

GEOL 370: Stratigraphy, Spring 2004

Professor: Dr. Marie Ferland
Class Time: *Lectures:* Mon, Tues, Thurs, Fri, 10-10:50 am, Black, Rm. 134
Lab: Tuesday *OR* Thursday, 2:00-5:50 pm, Lind, Rm. 102
Office: **Rm. 300 J, Lind Hall** (*third floor; take the stairs near the pendulum*)
Phone/email: 963-2829, ferlandm@cwu.edu
Office Hours: Mon 1-2:00 pm, Tues & Thurs 11:00-11:45 am, and by appointment
Required Text: **Sedimentary Geology** (2nd ed., 2004), by D.R. Prothero and F. Schwab

Course aim and description:

This class will examine topics such as the origin of sedimentary rocks, physical processes of sedimentation, the classification and description of major fossil groups, fundamental stratigraphic principles, and stratigraphic sequences for terrestrial and marine depositional environments. The class will involve identification, in hand samples and in the field, of sedimentary rocks, fossils, and stratigraphic and sedimentary features. The course also seeks to provide opportunities for students to improve their communication skills.

Intended Outcomes of Geology 370

Students should be able to:

- Explain and apply the basic stratigraphic principles of Steno, Smith, Hutton, and Walther.
- Describe, identify, classify and name common sedimentary rocks from hand samples.
- Describe and identify common fossils and trace fossils from hand samples and in the field.
- Measure and plot grain size, and interpret some standard graphs that show size distributions.
- Determine and graphically represent the composition of sedimentary rocks using common methods.
- List three important questions to ask yourself as you approach an outcrop of sedimentary rocks.
- Name affiliations of common sedimentary rock types with their depositional processes and setting.
- Explain Reynolds and Froude numbers, Stoke's Law, and Hjølstrom's diagram, and how each relates to natural processes.
- Describe the relationships between flow regimes, grain size and resultant sedimentary structures.
- Identify and describe common sedimentary structures and understand their processes of formation.
- Identify and describe the relationships between modern sediments and the sedimentary rocks that would result if those sediments were preserved.
- Systematically describe and measure a stratigraphic sequence.
- Construct a complex, neat stratigraphic section, following standard forms and conventions.
- Learn basic stereonet and polar plotting techniques and how they apply to sedimentary rocks.
- Describe the connection between a lithology, a lithofacies and a depositional environment.
- Apply Walther's Law to standard stratigraphic sections.
- Describe the active processes and deposits of common terrestrial and marine sedimentary environments.
- Explain geologic events revealed by layered rocks.
- Appropriately use rock vs. time descriptors.
- Describe primary agents and relevant physical processes that control deposition of clastic and chemical sedimentary rocks.
- Know and apply the North American stratigraphic code to classification of stratigraphic units.
- Describe and apply the basic principles of stratigraphic correlation, biostratigraphy and chronostratigraphy.

Student responsibilities:

Attendance is expected for all lectures. You are responsible for the material presented in lecture and in

your texts, as well as other assigned reading. If you miss a lecture, it is your responsibility to get the notes. I encourage you to ask questions and to participate in class as we discuss many complex issues that do not have simple answers. Thoughtful questions and comments will certainly enhance your learning experience.

NOTES:

- Students requiring special accommodation (DSS, SSS, etc) should arrange to meet with me so that we may make arrangements well in advance of when their accommodation is required.
- If something happens to you during the quarter that falls under the heading of 'extenuating circumstances' that prevents you, or is likely to prevent you, from completing a requirement for the course, contact me ASAP and inform me of the situation. This is YOUR responsibility.

Some tips for a successful quarter (you've heard this before....):

- (1) Attend class - there is a strong correlation between attendance and performance and, for this class, reading the text will NOT substitute for attending classes.
- (2) Read assigned materials before class, ask questions, and participate in class. Students who actively participate and engage in classroom discussions tend to perform well on tests.
- (3) Take complete notes, including what is presented on the board, on slides and on overheads. Include sketches and graphs - visual aids will enhance your understanding and exams will include figures.
- (4) Connect what you learn from class to your life and current events so that you understand the material.
- (5) If you do not understand a concept discussed in class, ASK QUESTIONS. If I move too quickly, ask me to repeat the information.
- (6) Study effectively for tests. Reread chapters, focusing on important diagrams and topics covered in class, and review your lecture notes. Group study helps to reveal strengths and weaknesses in your understanding of the material.

