Geomorphology (GEOL 151)
Schedule Fall 2008

Class meets in ROOM 219 DELEHANTY and in the GEOLOGY COMPUTER LAB

Class leaders: Paul Bierman and Luke Reusser, Geology Department and School of Natural Resources.

Paul: 307 Delehanty, 656-4411 and (802) 238-6826 (cel), pbierman@uvm.edu
Luke: 314 Delehanty, 656-3398 (office) and 617-833-7787 (cel), lreusser@uvm.edu

GTF: Lee Corbett, Masters of Geology Candidate, 314 Delehanty, 656-3398 (office) and 802-380-2344 (cel), Ashley.Corbett@uvm.edu

Office hours: Please stop by and see us if you have any questions about the class or class material.

Paul: Friday, 11-12 am, Room 307 Delehanty
Luke: Thursday, 1-2 pm, Room 314 Delehanty
Lee: Monday, 9-10 am, Room 314 Delehanty

Class Website: All of the readings for this class as well as other communal resources will be available for viewing and downloading on our 2008 Geomorphology website. Get there by visiting Paul's "classes I teach" site.

http://www.uvm.edu/~pbierman/classes/

You will notice that there are three of us involved with teaching the course. Paul, as a professor is leading the class. Luke Reusser, a senior doctoral student, will be teaching several weeks of the class under Paul's mentoring. Lee, a Masters student in the Geology Department, will be working with us both as a Teaching Assistant. You should feel free to come to any of us for advice and assistance.

Why Geomorphology?

Landscapes surround us all and often seem to be static, unchanging backdrops for our day-to-day activities. Yet, if we begin to look closely, landscapes are anything but static features; they are continually evolving at a variety of time and length scales.

So, what then is Geomorphology? It is the study of landscapes, their forms and the history and processes of their development. I'll argue that Geomorphology is one of the most synthetic of all geologic sub-disciplines. Properly done it must consider any number of processes and Earth characteristics: structure, lithology, tectonics, weathering, hydrology, and in New England, as over most of the world today, humans.

My goal for you as students was best expressed by one of my colleagues, "After this class you'll never look at a landscape the same way again. You'll always stop and wonder how and why the land looks the way it does..."

In 2008, Geomorphology at UVM will focus on rivers and hillslopes, the elements that make up just about every sub-aerial landscape of the world.

Class Schedule and Structure

Monday: 12:20- 13:10
Wednesday: 12:20-17:30
Friday: 12:20-14:15

Over the next 9 weeks, we will use a variety of tools and approaches to learn more about Earth's surface. Monday classes will be devoted to a mixture of lecture, activities, and some preparation for Wednesday fieldtrips and labs. Wednesday, we will do lab work and/or take fieldtrips and gather data. On Friday, we will reduce the data that we collected on Wednesday.

After the first 5 weeks, we will take a two-day break for the Geological Society of America Meeting and you and a partner will do a mid-term assignment.

After the 9th week, you and the different partner will complete a final assignment that synthesizes the semester's work.

The class will conclude at the end of the 10th week, on November 7. There is no final examination.

Special Dates:

Friday October 10, Lecture on Namibian Erosion and River Sediment Transport, Tibi Codilean, University of Glasgow, 1220-200

Monday October 13, 12:20-5:00, *A workshop on long-term landscape evolution: linking tectonics and surface processes*, Paul Bishop, University of Glasgow (please try and attend as much as possible)

Field Trips

Field trips make up an integral part of this course. All trips will include some amount of walking and sturdy shoes are a necessity. Of course, since it will be fall in Vermont, the weather will be cool and clear but make sure you are prepared for cold, wet conditions. Unless the weather is extreme enough to present a hazard, we will go out in the, rain, fog, snow, wind. For each trip you MUST have:

waterproof raingear

sturdy footwear
a sweater or fleece for warmth
a waterproof field notebook and pencil
perhaps a small knapsack to carry all this.
money for bakery and store stops
some food to stave off hunger pangs

Expectations And Responsibilities For The Course

Luke, Lee, and I will be responsible for providing you a well-organized, clearly presented view of Earth's surface and how it works. We will strive to have all assignments posted and returned to you in a timely fashion. We will strive to be available to help you with reasonable notice either in person or by email. As long as the email system is functioning or it's not a weekend, you should expect a response within 24 hours to an emailed question.

You will be responsible for completing a variety of assignments including readings over the course of the semester. These readings will be posted to the class web site as PDF files for you to download.

Attendance in class is expected. If you know in advance that you will miss a class, please let us know ahead of time. Also, we will abide by the Arts and Sciences guidelines for classroom behavior. Respect and courtesy are top priorities.

Group Projects

There are two projects in the class that serve to help you synthesize your learning and present what you know. Both projects will be done in pairs (two students working together) and the projects will build one upon the other.

The first project will be done over the week of October 6 and submitted October 10 at class time. The second project will be done at the end of class (week of November 3) and presented to your peers on November 7 during class.

The projects will both be presented as concept sketches which are annotated illustrations in which the annotations explain both form and process.

The first project will focus on how river systems and riverine landscapes work. The second project will build on the first and explain both how rivers and hillslopes work and how they interact through hydrologic processes and sediment movement.

Course Goals

We have structured both the classroom and field portions of this course to give you the best chance of achieving the following broader goals by the end of the class.

