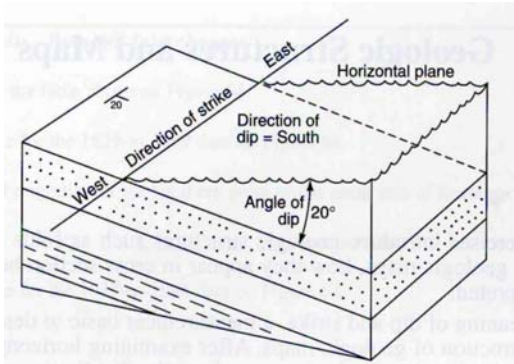


The **Objectives** are to gain experience

1. Drawing cross sections from information given on geologic maps.
2. Recognizing folds and naming their parts on stereoscopic air photos.
3. Thinking in three dimensions.

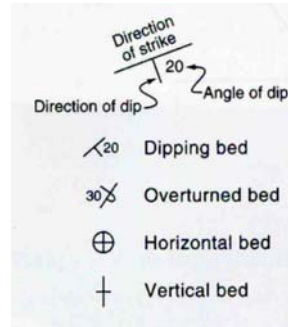
1. Maps and symbols

This diagram defines the strike and dip of an inclined plane.



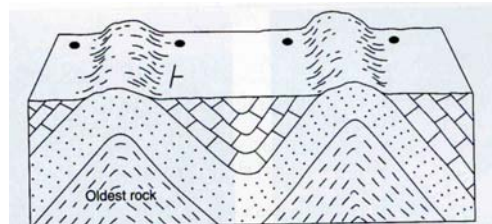
The **strike** is the line that is formed by the intersection of the plane of the inclined bed and a horizontal plane (like sea level).
 The **dip angle** is the angle the bed makes with the horizontal.
 The **dip direction** must be 90° from the strike direction and is the direction a marble would roll down on one of the dipping beds.

These symbols are used on geologic map to convey the orientation of planar beds. Note the symbols for horizontal, vertical, and overturned beds.



Overturned beds are those in which the stratigraphic top of the beds are lower than the stratigraphic bottom. Also note the use of the strike and dip symbol on the diagram to the left.

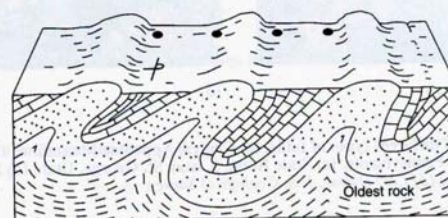
On the diagram to the right, draw in the appropriate strike and dip marker where indicated by the dark circles. A few examples are done for you. On (c), watch out for overturned beds.



