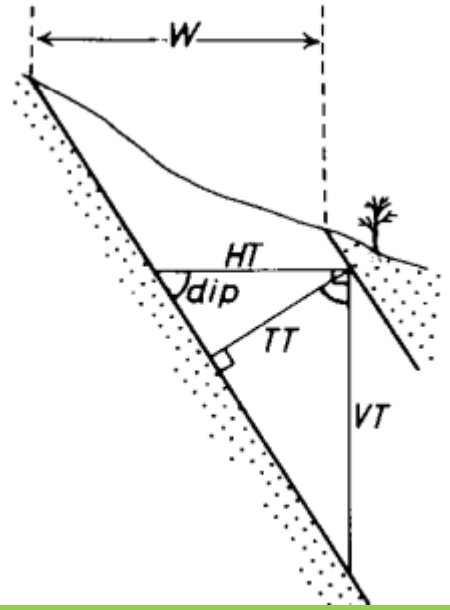
Structural Geology
and
Structural Analysis

The Earth is a Dynamic Planet.

Isochores and isopachs

Isochores are lines of equal vertical thickness and *isopachs* are lines of equal stratigraphic (true) thickness.

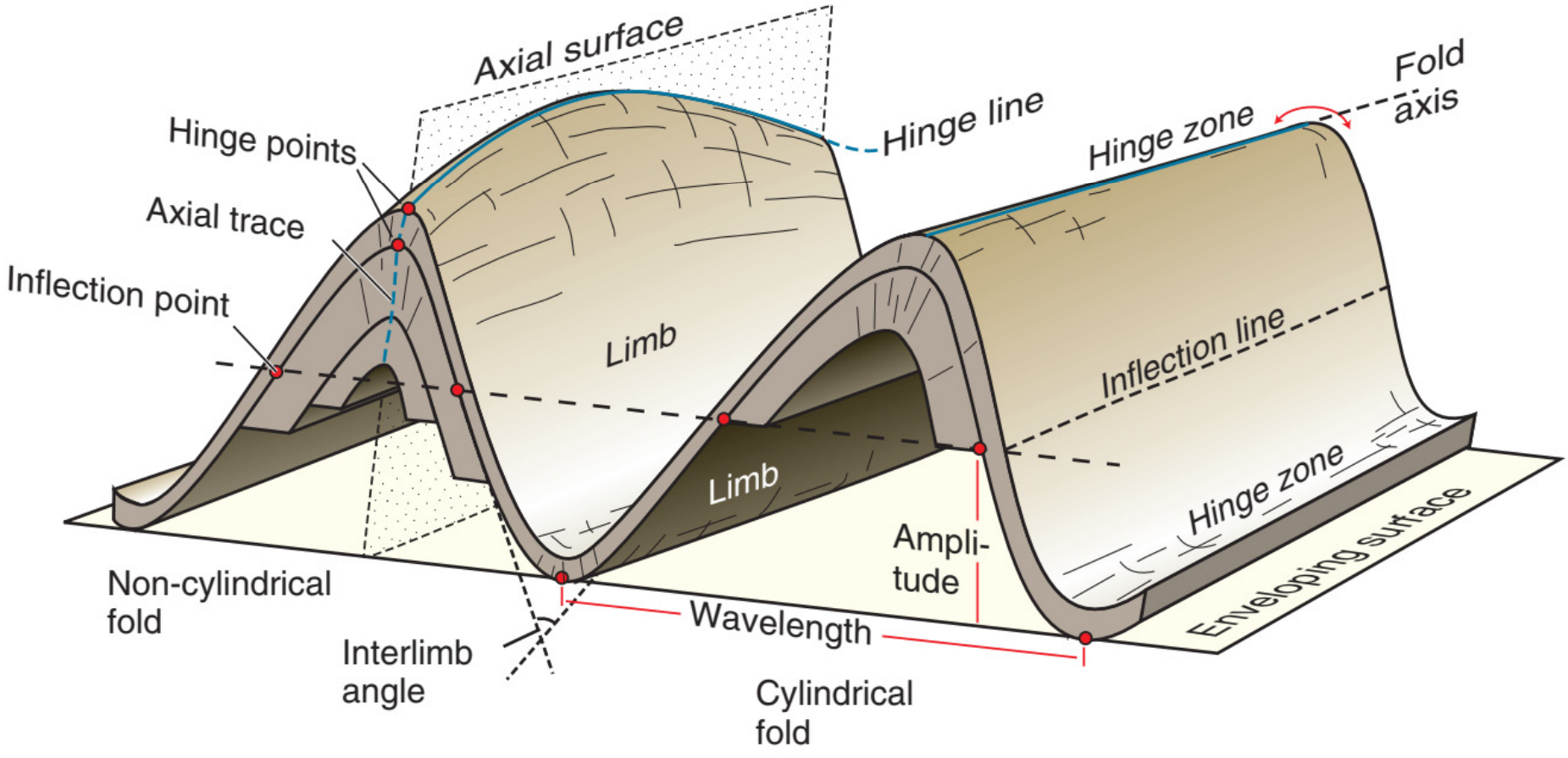


If VT and HT are both known, the dip can be calculated from

$$\tan(\text{dip}) = \frac{VT}{HT.}$$

Folding

A geological surface which is curved is said to be *folded*. Most folding is the result of crustal deformation