

GEOLOGIC FIELD METHODS

Lecture: F 9:00am - 2:20pm
Room: 128 Smith Hall

Professor Alec Gates
Office: 137 Smith Hall
Office Hours: TTh 9-10 am

Textbook: Geology in the Field, by R. Compton; purchase is mandatory. Reading should be done before the class.

Grading: Field Projects 1, 2, 3, 5 = 48%, Project 4 = 22 %, Exercises = 5%, Final Exam = 25%. Your graded written report will be returned within one week. You will then have one week to rewrite the report to improve your grade. 33% (1/3) of the report grade is based on the first draft and 67% (2/3) on the rewrite.

Required Supplies: field book, quadangle maps, ruler/protractor, writing utensils.

Recommended Supplies: mechanical pencil, colored pencils, hand lens, clip board, field bag or carrying case.

Field Projects: Departure promptly at 8:30am, return before 2:20 pm. You may drive your own car. Dress appropriately. Field reports 1, 2, 3, 5 are due by the next class (one week). Field report 4 is due in two weeks. Late reports will be docked 5%/day and will not be accepted after one week.

Lectures: On days with no field trip, lectures will end by 12:00m.

Attendance is mandatory.

Week	Topic	Reading
1	Introduction to Course and Maps, Topo Maps EXERCISE: Topographic Maps	Ch. 1, 6.1-6.3, 16
2	Field Equipment, Outcrop Procedure, Rock Types EXERCISE: Common Rocks, Strike and Dip	Ch. 2, 3, 4.
3	Field Project #1: Rocks and Maps	
4	Sedimentary Rocks, Stratigraphic Sections	Ch. 9, 11
5	Field Project #2: Stratigraphic Section	
6	Igneous and Metamorphic Rocks	Ch. 14, 15
7	GANJ Field Trip	
8	Field Project #3: Igneous and Metamorphic Rocks	
9	Deformed Rocks, Full Field Areas EXERCISE: Cross sections, unit thickness	Ch. 12, 6.4-6.5
10-11	Field Project # 4: Full Quad Mapping	
12	Fractures and joints	Ch. 7
13	Field Project # 5: Fractures and Joints	
14	Subsurface mapping, review	
15	Lab Practical	

Please bring this syllabus to every class.

FIELD REPORT FORMAT

All reports must be typed and follow this format. Field reports 1-4 & 6 will be graded and returned. If you rewrite these reports and resubmit them, you can improve your grade. Always use the metric system. Papers should be 5 double spaced pages (max) for reports 1-4 and 6. Report 5 should be 10 double spaced pages max.

ABSTRACT: (Write this last but place it first in your report)

"Executive summary" of findings in order of importance, not chronology or presentation. The writing should be simple and logical. For example: "The stratigraphic section along route I-280 shows a sequence typical of the Mesozoic Newark basin. Rift generated basalts are interlayered with sequences of red sandstone and siltstone showing features of shallow water deposition in wet and dry cycles. The basalts exhibit columnar joints and amygdules which are indicative of extrusion on the surface or into shallow water. The unidirectional ripple cross bedding in the sandstones and siltstones indicates fluvial deposition during wet periods. Mudcracks and reptile footprints document the development of lakes and mudflats during the dry periods. etc."

INTRODUCTION: (Write this 5th)

The introduction should state the purpose and importance of the project, give all pertinent background, and tell the reader what you will show in the report. If you write it after the rest of the report, you will know exactly what you have shown in the report. The introduction will therefore be more effective. An example is: "The Newark basin is one of a large group of Mesozoic rift basins along the east coast of North America. Construction of detailed stratigraphic sections is best method to determine the tectonics and depositional history of these basins. One of the most complete and best exposed stratigraphic sections in the Newark basin occurs along route I-280. In this report, a detailed stratigraphic section is presented and interpreted. etc."

