings: Chapter 8 in E and M.
Quiz 4

Week 6: 13 October: No Class THANKSGIVING

Week 7: 20 October
Lecture: Cool times: the last 55 million years. The impact of climate change: ice sheets appear in Canada and change the landscape

Readings: Chapter 9 in E and M.
Quiz 5

Fieldwork: 1 billion years in 2 days: Date to be arranged with class

This two-day field trip will give you an overview of Ontario's geology: Leave campus at 7 am. Overview of rocks of the Canadian Shield, Paleozoic limestones and reefs, Bleasdel Erratic Boulder, Holleford Meteorite Impact Crater and the Great Unconformity at Kingston, and at

Week 13: 1 December

Lecture: Shannon Carto (Ph.D student), Louise Daurio and Angie Falcon
"Caribbean volcanoes: relevance to ancient conditions on planet Earth".

Exam revision session and Quiz 10

Required course text:

Eyles, N. and Miall, A.D., 2007. *Canada Rocks: The Geologic Journey*. Fitzhenry and Whiteside, Markham. 512 pp.

Marking Scheme

Ten weekly quizzes (4 marks each)	40
Field Trip Report	25
Final Exam	35
	<u>100</u>

Note: Late work will be docked 10% a day in the absence of a doctor's note. In case of a missed Quiz with a doctor's note, no reset test will be given instead an average of your quiz marks to that point will be given. *No doctor's note, no mark.*

If you are having problems with any work let us know ahead of upcoming deadlines and we can usually sort something out.

Office Hours

Monday 11-1 pm Room S-567

TA office hours to be determined

Note: *Plagiarism will not be tolerated. Plagiarized reports (e.g., down loads from the web, using someone else's work etc) will be graded zero and handed to the Chair and Dean for assigning an academic penalty.*

Nick Eyles
Shannon Carto
Louise Daurio

Marmora Iron Mine. We will also visit the Oak Ridges Moraine and other glacial landforms staying overnight in Niagara Falls.

We will return to campus by 5.30 pm the next day.

Transport will be by bus with a small charge for transportation. We will arrange accommodation in Niagara Falls based on multiple occupancy.

The trip will be the subject of a Field Trip Report due November 18th. I will give you the format (and length of the report) later.

Week 8: 27 October:

Lecture: **Rocky resources and mining in Canada**

Readings: Chapter 10 in E and M.
Quiz 6

3 November

Lecture: **Environmental challenges for the future: climate, weather, waste, water and the role of geoscientists**

Readings: Chapters 11 and 12 in E and M
Quiz 7

Week 10: 10 November

Lecture: **Environmental challenges of the past: geology and its effects on civilization: ancient Egypt**

Readings: *To be placed online*
Quiz 8

Week 11: 17 November: No class (preparation time for Field Trip Report)
Field Trip Report due by 5 pm 18th November in drop box outside S-221

Week 12: 24 November

Lecture **Lisa Tutty (Ph.D student): "Geology and fish habitat in the Great Lakes"**

Readings *To be placed online*
Quiz 9