whereby rock layering such as bedding has been subjected to a shortening in a direction within the layering



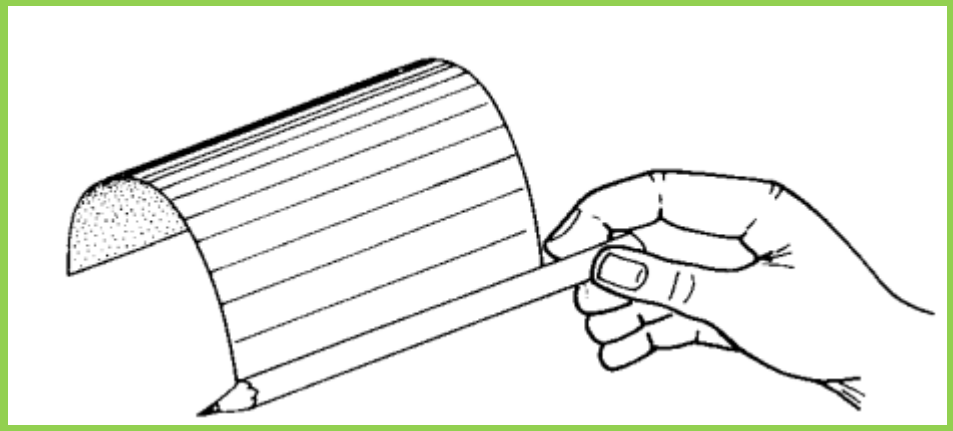
Cylindrical and non-cylindrical folding

A curved surface, the shape of which can be generated by taking a straight line and moving it whilst keeping it parallel to itself in space, is called a *cylindrically folded surface*.

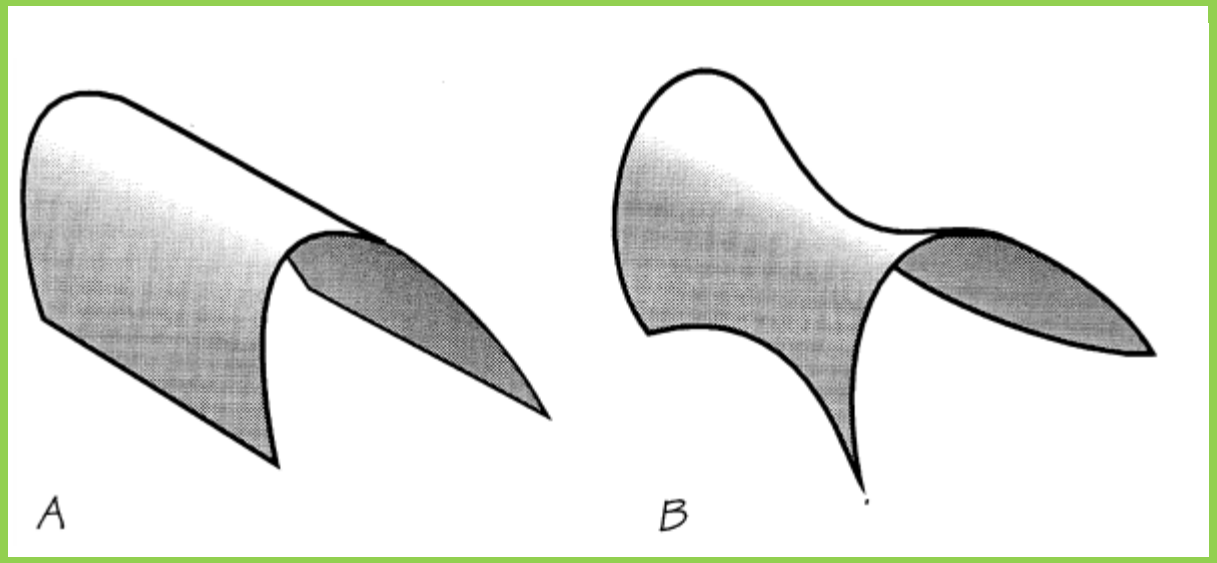
Folds which cannot be generated by translating a straight line are called *non-cylindrical*.

