

Please use yellow stickies or write directly on the poster with the marker provided to make comments

Portable outcrops

First-experience mapping under ideal conditions



Kurt Frieauf - Kutztown University of Pennsylvania
<http://faculty.kutztown.edu/frieauf>

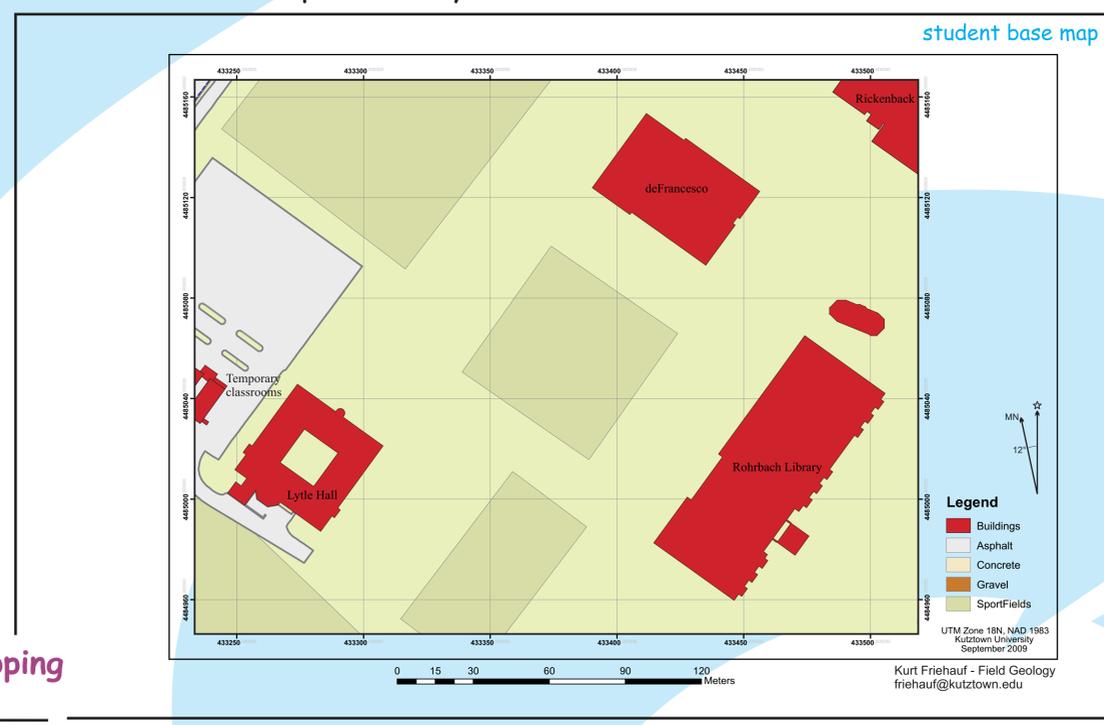


This is what I look like, so if you want to talk, please track me down!

or email frieauf@kutztown.edu

Background
 Geologic mapping is challenging because it requires rapid rock type identification, efficient strike and dip measurement, precise location on the map, and thoughtful visualization of the relationship between rock bodies, all given limited outcrop that can be less-than-perfect for measurements and less-than-ideally located.
 This exercise removes several of the variables that make mapping difficult so students can more fully focus on the underlying concept of mapping.

Objective
 Learn how to make a geologic map given the ideal conditions of fortuitously-located outcrops with planar strike-dip surfaces and unweathered rock samples on level terrain.

