

Geol. 532 Carbonate Petrology and Depositional Systems

Spring 2008 Tentative Class Schedule

Jan. 17 Thursday

Lec: Overview of class organization

Lab: Assigning microscopes.

Jan. 22 Tuesday

Lec: Introduction to carbonate sedimentation.

Readings:

Wilson, J. L., 1975, Carbonate Facies in Geologic Time: New York, Springer-Verlag, p.1-7.

Jan. 24 Thursday

Lec: Carbonate mineralogy

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 371-407, 417-425.

Tucker, M. E. and Wright, V. P., 1990, Chapter 6- Carbonate mineralogy and chemistry: *in* Carbonate Sedimentology: London, Blackwell Scientific Publications, p. 284-294.

Milliman, J. D., 1974, Chapter 1- Carbonates and the ocean: *in* Marine Carbonates: New York, Springer-Verlag, p. 3-12.

Lab: Determination of carbonate and commonly associated minerals in thin section and hand sample. Tour of rock saw lab.

Jan. 26 Saturday

Field trip 1: Overview of research project field area. Data collection: measure stratigraphic section and collect samples as a group. Depart Breland parking lot at 8:00am, return by 5pm.

Jan. 29 Tuesday

Lec: Carbonate mineralogy-the subtidal CO₃ factory and precipitation rates.

Readings:

Burton, E. and Walter, L., 1987, Relative rates of aragonite and Mg-calcite from seawater: Temperature or carbonate-ion control?: *Geology*, V.15, p. 111-114.

Research Project: *Thin section billets due in class.*

Jan. 31 Thursday

Lec. and Lab: No class . Giles at PRF Advisory Board Meeting

Feb. 5 Tuesday

Lec: Constituents of carbonate rocks - Skeletal grains (algae types; oncolites and stromatolites)

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 1-28, 60-63.

Bathurst, R., 1976, Chapt 1- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 58-70. Chapt. 5 - Recent carbonate algal stromatolites: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 90; 217-230.

Feb. 7 Thursday

Lec: Constituents of carbonate rocks - Skeletal grains I (invertebrates-molluscs and brachiopods)

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 141-177.

Bathurst, R., 1976, Chapt 1- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 2-25.

Lab: Skeletal grains - algal, oncolites and stromatolites).

Research Project: Introduction to computer drafting of measured sections.

Feb. 12 Tuesday

Lec: Constituents of carbonate rocks - Skeletal grains (invertebrates-echinoderms and trilobites).

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p.177-205.

Bathurst, R., 1976, Chapt 1- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 50 -57: p. 73-75.

Feb. 14 Thursday

Lec: Constituents of carbonate rocks - Skeletal grains (invertebrates-corals, sponges, stromatoporoids)

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 83-121.

Bathurst, R., 1976, Chapt 1- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 25-38.

Lab: Skeletal grains I (invertebrates-molluscs, brachiopods, echinoderms and trilobites)

Research Project: *Turn in copy of computer drafted measured section.*

Feb. 19 Tuesday

Lec: Constituents of carbonate rocks - Skeletal grains (invertebrates-bryozoans, forams, worm tubes, misc.)

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 123-141,33-48, 75-80.

Bathurst, R., 1976, Chapt 1- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 39-50; 70-73.

Feb. 21 Thursday

Lec: Constituents of carbonate rocks - Non-skeletal grains (ooids and pisoids)

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 227-245.

Bathurst, R., 1976, Chapt 2- Petrography of carbonate grains and Chapt. 7- Growth of ooids, pisolites, and grapestone: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 77-84; p. 295-319.

Lab: Skeletal grains II (invertebrates-corals, sponges, stromatoporoids, forams, worm tubes, and misc.)

Feb. 26 Tuesday

Lec: Constituents of carbonate rocks - Non-skeletal grains (peloids and intraclasts)

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 245-259.

- Bathurst, R., 1976, Chapt 2- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 84-87.
- Chafetz, H. S., 1986, Marine peloids: A product of bacterially induced precipitation of calcite: *Jour. Sed. Pet.*, V. 56, (6), p. 812-817.

Feb. 28 Thursday

Lec: Constituents of carbonate rocks - Carbonate mud (matrix) and the origin(s) of mud

Readings:

- Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 265-273.
- Bathurst, R., 1976, Chapt 2- Petrography of carbonate grains and Chapt. 6- Origin of Bahamian aragonite mud: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 87-89; p. 276-291.

Lab: Skeletal grains: Non-skeletal grains (peloids, intraclasts and ooids)

March 4 Tuesday

Lec: Constituents of carbonate rocks – Cement versus replacement spar

Readings:

- Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 313-371.
- Bathurst, R., 1976, Chapt 10- Cementation: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 415-457.
- Tucker, M. E. and Wright, V. Paul, 1990, Chapter 7- Diagenetic processes, products and environments: *in* Carbonate Sedimentology: London, Blackwell Scientific Publications, p. 314-364.

March 6 Thursday

Lec: Classification of carbonate rocks - Grabau, Folk, Dunham, Embry & Klovan

Readings:

- Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 283-303.
- Tucker, M. E. and Wright, V. Paul, 1990, Chapter 1-Limestone classification: *in* Carbonate Sedimentology: London, Blackwell Scientific Publications, p. 18-22.