The line capable of 'generating' the surface of a cylindrical fold is called the *fold axis*.
An important property of cylindrical folds is that the fold shape, as viewed on serial sections remains constant.

Serial sectioning of a non-cylindrical fold produces two-dimensional fold shapes which vary from one section to another



The concept of a cylindrically folded surface.



A: Cylindrical fold. **B**: Non-cylindrical fold.

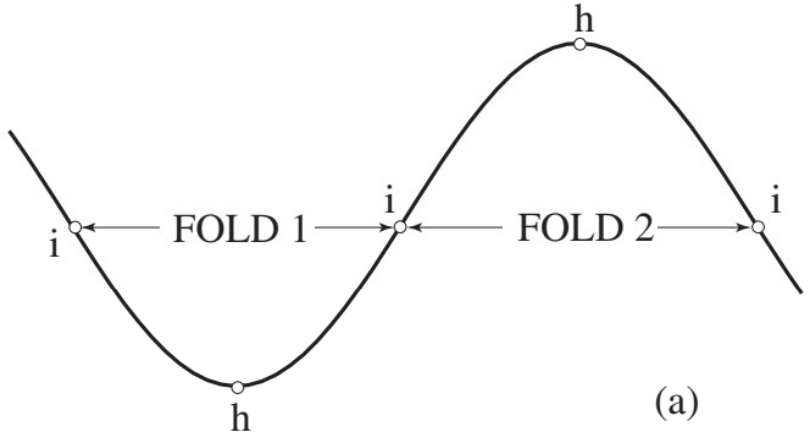
An important geometrical feature of cylindrical surface is that its shape can be fully represented in a cross-section drawn perpendicular to the axial direction. This is the *fold profile*

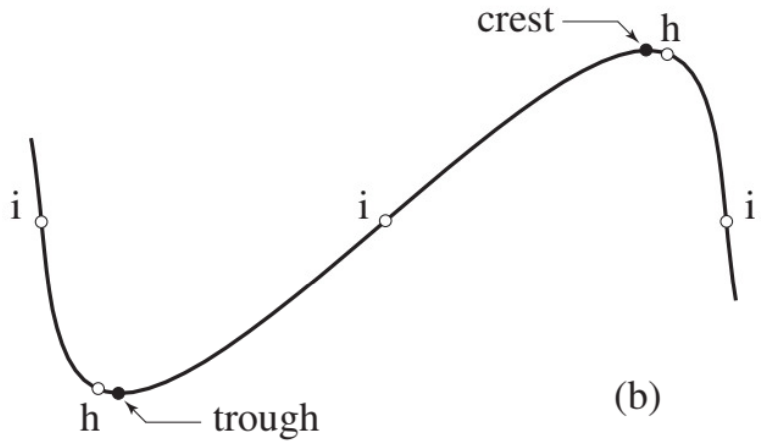
The lines which separate adjacent folds are the *inflection lines*. They mark the places where the surface changes from being convex to concave or vice-versa.

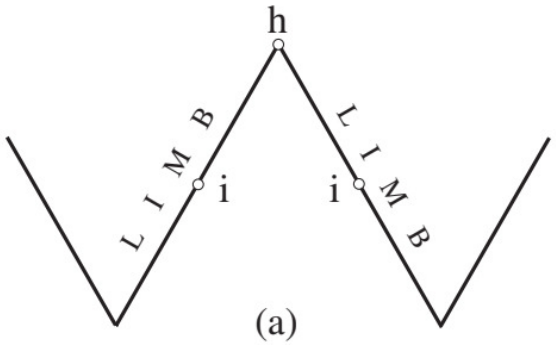
Between adjacent inflection lines the surface is not uniformly convex or concave but there are places where the curvature is more pronounced. This is called the *hinge zone*.

