

STRIKE AND DIP

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Background



❖ **Describing the orientation of layers of rock**

- When we describe the orientation of sedimentary rock units, we must keep in mind that these rocks were originally deposited as sediment in horizontal (flat) layers.

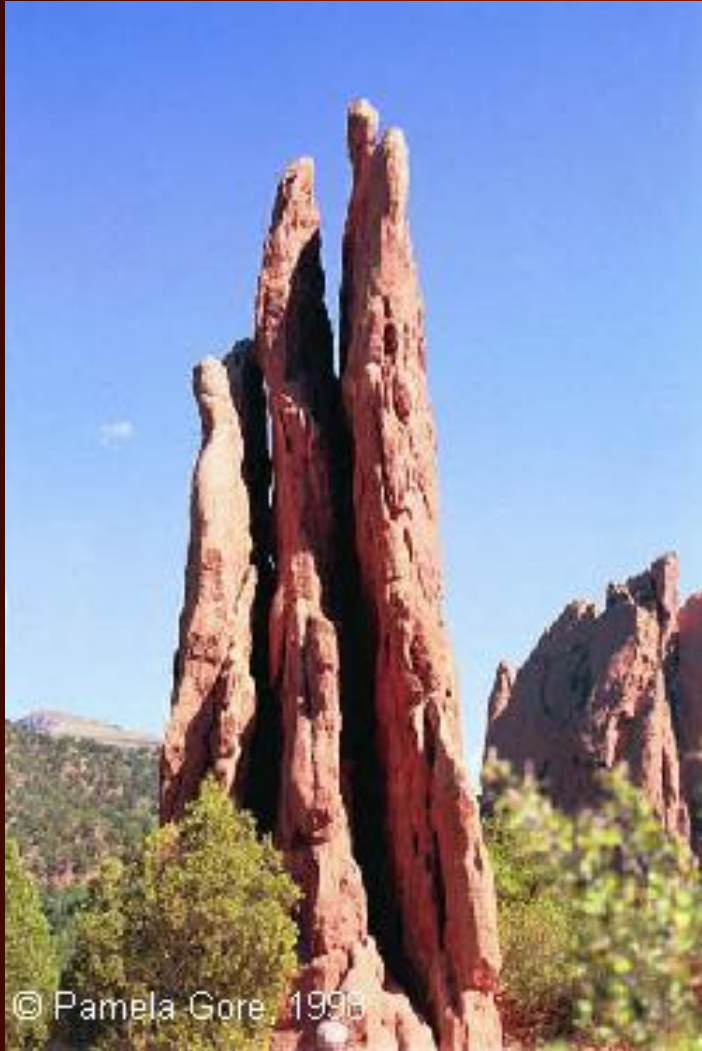
Background



❖ **Describing the orientation of layers of rock**

- Many kinds of rocks form in broad, flat layers, called beds, that stack up like the layers of a cake. In areas like northern Arizona, thick stacks of rock beds that have built up over millions of years remain in their original flat orientation (where they can be viewed as multicolored horizontal layers of rock that make up the spectacular walls of the Grand Canyon).

Background



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Garden of the Gods, Colorado Springs, CO.
<http://gpc.edu/~pgore/geology/geo101/crustaldeform.php>

- ❖ **Describing the orientation of layers of rock**
 - Tectonic forces cause the rock layers to be folded and uplifted, and sedimentary rocks can be in any orientation, including vertical.

Strike and Dip



❖ Describing the orientation of layers of rock

- In places like California near active plate boundaries, however, the forces that make earthquakes don't leave the beds flat for long, but bend and tilt them.



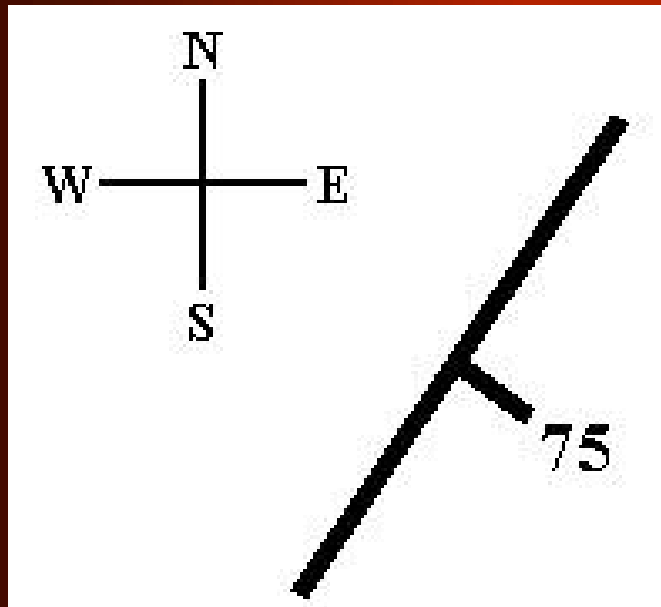
- These tilted rock layers are part of the Kayenta formation, siltstones and sandstones deposited by streams. Powerful forces caused these strata to move, fold and shift over eons.

