

Fall 2018 Tentative Class Schedule
Geol. 5315-003/6315-004 Carbonate Petrology and Depositional Systems
Lecture: M & W 12:30 - 1:20pm Geological Sciences 320
Lab: W 1:30 - 3:20pm Geological Sciences 320A

August 27 Monday

Lec: Overview of class organization and research project; Intro. to CO₃ sedimentation.

Readings:

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

August 29 Wednesday

Lec: Carbonate mineralogy & chemistry

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S, 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 372-407, 417-425.

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

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

Lab: Assign microscopes. Review basics of microscopes. Computer-drafted measured sections & Excel data files.

Research Project: Tour of rock saw lab and demonstration of how to cut rock sample billets.

September 3 Monday – Labor Day - No classes at UTEP

September 5 Wednesday

Lec: Carbonate precipitation-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.

Lab 1: Determination of carbonate and commonly associated minerals in thin section and hand sample.

Research Project: Look through samples and identify minerals in thin sections. Add to chart.

September 10 Monday

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.

September 12 Wednesday

Lec: Constituents of carbonate rocks - Skeletal grains (invertebrates-molluscs, brachiopods, echinoderms, ostracodes 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. 141-205.

Bathurst, R., 1976, Chapt 1- Petrography of carbonate grains: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 2-25, p. 50 -57: p. 73-75.

Lab 2: Skeletal grains – cyanobacteria, algae, oncolites and stromatolites).

Research Project: Identification of algae in thin sections. Add to chart.

September 17 Monday

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

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.

September 19 Wednesday

Lab 3: Skeletal grains I (invertebrates-molluscs, brachiopods, echinoderms, ostracodes, trilobites)

Research Project: Identification of invertebrates in thin section. Add to chart.

September 24 Monday

Lec: Constituents of carbonate rocks - Skeletal grains (invertebrates-bryozoans, forams, 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.

September 26 Wednesday

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

Research Project: Continue identifying grain types. Add to chart. Read: Gianniny & Miskell-Gerhardt, 2009, RMAG Special Pub. Paradox Basin Revisited; p. 310-380. Write introduction & geologic setting for research paper.

October 1 Monday

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

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.

October 3 Wednesday

Lec: Constituents of carbonate rocks - Carbonate mud (matrix) and the origin(s) of mud and identification of 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. 265-273 and p. 313-371

Bathurst, R., 1976, Chapt 2- Petrography of carbonate grains and Chapt. 6- Origin of Bahamian aragonite mud and Chapt. 10: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 87-89; p. 276-291, p. 415-457.

Lab 5: Non-skeletal grains (ooids, peloids, & intraclasts)

Research Project: Identify non-skeletal grains. *Turn in computer-drafted measured section.*

October 8 Monday

Lec: Cement types and diagenetic setting

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 305 -309; 313-370.

Bathurst, R., 1976, Chapt 10- Cementation: *in* Carbonate Sediments and Their Diagenesis: New York, Elsevier, p. 415-435.

October 10 Wednesday

Lec: Carbonate diagenesis; Dolomite and dolomitization models.

Readings:

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.

Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 340-370; 371-392.

Tucker, M. E. and Wright, V. Paul, 1990, Chapter 8-Dolomites & dolomitization models: *in* Carbonate Sedimentology: London, Blackwell Scientific Publications, p. 365-400.

Lab 6: Matrix mud, cements, and neomorphic and replacement spar.

Research Project: Demonstration of taking photomicrographs. Identify grain types, matrix, cements & estimate percentage of each in research samples. Add to chart.

October 15 Monday

Lec: Classification of carbonate rocks - Grabau, Folk, Dunham, Embry & Klovan; Porosity types and generation.

Readings:

Scholle, P. A. and Ulmer-Scholle, D. S., 2003, A Color Guide to the Petrography of Carbonate Rocks: AAPG Memoir 77, p. 283-302.

Tucker, M. E. and Wright, V. Paul, 1990, Chapter 1-Limestone classification: *in* Carbonate Sedimentology: London, Blackwell Scientific Publications, p. 18-22.

Moore, C. H., 1989, Chapt. 2- The classification and nature of carbonate porosity: *in* Carbonate Diagenesis and Porosity: Amsterdam, Elsevier, p. 21-40.

