

Instructor: Ganqing Jiang
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Office Hours: Monday 2:30 – 5:00 pm and by appointment (walk in is fine)

Recommended Textbooks:

1. Tucker, M.E., and Wright, V.P., 1990, Carbonate Sedimentology: Blackwell Scientific Publications, 482p., ISBN: 0-632-01472-5
 2. Scholle, P.A., Bebout, D.G., and Moore, C.H., 1983, Carbonate Depositional Environments (4th edition): American Association of Petroleum Geologists Memoir 33, 708p. (You can purchase from AAPG or Embay or Amzon.com)
 3. Read papers in Journals: *Journal of Sedimentary Research*, *Sedimentology*, *GSA Bulletin*
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Description:

Carbonate sediments are extraordinarily complex. They reflect not only the physical conditions of deposition, but also the chemical and biological parameters. One of the most exciting consequences of this complexity is that carbonate distribution in time and space and their textural details, biological makeup, and chemistry provide a wealth of data about the evolution of Earth's surface environments.

The purpose of this course is to provide an integrated overview of the modern non-marine and marine depositional environments dominated by carbonate sediments, concepts of carbon cycles and their controlling factors, chemical dynamics of carbonate precipitation and carbonate diagenesis, and the stable isotopes of carbonate rocks as tools for interpreting the climate/environmental changes in Earth history. To reach these goals, the course will use two primary resources: (1) a wide range of readings taken from various books and journal articles for understanding the major concepts, key papers and useful case studies, and (2) field projects providing hands-on experiences for identifying the carbonate facies, cycles, and their environmental interpretations.

Class Format

Lectures – More than half of the classes will be spent in lectures, but some discussions will go through the semester. For discussion sections, the major topics will be overviewed in the beginning of the class, followed by discussion led by a student assigned for a specific topic;

Discussions – No requirement for a textbook, although for those who are interested in, a recommended list is provided. Instead, reading assignments will be provided. All the students should read the papers for discussion, and the leading student should prepare a presentation. Reading assignments will be provided in the class website;

Short papers – Short (< 4 double spaced pages) papers will be due the week following discussion sections. The goal is for each student to provide a concise and thoughtful summary of the discussion topic. Papers should include a statement of the assigned topic, its geologic relevance, and a short discussion of the specific issues;

Field projects – Field trips may use the lecture time or most likely use the weekends. We will have two projects: The first project will focus on the identification of cycles and exposure surfaces in Arrow Canyon, and the other project will be the Cambrian units in Egan Range and in Hot Creek Range, central Nevada. The first project will involve two or three field trips to Arrow Canyon, and the second field trip will be a weekend field trip to Ely and Hot Creek Range. For each project, you will need to turn in a field report including the cycles and facies, collecting samples and taking pictures. You can measure the sections together, but you have to write the project report independently.

Grading

20%	Discussions, presentations, and summaries for discussion topics
20%	Midterm Exam
30%	Field Project 1
30%	Field Project 2

Class Schedule: The following schedule is tentative. We will need one Saturday and one (or two) weekend for field trips (will discuss in the first class), and adjustments to the schedule may be made in accordance with the rate of progress in the classroom.

Date	Lecture Topic	Short papers and Field trips
(M) Jan. 12	Introduction and discussion on syllabus	
(W) Jan. 14	Review of the siliciclastic depositional systems – Alluvial –Fluvial -Delta	
(M) Jan. 19	<i>Martin Luther King Day, No class</i>	
(W) Jan. 21	Review of the siliciclastic depositional systems – Marine systems	
(M) Jan. 26	Carbonate particles, secretion mechanisms and carbonate classification	
(W) Jan. 28	Carbonate depositional systems: An overview	
(M) Feb. 2	Carbonate depositional systems: Peritidal carbonates and cycles	
(W) Feb. 4	DISCUSSION: Carbonate cycles	<i>Summary due Feb. 9</i>
(M) Feb. 9	Carbonate Depositional System: (Ramp and Rimmed shelf)	
(W) Feb. 11	Carbonate Depositional System: Reefs, Mounds, and Carbonate Slopes	
(M) Feb. 16	<i>Washington's Birthday Recess No class</i>	
(W) Feb. 18	DISCUSSION: Keep up, catch up, give up and the drowning of carbonate platforms	<i>Summary due Feb. 23</i>
(M) Feb. 23	Marine carbonate diagenesis	
(W) Feb. 25	Subaerial exposure and meteoric diagenesis	
(F) Feb. 27	<i>Field trip to Arrow Canyon</i>	
(M) Mar. 2	Midterm exam review	
(W) Mar. 4	Midterm exam	
(M) Mar. 9	Carbonate mineralogy and chemistry	
(W) Mar. 11	Geochemical signal of carbonate diagenesis	
(M) Mar. 16	DISCUSSION: Interpreting carbonate chemistry	<i>Summary due March 23</i>
(W) Mar. 18	Project description and discussion	
(Saturday) Mar. 21	<i>Field trip to Arrow Canyon</i>	
(M) Mar. 23	The dolomite problem	
(W) Mar. 25	Establishing a diagenetic sequence of carbonates	
(M) Mar. 30	DISCUSSION: Diagenetic sequence of carbonates	
(W) Apr. 1	Unusual carbonates (Methane seeps and MISS structures)	<i>Summary due Apr. 15</i>
Apr. 6 – Apr. 11, Spring Break, No class		
(M) Apr. 13	No class, draw stratigraphic columns	
(W) Apr. 15	Soil carbonates	
(M) Apr. 20	Carbonate and climate changes: aragonite vs. calcite seas	
(W) Apr. 22	Project discussion: Paleozoic carbonates in western US	
(F-S) Apr. 24 – Apr. 26	<i>Weekend Field trip to Ely and Hot Creek</i>	
(M) Apr. 27	<i>No class, prepare the field project</i>	
(W) Apr. 29	Field project discussion	
(M) May 2	<i>No class, work for final project: Instructor will be available for answering questions</i>	
(W) May 6	Term paper due, end of class	