

# GEO 108 – OCEANOGRAPHY



*Digital image of "HMS Challenger Dredging the Sea Bed" painting by Michael J. Whitehand of East Yorkshire, England.  
The voyage of the HMS Challenger, 1872-1876, laid the foundations for modern-day oceanography.*

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**Lecture:** M W F 9:00-9:50 AM  
McConnell Hall Room B05

**Lecturer:** Steve Gaurin  
Burton B15C, x3690  
*sgaurin@email.smith.edu*  
OH: M 2:00-4:00, W 11:30-1:00

**Lab:** M Tu Th 1:10-4:00 PM  
Sabin-Reed Hall Room 104

**Instructor:** Beth Caissie  
Sabin-Reed 129, x3693  
*bethc@geo.umass.edu*  
OH: M, Tu 10:00-11:00, or by appt.

## General Course Guidelines:

All students enrolled in this course are **expected to attend class and lab meetings on a regular basis**. There will be no make-up meetings. Classes will start promptly at 9:00 a.m., so please make every effort to be on time. There will be numerous handouts distributed during this course, and they are **important!** We suggest that you get a 3-ring binder notebook or large folder and systematically file all course materials. If you must miss a class, please arrange for someone in the class to get copies of handouts for you. As a general rule, we will not bring handouts from previous meetings to class or lab. However, you can obtain copies of handouts from previous class lectures by coming to Steve Gaurin's office immediately after any regular class lecture period.

Make-up of the mid-term, rescheduling of a laboratory exercise, and extensions can be given only for reasons of illness or personal extenuating circumstances as recognized by the Class Dean's office. You must contact Steve Gaurin **in advance** of an exam or a paper deadline, and Beth Caissie **in advance** of a laboratory session, to request a make-up, reschedule, or extension.

## Study Materials:

### 1. Primary text and web site:

**Pinet, P.R., 2006.** *Invitation to Oceanography (4<sup>th</sup> edition)*: Jones and Bartlett Publishers, Sudbury, MA, 596 p. Ocean Link web site: [www.jbpub.com/oceanlink](http://www.jbpub.com/oceanlink)

### 2. Supplementary reference resources:

The **Smith College Science Library** has excellent holdings in marine science. We will introduce you to the full use of these resources later in the course. **Supplementary reading assignments** for class and lab from periodicals and other sources will be announced. Some starter supplementary reference resources are as follows:

Couper, A., 1989, *The Times Atlas and Encyclopedia of the Sea*: Harper and Row, 272 p.  
(in Oceans Lab, along with several other excellent oceans atlases).

Earle, S.A., 2001, *National Geographic Atlas of the Ocean*: NGS, Washington, DC, 192 p.  
(also in Oceans Lab).

Smith Oceanography home page: [www.science.smith.edu/departments/Geology/Ocean](http://www.science.smith.edu/departments/Geology/Ocean)

NOAA home page: [www.noaa.gov](http://www.noaa.gov)

SeaWeb home page: [www.seaweb.org](http://www.seaweb.org)

### 3. Moodle:

The Smith College **Moodle** service can be accessed at [moodon.smith.edu](http://moodon.smith.edu). When you log in with your GroupWise username and password, you will see a link to the Moodle site for the Oceanography class. This site will be updated often, with supplementary material including instructional **animations**, Powerpoint **class lectures** in PDF format, and links to **websites and articles** with helpful information.

Also, and importantly, 8-10 **quizzes** will be posted on the Moodle site during the semester. You will have more than adequate time to complete them, and they are easily mastered as long as you attend class and lab. Your biggest challenge will be remembering to take them.

## LECTURE SCHEDULE

<u>Date</u>	<u>Topic</u>	<u>Readings (Pinet text)</u>
M Jan 29	Course introduction, science, what is oceanography?	browse entire text
W 31	Earth in different dimensions, Earth's seasons	App. IV, p. 557 & Fig. IV-1
F Feb 02	Maps, navigation, a brief history of oceanography	Chap. 1, p. 3-26
<b><i>GEOLOGICAL: ORIGIN OF OCEANS, DRIFTING CONTINENTS, CHANGING MINDS</i></b>		
M Feb 05	Structure of Earth, origin of Oceans	Chap. 2, p. 33-36; handouts
W 07	Physiography of the seafloor	Chap. 2, p. 36-49; scan p. 49-59
F 09	Ocean basins, continental drift vs. sea floor spreading	Chap. 3, p. 63-72
M 12	Plate tectonics, earthquakes, volcanoes, etc.	Chap. 3, p. 72-88
W 14	Marine sediments I - introduction	Chap. 4, p. 95-101
F 16	Marine sediments II - shallow shelf waters	Chap. 4, p. 101-114
M 19	Marine sediments II - deep sea sed's, geologic history	Chap. 4, p. 114-127
W 21	--- RALLY DAY (NO CLASS) ---	

