Keeping it Real:

Making the Geology of the National Parks Relevant for Non-science Majors

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with thanks to the NSF/NAGT-sponsored
"cutting edge" workshops on course design and
quantitative methods in geoscience

The challenge: students who

- Need a science class (with lab)
- Are in their first, second, third and fourth years of college
- Are primarily non-science majors
- Think that the National Parks are interesting, but
- Aren’t convinced that science is relevant to their lives

Solution: convince them!

- Take local field trips
- Incorporate scientific articles (about recent research) on the parks we study in class
- Investigate real data to answer real questions

- My students want to know how local features formed
- this adds detailed information on the parks we study, illustrates the process of doing science, and surprises students because it demonstrates that we do not yet have all the answers
- my students always want to know the “real” answers!

Field trips:

Ohio Caverns ~ Mammoth Cave NP

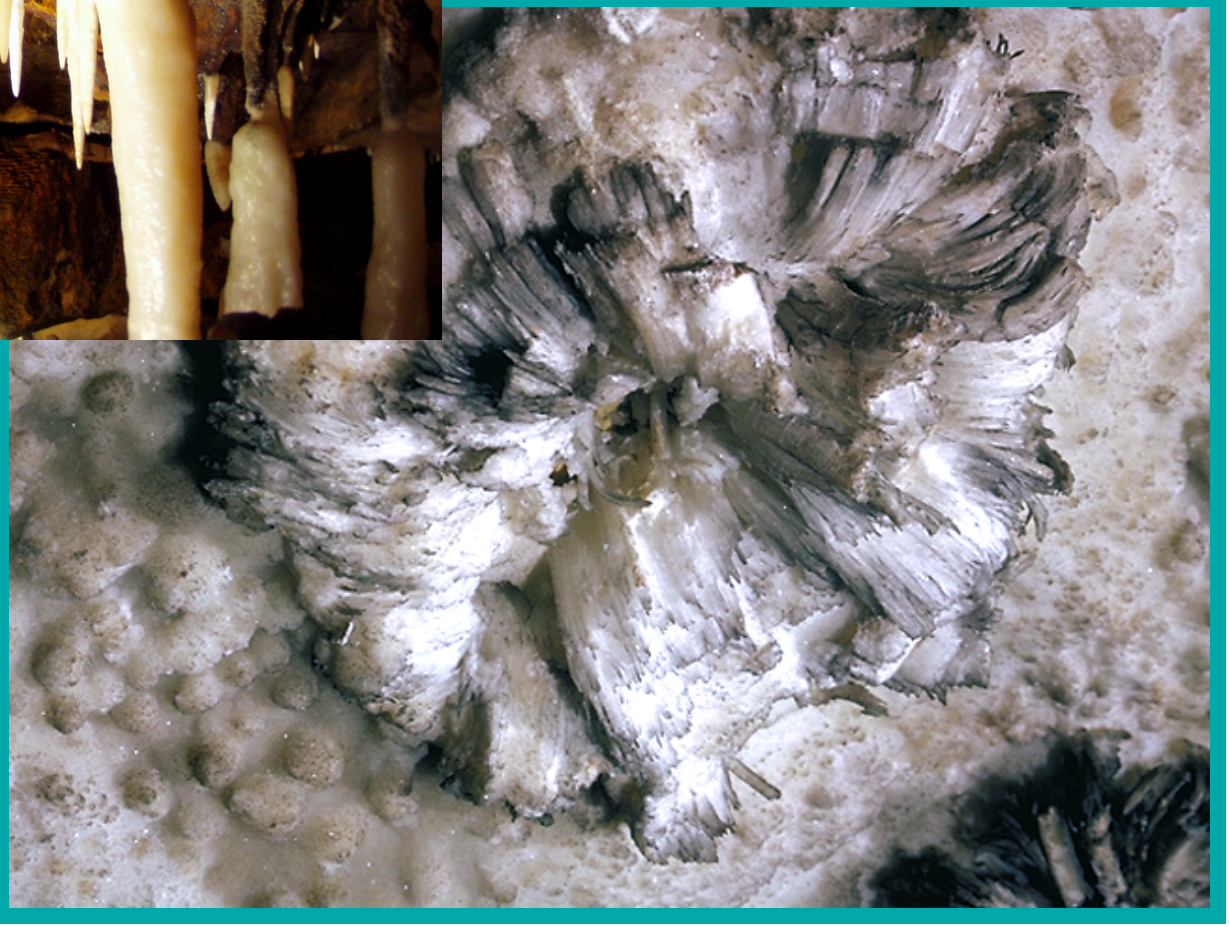
