

# **Structural Geology and Structural Analysis**

**The Earth is a Dynamic Planet.**

## contour maps and contour lines

A contour line is a line representing the locus of points in the map area of equal value for a specific parameters. Any map that employs contour lines to represent spatial variations in the value of a parameter is called a contour map.

Contour map is restricted to maps that show variation in elevation.

The difference in the value of a parameter represented by adjacent contour lines is called the contour interval.

$$\begin{aligned} &\text{Tangent (angle of dip)} \\ &= \frac{\text{contour interval}}{\text{spacing on map between contours}} \end{aligned}$$

Closely spaced contours represent steep gradients, and widely spaced contours represent gentle gradients.

Topographic maps depict the shape of the ground usually by means of *topographic contours*.

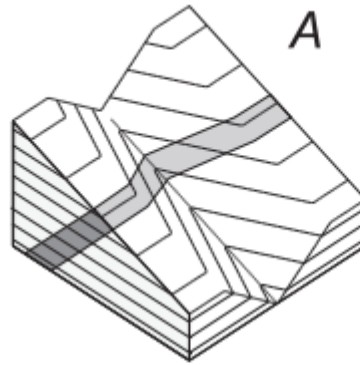
General characteristics of contour map:

- The contour interval on a map is constant.
- Contour lines generally should not merge or cross: (except overhang and vertical bed)

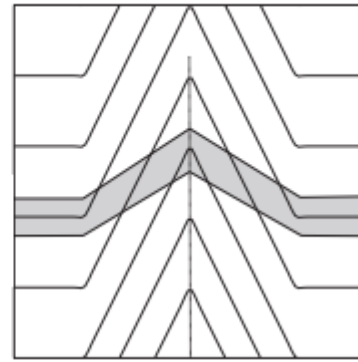
### **Effect of topography**

The relationships between dip and topography have been formalized into a series of statements, collectively called the *Rule of Vs*, by which the direction of dip can be estimated directly from the outcrop patterns.

*Beds dip  
upstream*

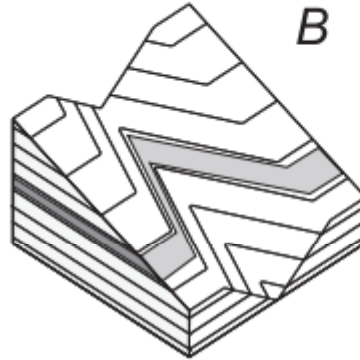


**A**

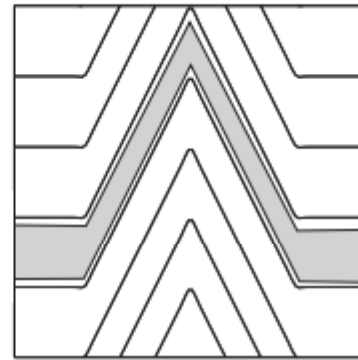


*V points  
upstream;  
blunter than  
contours*

*Horizontal  
beds*

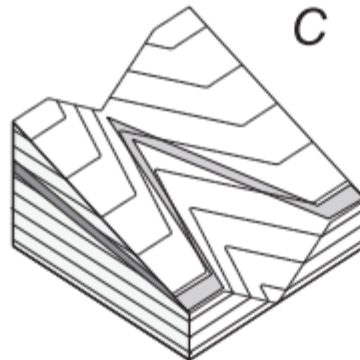


**B**

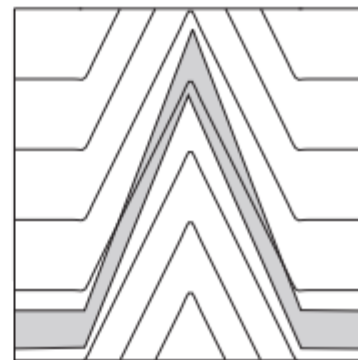


*V points  
upstream;  
parallel to  
contours*

*Beds dip  
gently  
downstream*

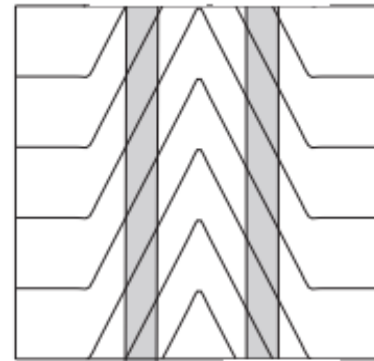
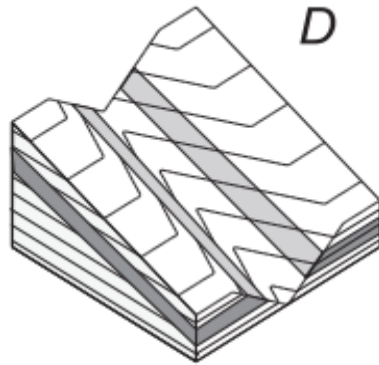


