

Dr. K. A. Lemke  
Office: Science B345

Email: klemke@uwsp.edu  
Phone: 346-2709

## GEOLOGY 370: GLACIAL GEOLOGY

### WHY STUDY GLACIAL GEOLOGY?

Although there are currently no glaciers in Wisconsin, glaciers sculpted the physical environment of Wisconsin, affecting its topography, its soil, its economy and its water resources. Studying glacial geology will allow us to gain an understanding of the characteristics and geographic distribution of glacial landforms and resources derived from glacial activity.

On a wider scale, glaciers impacted the physical environment of large portions of North America, Eurasia, South America, and portions of Africa. Today, glaciers continue to impact polar environments including Antarctica and Greenland, other high latitude regions such as northern Canada, and high alpine environments throughout the world's major mountain ranges. In addition to creating some spectacular scenery, these existing glaciers continue to affect soil and water resources of far-away areas. For example, Himalayan glaciers feed the major rivers of southeastern Asia such as the Ganges and the Indus. These rivers are an important source of fresh water for millions of people living in Southeast Asia. As Himalayan glaciers melt, the potential for flooding in the immediate future increases, and farther into the future there is the potential for serious shortages of water (Science Magazine, 1998).

Another reason for studying glaciers includes the fact that the amount of water stored in glaciers directly affects global sea level. Measurements from satellite altimeters show increases in sea level of approximately 3.3 mm/yr since 1992 (University of Colorado). Whether glaciers grow or shrink – a function of changing global climatic conditions – is a major determinant of changes in sea level. According to CIESIN, about 40% of the world's population lives near coastal areas, areas which provide economic benefits from fishing, trade and transportation to tourism and recreation. Changes in global sea level directly impact these activities and coastal populations.

Last information obtained from glacial ice cores allows us to reconstruct past climatic conditions – changes in temperature and precipitation as well as the timing of the changes – fairly accurately. Accurate reconstructions of past climatic conditions aid our ability to forecast how the earth's climate may change in the future. As glaciers

around the world continue to shrink, we lose that source of information.

Thus glacial geology, the study of glaciers, their behavior and the ways in which they modify the landscape, is an important field of study. Governmental bodies at all levels make policies and decisions that are affected by, and affect, our physical environment, including glacial environments. Because glaciers have played and continue to play a role shaping our physical environment, it is important for us to understand the basic workings of glaciers if we want to evaluate critically the impacts of various policies.

The goal of this class is to explore the characteristics and behavior of glaciers, the formation and characteristics of glacial landforms and landscapes, and the climatic factors that affect glacier growth and retreat. We will not explore policies related to glaciers; rather the objective is to gain an understanding of how glaciers work and how they impact our environment.

### COURSE LEARNING OUTCOMES

By the end of the semester, you should be able to:

- 1) classify glaciers based on morphology, temperature, and mass balance;
- 2) explain the processes and patterns of glacial flow;
- 3) discuss factors affecting glacial mass balance and interpret mass balance data;
- 4) describe glacial drainage systems and meltwater production;
- 5) explain the processes of glacial erosion, transport, and deposition;
- 6) describe the characteristics and formation of glacial landforms and landscapes, and identify different types of glacial landforms;
- 7) summarize Wisconsin's glacial history, including the location and characteristics of major deposits and landforms;
- 8) list key events from the late Pleistocene and describe some methods used to date these events; and,
- 9) discuss causes of climate change associated with glacials and interglacials.

## FORMAT AND POLICIES

### Resources

- Rental text: Bennett & Glasser (2009) *Glacial Geology: Ice Sheets and Landforms*.
- Course web site: contains the class calendar, assigned readings, lecture outlines, diagrams and links to assignments and external sites:  
<http://www4.uwsp.edu/geo/faculty/lemke/geol370/index.html>

### Expectations

**You are expected to attend class** from 3:30-4:45 Monday and Wednesday in Science D320. I will occasionally take attendance, primarily through in-class activities. If you are not in class, you will not get credit for the in-class activities. If you miss class due to a university sponsored event such as a field trip or a sporting event, please provide a note or email from the supervising instructor or coach. You will be excused from in-class activities for days when you have a valid excuse, but you are still responsible for all the material covered in class.

In this class you will read about glaciers, write about glaciers, talk about glaciers, listen to others talk about glaciers (either me or your classmates) and do activities related to glaciers. **You are expected to participate** in all of these activities. Although I will lecture, there will be time devoted to discussion in almost every class period. **You are expected to contribute to these discussions in a meaningful way.** Meaningful contributions include asking and answering questions, contributing comments and providing explanations. Whether you have completed required readings and assignments prior to class will determine your ability to contribute in a meaningful way. Hence, **you are expected to do assigned readings prior to class and you are expected to put forth a concerted effort toward completing assignments prior to coming to class.**

Although lecture outlines are available on the web, you will need to add information to the outlines. Simply having the web outlines without any additional information is insufficient for earning a good grade in this class. Hence, **you are expected to take notes in class.**

### Electronic Devices

As a general rule, cell phones should be put away during class. Laptops and tablets are allowed provided you use them for taking notes, accessing class material or researching material related to in-class activities. Use of any type of electronic device for texting, emailing, face-booking, listening to music, etc. is not allowed during class. It is rude and distracting to other students in the class and to me.

### Student rights and responsibilities

UWSP has specific guidelines regarding student rights and responsibilities, academic standards and disciplinary procedures, accommodation of religious beliefs, and conduct on university land, which you can access at:  
<http://www.uwsp.edu/dos/Pages/default.aspx>.

## EVALUATION & GRADING

The final course grade will be based on tests (50%) and a variety of assignments and projects (50%).

### Projects and Assignments

The assignments and projects are intended to insure you understand the concepts discussed during lectures and to allow you the opportunity to delve deeper into selected topics. The weight of individual assignments and projects will vary depending on the length and complexity of the activity. Failure to turn this work in on time may result in a grade penalty.

### Tests

Tests will be of varying lengths and weights. Some will consist of only two or three questions while others may consist of 20 or more questions. Test questions may be short answer, fill in the blank, true/false, matching, multiple choice, math calculations, and labeling on diagrams, maps or photos. There are two basic types of tests, announced tests and unannounced tests. Unannounced tests will be open-note/open-book and generally you will be allowed to talk to your classmates during these tests. Announced tests will be closed-note/closed-book and discussions with classmates will not be allowed. These tests will be announced one week in advance of the test.

### Letter Grades

Letter grades are assigned using the following guide:

A: 93-100	B-: 80-82	D+: 67-69
A-: 90-92	C+: 77-79	D: 60-66
B+: 87-89	C: 73-76	F: below 60
B: 83-86	C-: 70-72	

### Contact Information

- Office hours: Tuesday, Wednesday, Thursday 2:00-3:00, and by appointment. If my door is open, feel free to stop in.
- Email: [klemke@uwsp.edu](mailto:klemke@uwsp.edu). I usually check my email twice a day – first thing in the morning and last thing before I go home at the end of the day. I try to respond to all emails within 24 hours (except on weekends).
- Phone: 346-2709