Above- Tilted Sedimentary Rocks, CA

Below-Kayenta Strata, UH

<http://www.byways.org/browse/byways/2027/places/3455/>

Strike and Dip

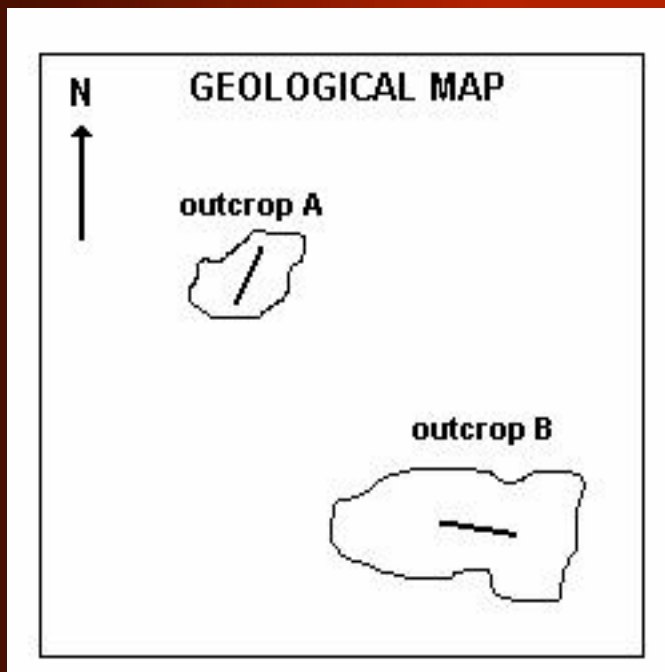


❖ Representation of strike and dip on a geological map.

- Tilted beds are shown on a geological map with a strike and dip symbol.
- The symbol consists of three parts: a long line, a short line, and a number. The long line is called the strike line, and shows the direction in the bed that is still horizontal.
- The orientation or attitude of any tabular or planar feature can be uniquely described by combining *two parameters* - **strike and dip**.

Strike

❖ Representation of strike on a geological map.



- Any tilted surface has a direction that is horizontal.
- Strike is the orientation of a rock outcrop.
- The compass direction along which the bed of rock trends (with respect to north) is called strike.
- The strike of the rock's bedding or foliation is the direction of a level line across its surface
- A level line in a plane measured as the acute angle from north

Strike

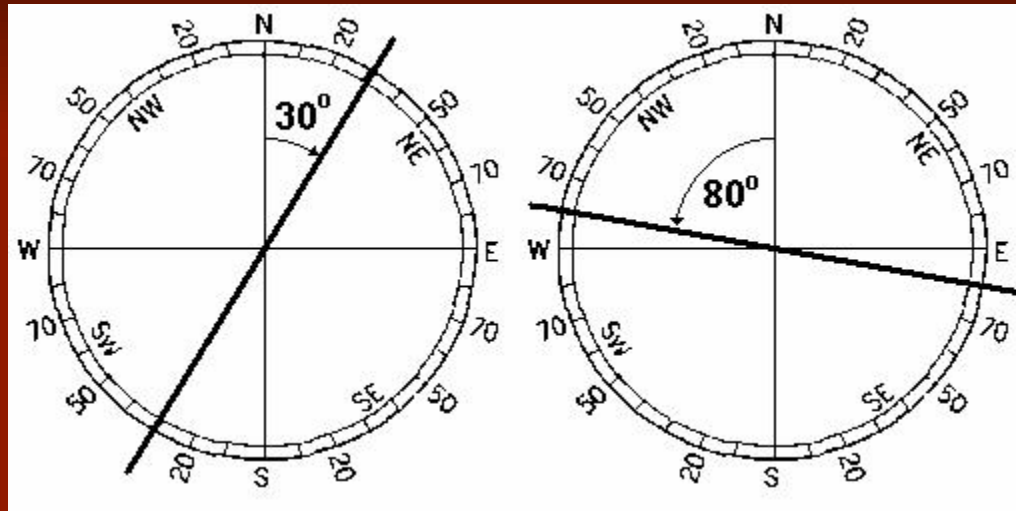
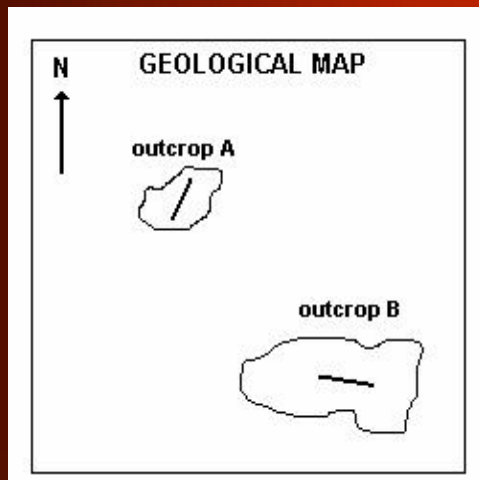


Figure 2: Line striking N 30° E.

Figure 3: Line striking N 80° W.