**C**



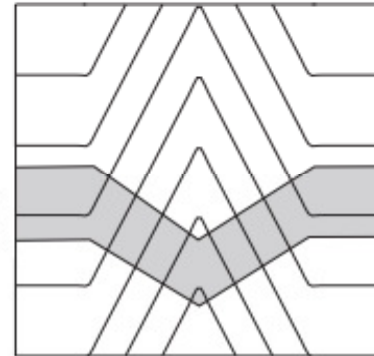
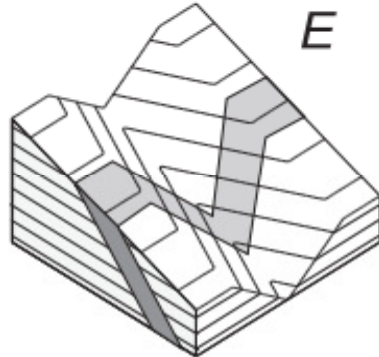
*V points  
upstream;  
sharper than  
contours*

*Beds dip  
with stream  
gradient*



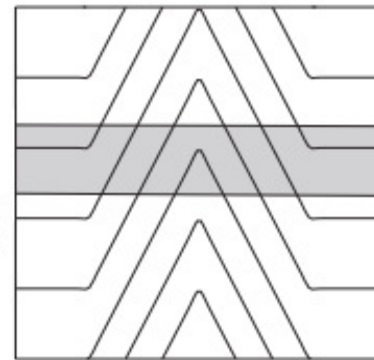
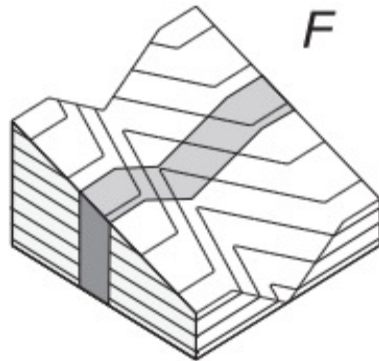
*No V  
shape*

*Beds dip  
steeply  
downstream*



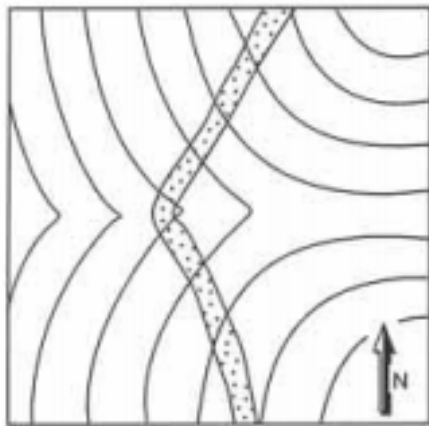
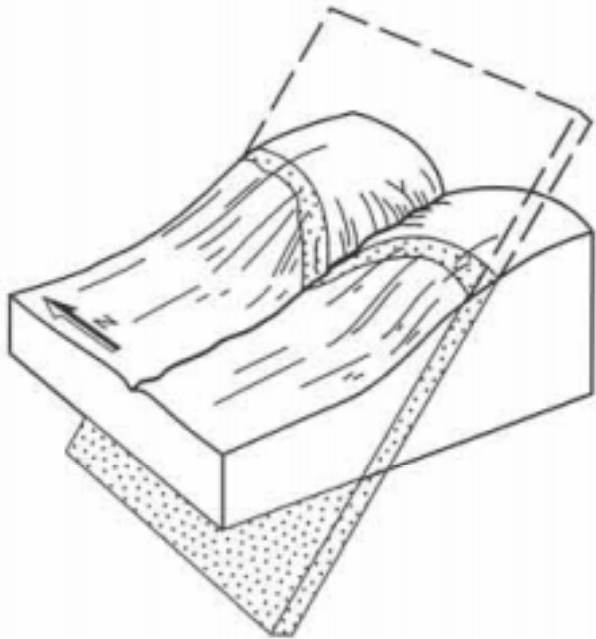
*V points  
downstream*