Components of the Course:

- **Exams;** There will be one Midterm and one Final Exam. **NOTE: No make-ups.**
- **Assignments:** A number of assignments will be given out throughout the quarter. **Assignments are due at the beginning of the class on the day assigned (otherwise it is late).** Due dates will be announced in lecture in advance. Assignments that involve writing will be assessed for format, content, correctness of grammar, and style.
- **Laboratory Exercises:** Plan to spend ALL of the allotted lab time in the lab so that you can complete the required exercise. Laboratory materials may not be available at other times. Many of the labs require a lot of thinking as well as some repetitive, time-consuming work. Please do not wait until the day before the labs are due to begin working on them as your grade will suffer. **Lab exercises are due at the beginning of the following week unless otherwise stated. NOTE: See statement below under academic honesty.**

- **Required Field Trip, Thursday afternoon through Sunday, May 6-9, 2004 to the WA/OR coast.** The field trip will involve camping (you supply tent and field clothing) and extra fees. As shown below, the field trip report constitutes 15% of your grade for this class. Your field trip report will be assessed for format, content, correctness of grammar, and style.

Distribution of Assessment

<i>Assignments and class/field trip participation:</i>	10%
<i>Labs:</i>	30%
<i>Field Trip Report (incorporates 2 labs)</i>	15%
<i>Midterm:</i>	15%
<i>Final Exam:</i>	30%

*The final exam will be two hours long. Approximately half of the questions on the final will relate to material covered since the Midterm; the remainder will relate to material covered during the entire quarter. Letter grades will be assigned on the following scale. There may be a "curve" for the Midterm, but it will be best not to count on a change from the scale shown below!

**** NOTE: No make-up exams or extra-credit assignments will be given.**

<i>Grade Percent</i>	<i>Grade Percent</i>
A 100-93	C 76-73
A- 92-90	C- 72-70
B+ 89-87	D+ 69-67
B 86-83	D 66-63
B- 82-80	D- 62-60
C+ 79-77	F Below 60

Academic Honesty: Students are expected to be academically honest. Academic dishonesty is defined in the *Proscribed Conduct* section of the *Student Judicial Code* in the back of your academic catalog. Plagiarism is defined in this section as "the appropriation of any other person's work and the unacknowledged incorporation of that work in one's own work offered for credit" (p. 244, of the CWU Undergraduate/ Graduate Catalog, 2000-01). Plagiarism may range from an entire paper to a phrase within a sentence. When you are paraphrasing an idea that is not your own and is not common knowledge, you need to cite the source. Copying the work of other students on tests, exercises, or extra credit is also considered academically dishonest. Academic dishonesty in any form will result in a failing grade. ***For this class, you may discuss your lab exercises, data analysis and interpretations with other students. However, your final product should be your own individual and creative work. If one student copies the work of another student, both students will receive a failing grade.***

Class Schedule (any changes will be announced in class)

NOTES: * April 5th is the last day to change your schedule -without penalty and May 14 is the deadline for "Uncontested Withdrawal".