METHODS: (Write this first)

A short summary of what methods were used in data collection, and where and when you did it. Keep your writing simple and to the point. "The stratigraphic section was measured along route I-280 in West Orange, NJ between mile markers 23 and 24 in July, 1994. Bed morphology, grain size, and sedimentary structures were visually identified and observed at a cm-m scale and mm scale using a hand lens. Features were measured using a meter stick. Orientation data were collected at regular 10m intervals using a Brunton pocket transit. etc."

DATA: (Write this 2nd)

Basically, what you observed. Keep organized and group the data as appropriate. If there are several types of data collected, subheadings are recommended. Include no interpretations. For example: "Basalt: The basalt is greenish black with abundant columnar to splintery joints. Grainsize is fine but locally there are medium-grained zones with diabasic texture. There are thin discontinuous zones that are amygdule-rich. The amygdules are filled with calcite, prehnite, and drusy quartz. Layers of basalt range in thickness from 5 to 18m and are composed of one to four flows. They have sharp lower contacts and sharp contacts between the flows. However, upper contacts with sedimentary rocks are commonly scoured. Sandstone: Red medium to very coarse-

grained sandstone forms 1 to 3 m thick beds. The beds are generally massive but locally exhibit 1-4 cm thick ripple cross beds near the upper contact. There are also 5 - 15 cm channel cuts into the bed tops. The grains are dominantly white quartz but there are up to 30 % feldspar grains and 10 % granitic lithic fragments locally. The rock ranges from quartz arenite to lithic arkosic arenite. Siltstone: Red thinly laminated siltstone occurs in 1 - 3 m layers that are interbedded with the sandstone. The siltstone contains 1 - 2 cm ripple cross laminations. Layers capped with closely spaced dessication cracks are common. Locally, the layer tops also contain fossil footprints of reptiles. etc.”

INTERPRETATIONS: (Write this 3rd)

Interpret all of the data (from last section) in this section and speculate where appropriate. If possible, group the data to have multiple pieces of evidence support a single theme (or a few related themes). No new data should be presented. “The red color to the sandstone coupled with mudcracks, fossil footprints, and ripple cross bedding are consistent with subareal deposition in a fluvial to lacustrine environment. The amygdules in the basalt support shallow water or subareal extrusion. The layers containing mud cracks and reptile layers are consistent with deposition within a shallow lake or a mud flat. The interbedding of these layers with those containing evidence of a deeper water fluvial environment document the cycling of wet and dry periods during deposition. etc.”

CONCLUSIONS: (Write this 4th)

Summarize findings in order. Numbered conclusions work well.

USE OF THE COMPUTERS

All reports are to be prepared using computers. The Geology computer facility is located in Smith 127. Access is limited to M-F 8:30am to 5:30pm. It can have longer hours if faculty or TAs stay late. Preparation includes two parts; the text must be typed following the guidelines included and figures must be computer drafted. The text need not be typed in the Geology facility, especially if you have your own computer. The computer drafting may also be done elsewhere but it will be easier to use the facility.

Drafting of maps, stratigraphic columns, cross-sections and profiles should be done using the program Coreldraw or even Word which are loaded on all of the computers. You should first draw a sketch of the illustration to be drafted as accurately as you can.

LEARNING GOALS

There are several skill sets students will learn in this course. To pass and excel in this course, students will need to master the following:

- Read, interpret and locate data and information on topographic maps
- Become proficient in the use of a pocket transit
- Identify rocks and minerals in the field
- Obtain pertinent geologic data from bedrock exposures in the field
- Compile and organize field data from a variety of rock types
- Produce complete geologic maps from field data
- Read and interpret geologic maps from any source
- Construct standard geologic cross sections from any map
- Measure a stratigraphic section in sedimentary rock
- Produce a graphic stratigraphic column from field data
- Interpret a graphic stratigraphic column
- Apply simple trigonometric functions to solve unit thickness and slope/dip issues
- Use computer drafting programs to produce diagrams.
- Write a report using field data in technical format
- Learn standard technical writing style
- Learn to separate observation from interpretation in writing and discussion
- Revise returned papers to address editorial requests
- Identify poor writing regardless of the source