*Beds  
vertical*

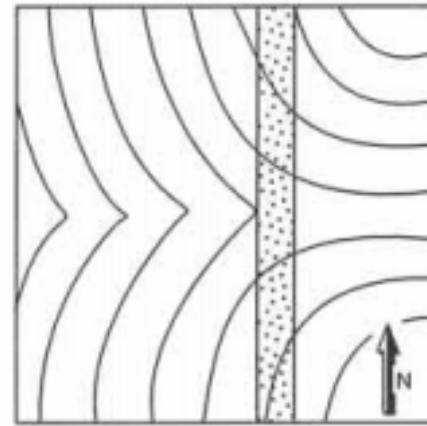
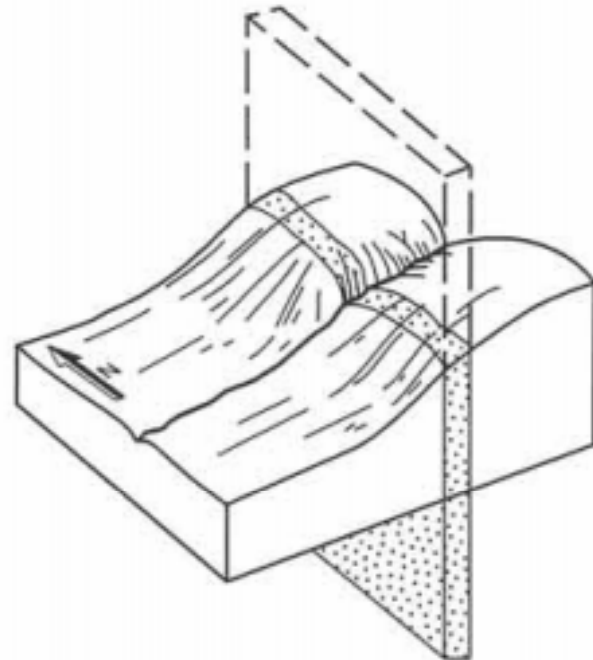


*No V  
shape*

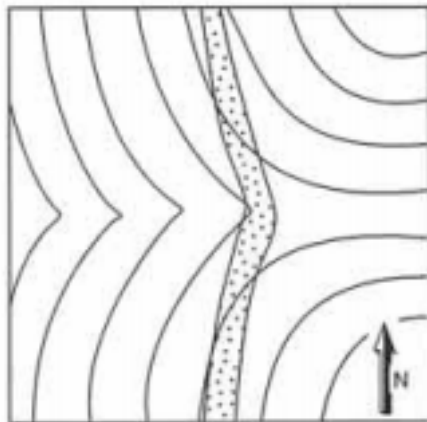
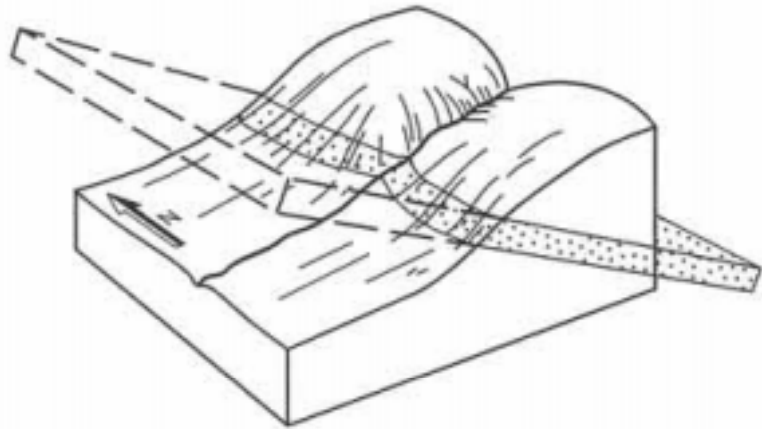
a) Downstream dip