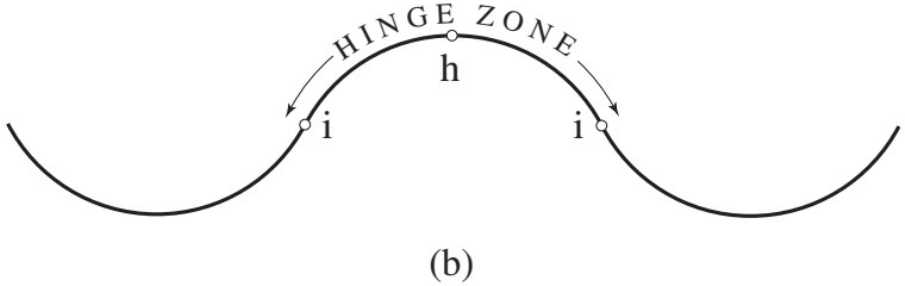
The *hinge line* is the line of maximum curvature. *Like the inflection lines, the hinge line need not be straight except when the folding is cylindrical.* Hinge lines divide folds into separate *limbs.*

The *crest* or high point and the *trough* or low point on the curves are two such features. In three dimensions, each of these points is the intersection of a line and the profile plane. These are the *crest line* and the *trough line*, and they are parallel to the axis.