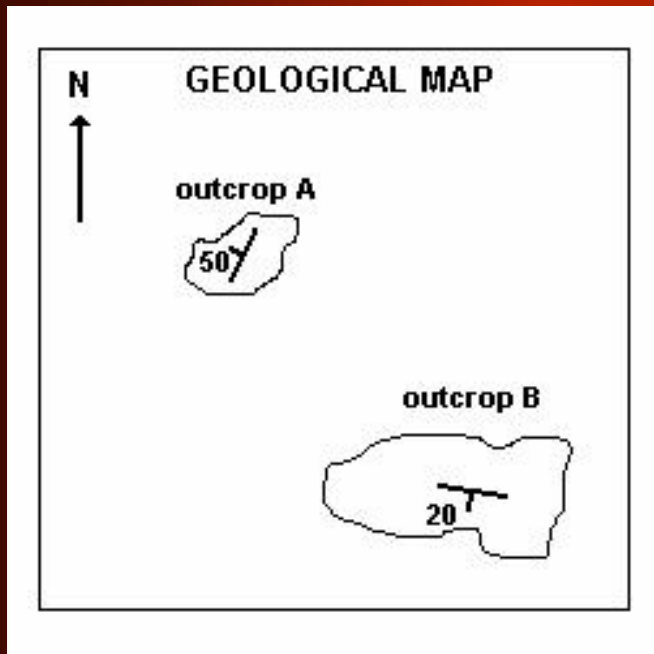


❖ Representation of strike on a geological map.

- By convention, geologists always measure strike as the acute ($<90^\circ$) angle in degrees from north to the line.

Dip

❖ Representation of dip on a geological map.



- Dip is the acute angle between an inclined plane and an imaginary horizontal plane, measured perpendicular to strike
- Dip is measured as an angle and a direction, and varies from 0° (horizontal) to 90° (vertical).
- Dip is how steeply the bed or foliation slopes downhill.
- Unless the plane is vertical, the dip direction must be specified in addition to the dip amount (*N, E, S, W, NE, NW, SE, SW*).