Clifton Gorge ~ Grand Canyon NP

Ohio glacial deposits ~ Glacier NP

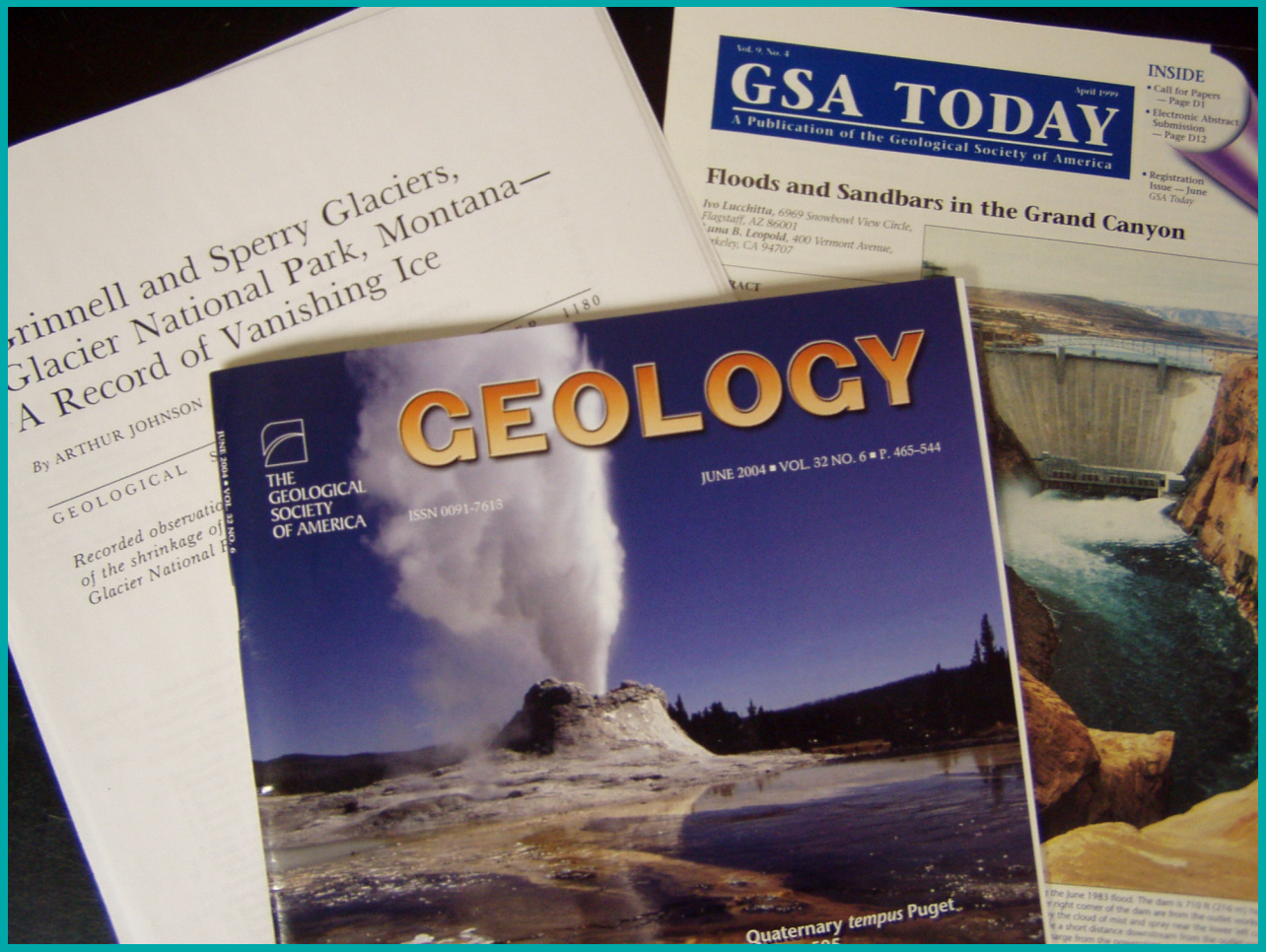
Ohio Caverns

Compare/contrast with Mammoth Cave

- Both are solution caves in limestone
- Both have calcareous speleothems; Ohio Caverns has more of them
- Mammoth Cave also has gypsum formations; Ohio Caverns has some iron-oxide formations
- Mammoth Cave is BIGGER



Structured reading of scientific articles



For articles (from Geology, GSA Bulletin, GSA Today, Science, or Nature) on the parks we are studying, I ask students questions that focus on

- Identifying the question being investigated
- Describing the methods used to study the question
- Describing the data collected
- Summarizing the author(s) interpretation

On the day their answers to those questions are due:

- Groups of 3-4 students compare their answers, and refine them. They write out their best answers, to turn in as a group. (Students who haven't done the assignment are stuck with each other.)
- For each question, each group reads their best answer to the class.
- The class votes on who has the best answer to each question. Each winning answer earns a prize for the group that crafted it.

