

**GEOS 322 -- STRATIGRAPHY and SEDIMENTATION (4 credits) -- Fall 2007**

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**Lecture:** TR 2:00-3:30, REIC 233

**Labs:** W 2:15 - 5:25 PM, REIC 229

**Office hours:** TR 4:00 - 5:00 PM, or by appointment.

**Text:** Nichols, G., 1999, Sedimentology & Stratigraphy, Blackwell Science, 355 p.

**Course Prerequisites:** GEOS 101 or GE 261, GEOS 112

**Course Description and Objectives:**

Stratigraphic successions provide the most comprehensive record of Earth history available. Stratigraphers and sedimentologists must apply their knowledge of how sedimentary successions are deposited and preserved to interpret the geologic history recorded in the rocks. This course is designed to give you an introduction to the methods used to interpret Earth history through examination of the stratigraphic record. An actualistic approach will be employed, meaning that modern processes and depositional environments will serve as guides to interpreting ancient sedimentary deposits. You must, however, proceed with the understanding that not all sedimentary processes or environments that existed in the past are well represented in the present. Interpretation of Earth history depends on a well-developed background in a variety of stratigraphic methods which you will become acquainted with during this course.

The semester will be divided up into three general segments briefly outlined below. A more detailed semester outline follows on the next page. The first part of the course will deal with the basic aspects of sedimentation and the formation of sedimentary rocks. This will provide the framework to interpret the processes of sedimentation responsible for forming different types of sedimentary rocks. The second part will look at the dominant types of environments where sediments are deposited to furnish the actualistic background to interpret ancient environments. The third part will entail synthesizing sedimentologic and stratigraphic data to permit interpretations of Earth history.

**Part I - Making Rocks**

Getting To Know Sediment

Transporting and Depositing Sediment

Sedimentary Rocks

**Part II - Making History, Shifting Environments and Stratigraphic Successions**

Terrestrial Environments

Shallow Marine Environments

Deep Marine Environments

**Part III - Interpreting History**

Converting Sediments to Rocks

Stratigraphy and Correlation

Stratigraphic Methods (Litho-, Bio-, Magneto-, Chemo-, Subsurface stratigraphy)

Basin Analysis

<b>Date</b>	<b>Topic</b>	<b>Quiz/Exam</b>	<b>Reading</b>
R Sept. 6	Introduction: Stratigraphy, Sedimentology, Facies, and Geologic Time		Ch. 1
	<b>Part I - Making Rocks</b>		
T Sept. 11	Sedimentary Grains, Shape, and Fabric (guest lecture)		Ch. 2
R Sept. 13	Siliciclastic Sediments and Rocks (guest lecture)		Ch. 2
T Sept. 18	Transport of Sediment (guest lecture)		Ch. 4
R Sept. 20	Sedimentary Structures		Ch. 4
T Sept. 25	Carbonate Sediments and Rocks		Ch. 3
R Sept. 27	Other Sedimentary Rocks	Quiz 1	Ch. 3
	<b>Part II - Making History</b>		
T Oct. 2	Introduction to Continental Environments		Ch. 5 & 6
R Oct. 4	Fluvial Environments and Paleosols		Ch. 6 & 9
S Oct. 6	Field Trip – Usibelli Group Healy		
T Oct. 9	Fluvial and Glacial Environments		Ch. 7 & 9
R Oct. 11	<b>Exam 1</b>	Exam 1	
T Oct. 16	Introduction to Marine Environments		Ch. 11
R Oct. 18	Marginal Marine Environments – Deltas, Estuaries, Coastlines		Ch. 12 & 13
T Oct. 23	Shallow Siliciclastic Marine Environments		Ch. 13 & 14
R Oct. 25	Reefs and Carbonate Platforms		Ch. 14
T Oct. 30	Slide Show: Episodic Sedimentation		Ch. 15
R. Nov. 1	Deep Ocean Environments	Quiz 2	
	<b>Part III - Interpreting History</b>		
T Nov. 6	From Sediments to Rocks		Ch. 17
R Nov. 8	Lithostratigraphy and Correlation		Ch. 18
T Nov. 13	Biostratigraphy and Correlation		Ch. 19
R Nov. 15	Geochronology		Ch. 20
T Nov. 20	<b>Exam 2</b>	Exam 2	
R Nov. 22	Thanksgiving Break		
T Nov. 27	Subsurface Stratigraphy: Well Logs and Seismic Stratigraphy		Ch. 22
R Nov. 29	Seismic and Sequence Stratigraphy		Ch. 22 & 21
T Dec. 4	Sequence Stratigraphy		Ch. 21
R Dec. 6	Chemostratigraphy		Ch. 20
T Dec. 11	Magnetostratigraphy		Ch. 20
R Dec. 13	Earth Through Geologic Time		Ch. 23 & 24
R Dec. 20	Final Exam 1:00-3:00pm	Exam 3	

**Support Services:** Libraries, Alaska Division of Geological and Geophysical Surveys, U.S. Geological Survey, graduate students, various websites.

## Lab Schedule

Sept. 12	Sediments – Grain Size and Textures
Sept. 19	Sedimentary Rocks
Sept. 26	Primary Sedimentary Structures
Oct. 3	Fluvial Field Trip
Oct. 10	No Lab
Oct. 17	Introduction to Sedimentary Petrography
Oct. 24	Biogenic Sedimentary Structures
Oct. 31	Siliciclastic Facies Analysis
Nov. 7	Carbonate Facies Analysis
Nov. 14	Sedimentary Petrography and Diagenesis
Nov. 21	Lithostratigraphy and Correlation
Nov. 28	Subsurface Strat: Well Logs
Dec. 5	Subsurface Strat: Seismic Stratigraphy
Dec. 12	Sequence Stratigraphy

### Course Grading Break Down

Quizzes and Homework - 25%

Class Participation - 5%

Exams - 40%

(Midterms - 25%, Final - 15%)

Lab 30%

### Course Goals and Student Learning Outcomes

In this course you will be required to learn to identify sedimentary rocks and structures and develop interpretations of changing sedimentary environments from vertical successions of sedimentary rocks. You will also develop expertise using several different types of stratigraphic data and analyses.

**Required Supplies:** Hand lens, colored pencils, ruler, protractor

### Instructional Methods, Evaluation, and Course Policy

This course will be a mixture of traditional lectures and active learning including classroom discussions and lab exercises. Quizzes and exams will be based on lectures, lab exercises, and assigned readings. Lectures and readings are meant to compliment one another. Material covered in lecture will not always be covered in the readings (and visa versa). Therefore, lecture attendance and keeping up with assigned readings is vital (if you do happen to miss a lecture be sure to review the PowerPoint presentation and get a copy of the lecture notes from a fellow student). Class attendance is highly recommended. Grading will be based on quizzes, exams, homework assignments, labs and participation in class discussions. Scores will be tabulated and grades determined on a curve according to the breakdown above. Make-ups for missed labs, exams, or quizzes will be permitted only with a valid excuse. Lab exercises and homework must be turned in one week after the lab exercise or homework was assigned. Two percent of the total score will be deducted per day for late lab or homework assignments. You are encouraged to work together on homework and during lab sessions but you must submit your own work for evaluation. All exams and quizzes will be closed book and must be completed on you own. Students are required to adhere to the UAF Student Code of Conduct.