Lab: Matrix mud, cements, and neomorphic and replacement spar. Diagenetic environments.

March 11 Tuesday

Lec: Models of dolomitization and porosity generation.

Readings:

- Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 141-177.
- Tucker, M. E. and Wright, V. Paul, 1990, Chapter 8- Dolomites and dolomitization models: *in* Carbonate Sedimentology: London, Blackwell Scientific Publications, p. 365-400.
- Moore, C. H., 1989, Chapt. 2- The classification and nature of carbonate porosity: *in* Carbonate Diagenesis and Porosity: Amsterdam, Elsevier, p. 21-40.

March 13 Thursday

Lec: Diagenesis and paragenetic sequence.

Lab: Dolomite and porosity recognition and classification

Research Project: Carbonate rock classification of research samples.

Take home lab exam on grain types March 14- 21. Sign up for 3-hour time slot.

March 18 Tuesday *No Lecture– Giles in Mexico*

March 20 Thursday

Lec: Carbonate depositional environments- profiles (ramp, rimmed margin/platform, offshore banks)

Readings:

- Wilson, J. L., 1975, Chapt. 2- The stratigraphy of carbonate deposits; *in* Carbonate Facies in Geologic Time: New York, Springer-Verlag, p. 20- 42
- Enos, P., 1983, Chapt. 6- Shelf Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 268-295.

Lab: No new lab. Work on classification of research samples and photographing thin sections.

March 25 Tuesday *No Lecture – Spring Break*

March 27 Thursday *No Lecture or lab – Spring Break*

April 1 Tuesday

Lec: Tidal flat environment.

Readings:

- Shinn, E. A., 1983, Chapt. 4-Tidal Flat Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 172-210.

April 3 Thursday

Lab: Field trip 2 to Permian tidal flat facies assemblages and shallowing-upward cycles in the Robledos Mountains

Research Project: *Bring to the field and hand in computer drafted measured section, petrographic descriptions, photomicrographs, and classification of research project samples.*

April 8 Tuesday

Lec: Shelf environment.

Readings:

- Enos, P., 1983, Chapt. 6-Shelf Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 268-295.
- Wilson, J.L. and Jordon, C., 1983, Chapt. 7-Middle Shelf Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 298-343.

April 10 Thursday

Lec: Bank margin environment.

Readings:

- Halley, R. B., Harris, P. M., and Hine, A.C., 1983, Chapt. 9-Bank Margin Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 264-506.

Lab: Thin section analysis of facies of the Pennsylvanian phylloid algal mound complexes.

April 13 Sunday

Fieldtrip: Pennsylvanian bank margin phylloid algal mound complexes, Sacramento Mountains. Depart Breland parking lot at 8:00am and return by 5:00pm.

April 15 Tuesday

Lec: Reef environment

Readings:

James, N. P., 1983, Chapt. 8-Reef Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 346-462.

April 17 Thursday

Lec: Reef and foreereef environment

Readings:

Enos, P. and Moore, C. H., 1983, Chapt. 10- Fore-reef Slope Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 508-537.

Lab: Overview and facies of the Permian Reef Complex, Guadalupe Mtns. & karst processes. Thin section analysis of Permian Reef complex facies.

Readings: To be assigned

Research Project: Determine depositional facies of research project samples. Write facies description.

April 22 Tuesday

Lec: *No lecture; Giles at AAPG Meeting. Work on research project and lab from last week.*

April 24 Thursday

Lec: Slope, basin margin or toe-of slope, basinal environment.

Readings:

Cook, H. E. and Mullins, H. T., 1983, Chapt. 11- Basin Margin Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 540-617.

Scholle, P. A., Arthur, M. A., and Eckdale, A.A., 1983, Chapt. 12-Pelagic Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., eds., Carbonate Depositional Environments: A.A.P.G. Memoir 33, p. 620-691.

Lab: Finish thin section analysis of Permian Reef complex facies..

April 25--27 Friday - Sunday

Field trip: Permian Reef Complex, Guadalupe Mtns/ Carlsbad Caverns. Examine depositional facies of Permian Reef complex. Study diagenetic alteration of reef system at Carlsbad Caverns. Depart Breland parking lot 1:00 pm on April 25 and return late afternoon on April 27.

April 29 Tuesday

Lec: Shallowing upward cycles and large-scale cyclicity. Models of cyclicity.

Readings:

James, N. P., 1984, Shallowing-upward sequences in carbonates: *in* Walker, R. G., ed., Facies Models, Geoscience Canada Reprint Series 1, Second Ed., p. 213-244.

Read, J. F., Grotzinger, J. P., Bova, J. A., and Koerschner, W. F., III, 1986, Models for generation of carbonate cycles: *Geology*, V. 14, p. 107-110.

May 1 Thursday

Lec: Sequence stratigraphy of carbonate platforms:

Readings:

Sarg, J. F., 1988, Carbonate sequence stratigraphy: *in* Wilgus, C. K., Hastings, B. S., Kendall, C., Posamentier, H. W., Ross, C. A., and Van Wagoner, J. C., Sea-level Changes: An Integrated Approach, S.E.P.M. Spec Pub. No. 42, p. 155-181.

Lab: Determine cyclicity and facies stacking patterns of research project measured section. Enter cycle patterns on digital measured section.

May 9 Thursday

Written Project Due: In my office by 5:00pm.