

Introduction to Geological Mapping
Geology 301
Fall Quarter 2003
<http://blackboard.csusb.edu>
Rainbow Basin Exercise

Dr. Joan E. Fryxell
Phone: 880-5311
Office: BI 114
Email: jfryxell@csusb.edu

Assignment:

Your assignment is to map as much of the basin as possible, starting from the eastern side, recording all units that you observe, and mapping the structure exposed in the basin. Refer to Chapters 3, 4, 5, 6, and 10 in Compton for pertinent information, as well as pertinent Appendices. Also read the Handy Tips below for the details necessary to make a first-rate map.

Turn in:

Field Map -- inked and colored at the end of each day in the field. See handout for an example.

Report of Units -- a short report of geologic units encountered, following the format of Dibblee. See handout for an example.

Office Map -- inked and colored, including an explanation. See map posted across from my office for an example.

Cross Section -- see map posted in BI-105 for location of section.

Handy Tips for Producing a First-Rate Field Map:

while in the field:

If you can see it, measure it. Even if you think it is not important, record it. You can always ignore it later, but having to go back out to that outcrop to measure something you already stood on is a waste of time, and in some cases requires several days.

Record everything that will fit on the map immediately, while you are standing on the outcrop.

Record all attitudes, comments, rock descriptions, etc. in your field notebook also while you are standing on it (the outcrop, not your notebook). To speed things up, abbreviate like a mad thing, for example, outcrop = oc, limestone = ls, fold axis = fa, axial plane = ap, sandstone = ss, and so forth. Use any abbreviations you like, but put a glossary of them at the front or the back of your notebook. You may forget some of them, even the ones that seem completely obvious at the time. You may also be hit by a meteorite, and someone else will have to use your notes to finish the project, so make notes that are interpretable by any geologist.

Remember to look up from the outcrop, and look around at the larger geologic features in the area. Sketch on the map what you see in the distance. Get in the habit of making sketches of complicated areas in your notebook. This helps you decipher what you are seeing, and helps you remember it later. Photos are also useful, although lighting can be misleading. Overcast days are often the best for photographing outcrops, as the lighting is uniform and shadows are muted.

If the first glance at an outcrop, cliff face, hill, etc. doesn't make complete sense, sit down and watch it for a while. Take a drink of water, have a snack, sketch it out in your notebook, and generally allow your eyes and brain to absorb what you are seeing. Very often, what looks like chaos at first resolves itself into a clear picture of several structures by the time you've eaten lunch while watching it, tracing individual features with your eyes. Carry extra cookies if necessary.

The map is not complete if it does not include **all** contacts and units in the area. "I didn't feel like mapping the alluvium" is not a legitimate reason. Neither is "I was supposed to trace the contact **all the way** over the hill?" If the contact goes somewhere, so must you, and it must show up on your map.

It is just as important to show **what you don't know** as well as to show everything you do know. Sometimes the rocks just don't cooperate, and after looking at the area in detail for a long time, you are still not sure where the contact goes. Make sure this uncertainty shows up on your map. Although you must show clearly everything you can determine from the field area, you may not claim to know things that are not supported by surface evidence (unless you have done a geophysical survey, or own a drilling rig).

at the end of a day's mapping:

1. take off your boots¹
2. open a beverage²
3. ink and color the day's work on your map -- all of the work that you consider to be reliable. It is ok to leave a corner in pencil, if it was confusing, so that when you go out the next day, you can start your traverse there and clear up the confusion. If you **do** ink in something that turns out later to be wrong, **neatly and carefully** use white-out to correct the mistake, but keep this a rare occurrence. **Never** shake your pen over the map! The order of what you ink will help make your map legible. To avoid introducing errors:
 - A. ink in all attitude symbols (just the symbols) with the smallest pen (00 or smaller) you have.
 - B. ink in the associated numbers with the smallest pen you have.
 - C. ink in contacts -- start with the youngest contact, generally the alluvial contact, and proceed to successively older contacts (this progression avoids the error of an older contact shown as cutting a younger contact). As shown in Appendix 7 in Compton, faults are shown in a heavier weight line than depositional and intrusive contacts.
 - D. color in **LIGHTLY** the area you covered during the day -- enough of a wash of color to see what you've done, but light enough that the topography is still clear, and it is possible to photocopy the map (which is necessary to do sometimes).
 - E. Look over your map and review what you saw during the day, and think about what sorts of patterns are emerging on the map.
 - F. Review your field notes. You may want to add some comments about some stations, or a summary to pull together what was accomplished during the day. Discuss with your field partner or field assistant what you saw and what you think about it.
 - G. Plan out, based on what you saw that day (and previous days) what would be a productive traverse for the next day. Do some of this while in the field, as you can see things such as cliffs that may not be apparent on the map, which will be a problem if your planned traverse goes directly up or down one. If it is helpful, you can mark your planned traverse on the map, but do so **LIGHTLY IN PENCIL** so it can be erased, so successive traverse lines don't clutter up the map or confuse you into thinking they are contacts.
4. **then** finish the beverage².
5. start dinner.

Geologic features you observe in the field should be giving you clues about what is over the next hill, and raising some questions in your mind. Be sure to keep thinking about these, and test whether you were right when you get over that next hill. Some of the most intense thinking you will ever do will be as you are mapping along -- don't make the fatal error of taking an attitude at a station, then putting your brain away with your compass until the next station. Look around you as you walk along, both at features near your feet, and at larger features that form the entire ridge up on the skyline. Sketch in the position of contacts you see in the distance -- often they are easier to locate from the next hilltop than when you are standing on them. Be sure to also go stand on them and walk along them to make sure you understand the nature of the contacts, but locating them from a good vantage point is often the best way.

¹activities 1 and 2 are interchangeable

²beer, Mountain Dew, Diet Pepsi, etc. Unfortunately, due to legal restrictions, we have to stick with soft drinks on this trip.