Carefully chosen articles complement course material:

Husen, Taylor, Smith and Healser, 2004, Changes in geyser eruption behavior and remotely triggered seismicity in Yellowstone National Park produced by the 2002 M 7.9 Denali fault earthquake, Alaska: Geology, v. 32, p. 537-540.

We've previously studied the process of geyser eruption, and our follow up geyser lab is entitled "How faithful is Old Faithful?"

Lucchitta and Leopold, 1999, Floods and sandbars in the Grand Canyon: GSA Today, v. 9, n. 4, p. 1-7.

During our next class period, we consider the "costs" and "benefits" of damming the Colorado River. Many students enjoy the mix of geology and public policy in this discussion.

Our next lab exercise is estimating the volume of the canyon, and from that the average rate of erosion…. This article is an excellent reminder of how the river has been altered by human actions.

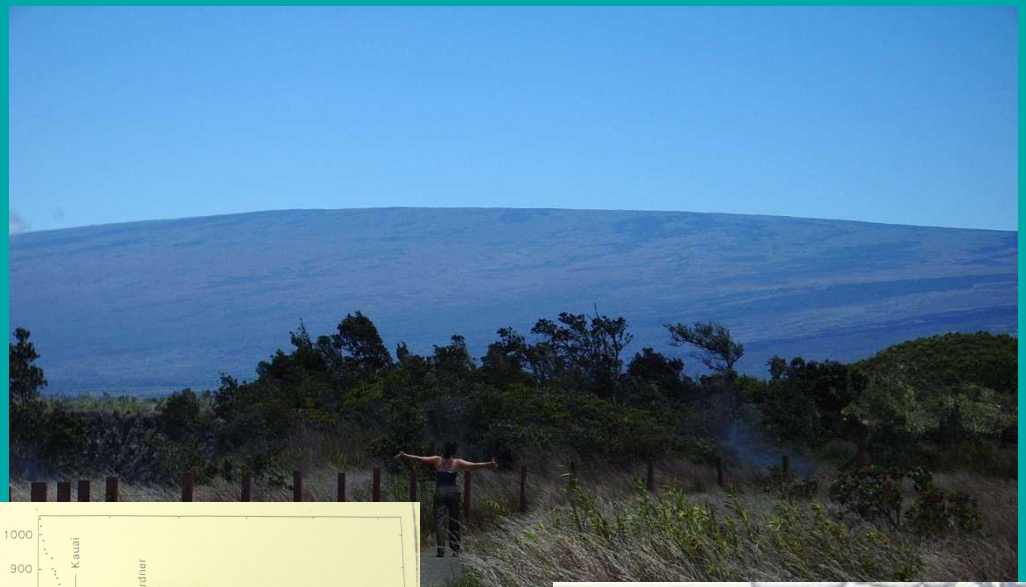
Excerpt from Johnson, 1980, Grinnell and Sperry Glaciers, Glacier National Park, Montana – a record of vanishing ice: USGS Professional Paper 1180.