Mazzullo, S.J. (2004) Overview of Porosity Evolution in Carbonate Reservoirs Kansas Geological Society Bulletin, v. 79, nos. 1 and 2; available on the KGS website (<http://www.kgslibrary.com/bulletins/bulletins.htm>).

October 17 Wednesday

Lab 7: Classification of CO₃ rocks, porosity and dolomite.

Research Project: Classify research samples and write description of lithofacies.

October 22 Monday *Lab Practical Exam scheduled for week of October 22*

Lec: Ancestral Rocky Mountains Basins, Glacio-eustasy, Phylloid algal mound complexes

Readings:

Kues, B. S., and Giles, K. A., 2004, The Late Paleozoic Ancestral Rocky Mountains system in New Mexico: *in* Mack, G. H. and Giles, K. A., (eds.), Geology of New Mexico, A Geologic History: New Mexico Geological Society Special Publication, p. 95-136.

Wilson, J. L., 1975, Chapt. VI- Pennsylvanian to lower Permian Shelf Margin facies in Southwestern USA; *in* Carbonate Facies in Geologic Time: New York, Springer-Verlag, p. 169-201.

October 24 Wednesday

Lec: Carbonate Caprock: Piper Poe

Readings:

Caprock classification manuscript – Please write review of this.

Lab: Caprock Fabrics: Demonstration of different types

October 29 Monday

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

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.

October 31 Wednesday

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.

Lab 8: Recognition of tidal flat facies assemblages and shallowing-upward cycles.

Research Project: *Hand-in classification of research samples, Table of sample characteristics, & lithofacies description.*

November 5 & 7 – No class GSA Annual Meeting in Indianapolis

November 12 Monday

Lec: Shelf environment.

Readings:

Enos, P., 1983, Chapt. 6-Shelf Environment: *in* Scholle, P. A., Bebout, D. G., and Moore, C. H., 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

November 14 Wednesday

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

Research Project: Depositional facies analysis of research measured section.

November 17 Saturday

Fieldtrip 1: Pennsylvanian bank margin phylloid algal mound complexes, Sacramento Mountains. Depart Geology Department parking lot at 8:00am and return by 5:00pm.

November 19 Monday

Lec: Shelf margin reef and forereef environment

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.

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

November 21 Wednesday – No class Thanksgiving break

November 26 Monday

Lec: Slope, basin margin or toe-of slope, basinal environment in the Permian Delaware Basin.

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.

November 28 Wednesday

Lec: Sequence stratigraphy of carbonate platforms & Permian Reef Complex.

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

Research Project: Write-up depositional facies descriptions and interpretation of depositional facies model for research section.

December 1 & 2 Saturday & Sunday

Field trip 2: Permian Reef Complex, Guadalupe Mtns/ Carlsbad Caverns. Examine depositional facies of Permian Reef complex. Study diagenetic alteration of reef system at Carlsbad Caverns. Depart Geology Department parking lot 7:30am, return to El Paso each day late afternoon around 5:30pm.

December 3 Monday

Lec: Lacustrine Carbonates, Brazilian and Angolan Pre-salt Lacustrine Systems

Readings:

Gierlowski-Kordesch, E. H., 2010 Lacustrine Carbonates: *In:* Alonzo-Zarza, A. M. and Tanner, L. H. (eds) Carbonates in Continental Settings. Developments in Sedimentology, v.61, p. 1-101.

December 5 Wednesday

Lec: Cool water carbonates? Heterozoan versus Photozoan biofacies associations

Readings:

James, N. P., 2010, The cool water depositional realm: *In:* James N. P. and Clarke J. (eds) Cool-Water Carbonates Edited by Noel P. James and Jonathan A. D. Clarke. v.56, p.1-20.

Mutti, M. and Hallock, P. 2003, Carbonate systems along nutrient and temperature gradients: some sedimentological and geochemical constraints: International Journal of Earth Science (Geol. Rundsch), v. 92, p. 465-475.

Lab: Lacustrine and cool-water carbonate systems

December 10 Monday

Turn in carbonate research paper to Dr. Giles's office by 1pm.
