

Earth Sciences 2260A, Stratigraphy and Sedimentology: From Beds to Basins

Instructor: Dr. A. G. Plint. Rm 1072, B&G building, gplint@uwo.ca

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Assistants: Beth Hooper & Omar Al-Mufti.

Lectures: Two lecture hours/ week; Tuesday & Thursday, 11:30-12:30 am P&AB 117

Labs: Three laboratory hours per week; Monday 2:30-5:30 pm, B&G Rm. 1065.

Corequisite: ES 2200A/B

“Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.”

Syllabus and Outline:

The aim in this course is to show how Historical Geology, based on stratigraphy, lies at the very core of Geology as a science. Remember that, without the element of **TIME**, Geology is nothing more than chemistry, physics and biology! It is essential to appreciate the enormity of geological time, and to understand the different methods that are available to determine both the *relative* ages of rocks, and also their *absolute* age.

The course has three distinct parts. First we will look briefly at the origins, composition, transport and deposition of sedimentary rocks because it is necessary to know what the building blocks look like before we start to build stratigraphic successions.

The second part (and this will be only a brief review) will examine how and why sedimentary basins form in the first place. Sedimentary basins will be considered in terms of plate tectonic mechanisms and plate settings.

The third part will involve a brief historical review of the evolution of the concept of Geological Time and the gradual rejection of the biblical timescale during the early 1800's. We will examine various ways of dividing up packages of sedimentary rocks into manageable pieces, and consider methods that are available to correlate rock successions from local to intercontinental scales.

In the labs, we will look at some of the main types of sedimentary rock, both in hand specimen and thin section. In lab, we will look at various stratigraphic problems. Much of the emphasis will be on using ‘real world’ industry data (well logs, seismic) that any practicing petroleum geologist would use.

Approximate Class Schedule

Lecture	Main Topics	Lab Exercises
1	Sept 4. Introduction, Origin of clastic grains, weathering.	West Alberta - Rock I.D.
2	Terminology used to describe clastic sediments; fabric, texture, composition	
3	Origin of carbonate sediment grains, bioclastic & inorganic.	West Alberta - Facies Concepts
4	Origin of Chemical Sediments, evaporites, ironstones, organic sediments	
5	Characteristics of fluids, Fluid flow, turbulence, flow structure, Reynolds number, Froude number.	West Alberta - Correlation Principles & Environmental Synthesis
6	Transport of loose granular sediment, Hjulstrom diagram, bedform phase diagram, bedforms produced by unidirectional currents	
7	Bedforms produced by oscillatory currents	Intro to Seismic Stratigraphy
8	Sediment gravity flows, slides, slumps, debris flows	
9	Sediment gravity flows, turbidity currents & associated structures.	North Sea Basin Seismic Exercise
10	Review of Earth's plate structure & plate motion; basin types;	
11	Rift basins.	Divergent margin seismic exercise
12	Divergent margin basins & ocean basins	
13	Convergent margin basins, back-arc & forearc basins, foreland basins	North Italy - Po Basin Seismic Exercise
	Mid Term Exam, 22nd Oct., 1 hour	
14	Strike slip basins, epeiric basins, intracratonic basins	Lab Exam # 1; 26th October
15	Practical Stratigraphy - methods available to modern stratigraphers; outcrop, core, cuttings, wireline logs, FML, 2-D and 3-D seismic.	
16	Historical Geology; Evolution of idea from Herodotus to Werner	Exploration Game - Intro to Principles of Well Log Correlation.
17	Evolution of ideas; Hutton to Lyell	
18	Evolution of ideas; Darwin to the Deep-Sea Drilling Project	Exploration Game - Intro to Isopach Mapping & Drilling Strategy
19	Stratigraphy; Lithostratigraphy and terminology	
20	Allostratigraphy & Sequence Stratigraphy	Exploration Game - Developing Predictive Exploration Models & Economic Considerations.
21	Biostratigraphy	
22	Biostratigraphy	Revision & Review of Lab Exercises
23	Magnetostratigraphy	
24	Chronostratigraphy	Lab Exam # 2; 7th December
25	Cyclostratigraphy	

Course Materials:

Text: Gary Nichols: *Sedimentology and Stratigraphy*. (2nd Edition), Wiley-Blackwell. (This text, which is strongly recommended, is also useful for 3314B). New and second-hand copies are commonly available on Amazon – commonly cheaper than the UWO bookstore.

Evaluation

20% MidTerm Test (1 hour, Short answers)

30% based on **TWO** lab exams (3 hours each)

50% Final Exam (Short Answer and Short Essay Style, 2 hours)

No electronic devices are permitted during any examination or test.

Laboratories. I do not give ‘brownie points’ for attending lab sessions. I make the assumption that you are sufficiently mature to realize that attendance is an integral, and critical part of the course. Many key ideas and skills will be discussed and developed in the lab, and hence *attendance is strongly recommended*. Two lab problems will be set and marked. Your ability to complete these marked exercises is strongly dependent on the degree of attention and participation you display in the lab sessions.

Academic Offences:

“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

Absence from Exams

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:

<http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

Accommodation due to Illness

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services.

The form can be found here:

https://studentservices.uwo.ca/secure/medical_document.pdf

Accessibility

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for

any specific question regarding an accommodation.

Support Services

Students who are in emotional or mental distress should refer to mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help.

Registrarial Services are available at: <http://www.registrar.uwo.ca/>, and Student Support Services are listed at <http://westernusc.ca/services/>