Dip

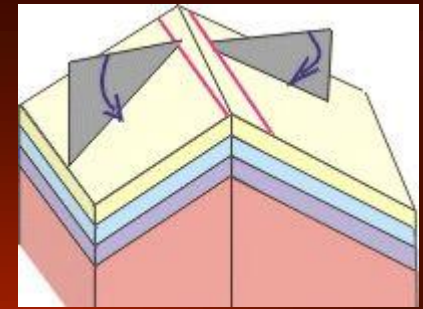
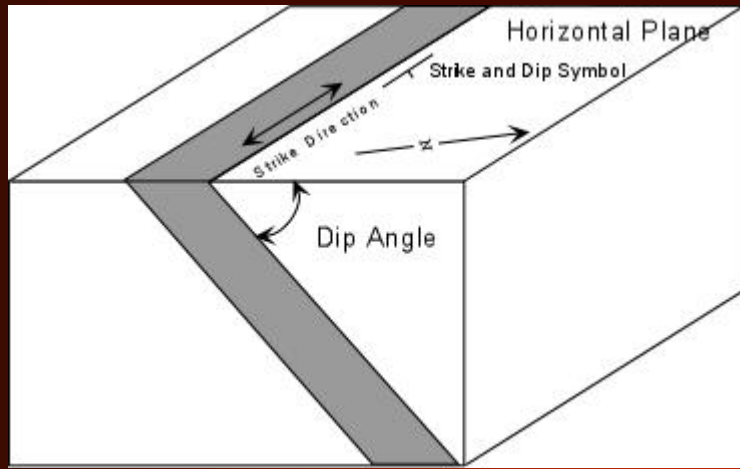
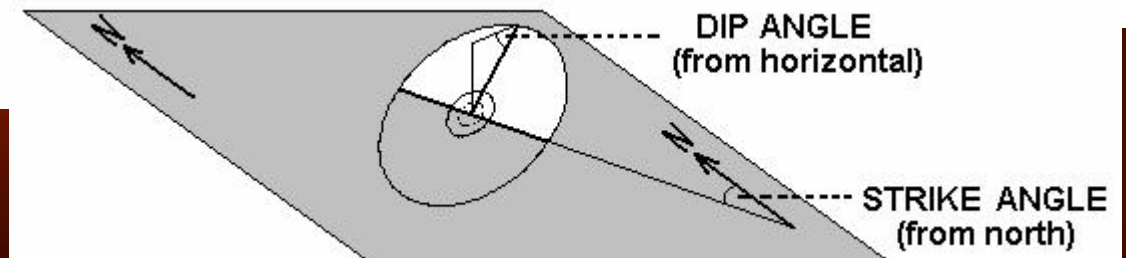
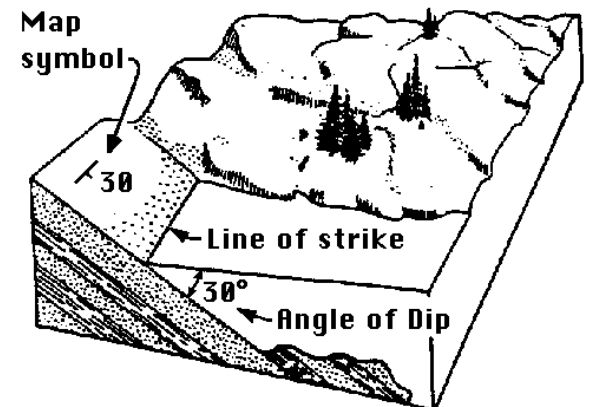
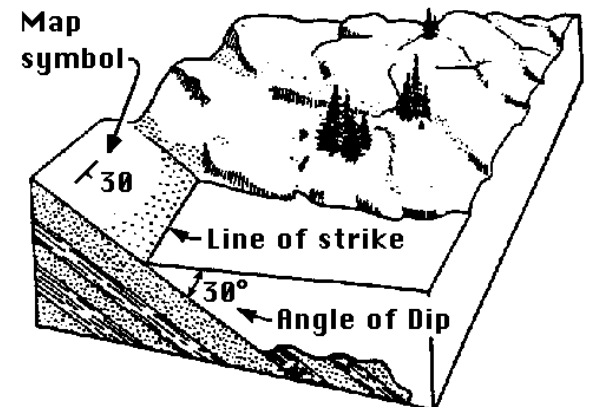
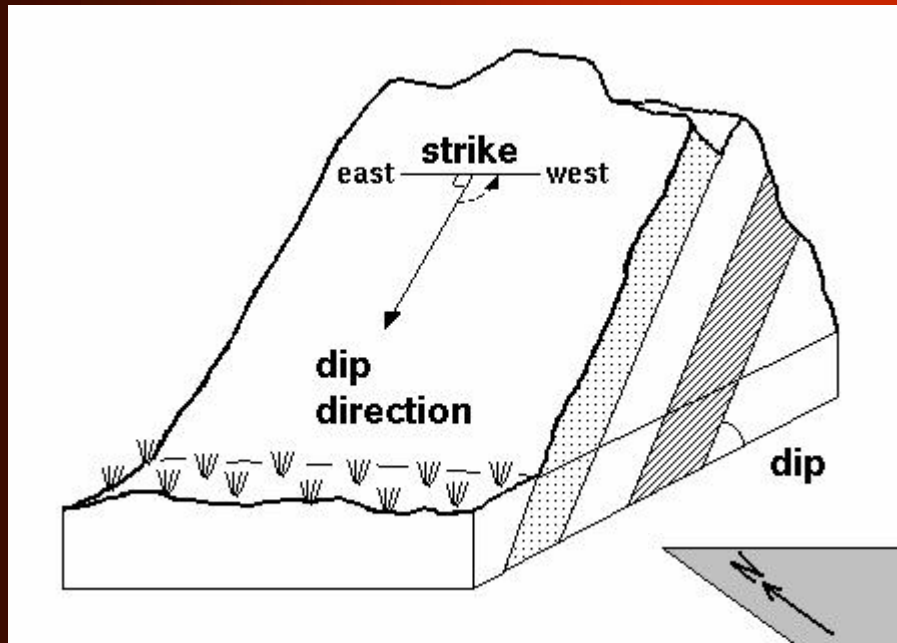
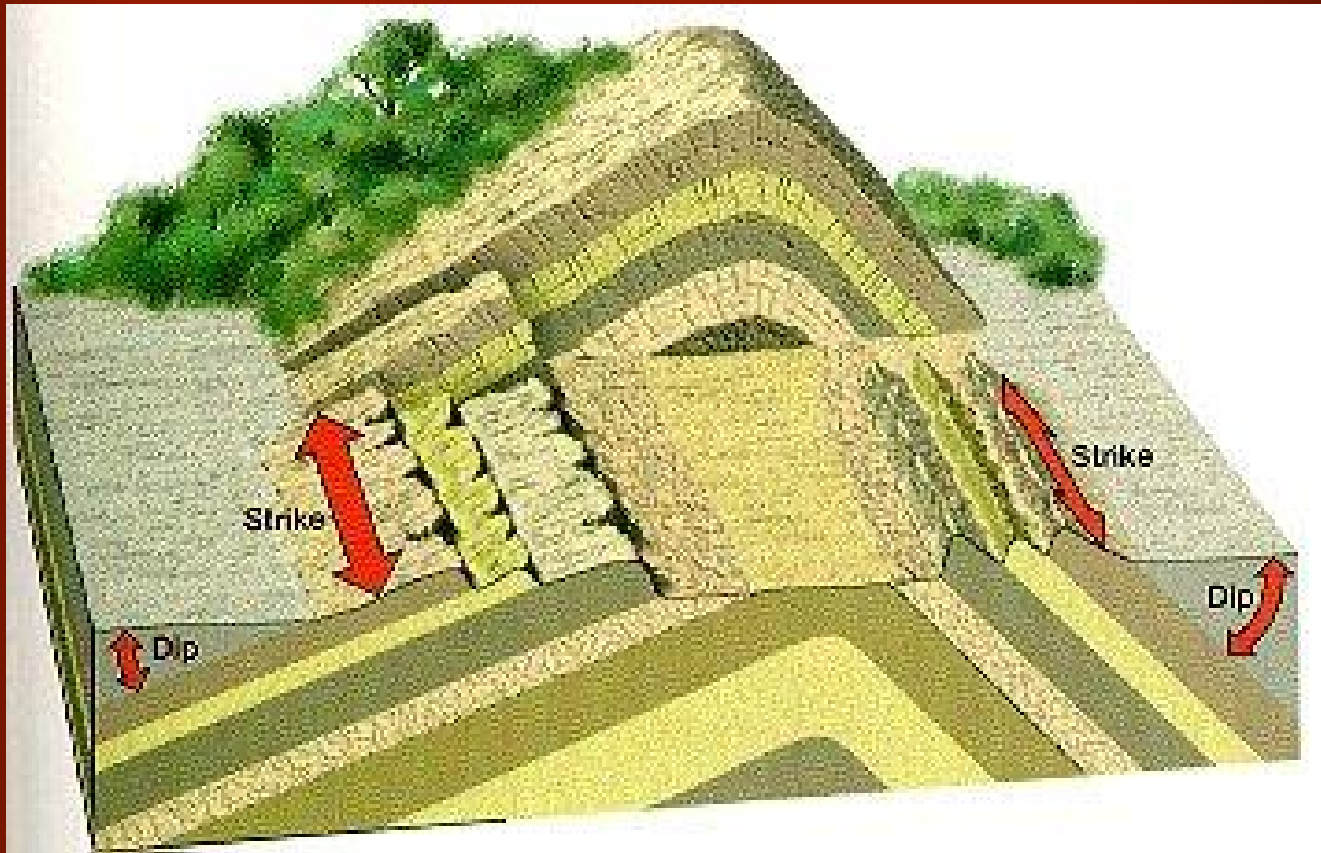