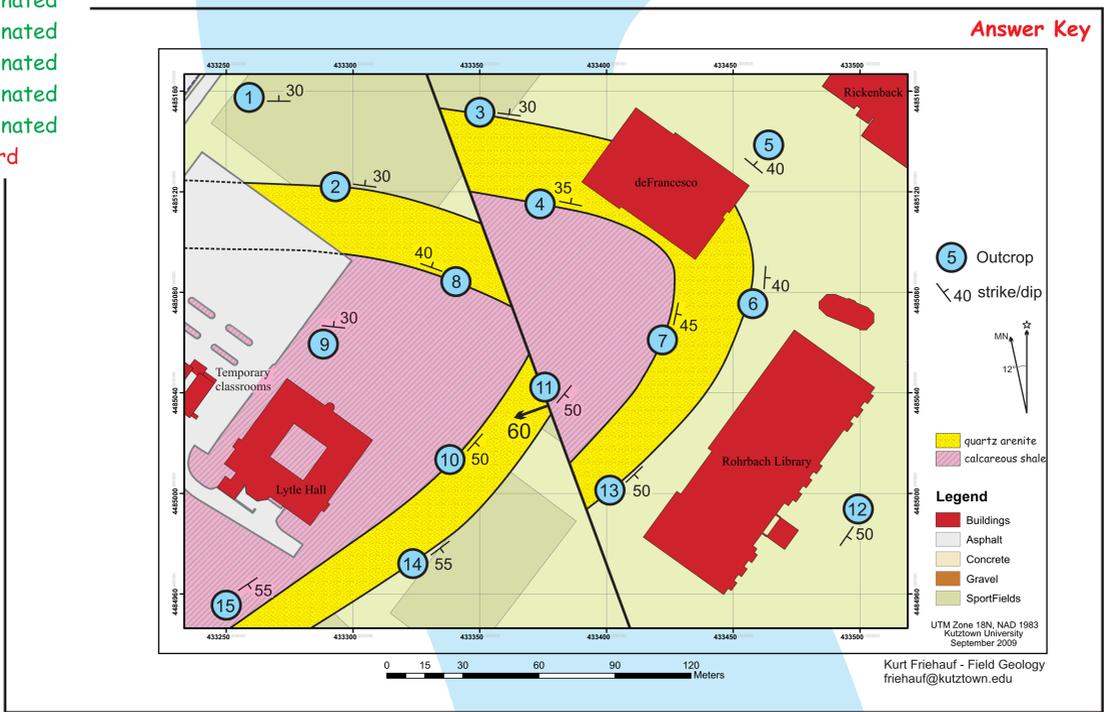


Base map for students
 Geography department maintains a GIS database of the campus (surveyed by geography students in their classes). University also maintains an AutoCAD map of the campus.
 For the student version, I removed sidewalks, park benches, and other detailed landmarks to force students to triangulate their locations rather than eyeball. I also require students to show their triangulation work on their maps in light pencil.

Things that complicate geologic mapping

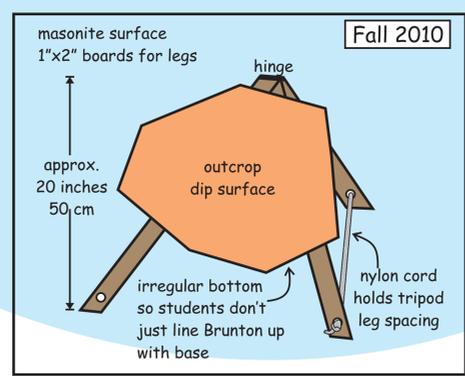
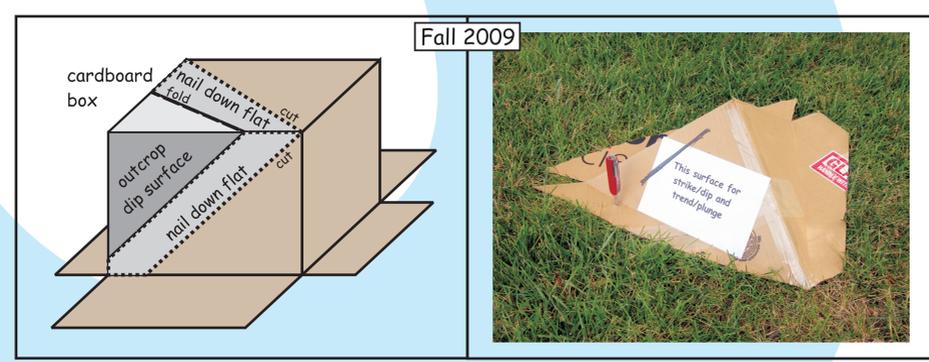
Variable	This exercise
Lack of outcrop	factor eliminated
Less-than-heuristic outcrop locations	factor eliminated
Outcrop weathered	factor eliminated
Outcrop highly irregular surfaces	factor eliminated
Outcrop difficult to access	factor eliminated
Bad weather	still wild card

- Preparation**
- Using a digital GIS map of campus as base map, sketch a geologic map of an ideal geologic structure (e.g., fold, fault, faulted fold) on a separate layer.
 - Identify key locations where outcrops would be necessary to define the geologic structure
 - Print the final geologic map for self.
 - Print map sans geology for students to use as base map.
 - Select hand specimens to represent each mapping unit (e.g., quartz arenite, calcareous shale, etc.).
 - Make portable outcrops
 - First iteration (Fall 2009)
 - Cut cardboard box corners to make outcrops
 - Label outcrop rock type ("Rock A," "Rock B," etc.) with marker on box
 - Second iteration (Fall 2010 with Dr. Sarah Tindall)
 - Cut tripods and surfaces from stakes and ply wood, respectively - hinge with brass hinges or Cordura/Nylon
 - Notify groundskeeper not to remove outcrops without instructor's consent
 - Place portable outcrops in locations on campus corresponding to planned map, including samples of appropriate rock type at each station



Answer key
 Work out answer key using base map before turning off sidewalk layers (so don't select outcrop locations on sidewalk where high traffic and cannot stake outcrops down)
 This example is more complex than the simple plunging syncline I ran last fall. The simple syncline was challenging enough for some students, and an "easy opening game win" for others. I'll run this more complex example with 15 outcrops this fall, but run it as a 4-5 hour exercise rather than just 2 hours.

- Assessment**
- Correct location of outcrops on map using triangulation
 - Correct location of geologic contacts plotted on map with interpolated contacts between outcrops
 - Correct strike/dip orientation data plotted on map
 - Identify geologic structure in 3-D based on 2-D map
 - Extra credit
 - calculate amount of fault offset assuming only dip-slip movement



Portable outcrops
 Last year I made the outcrops by cutting up cardboard boxes from the recycling bin. I pegged the boxes down using some spare 6 inch nails.
 Cardboard flexed a bit when heavy-handed students leaned their Bruntons on the surface, creating a little more spread in the measurements than I'd like.
 This year I'll be constructing sturdier outcrops with a tripod design using lumber discarded by the theater department (an old set) that I pulled from the dumpster last spring.

Follow-up
 Once students are relatively comfortable with the basic concept, we go out to map rocks "in the wild."

- Student equipment**
- Plexiglas map board
 - Hand lens for rock identification
 - Colored pencils + hard lead mechanical pencil
 - Map scale
 - Brunton compass

- Pre-exercise**
- Students must pass strike/dip quiz prior to participation in the exercise
 - Demonstrate triangulation technique with the group

Comments, please!