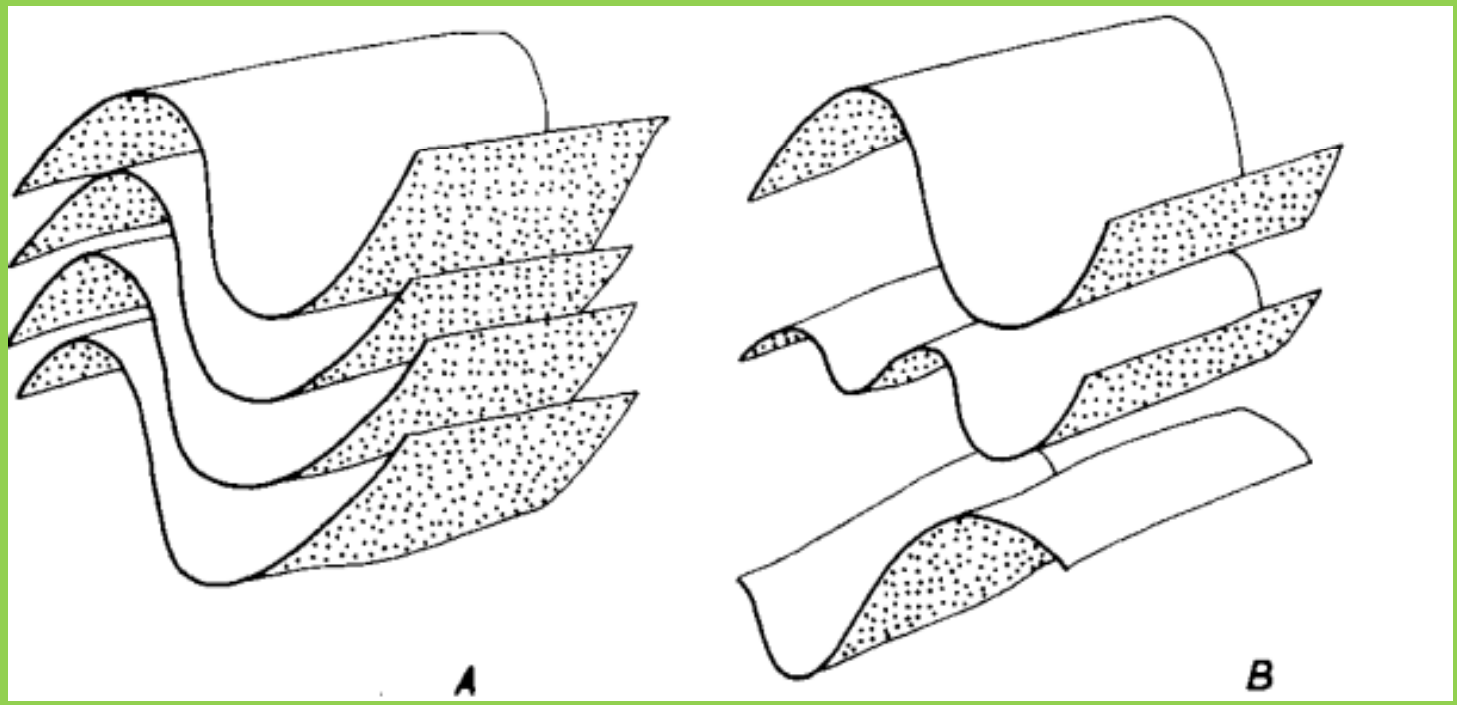






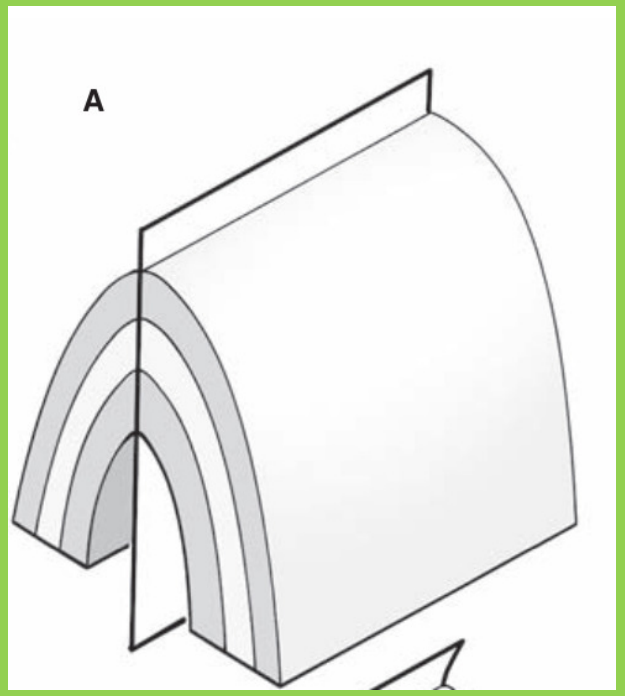
Harmonic folding is where the number and positions of folds in successive surfaces broadly match .Where this matching of folds does not exist the style of folding is called *disharmonic* .

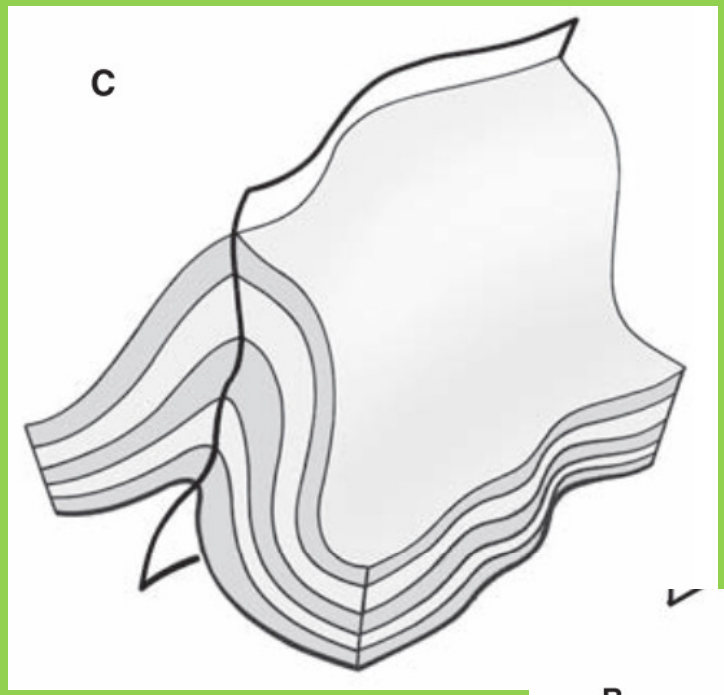
The *axial surface* of a fold is the surface which contains the hinge lines of successive harmonically folded surfaces.