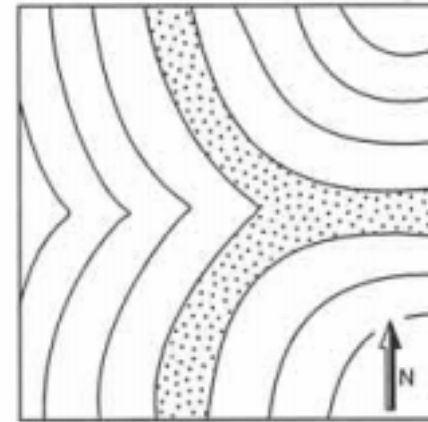
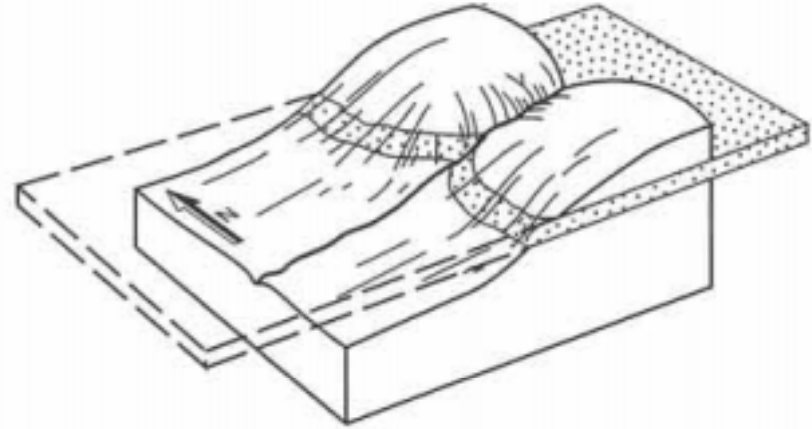
b) Vertical dip



c) Upstream dip



d) Horizontal dip

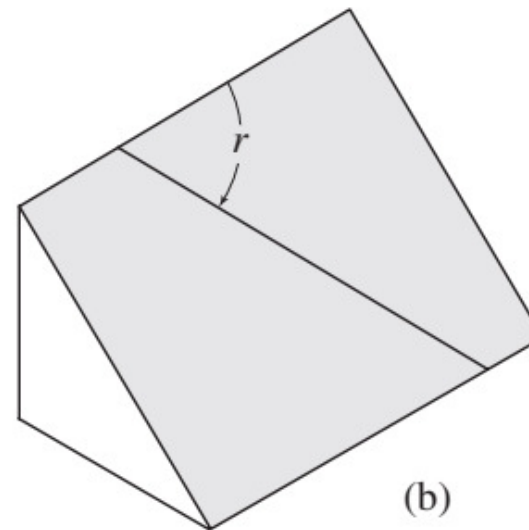
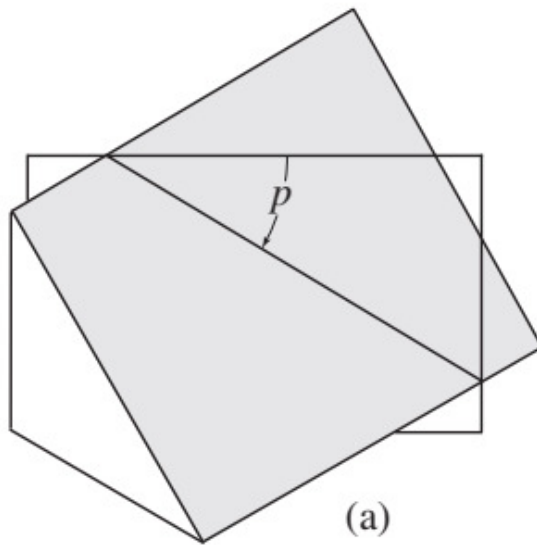


**Line:** the geometrical element generated by a moving point; it has only extension along the path of the point. Lines may be rectilinear (straight) or curvilinear (curved). Only straight lines are treated here.