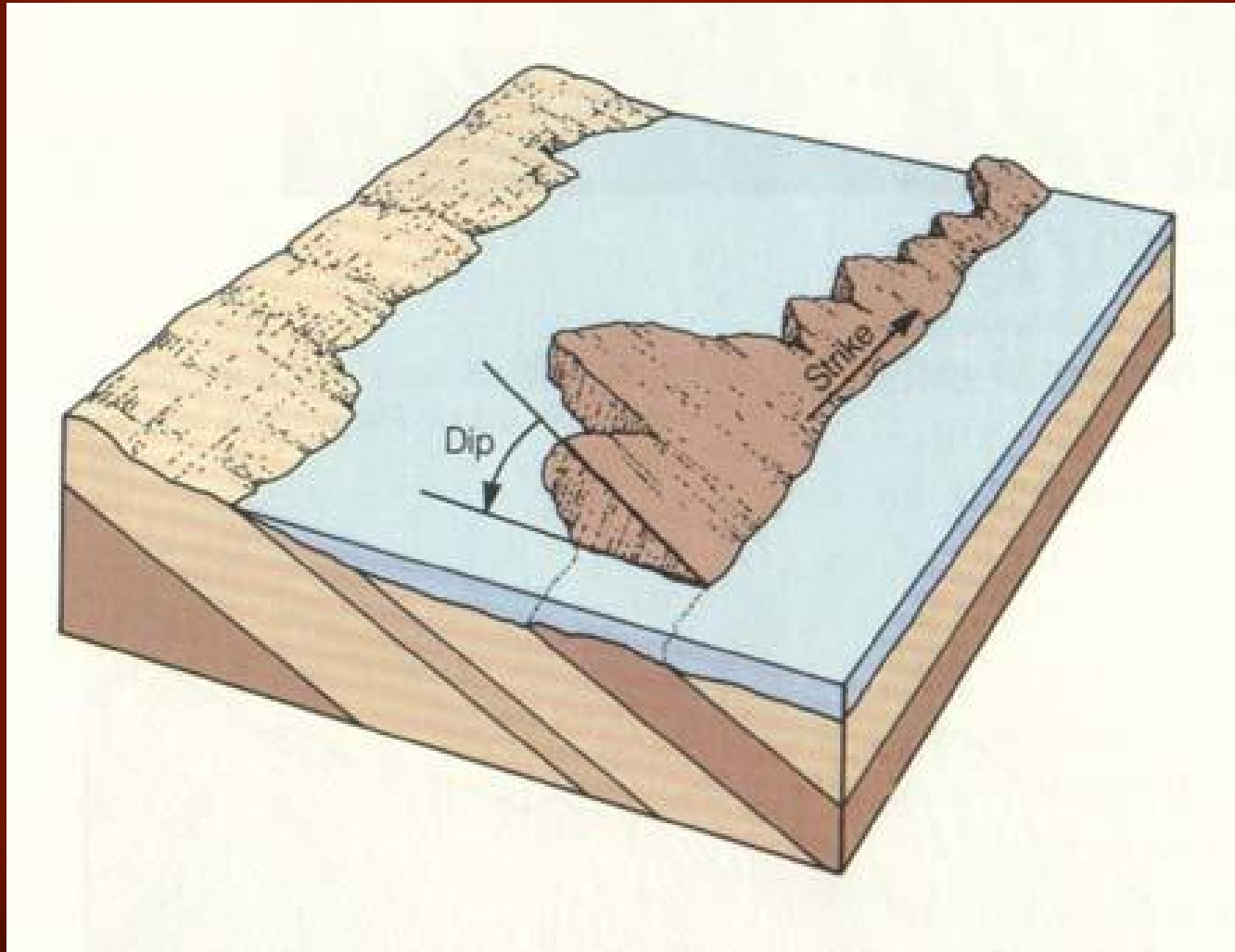
Figure 8. This figure (20-9 from Press and Siver) shows the strike and dip of an inclined bed, and how those features are represented on a geologic map.