## LECTURE SCHEDULE (continued)

<u>Date</u>	<u>Topic</u>	<u>Readings</u>
<b><i>CHEMICAL: THE WATER MOLECULE, NATURE OF SEA WATER, SALINITY</i></b>		
F Feb 23	The water molecule, H-bonding, latent heat	Chap. 5, p. 137-144
M 26	Sea water properties I - solutes and salinity	Chap. 5, p. 144-155
W 28	Sea water properties II - density and stratification	Chap. 5, p. 155-162
<b><i>PHYSICAL PART I: OCEAN CIRCULATION, OCEAN-ATMOSPHERE-CLIMATE INTERACTIONS</i></b>		
F Mar 02	Solar forcing, heat transport, hurricanes	Chap. 6, p. 212-213; handouts
M 05	Global warming and sea level rise	Chap. 15, p. 537-542
W 07	interactive visit with Andrew Revkin of the NY Times	"The Big Melt" articles
F 09	Atmospheric circulation and the Coriolis Effect	Chap. 6, p. 191-197
M 12	<i>Catch-up and review</i>	
<b>W 14</b>	<b>Mid-Term Exam</b>	
F 16	Wind-driven surface ocean circulation overview	Chap. 6, p. 198-204
<b>Sa-Su 17-25</b>	<b>- - - SPRING BREAK - - -</b>	
M 26	Ekman transport, up/downwelling, and geostrophic flow	Chap. 6, p. 205-214
W 28	El Niño and other ocean-related climate patterns	Chap. 10, p. 371-377; handouts
F 30	Thermohaline deep ocean circulation	Chap. 6, p. 214-221
M Apr 02	The great ocean conveyor and climate change	Chap. 6, p. 221-222; handouts
<b><i>PHYSICAL PART II: WAVES AND TIDES, AND THE OCEANS WHO LOVE THEM</i></b>		
W Apr 04	Wave characteristics and formation	Chap. 7, p. 236-244
F 06	Wave behavior and propagation, different wave types	Chap. 7, p. 244-260; handouts
M 09	Tide characteristics and generation	Chap. 8, p. 267-273
W 11	Tide theory and reality	Chap. 8, p. 273-288
<b><i>PHYSICAL PART III: COASTAL OCEAN PROCESSES, HAZARDS, HABITATS, RESOURCES</i></b>		
F Apr 13	Coastlines, beaches, and shoreline processes	Chap. 11, p. 385-392
M 16	Management and mismanagement of coasts	Chap. 11, p. 410-417
W 18	USA coasts - dunes, barrier islands, cliffs, deltas	Chap. 11, p. 392-409
F 20	Coastal habitats - estuaries, lagoons, marshes, swamps	Chap. 12, p. 423-447
<b><i>BIOLOGICAL: THE MARINE BIOSPHERE, PLANKTON AND FISH AND MAMMALS, OH MY!</i></b>		
M Apr 23	Distribution of life in the oceans	Chap. 9, p. 297-299, 304-315
W 25	Marine productivity basics and nutrient cycles	Chap. 10, p. 339-360
F 27	Marine productivity patterns around the globe	Chap. 10, p. 361-371, 377-378
M 30	Unique ecosystems - hydrothermal vents and coral reefs	Chap. 12, p. 447-456, 481-483
W May 02	Human impacts on marine environments	Chap. 15, p. 511-529, 532-537
F 04	<b><i>Review and farewell (NOTE: term papers due by 5:00 PM)</i></b>	
M 07	Special office hours	

**READING PERIOD: May 5-7; EXAM WEEK: May 8-11**

## LABORATORY SCHEDULE

<u>Week</u>	<u>Topic</u>
1/29	Introduction to Ocean Maps and the Ocean Basins; see Pinet, Appendix IV, p. 557-560.
2/05	Submarine Topography and Bathymetric Maps; video: "Fire Under the Sea"
2/12	Submarine Topography continued - Introduction to Deep-Sea Drilling - DSDP, ODP, & IODP; video: "Windows to the Past"
2/19	Introduction to Marine Microfossils - sample preparation, continue work on DSDP projects
2/26	Introduction to Marine Microfossils continued - sample analysis
3/05	Introduction to Marine Sediments (also: Science Library orientation to bibliographic resources) <b>NOTE: DSDP-ODP project reports due at time of 6<sup>th</sup> lab meeting</b>
3/12	Introduction to Ocean Water Properties - Temperature, Salinity, and Density
3/19	- - - <b>SPRING BREAK</b> - - -
3/26	Water Mass Characteristics, Ocean Circulation, Ocean-Atmosphere-Climate Interactions
4/02	<b>Lab Catch-up/Comp Time for Cruise and Field Trip</b>
4/9	Introduction to Waves and Tides
4/16	Comparative Coastal Geomorphology
4/23	Marine Planktonic Organisms; see Pinet, Chapters 10 and 12
4/30	Marine Fisheries: Where have all the fish gone? videos, slides, discussion, etc.; see Pinet, Chapter 14, pp. 500-506

## 2006 FIELD TRIPS

- Thursday, April 5** Optional one-day oceanographic training cruise on Long Island Sound with Project Oceanology, Groton, CT. (Weather backup date is Thursday, April 12.)
- Saturday, April 21** Required field trip to Plum Island, a barrier island on the Massachusetts coast. See, learn, enjoy - a great coastal experience! (Weather backup date is Sunday, April 22.)

## EVALUATION

Your grade for the course will be based on your performance on two approximately co-equal exams (mid-term and final), your lab work (including a short written report on the Deep-Sea Drilling Project), Blackboard quizzes (8-10 quizzes, approx. 10 questions each, based on class lectures, textbook readings, and laboratory exercises), and the oceans paper/project of 8-10 pages in length due on the last day of classes. (NOTE: evaluation for the writing-intensive students will be slightly different.) The final exam will cover topics only from the second half of the course. The evaluation formula is as follows:

Mid-term exam	25%
Final exam	25%
Blackboard quizzes	05%
Lab work	25%
Oceans paper/project	20%