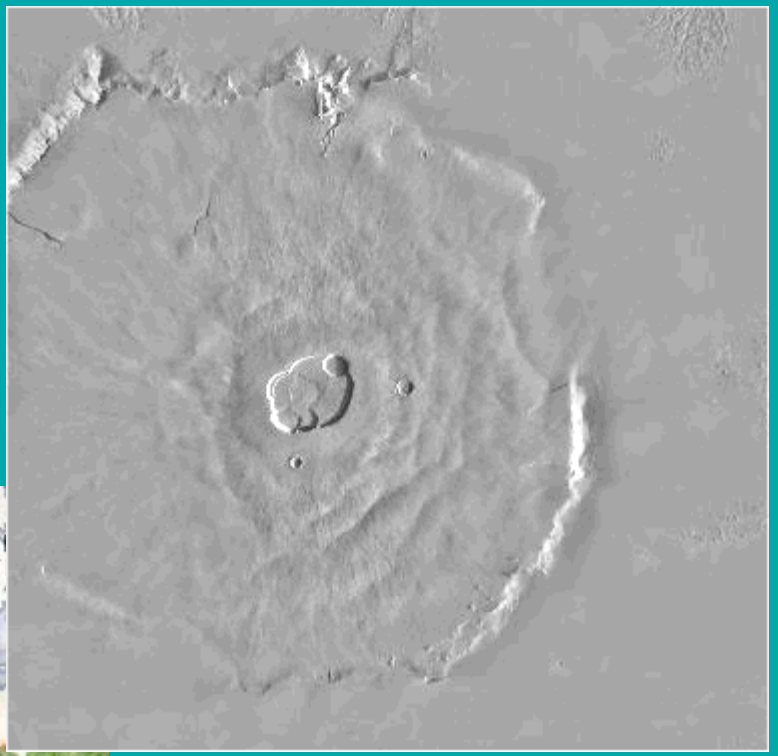
We've studied how glaciers form, and how they shape the landscape. We've also examined GIS-generated maps of glacial deposits in Glacier National Park, so students know that the glaciers now are mere shadows of their former selves.

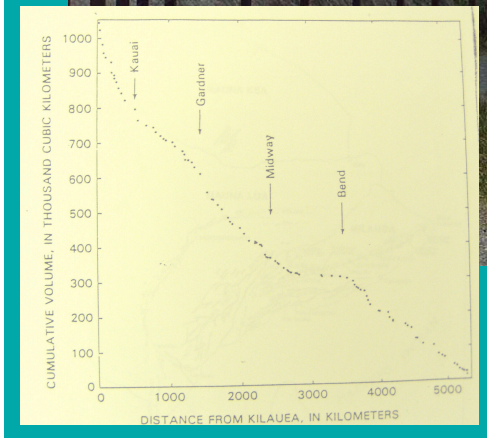
Our next lab exercise is estimating when Grinnell Glacier will be completely melted.

