Earth 333 Sedimentology
Lab 5
An Introduction to Carbonate Petrography

In today's lab you will learn to identify various modern carbonate particles as well as ancient carbonate components in thin section based on morphology and internal microstructure. You will also learn to differentiate between calcite and dolomite from stained thin sections.

- Don't forget labels and a **scale** on your sketches.

PART A: Carbonate particles

Question 1
Ten different carbonate particles are supplied in separate plastic bags. **DO NOT REMOVE THE PARTICLES FROM THEIR BAG!!** Sketch a loose sample view and diagnostic characteristics of each in the chart at the back of the lab. Don't forget to include a scale. This chart will be an excellent study guide so do a good job! Make sure you use the poster in the lab to help identify the carbonate particles.

PART B: Carbonate Petrography

Question 2
Sketch a thin section view and diagnostic characteristics of each of the ten carbonate particles you identified in Part A. Fill in the chart at the back of the lab using the samples in the following questions, posters in the lab, handouts, and AAPG Memoir 77. Don't forget to include a scale. This chart will be an excellent study guide so do a good job!

Part C: Thin Sections

Question 3: Marine Ooids

Ooids are small (generally sand to silt-size), spherical to oval carbonate particles, which are characterized by a nucleus surrounded by laminae or a cortex. They can be concentric or radial in structure.

Thin Section TS-599 and take a quick look at the sample under the microscope.

a) From examining the thin section, sketch a superficial ooid and an ooid with a thick cortex. Label and include scales.
b) What kinds of particles make up the nuclei of the ooids? Find two different types of particles.

Question 4: Thin Section TS-432

a) Sketch a cross-section of a crinoid.
b) Sketch a foraminifera (look carefully).
c) What is the cement in this sample and characteristic properties?

Question 5: Thin Section HOL

a) Identify and sketch two microstructures found on this slide. Label and include scale.
b) Name this fragment.

Question 6: Thin Section RC-2

Note that many of the shell fragments have dark, diffuse margins from which numerous curved and straight filaments descend into the grain. These are microborings created by various algae (curved) and fungi (straight). The subsequent filling of the microborings by carbonate mud are referred to as "micritization". As you can deduce, the ultimate result is physical weakening of the grain and eventually the obliteration of diagnostic microstructure.

a) Find an example of this on the slide and sketch. Label and include scale.
b) Taken to the extreme, how is it possible for micritized skeletal fragments to become peloids? Explain.

Question 7: Calcareous Algae

Tray specimens RC-3 Halimeda (an aragonitic, codiacean green algae) and RC-5 Goniolithon (a high Mg-calcite coralline red algae)

Both of these algae are extremely important sediment producers in modern shallow water carbonate environments

a) Describe (colour, shape, surface texture) and sketch (with scale) each of these calcareous algae as they appear in the trays.

Question 8: Thin Sections 6334 and 8720.

These thin sections contain examples of fossils commonly encountered in early and middle Palaeozoic carbonate sediments including: brachiopods, trilobites, echinoderms, molluscs, bryozoans etc… The nonskeletal components might include peloids, intraclasts, sparite, micrite and minor clastic particles.

a) Fill in the percentage chart included at the end of this lab assignment. You may not find examples of everything on the list.
b) Name each sample according to Folk's (Table 3; based on composition with some textural aspects) and Dunham's (Table 4; based on textural distinctions) limestone classification. Add a descriptive term to the Dunham classification (e.g. oolitic packstone).

Question 9: Thin Section TS-6436

a) What are the two major components on this slide?
b) What post-depositional changes do these components record?

Part D: Stained Carbonate Thin Sections

The most common stain for differentiating calcite and dolomite is Alizarin Red S. To see whether there is iron incorporated in the carbonate lattice we use a solution of potassium ferricyanide. The degree of staining by potassium ferricyanide is proportional to the amount of iron in the lattice. The two stains are mixed before they are used to stain an unknown carbonate (either calcium carbonate or dolomite).

MINERAL	NONFERROAN	FERROAN
Calcite	Pinky Brown to Red	Purple, Bluish Purple
Dolomite	No colour	Blue, Turquoise

Question 10: Thin Section 87-1-30

a) Estimate the volumetric proportion of dolomite in this slide.
b) If this slide was not stained, how would you recognize the dolomite crystals?
c) Where do you find most of the ferroan calcite in this thin section?

Question 11: Thin Section 87-53

a) What is the dominant mineral in this thin section?
b) Looking at ferroan composition, what is the dominant mineral in this thin section? What is the stain colour? Does it occur as individual grains or along intracrystaline boundaries?

Part A: Question 1 Table:

	Loose Sample Sketch & Diagnostic characteristics		**Loose Sample Sketch & Diagnostic characteristics**
Porites (coral)		**Molluscs (gastropod)**	
Coral		**Molluscs (bivalve)**	
Homatrema rubrum (coral)		**Halimeda**	
Foraminifera		**Goniolithon**	
Sea Urchin Spine		**Ooids**	

Part B Question 2 Table:

	Thin Section Sketch & Diagnostic characteristics		**Thin Section Sketch & Diagnostic characteristics**
Porites (coral)		**Molluscs (gastropod)**	
Coral		**Molluscs (bivalve)**	
Homatrema rubrum (coral)		**Halimeda**	
Foraminifera		**Goniolithon**	
Sea Urchin Spine		**Ooids**	

Question 8 Table:

Component (Carbonate or Clastic)	**6334**	**8720**
Micrite		
Sparite		
Brachiopods		
Trilobites		
Echinoderms		
Molluscs		
Bryozoans		
Ostracods		
Foraminifera		
Ooids		
Peloids		
Intraclasts		
Quartz		
Feldspar		
Opaque		
Coral		
Folk Name		
Dunham Name		