

Reading Guide for August 27

from Cvancara, *Field Manual for the Amateur Geologist*

Chapter 1. Introduction to Landforms

pp. 2–3. *Construction vs. Destruction.*

- Identify some constructional geologic processes.
- Identify some destructional geologic processes.

pp. 3–9 *Using Topographic Maps and Aerial Photographs to identify Landforms.* The principal idea here is to learn to identify landforms by their shapes.

Topographic maps are described first. These are a very common way to describe the three-dimensional shape of the terrain using a two-dimensional map. This section gives a very thorough explanation of how these maps work and how to interpret them. A little practice helps too.

Aerial photographs are a bit more difficult to interpret, because the elevation data is not explicit. The book gives some guidelines on how to interpret these as well. Viewing stereopairs, either with the unaided eye or a special stereoscopic viewer, allows you to see topography in relief. We won't be doing much with either aerial photographs or stereopairs in this class, so you may skip this part.

Chapter 9. Rock Deformation-Related Landforms

p. 87. Rocks fold, crumple, and bend. This chapter tells how to describe and recognize the resulting structures.

pp. 87–88. *Dip and Strike.* These two angles tell everything there is to know about the orientation of a flat plane. This section is short; find out what **dip** and **strike** are.

pp. 88–95. *Fold-Controlled Landforms.* There is a lot in this section.

First, find the meanings of the terms **monocline**, **anticline**, **dome**, **syncline**, and **basin**. These are the basic structural elements found in any folded terrain (such as that of Wyoming).

Then, erosion of folded-rock features produces distinctive landforms. Be able to identify the shape of and explain the formation of **hogbacks**, **flatirons**, and **cuervas**.

- What can you learn from V-shaped notches cut into ridges?

Folded features have another angle characterizing them: **plunge**.

- What is plunge?
- What topographic features result from a plunging anticline? A plunging syncline?

Finally, the book describes drainage patterns that develop in different types of terrain. These are shown schematically in Figure 9-9 on page 95. Visualize how erosion of the deformational features described would produce these different patterns.

pp. 95–101. *Fracture-Controlled Landforms*.

The first fractures described are **joints**.

- How are joints formed?
- What large-scale structures do sets of joints create in rocks?
- What sort of drainage pattern follows joints?

The second major category of fractures are **faults**.

- What is the difference between a fault and a joint?
- How are **normal** and **reverse** faults defined? What is the difference?

Page 99 defines a **graben**, a down-dropped block with normal faults on each side. The converse structure, an up-thrust block (not mentioned in the book), is known as a **horst**.

A fault that does not create much elevation change when the rock moves is a **strike-slip** fault. (The fault *slips* in the direction of its *strike*—get it?)

- What sort of land forms are evident along a strike-slip fault?

Chapter 11. Time and Geology

Time is an elusive concept, as this introduction declares. Time is an important concept to geology, as the span of geologic events leading to the way the Earth is now required a vast amount of time to occur.

The most critical idea in this introduction is the **principle of uniformitarianism**, which is introduced here. Although the principle will be expanded in chapter 19 (September 24 for that), get an idea of what this chapter takes it to mean.

pp. 117–119. *Measurement of Time*. This briefly describes the ways geologists can estimate time, and the ages of objects, that are prehistoric. Note what they are and how they work. More than half the section is devoted to **radiometric dating**, which in part attests to its importance. Note how radiometric dating works, what its shortcomings are, and how it can be cross-checked.

pp. 119–124. *Geologic Time Scale*. Although Figure 11-1 and table 11-1 list the geologic time scale, the text first discusses some principles that can be used to compare the ages of rock layers. The geologic record is a sort of puzzle, which we can piece together beginning with the parts that are close together. Unfortunately, it is an incomplete puzzle, so we may not always have all the pieces we need to make a complete picture.

The first clue of the relative ages of two neighboring rocks is given by the **principle of superposition**.

- How does the principle of superposition allow us to find the sequence of rock layers?

Describe the major types of **unconformities**, and explain how they are created:

- **angular unconformity**
- **nonconformity**
- **disconformity**

Now we read of other ways to find the relative ages of neighboring rocks.

- How does the **principle of faunal succession** allow distant formations to be correlated?
- What does the **principle of crosscutting relationships** tell about the ages of rocks or faults?
- How does the **principle of inclusion** allow us to tell which of two rock layers is older?

Now, at last, the book returns to the geologic time scale itself, or, more correctly, to the names given to different intervals in the geologic past. You won't be quizzed on these names, but it is useful to know the names and their orders, so that you can get an idea of where in the grand scheme of things different geological items fit.

pp. 124–125. *Comprehending Geologic Time*. This section is short, but take some time as you read it to imagine the vast spans of time described.