Geology 111

Observing and Describing Rocks in the Field

A Systematic Scheme for Field Observations

General features of the exposure:

What is the **location**, both general ("northwest corner of the intersection…") and the New Zealand Map Series grid reference?

What is the **topography** (hilltop, streambank, hillside, etc) of the area around the exposure?

What are the **dimensions** (length and height) of the exposure?

What is the **orientation** (E-W, N-S, horizontal, etc) of the exposure? What direction does it face?

What is the **general appearance** of the exposure (fresh, weathered, slumped, overgrown with plants, etc.)?

Are similar rocks present in other nearby exposures. Why does this outcrop end?

What are the **shapes** of the rock bodies in the exposure? Art they flat, tubular bodies, lenses or other shapes?

If more than one rock type is present, what are the relations between the rock types? Is one consistently above the other? Interbedded? Measure the thickness of the rock units.

For each rock unit present:

Examine fresh samples if possible: describe mineral constituents and texture. Describe the main rock types as hand specimens according to the outline from Lab 3. Determine if volcanic, sedimentary, plutonic, metamorphic. Name the rock if possible.

Other important features of the rocks (describe for each unit):

Presence and orientation of primary features such as **bedding.** (Bedding is produced in sedimentary and volcanic rocks when slight interruptions occur during deposition, or as a result of rock-hardening processes. Generally, bedding is originally horizontal or sloping at most at 10 degrees. So, if bedding can be

recognized and it slopes more than 10 degrees, it is a sign that the rocks have been deformed).

Other primary structures, sedimentary or volcanic, especially those that might indicate tops and bottoms or units or current directions. These include **cross bedding**, **graded bedding** or **channels** among others. Describe these features and measure their orientations.

Fossils (describe and identify if possible)

Presence and orientation of **secondary** features:

Fractures (joints): sets, orientation, spacing (size of rocks between joints)

Faults (fractures along which movement has occurred). Measure direction and amount of displacement, if possible.

Folds

Foliation (Foliation is planar arrangement of minerals; foliated texture is a common property of metamorphic rocks)

Your notes about the outcrop features should now be the basis of a detailed **written description** of each type of rock in the exposure and the relationships among all the rock units. It should be clear to you from your description how the rock units can be distinguished from each other.

A sketch of the exposure

In addition to a complete written description, it is important to have a visual record of the exposure. This need not be artistic, but should show the most important geologic features in relation to each other. Take a sheet of graph paper and begin by sketching the general outline of the entire exposure; then sketch the boundaries of the exposed rock face. Put on some lines to indicate bedding (if present) and the orientation of major joints, faults and contacts between different lithologies. Detailed sketches of smaller areas can be referred to the main sketch.

INTERPRETATION

You are now in a position to begin interpreting the geologic history, having described the exposure pictorially and in writing. Your interpretation of each rock unit and whole exposure should include discussion of the following questions (after Compton, 1985, p. 31)

What was the geologic environment or conditions under which the unit was originally deposited or crystallized? (for instance, “marine below fair-weather wave base” or “product of basaltic volcanism”).

What were specific processes involved in the formation of the rock unit? (for instance, “deposition by wind” or “pyroclastic flow”).

How are the rock units in the exposure related to each other genetically? (for instance, are they comformable? is there an intrusion?)

How have the rocks been modified after formation by processes such as cementation, compaction or recrystallization?

How have the rocks been deformed structurally or tectonically?

What is the geologic age of the rock unit and what are the age relations among the units?

REFERENCE:

Compton, Robert R., 1985, ***Geology in the Field***: New York, John Wiley, 398 p.

This guide to field observations is modified from chapter 3 of Compton’s book. The book is a detailed, clear introduction to methods in field geology. It is an excellent resource for students and professionals. Students planning to take more geology classes are encouraged to purchase a copy.