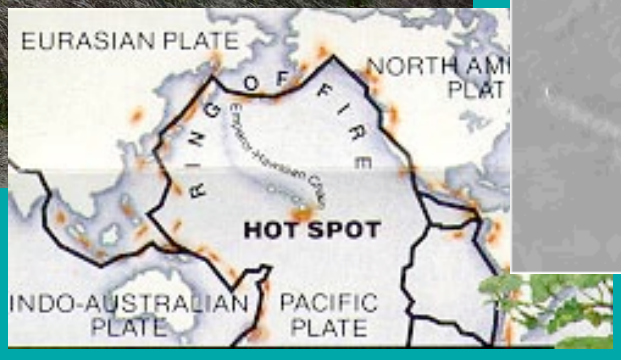
Real data, real questions:

- If the Pacific Plate were stationary, which would be bigger: Hawaii or Olympus Mons?

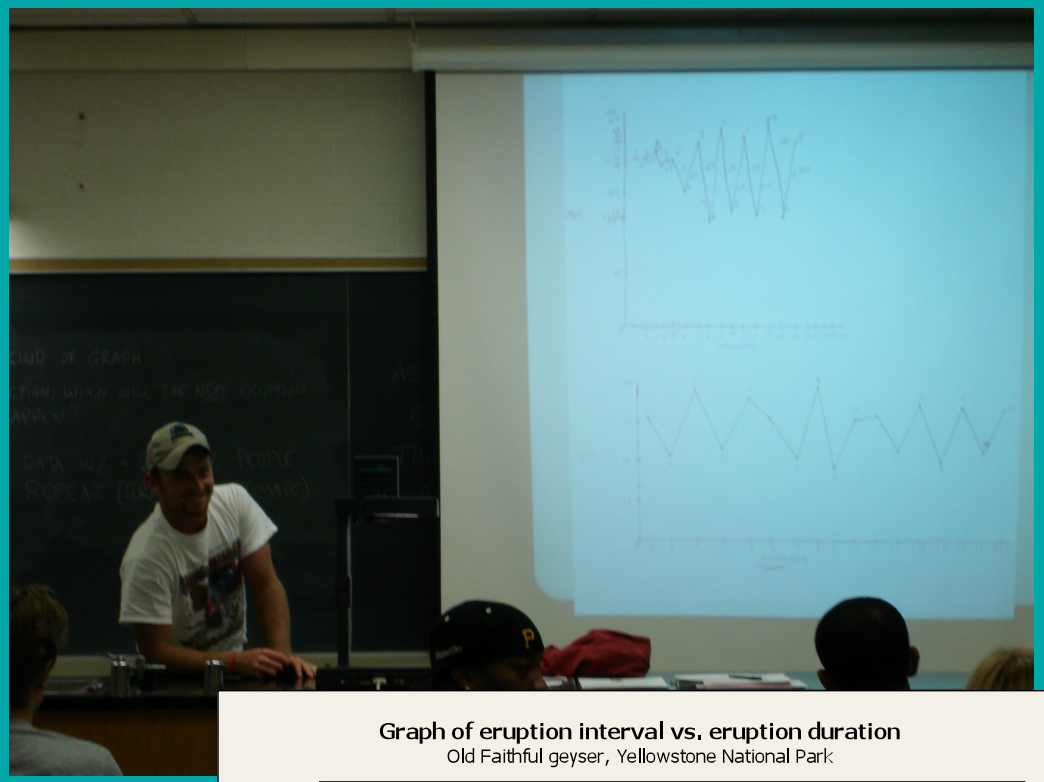


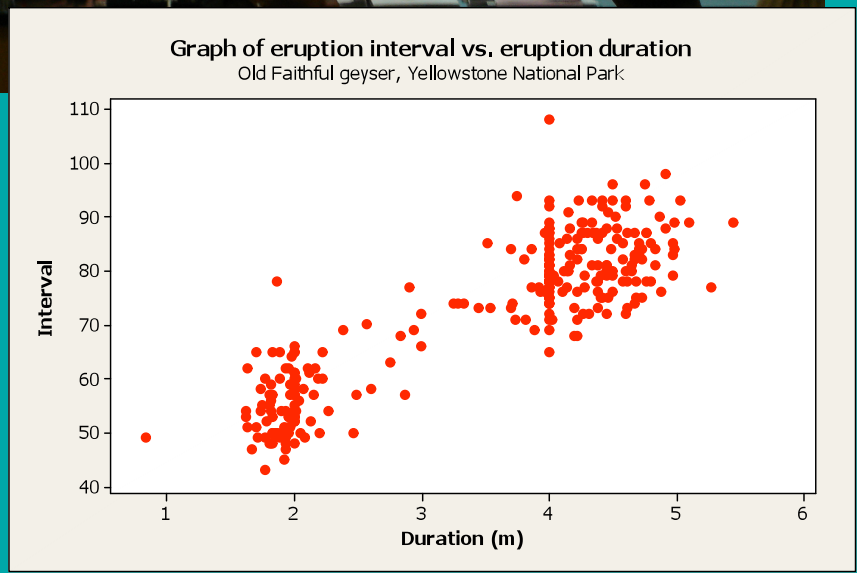






How faithful is Old Faithful?