(a) Symmetrical folds



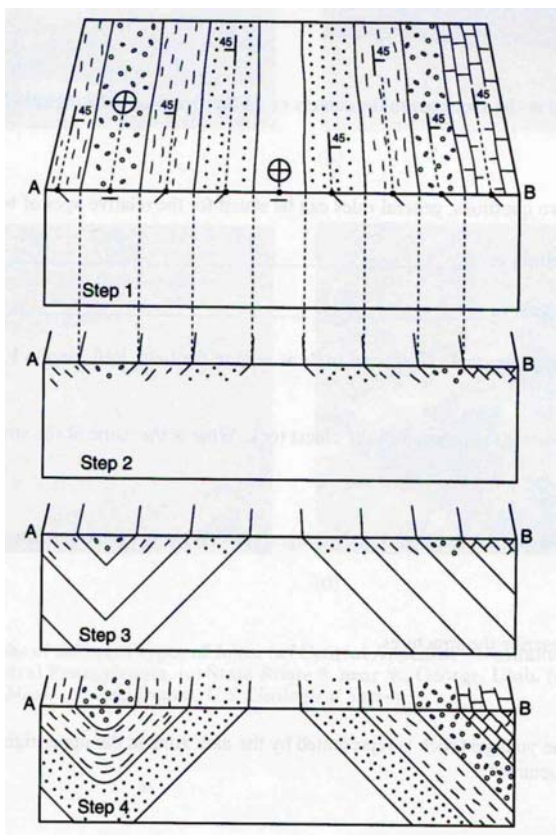
(b) Asymmetrical folds



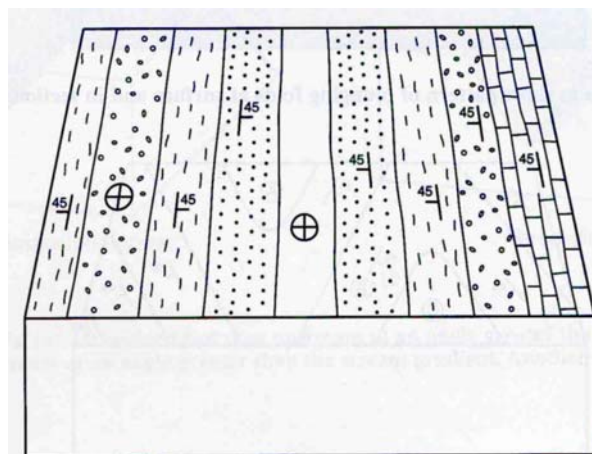
(c) Overturned folds

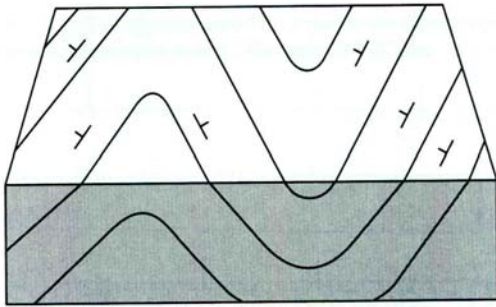
2. Drawing Cross Sections

In this section we will learn to draw cross sections based on information given on geologic maps. The diagram on the lower left shows a step by step approach to drawing cross sections. Note that the strike and dip symbols are used to determine dip. But on the cross sections the contacts between the sedimentary units as well as the internal patterns for the sedimentary units are used to convey the sense of dip.

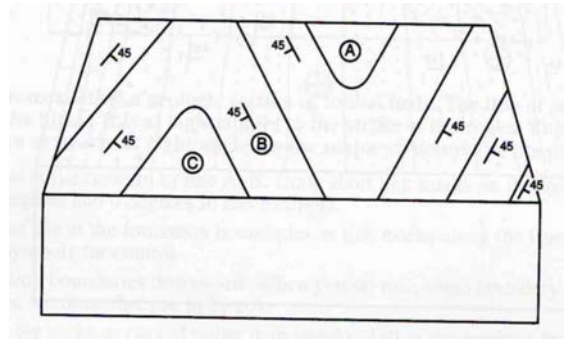


On the diagram below, follow the example and draw a cross section on the front part of the block.