Strike and Dip

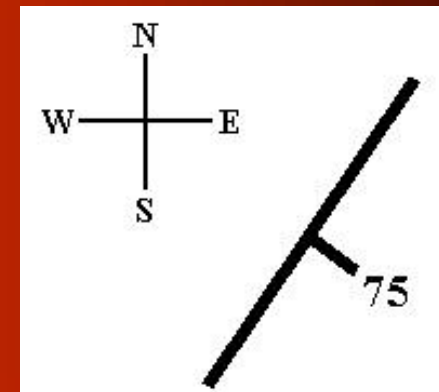
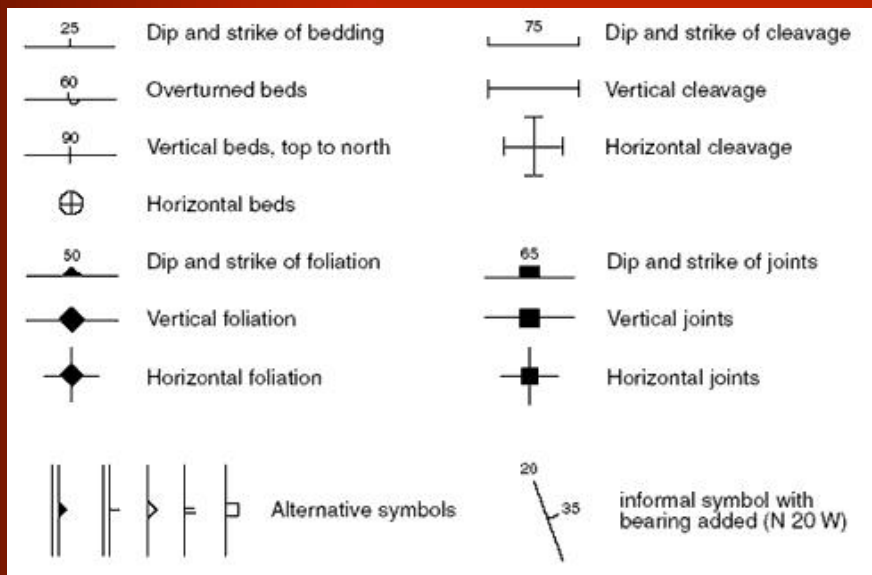


Strike and Dip

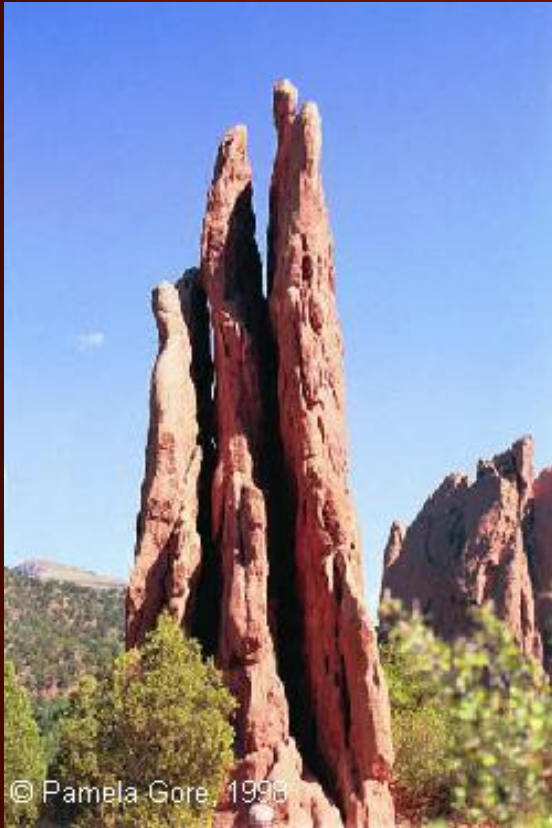


Strike and Dip

❖ Representation of strike and dip on a geological map.