Reading

Week 1:	March 30- April 2, 2004: Principles of Stratigraphy	
Tuesday:	Introduction: Why study Stratigraphy and Sedimentology? Stratigraphic	
Thursday:	Principles: Steno, Smith, Hutton, Walther +	Ch. 15
Friday:	Unconformities, correlation, and time units vs. rock units	Ch. 15
LAB:	<i>Introduction to the labs and the field trip (1 hour)</i>	
Week 2:	April 5-9, 2004: Sedimentary Particles and Rocks	
Monday:	Sedimentary particles: Size, shape, texture, composition Provenance,	Ch. 1
Tuesday:	weathering and the formation of Clastic Rocks	Ch. 2
Thursday:	Clastic Rocks: Overview and abundance	Ch. 1
Friday:	Carbonate Rocks: Clastic and Chemical (overview, abundance)	Ch. 2, 11
LAB:	<i>Re-Introduction to Sedimentary Rocks</i>	
Week 3:	April 12-16, 2004: Transport, Sedimentation and Sedimentary Structures	
Monday:	Fluid flows, and sediment entrainment, transport and deposition	Ch. 3
Tuesday:	Types of sediment gravity flows and their deposits	Ch. 3
Thursday:	Physical sedimentary structures	Ch. 4
Friday:	Biogenic structures and trace fossils	Ch. 4
LAB:	<i>More Sedimentary Rocks</i>	
Week 4:	April 19-23, 2004: Siliciclastic Sediments and Environments	
Monday:	Sandstones and conglomerates	Ch. 5
Tuesday:	Sandstones (continued) and measuring grain size	Ch. 5
Thursday:	Mudrocks	Ch. 6
Friday:	Mudrocks (cont'd) and Diagenesis	Ch. 6,7
LAB:	<i>Fossils I. Paleozoic and Other Major Fossil Groups</i>	
Week 5:	April 26-30, 2004: Terrestrial Depositional Environments	
Monday:	Alluvial fans	Ch. 8
Tuesday:	Fluvial systems	Ch. 8
Thursday:	Lakes, evaporites and eolian systems	Ch. 8,14
Friday:	Midterm Exam (material covered through/including April 27)	
LAB:	<i>Fossils II. Molluscs and Principles of Paleoecology</i>	
Week 6:	May 3-7, 2004: Coastal and Marine Depositional Environments	
Monday:	Deltaic environments	Ch. 9
Tuesday:	Coastal environments	Ch. 9
Thursday:	Continental shelf environments	Ch. 10
Friday:	Field trip!	
LAB:	<i>Field trip preparation (required) + Review Ch. 9 before the field trip</i>	
May 6-9:	<i>REQUIRED field trip to WA/OR coast.</i>	

Week 7: May 10-14, 2004: Marine Environments and Carbonate Rocks
 Monday: Continental slopes, submarine fans and turbidites **Ch. 10**
 Tuesday: Pelagic environments and associated sedimentary rocks **Ch. 10,13**
 Thursday: Introduction to Carbonate Rocks **Ch. 11**
 Friday: Carbonate Rocks (continued) **Ch. 11**
LAB: *Willapa Bay Sediment Transport and Grain Size Analysis*

Week 8: May 17-21, 2004: Carbonate Environments and the Stratigraphic Code
 Monday: Carbonate Environments: Modern **Ch. 12**
 Tuesday: Carbonate Environments: Ancient **Ch. 12**
 Thursday: *SOURCE 2004: No Class (Attend SOURCE and complete assignment)*
 Friday: The Stratigraphic Code and measuring Stratigraphic sections **Ch. 15**
LAB: *Willapa Bay Sediment Transport and Grain Size Analysis*

Week 9: May 24-28, 2004: Methods and Principles of Stratigraphic Correlation
 Monday: Biostratigraphy (Appendix A) + *Field Trip Report Due!* **Ch. 16**
 Tuesday: Biostratigraphy (continued) and Stratigraphic correlation **Ch. 16,17**
 Thursday: Geochronology and Chronostratigraphy **Ch. 18**
 Friday: Basin Analysis, tectonics and sedimentation **Ch. 19**
LAB: *Field Exercise: Measuring and Describing a Stratigraphic Section*

Week 10: May 31- June 4, 2004: Stratigraphic Correlation (continued)
 Monday: (5/31, Memorial Day holiday)
 Tuesday: More on Stratigraphic correlations and Introduction to Fence Diagrams **Ch. 15**
 Thursday: Concluding comments on Stratigraphic correlation **Ch. 16-19**
 Friday: Review for Final Exam
LAB: *Stratigraphic Correlation and Fence Diagrams*

Exam Week: June 8-11, 2004

FINAL EXAM: Tuesday, June 8, 2004 (12:00 - 2:00 pm) - mark this date now!

The final exam will be cumulative and include questions about material from lectures, homework, assignments, labs, and the field trips.