

Geomorphology (Geol/Geog 320). Fall, 2008.

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Office hours: Tuesday, 9-10AM; Wednesday, 2:30-3:30 PM, or by appointment.

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Course website: see Learn@UW page for syllabus, lecture slides, and other material

Geomorphology is the study of landforms and landscapes and the processes that have shaped them. It is a basic science, driven in part by curiosity about the landscapes in which we live and the distinctive landforms that occur within them. Geomorphology also has important practical applications, however, and is essential to understanding many natural hazards and many forms of environmental change. An understanding of geomorphic processes is directly relevant to fields such as geotechnical and environmental engineering, sedimentology, soil science, and archaeology. Modern geomorphology is often highly quantitative, but direct observation of processes and landforms in the field is still an essential component of geomorphological research.

In this course, we will generally follow a sequence from process to form, starting with an in-depth look at a particular group of geomorphic processes, followed by discussion of the landforms those processes create and their importance in interpreting long-term landscape development.

Prerequisites. One of the following: Geol 100, 101, 106, 109 or Geog 120, 127. Familiarity with concepts and terminology covered in those courses is assumed.

Field Trips: Two one-day, Saturday field trips are required, on 9/27 and 10/18. *Be ready to leave from Weeks Hall at 8 AM, both days.* Bring a lunch and be prepared for the weather. If you have an unavoidable scheduling contact with either field trip, *let me know early in the semester.*

Lab: Lab exercises provide experience with basic tools used in geomorphology. These include a) field observations and measurements, b) interpretation of landforms and landscapes from maps, remotely sensed images, and digital elevation models, and c) use of simple numerical models of geomorphic processes. *The lab grade also includes exercises completed during field trips, or with data collected on the field trips.* Because of the Labor Day holiday, the first lab sessions will be on September 8. The TA will provide a schedule of lab exercises.

Grading. There will be one quiz and three exams during the semester, given during regular lecture periods. There will *not* be a final exam during finals week. The course grade will be based on the exams and quiz (75% total), and the final lab grade (25%). There is no extra credit. If unavoidable circumstances prevent you from taking an exam, discuss this with the instructor beforehand, if at all possible, or immediately afterward. Make-up work can only be arranged if this is done in a timely fashion.

Exam format will be a mixture of multiple choice, short answer, and short essay questions. The quiz will be similar but shorter. Exam and quiz questions will deal with topics covered in lecture, with a few questions also drawn from required readings.

The exams and quiz for this course are based on lecture and the **required readings**. The readings will be placed on electronic reserve in the UW-Madison library system (you can access them from your MyUW page). You are responsible for material covered in them, and at least a few exam or quiz questions will be drawn from them. I have placed the following textbook on reserve: *Process Geomorphology*, by Dale F. Ritter, R. Craig Kochel, and Jerry R. Miller (Prentice Hall, ISBN 0-697-34411-8; Waveland Press, ISBN 13:978-1-57766-461-1). I have assigned three short sections from this text as required reading. Beyond those sections, *this textbook is optional reading*, if you want more in-depth information on a topic. *Process Geomorphology* is by far the most up-to-date and scientifically accurate textbook available, so I recommend that you take a look at it or even get your own copy if you are interested in going on to more advanced coursework in geomorphology.

Course Topics and Reading Assignments.

9/2. Introduction to the course. Overview of geomorphology. Major historical developments and basic concepts. Driving and resisting forces, types of equilibrium, and thresholds.

9/9, 9/11. Dating methods used in geomorphology: Radiocarbon, luminescence, cosmogenic nuclides. *Required reading, on reserve:* Schaetzl and Anderson, *Soils: Genesis and Geomorphology*, pages 596-605 and 612-618.

9/16. Glacial processes, part 1: Types of glaciers, mass balance of glaciers, and ice flow.

9/18. Quiz (first part of class period)

9/18, 9/23. Glacial processes, part 2: Glacial erosion, sediment transport, and deposition.

9/25, 9/30, 10/2. Glacial landforms and glaciated landscapes. *Required readings, on reserve:* 1. Dott and Attig, *Roadside Geology of Wisconsin*, pages 21 through 28; 2. Carlson, A.E., Mickelson, D.M., Principato, S.M., and Chapel, D.M., 2005, The genesis of the northern Kettle Moraine, Wisconsin. *Geomorphology* 67: 365-374.

9/27 (Saturday) Field Trip 1. 8AM to 5PM.

10/7. Weathering and soils. *Required reading, on reserve:* Schaetzl and Anderson, *Soils: Genesis and Geomorphology*, pages 32 through 40 (You are responsible for knowing the master horizon definitions covered in Table 3.1; look over Table 3.2 and Figure 3.5, but you are *not* responsible for the detailed information present there).

10/9, 10/14 Hillslope processes, part 1. Mass wasting.

10/16. Exam 1.

10/18, 10/21. Hillslope processes, part 2. Runoff, rainsplash, slopewash and creep. Hillslope form. *Required reading, on reserve:* Dunne and Leopold, *Water in Environmental Planning*, pages 255 through 274.

10/18 (Saturday) Field Trip 2. 8AM to 5PM.

10/23, 10/28. Fluvial processes, part 1: Discharge and the hydrograph. Floods and flood frequency. Channel initiation, drainage network development, and stream capture. Drainage basin characteristics, flood hydrology, and sediment yield. *Required reading, on reserve:* Thornbury, W.D., 1969, *Principles of Geomorphology, 2nd Ed.*, p. 147-154 (start at “Shifting Stream Divides.”)

10/30, 11/4. Fluvial processes, part 2: In-channel flow, sediment transport, bedforms, and channel patterns. *Required reading, on reserve:* Ritter et al., *Process Geomorphology*, p. 214-225 (start at “Channel Patterns”).

11/6. Exam 2.

11/11, 11/13. Floodplains, aggradation and incision, terraces, response of the alluvial system to climate change and tectonics. *Required reading, on reserve:* Leopold, L.B., Wolman, M.G., and Miller, J.P., 1964, *Fluvial Processes in Geomorphology*, p. 316-332.

11/18. Alluvial fans and pediments. *Required reading, on reserve:* Ritter et al., *Process Geomorphology*, p. 248-259 (start at “Alluvial Fans”).

11/20, 11/25. Coastal processes and landforms. *Required readings, on reserve:* 1. Ritter et al., *Process Geomorphology*, p. 264-269 (start at “Deltas”), 2. Nelson, S.A., and Leclair, S.F., 2007, Katrina’s unique splay deposits in a New Orleans neighborhood, *GSA Today* 16:4-10.

12/2, 12/4. Eolian processes and landforms. *Required reading, on reserve:* Giles, J. 2005. The dustiest place on Earth. *Nature* 434:816-819.

12/9. Summing up, and review.

12/11. Exam 3 (held on last class day).

No exam during final exam week.