- Understand and be able to interpret the landscape of Vermont in which you live in terms of both geologic history and surface process,

- Predict how a landscape will respond to both human and natural perturbations,
- Experience the power of peer review and revision in the production of high quality scientific reports and presentations,
- Master data collection techniques with wide application including surveying and GPS,
- Increase you ability and comfort with quantitative calculations,
- Improve your ability to collect quantitative and qualitative field data in adverse conditions,
- Recognize the value of simple models to represent physical systems and apply such models to data we collect or situations we observe,
- Improve your ability to reduce field data and write meaningful summaries of your observations,

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Grading

Fieldtrip reports and lab exercises (drop lowest or missed lab)	50%
Mid semester Project	20%
Final Project	30%

Lee will be grading your laboratory assignments. Luke and I will both grade your projects.

Assignment due dates and late assignments: All lab assignments are due at the start of class (1220 pm) on Monday. Assignments handed in after class starts on Monday will lose 10% of their grade. Assignments handed in Tuesday will lose 20% of their grade. Without permission of the instructors obtained ahead of time, assignments will not be accepted after Tuesday evening (this is so we can grade and return all assignments by Friday).

Semester Schedule

Readings for each week are listed below and available for download on Paul's "classes I teach" website. (http://www.uvm.edu/~pbierman/classes/)

Week 1. Getting started (September 3 and 5)

This week we will get to know each other, learn what Geomorphology is all about, and start learning how to think both quantitatively about how Earth's surface works.

Wednesday – About Geomorphology and concept sketches (Paul)
Friday – Quantifying surface process – floods on the Winooski (Luke)

Readings:
- *Dunne and Leopold*, p. 92-102
- *Ritter et. al.,* Chapter 5, p. 160-172

Week 2. River Morphology (September 8, 10, and 12)

We will learn how rivers and river channels are categorized and how they work. We will float the Winooski River to see relevant forms and collect data.

Monday – Fluvial landforms and processes (Luke)
Wednesday – Floating the Winooski (Luke)
Friday – Reducing float trip data (Luke)

Readings:

- *Ritter et .al*., Chapter 6
- *Ritter et .al*., Chapter 7

Week 3. River Flow and Fluxes (September 15, 17, and 19)

Rivers move water and sediment and that movement can be quantified. We will measure flow and collect data needed to model the amount and speed of flow under different conditions.

Monday – Introduction to River flow (Luke)
Wednesday – Measuring flow (Luke)
Friday – Reducing river flow data (Luke)

Readings:

- *Ritter et .al*., Chapter 5, p.173-188
- *Ritter et .al*., Chapter 6, p. 190-206
- Manual of Field Hydrology Chapter, Chapter 3

Week 4. River History (September 22, 24, and 26)

Rivers and the water in them leave a mark on the landscape. Reading the clues that rivers leave behind, we can ferret out the history of the land and of the response of channels to changing boundary conditions including climate and base level.

Monday -- Introduction to Riverine change over time (Luke)
Wednesday – Huntington River terraces (Luke)
Friday – Terrace data reduction (Luke)

Readings:

- *Ritter et .al*., Chapter 7, p. 242-248
- Late Pleistocene-Holocene History: Huntington River and Miller Brook Valleys, Northern Vermont, Wright et .al., p. C4-12 to C4-28.

Week 5. Soils (September 29, October 1 and 3)

Soils are a marker of time on the landscape. Knowing how they form and how they change can allow you to decipher landscape history.

Monday – Introduction to soils and geomorphology (Paul)
Wednesday – Huntington River terrace soils (Paul)
Friday – Soils data reduction (Paul)

Readings:

- *Pipkin et .al.,* Chapter 6, Soils, Weathering and Erosion
- Bierman**,** Henry's Land, 47-56

Week 6. Mid-term Report Preparation (October 6, 8, and 10)

This week, you will work with a partner of your choosing to design and complete a concept sketch that details the morphology, history, and processes of rivers as you have come to know them. On Friday, there will be a presentation on the generation and transport of sediment in southern Africa. Your concept sketch will be due at class time on Friday, October 10.

Monday -- Work on concept sketch poster with partner
Wednesday -- Work concept sketch poster with partner
Friday – Namibian River lecture

Week 7. Hillslope Hydrology (October 13, 15, and 22)

Water is a prime shaper of the landscape. It flows over and into the landscape following various flow paths at different rates. This week, we will measure the rate at which water infiltrates into soils and examine different flow paths. On Monday, there will be a workshop about the interaction of topography and tectonics.

Monday – Introduction to hillslope hydrology (Paul)
Wednesday – Infiltration measurements (Paul)
Friday – Infiltration data reductions (Paul)

Readings:

- *Dunne and Leopold,* Chapter 6, p. 163-191

Week 8. Hillslope Failures (October 20, 22, and 24)

Hillslopes are the shape of the Earth and the source of sediment to rivers. We will examine slopes where mass movements are occurring and take measurements to calculate rates of mass loss from slopes.

Monday – Introduction to slope processes (Paul)
Wednesday – Landslide field trip (Paul)
Friday – Landslide data reduction (Paul)

Readings:

- *Pipkin et .al.,* Chapter 7, Mass Wasting

Week 9. Hillslope Modeling (October 27, 29, and 31)

Slopes and the materials of which they are made, are amenable to measurement and modeling, both physical and mathematical. We'll do both, including doing a controversial experiment.

Monday – Review of slope models (Paul)
Wednesday – Mathematical modeling (Paul)
Friday – Physical modeling (Paul)

Readings:

- Hillslope Evolution by Bedrock Landslides, Alexander L. Densmore, *et al.,* *Science* ***275****, 369 (1997)*
- *Reply* by Alto et al.

Week 10. Summary Preparation and Presentation (November 3, 5, and 7)

The first part of this week will be spent working with your partner to prepare a poster that is your concept sketch of how rivers and hillslopes work and how they interact. You will present your poster during Friday afternoon's class period.

Monday – Work on Poster with partner
Wednesday -- Work on Poster with partner
Friday -- Poster Presentation (Delehanty lobby)