**Plunge:** the vertical angle measured downward from the horizontal to a line .

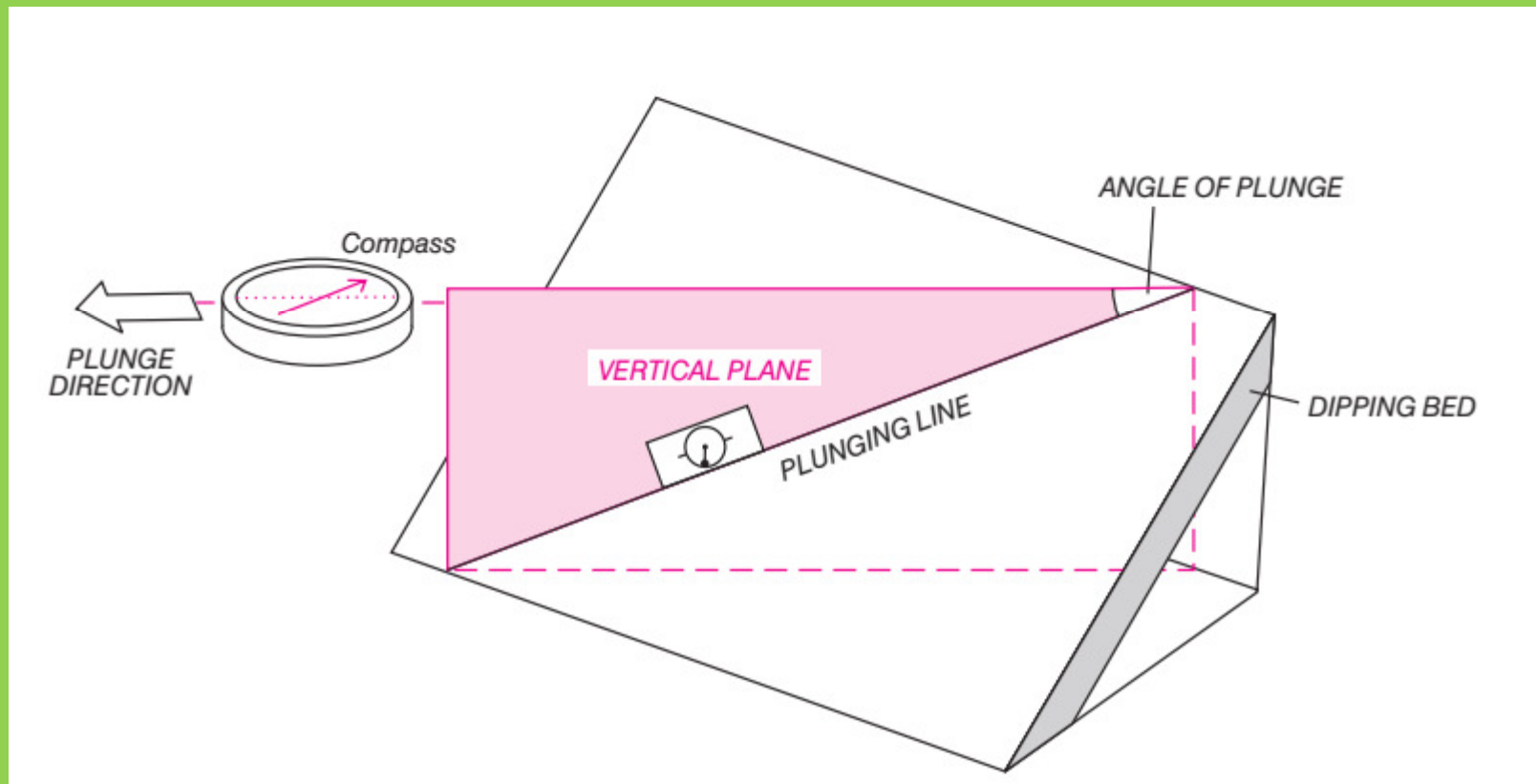
**Pitch:** the angle between the strike direction and a line in a specified plane. Rake is synonymous.

**Trend:** the horizontal direction of the vertical plane containing the line, specified by its bearing or azimuth.





## The concepts of direction of plunge and angle of plunge.



**Thickness:** the perpendicular distance between the parallel planes bounding a tabular body, as displayed on any section perpendicular to these planes; also called the true or stratigraphic thickness.

**Apparent thickness:** the distance between the bounding planes measured in some other direction, for example, the perpendicular distance between the traces of the bounding planes on an oblique section, or in some other specified direction, as in a drill hole. It is always greater than true thickness.

**Outcrop width:** the strike-normal distance between the traces of the parallel bounding planes measured at the earth's surface. It may be measured horizontally or on an incline.

**Depth:** the vertical distance from a specified level (commonly the earth's surface) downward to a point, line or plane.