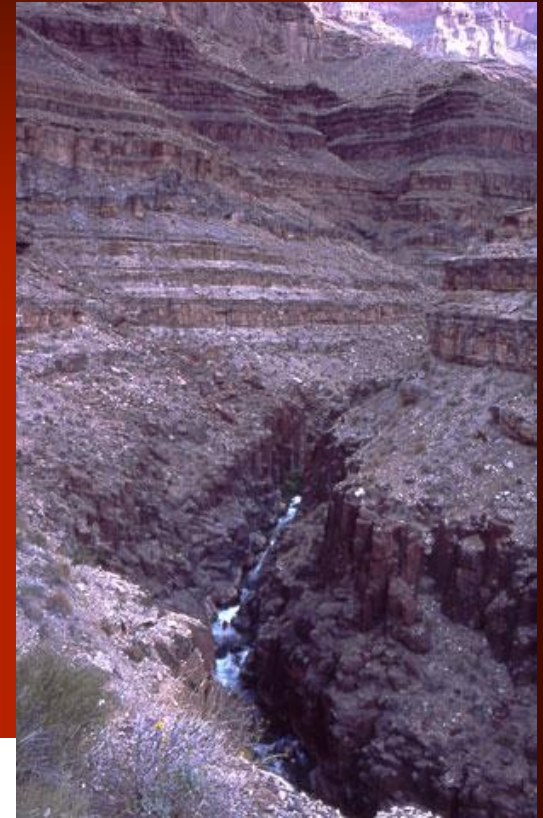
Strike and Dip



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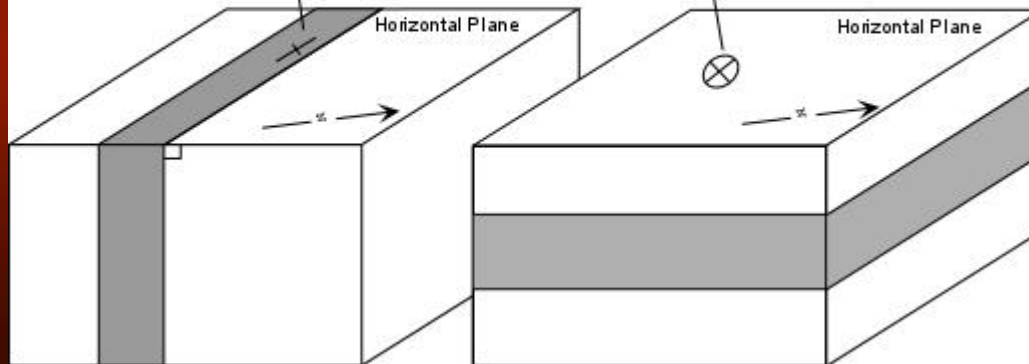
❖ More Strike and Dip Symbols

- Vertical Beds Strike and Dip Symbol
- Horizontal Beds Strike and Dip



Strike and Dip Symbol for Vertical Beds

Strike and Dip Symbol for Horizontal Beds

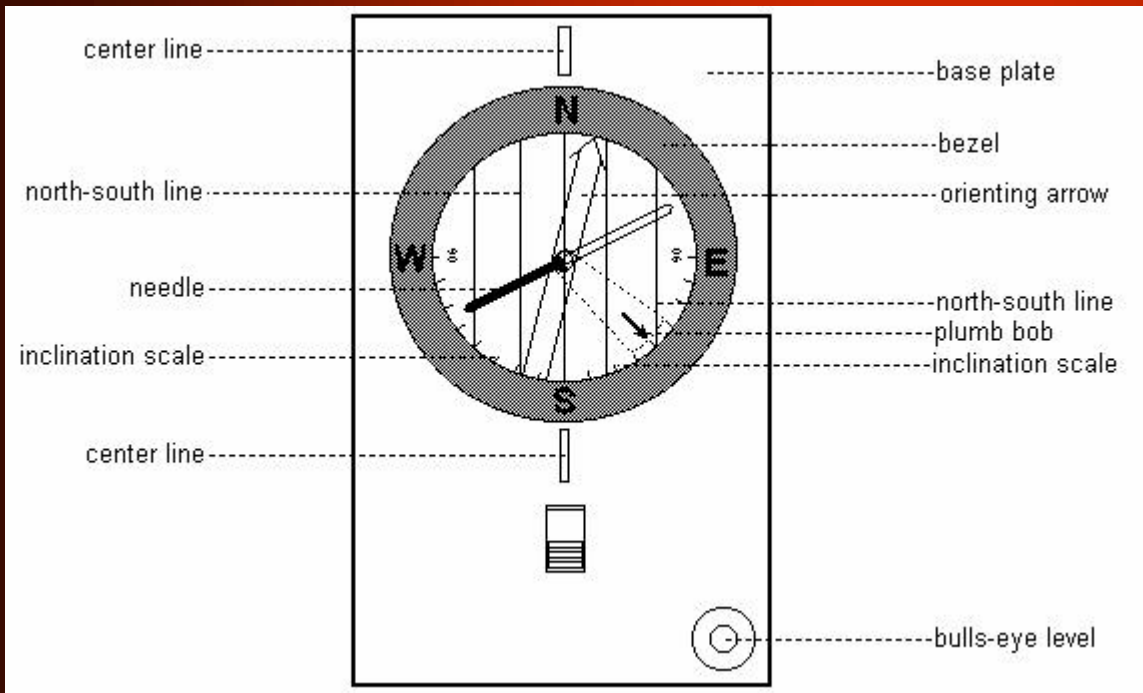


Measuring Strike and Dip



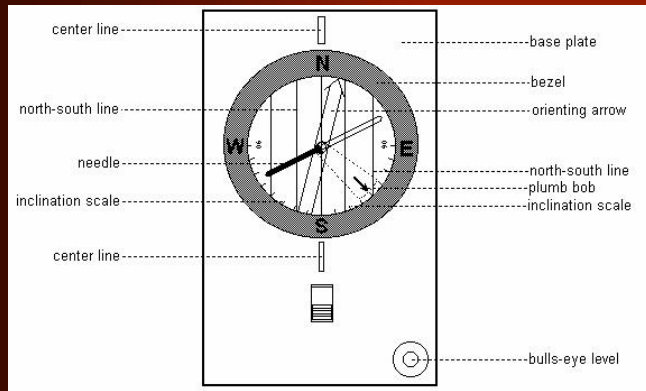
❖ Ranger Compass

- Measuring strike and dip with these Rangers is a 7-step process.