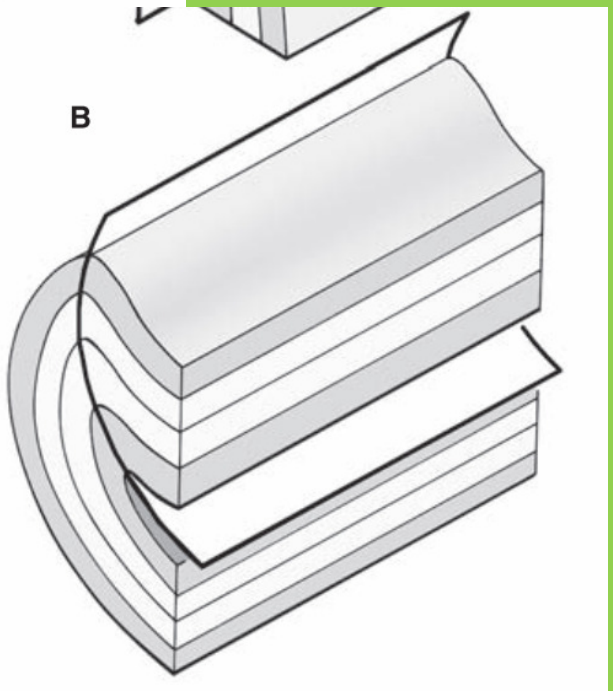


A: Harmonic folding. **B**: Disharmonic folding.

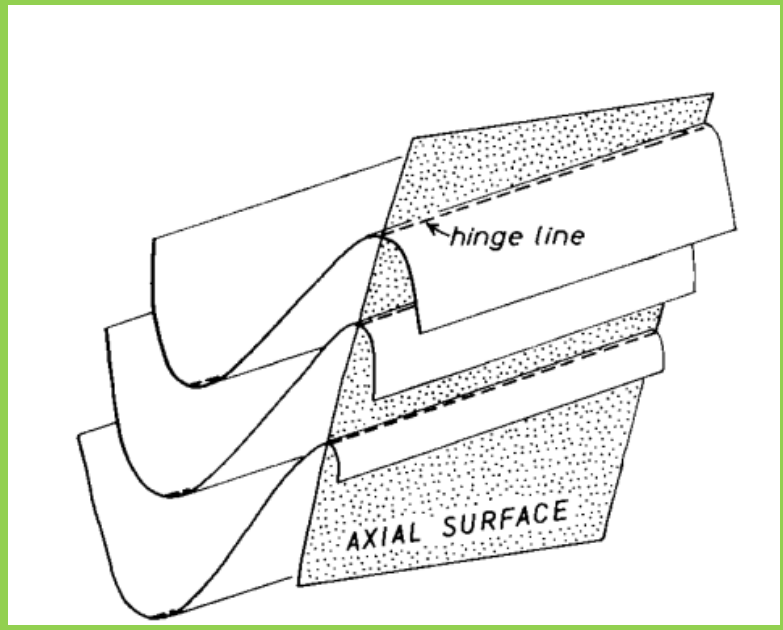
The axial surface of a fold may be planar , curved irregular .







The axial surface.