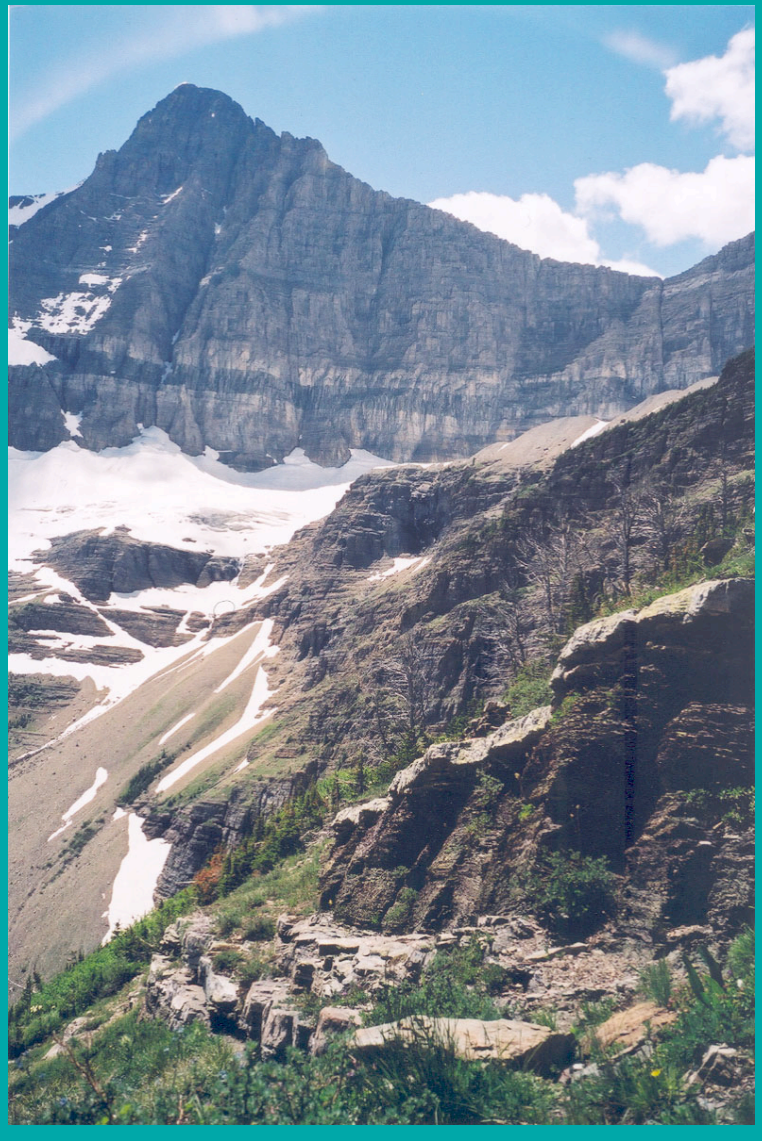


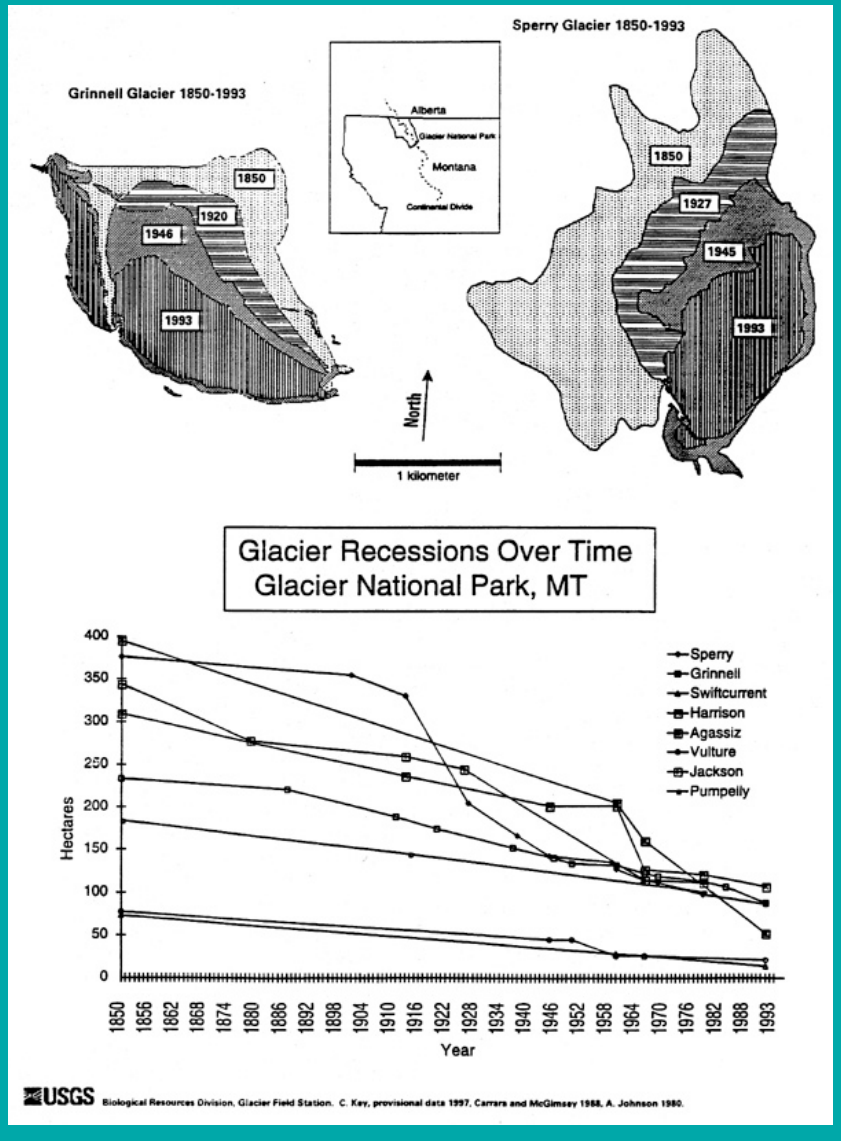


How much sediment has eroded to form the Grand Canyon?

What was the average rate of erosion?

When will the glaciers be gone from Glacier National Park?





Keeping non-science majors interested is a matter of making the relevance of course material apparent.

Local field trips, articles about current research, and labs that use real data to answer real questions are three great ways to do that.