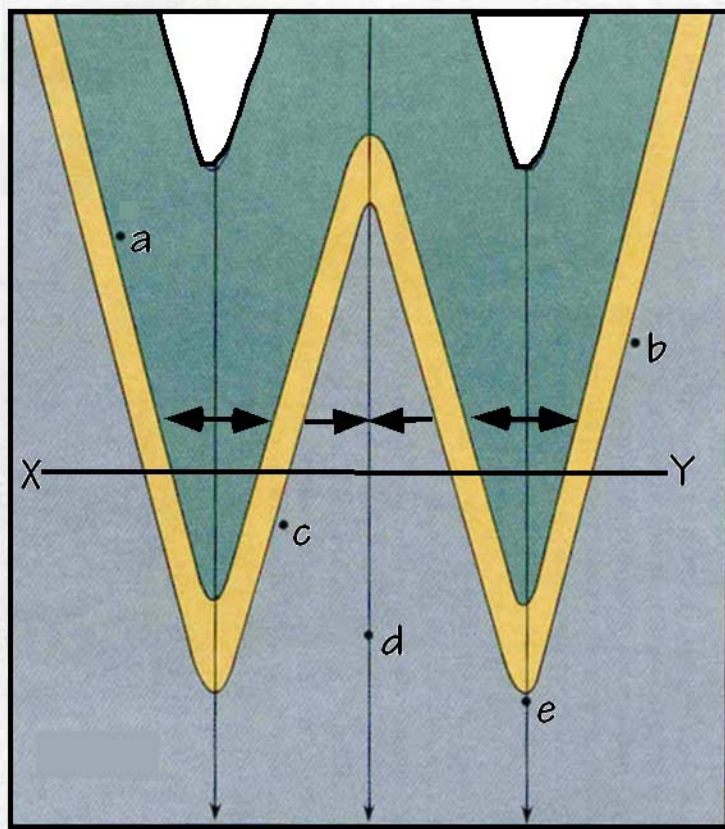
Example



Exercise

On the block diagram on the right, draw a cross section on the blank front part of the block. Follow the example given on the left.

What is the relative ages of beds A, B, and C?



On the diagram at left fill in the strike and dip symbol at the locations denoted by the letters.

Then draw a cross section along the line X-Y. It works the same as the block diagrams except that the cross section is not attached to the map as in the block diagrams.



3. Problems in the lab book.

Look at the Structural Geology section in the lab book on pages 162-189. Review the outcrop patterns we have gone over in class. They are not formally assigned, but you should be able to answer the questions on the top of page 174.

Part 10, page 174

Use the stereoglasses to look at the structure.

1. Here, on this piece of paper, draw a cross section from the lower left corner of the photograph to the middle of the right-hand edge of the photograph. Don't worry about the topographic details. Instead, concentrate on the structural relationships.

2. What would you call the structure in the lower part of the photograph? Describe the direction of plunge.

Part 11, page 175

These beds are so flat the contacts look like contour lines. Look at this photograph for a while for a good example of horizontal sedimentary rocks.

Part 12, page 175

Read the caption and look at the photos.

What kind of contact separates the older sequence and the younger sequence?

What is the sequence of geologic events that must have taken place here?

Part 14, Page 176

Draw a quick sketch map here on this piece of paper that shows

- a. The location of the San Andreas Fault
- b. The way that streams are offset
- c. The relative direction of movement on either side of the fault.

Part 16, Page 177

Draw a north-south geologic cross section through this structure.

Where are the oldest rocks in this structure?

What is this structure called?

How might the *topography* change if the oldest rocks were weak and susceptible to erosion while the younger rocks were strong and resisted erosion?

Part 17, Geologic map of the Grand Canyon

How does the outcrop pattern indicate that most of the Paleozoic strata in the area are horizontal?

Which rock types are cliff formers and which rock types are shallow slope formers?

What effect has faulting had on the course of the Colorado River and on the development of tributary valleys?

Part 18, Geologic map of the state of Michigan

Where are the youngest rocks on the structure that crops out on the Michigan Peninsula?

Where are the oldest rocks on the structure that crops out on the Michigan Peninsula?

What is the structure called?

Draw a quick east-west cross section showing the structure of the rocks underneath the Michigan Peninsula.

Part 20, Geologic map of the southeastern United States

What is the regional strike of the Cretaceous and Tertiary rocks in southern Alabama?

In what direction do these rocks dip?

What is the regional strike of the Paleozoic rocks in Tennessee, Georgia, and northeastern Alabama?

What structural features are indicated by the outcrop patterns of these Paleozoic rocks?

What is the structural relationship between the Cretaceous rocks and the Paleozoic rocks?

What is the sequence of geologic events that led up to the outcrop patterns we see today?

Part 21, Geologic map of Chico, California

This is actually a map of igneous and metamorphic rocks in the Sierra Nevada Mountains east of Chico, which is located in the northern portions of the Sacramento Valley.

Which is older, the granitic rock or the metamorphic rock? How do you know?

Which is older, the granitic rocks or the extrusive rocks? How do you know?

What is the sequence of events that led to the outcrop pattern as shown by this map? Don't get too detailed. Consider the metamorphic rocks as a group, the plutonic rocks as a group, and the extrusive rocks as a group.