

GEOLOGY 220: TECTONICS

Lectures: MW 9:50-11:00; F 9:40-10:40, Mudd 73 Lab: Th 1:00-5:00, Mudd 73

Contact Information

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<http://people.carleton.edu/~stitus/teaching/220/index.html>

<http://carlwiki.carleton.edu>

TAs: Lab – Tom Birren, Nina Whitney Class – Peter Scheuermann

Introduction

Plate tectonic theory gained widespread acceptance in the earth science community less than 40 years ago. The theory explains the origins of volcanoes and earthquakes and the locations of mountain belts and oceans. We will explore topics such as the structure of the Earth, earthquake analysis and prediction, the creation and destruction of the ocean floor, and the location and style of mountain building across the globe. Weekly writing assignments, homework exercises, and a group laboratory project are required.

Learning goals

Much of your success in this course will be measured on your ability to think like a scientist and solve problems using a variety of tools rather than your ability to recall facts (although a moderate amount of recollection of structures and terms is necessary, too).

Upon your successful completion of this course, I hope you will:

- enjoy thinking about the dynamism of Earth on the geologic time scale
- be comfortable using quantitative methods to understand topics in tectonics including plate motion, earthquake mechanisms, the types of plate boundaries, and magnetism of the sea floor
- have working conceptual understanding of several geophysical methods including gravity, magnetics, paleomagnetism, and seismology
- appreciate current scientific debate on questions related to the plate tectonic paradigm
- hone your scientific writing and editing skills

Text

Main text: P. Kearey, Klepeis, and F.J. Vine. *Global Tectonics*, third edition. Blackwell Science. All readings assigned in the tentative schedule are from this text. Additional readings may be assigned for particular topics as necessary.

Please bring to each class

- buy a ruler at the bookstore that has a protractor and bring it every day
- colored pencils will be useful
- bring a calculator
- bring the textbook

Grading

Exams	30%
Homework and quizzes	15%
Laboratory exercises	15%
Group laboratory project	10%
Plate tectonics wiki	30%

Exams

There will be two or three midterms for this course (if three, probably weeks 3, 7, and 9; if two, probably weeks 5 and 9) and no final exam. At least one of the midterms may be a take-home exam.

Homework and quizzes

There are ~5 homework exercises that I will assign throughout the term. These are designed to allow exploration of important concepts in plate tectonics, often in a bit more mathematical detail, than we'll cover in class. Be sure to start the homework early so you can come talk to me if you have questions. There may be unannounced in-class quizzes about the reading material. Make sure you do the reading before class.

Labs

Not only do labs make up a significant portion of your grade, they also represent the best way for you to practice and really understand ideas and concepts discussed in class. Please be neat and turn in work on time – laboratory exercises are due at the start of lab the following week.

Group project

There will be a group project for this course carried out during several of the lab meetings. This project will be to design a lab for this tectonics course based on an experimental concept. It's kind of post-modern, I know, but it will give your group a chance to explore a plate tectonic concept in more detail and figure out how to share this information with other Tectonics students. In the last session, you'll trade labs and have a chance to try out another groups' lab.

Plate tectonics wiki

In this course, you will be writing an article about your very own tectonic plate, or part of a tectonic plate, on the course wiki. Please note at the start that I do not know all the answers about each plate; you will often be discovering information on your own.

The structure of this assignment is not like a normal term paper that you write in a few days at the end of term. Instead, there will be short, focused, weekly writing assignments that are often loosely related to the course material. This way, you have a chance to apply what we discuss in class to your own personal test case. Peer editing is an important part of this writing assignment– you'll edit other's pages each week following a new writing assignment. At the end of the term, you will have time to revise and reorganize your article based on comments of your peers and Sarah.

Please note that this assignment may (and should) take 3-4 hours per week outside of class, especially later in the term as the topics become more research-based.

Tentative syllabus

Week	Topic	Reading
1	9/12/11 Historical development of plate tectonics	Chapter 1
	Lab 1: Intro to plate tectonics	
2	9/19/11 Internal structure and composition of the earth	Chapter 2
	Lab 2: Earthquake seismology	
3	9/26/11 Gravity, heatflow, magnetics, paleomagnetism <i>First midterm</i> Lab 3: Gravity	Chapters 3-4
4	10/3/11 Kinematics of plate tectonics	Chapter 5
	Lab 4: project start	
5	10/10/11 Oceanic plates: ridges and transform faults Go to GSA? Lab 5: TBA	Chapter 6 & 8
6	10/17/11 Subduction zones	Chapter 9
	Lab 6: TBA	
7	10/24/11 Mountain belts <i>Second midterm</i> Lab 7: Project	Chapter 10
8	10/31/11 Rift systems	Chapter 7
	Lab 8: Project	
9	11/7/11 Mechanisms and implications of plate tectonics <i>Third midterm</i> Lab 9: Project testing and evaluation	Chapter 12-13
10	11/14/11 Special topics in plate tectonics No lab.	TBA