Measuring Strike and Dip

❖ Ranger Compass



1. POSITION COMPASS FOR TAKING STRIKE

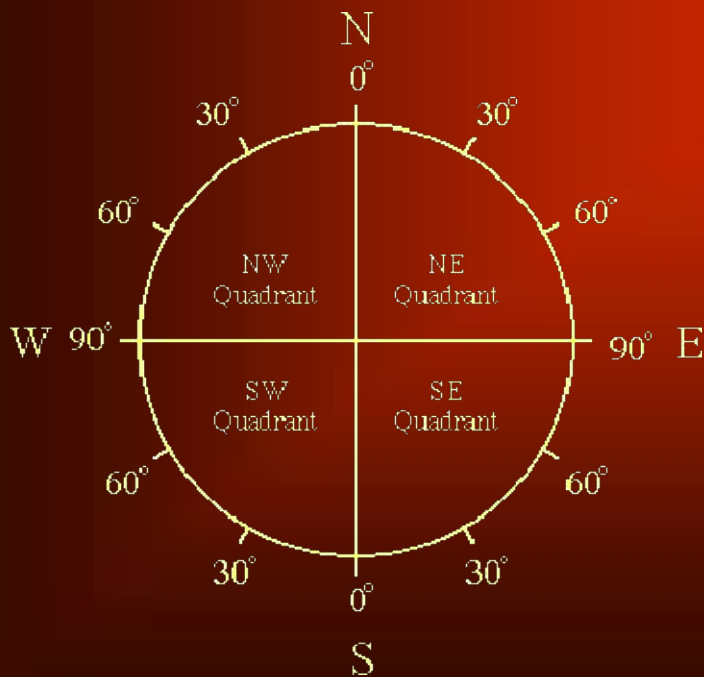
- Using the bull's eye, hold the compass level and place the longer side of the *base plate* against the surface to be measured.

2. DIAL IN STRIKE

- Keeping the compass in position #1, turn the *bezel* until the orienting arrow lines up with the needle. Get in the habit of lining up red to red (north to north) as that is how bearings are taken. For strike, however, it doesn't matter what ends of the orienting arrow and needle line up.

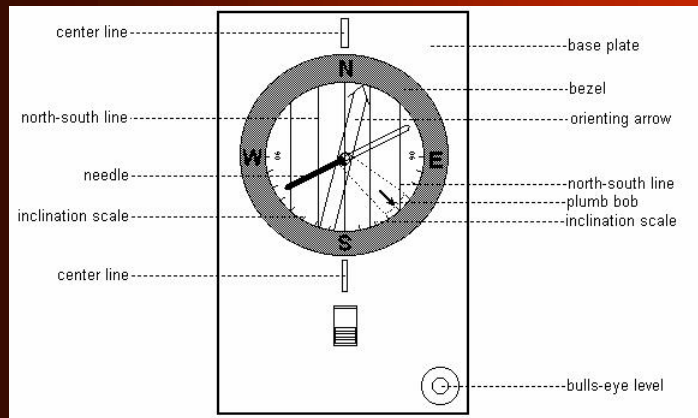
3. POSITION COMPASS FOR PLOTTING STRIKE

- Move the compass to the map and without changing the strike you just dialed-in (**don't touch the bezel!**), rotate the *base plate* so that the north-south lines on your compass line up with north and south on the map (use lines of longitude, UTM, Township-Range, roads, building edges, or whatever is available). Find your position on the map and place the long side of the compass over that point while simultaneously keeping the N-S lines on the compass lined up with N-S on the map.



Measuring Strike and Dip

❖ Ranger Compass



4. PLOT STRIKE

- Draw a line against the long side of your compass through your position on the map to represent the strike direction.

5. GET THE COMPASS READY TO MEASURE DIP

- With the mirror completely open, hold the compass with the mirror facing you on the left. Turn the *bezel* until N is up and E and W are on the *centerline*.

6. MEASURE DIP AMOUNT

- Align the south edge of the compass with the dip direction and place it against the plane to be measured. Remember that the dip direction is perpendicular to strike. It is also the direction in which water would flow (ball roll etc.), and therefore the direction in which the maximum dip amount is measured. Read the dip amount where the *plumb bob* points on the *inclination scale*.

7. RECORD DIP AMOUNT AND DIRECTION ON MAP

- Make a “tick” perpendicular to the line representing strike direction in the appropriate dip direction. Write the dip amount next to the tick.