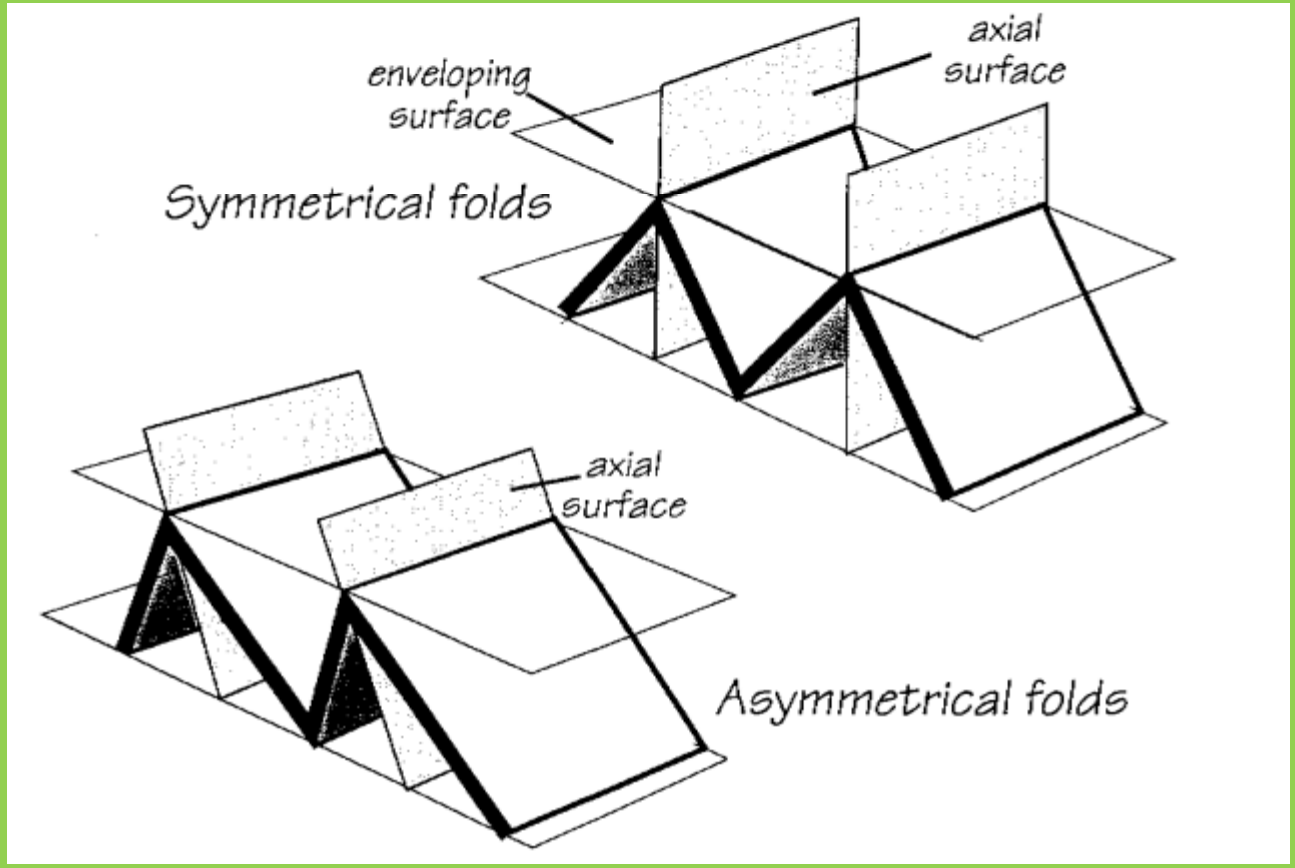
Symmetrical and asymmetrical folds

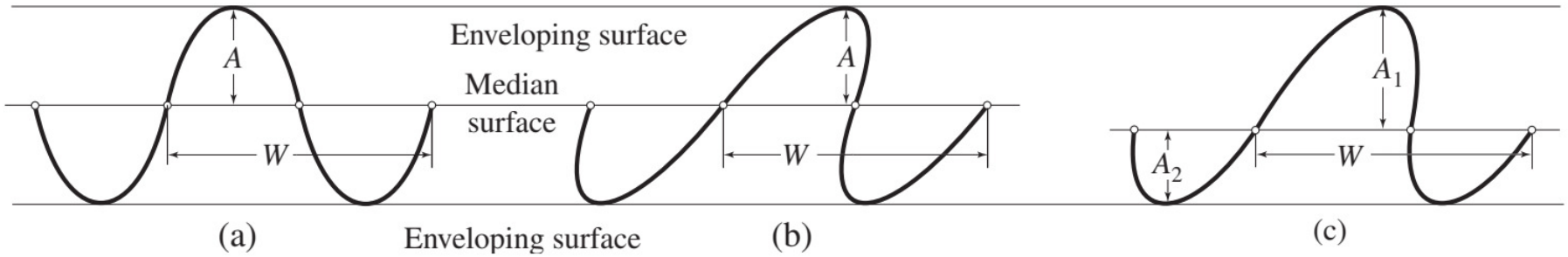
When one limb of a fold is the mirror image of the other, and the axial surface is a plane of symmetry, the fold is said to be *symmetrical* .

There exists a common misconception that the limbs of a symmetrical fold must have equal dips in opposite directions. This need not be the case, but the lengths of the limbs must be equal .

Another property of a symmetrical fold is that the *enveloping surface* (the surface describing the average dip of the folded bed) is at right angles to the axial surface of each fold.

Asymmetrical folds usually have limbs of unequal length and an enveloping surface which is not perpendicular to the axial surface.





The attitude of the fold axis is measured as the angle between the axis and the horizontal. This angle, which must be measured in a vertical plane (like the dip angle) is termed the *fold plunge*.