

**Sedimentary Rocks (GEOL 321)**  
Spring 2010 syllabus

Instructor: Peter Ryan, 429 MBH, x2557, pryan@middlebury.edu  
Office Hours: M-W 11-12, Th 1:30 – 2:30, or by appointment  
Text: Prothero DR, Schwab F (2004) *Sedimentary Geology: An Introduction to Sedimentary Rocks and Stratigraphy (2e)*, Freeman.  
Lecture: M-W-F 10:10 – 11:00, MBH 417  
Lab: W 1:30 – 4:15, MBH 419

**OBJECTIVES**

“Sedimentary geology is probably the most practical and valuable course in the undergraduate geology curriculum”, or so say Prothero and Schwab (2004). In order to present the breadth of materials embodied in the field of sedimentary geology, this course is designed to cover the principles of sedimentary petrology and stratigraphy and the processes of sedimentation and diagenesis through lecture, seminar/discussion, and lab- and field-oriented exercises. We will begin with fundamental concepts and then apply this knowledge to specific topics and case studies throughout the course. Some examples of topics include chemical weathering and sediment production, classification of sedimentary rocks, the sedimentological, mineralogical and geochemical record of ancient climates, interpretation of tectonic environments from the sedimentary record, maturation of organic matter into hydrocarbons, the sedimentary and tectonic requirements for creating oil and gas reservoirs, hydrogeology of deep basinal groundwater and sedimentary diagenesis. Also, given that the sedimentary rock sequence provides a long-term record of surface processes, we will examine aspects of how the Earth’s surface has changed through time, both with respect to continental and marine environments.

In lab we will study sedimentary rocks in thin section (optical microscopy) and hand sample as well as in the field and by instrumental analysis (X-ray diffraction and inductively coupled argon plasma spectrometry). Field trips will take advantage of the excellent clastic and carbonate sedimentary rocks in the Champlain Valley.

<u>WEEK</u>	<u>LECTURE</u>	<u>LAB</u>
Feb 8-12	Intro, basic principles, weathering, sediment supply	Stratigraphic principles
Feb 15-19	Sediment transport, sed structures	Sed structures; textures, grain size and sedimentary environment
Feb 22-26	Siliciclastics: sandstones,	Clastic and carbonate petrology (optical microscopy)
Mar 1-5	Siliciclastics: mudstones, clastic diagenesis, geochemistry	Sandstone diagenesis. XRD.

Mar 8-12	Continental environments <i>Take-home exam due Fri 10AM</i>	Champl. Valley Stratigraphy I Cambrian to Beekmantown
Mar 15-19	NE GSA (no class MW)	Champl. Valley Stratigraphy II Chazy, Black River, Trenton
Mar 22-26	<i>BREAK</i>	
Mar 29-	Marine environments, Carbonates: petrology, deposition, global CO <sub>2</sub> cycles.	Carbonates in the field: the Crown Point Section (Chazy Group)
Apr 5-9	Stratigraphy <i>Term Paper 1<sup>st</sup> Draft Due (Fri 10AM)</i>	Monkton sandstone @ Salmon Hole Cambrian peritidal deposition
Apr 12-16	Stratigraphy (case studies)	Poultney River section Cambrian slope and rise deposition
Apr 19-23	Geochronology	K-bentonite, shale (field) Sed record of volcanoclastic activity
Apr 26-30	Sedimentary tectonics, regional stratigraphic records, Mars <i>Term Paper Due (Fri 10AM)</i>	K-bentonite, shale (lab; XRD, ICP)
May 3-7	Term paper presentations	Data synthesis, interpretation

Last day of finals      **Final Exam Due (4 PM)**

**ASSIGNMENTS/ASSESSMENT**

Lab.....	25%
2 Exams.....	35%
	(15%, 20%, take-home)
Term Paper and presentation.....	25%
	(10% 1 <sup>st</sup> draft, 10% 2 <sup>nd</sup> draft, 5% presentation)
Discussion, participation.....	15%

→ Part of the lecture component of the course will be “lecture”, but a significant portion will also be seminar-style. Students will present classic and cutting-edge articles on thematic topics and all students will be expected to have read the articles and contribute to meaningful discussion.