

Geotectonic

The development and maturation of the earth:

After that formed the earth from gaseous nebula, witnessed many changes that paved the way for their access to what they are now. Most prominent of these changes is formation covers the Earth's Interior (core , mantle and crust) the outer covers (Atmosphere, Hydrosphere and Biosphere). The following is a simple explanation of how these internal and external covers of the earth.

Internal covers:

When the earth started formed as a result of rock collected solids of different sizes and densities happened knows **Differential** between these materials, which were liquid or fluid materials at the beginning where heavy materials went down to the center of the earth composed of core while the lightest materials risen to the top composed crust, the medium-density material occupying the middle part of the earth between the crust and the core to be what called mantle.

Outer covers:

After hardening the outer part of the earth and be the solid crust, volcanic activity occurred and wide range led to the exit of magma from the mantle and exit of large amounts of various gases that accumulated on the earth and interacted with each other to be the earth's atmosphere, and that it differs in its components and their percentages dramatically from what it is today as scientists suppose the presence of large amounts of hydrogen in the atmosphere of the land and initial hydrogen because of the main components in the universe, and the existence of hydrogen either was in a free or combined with oxygen is configured of water vapor.

The pool of water vapor in the atmosphere in large quantities result was abundant rainfall accumulated in large depressions on the surface of the earth and thus formed the oceans, seas, rivers and groundwater, which we all call the Earth's hydrosphere.

After be atmosphere and hydrosphere earth become ready to receive life and **Biosphere** appear.

Plate tectonics theory

Attributable this theory to the German scientist (Alfred Wegener, 1880-1930), he think that the earth was a monolith block represents great continent called **Pangaea** means all land surrounded by low and wide land called **Panthalassa** it means all of the sea but before more than (200) million years that great mass disintegrated into two blocks north was called (Laurasia) and South called (Gondwana) . Then these two blocs began to move and fission into smaller pieces moved to the sites currently occupied by fig (3).

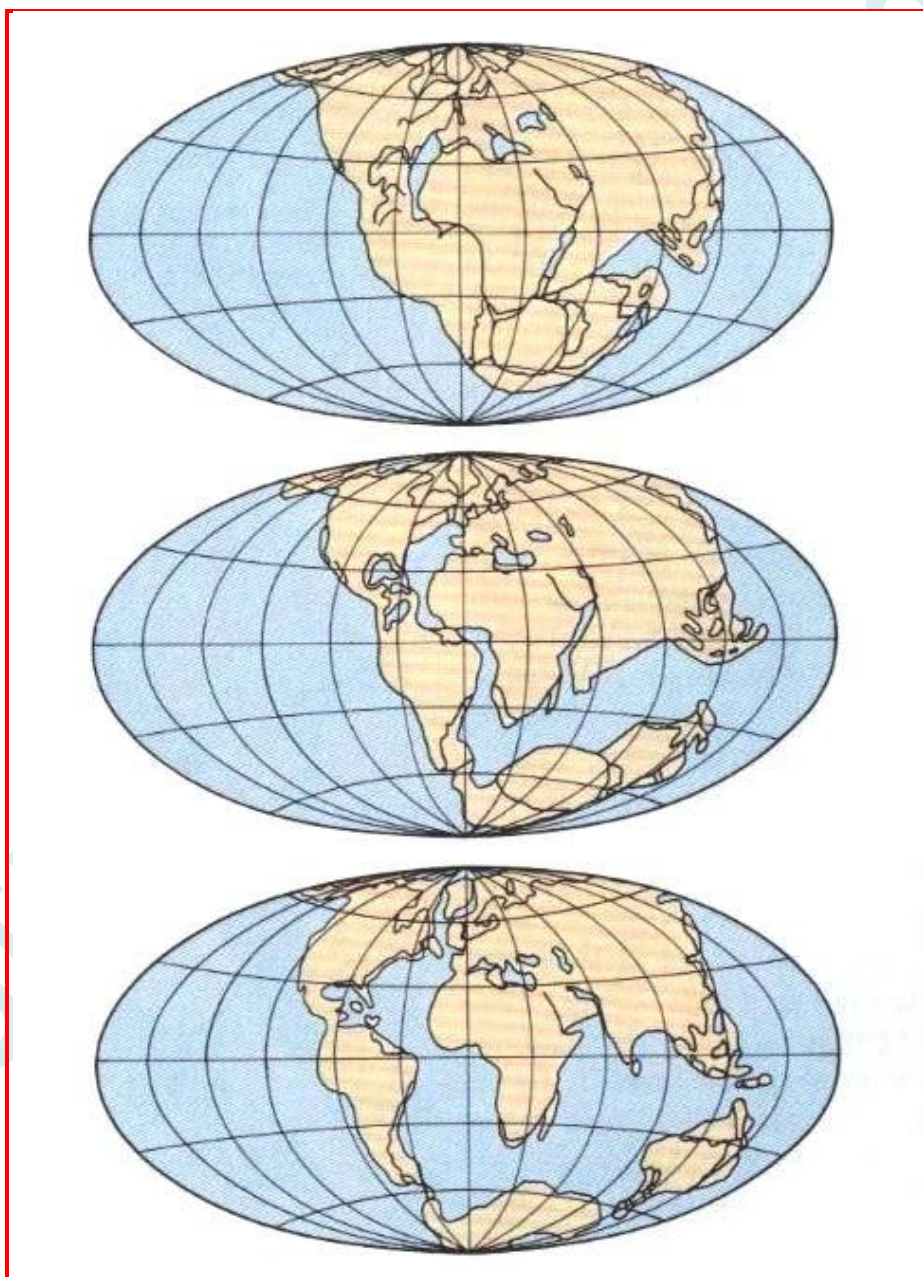


Fig (3) Map showing the broken continent Pangaea to the current continents

Wegener's evidences

1. Similarity form opposite edges of continents, especially between Africa and the Americas.
2. Similarity fossils in the continental margins, for example, swimming-type reptiles (Mesosaurus) where they found these reptiles only in eastern South America such as Brazil as well as West Africa, did not exist in any other region in the world.
3. Similarity units ancient rocks in Africa through the Atlantic Ocean and North America, if the re-collect the two continents with each line of these units stick together.

Rock Deformation

Stress: the pressure or force applied to rocks that cause deformation , there are two types Uniform stress is equal in all directions and Differential stress is not equal in all directions.

Strain is the result of applying a stress to a rock . The change in size and/or shape of a solid.

Nature of Materials

Ductile deformation

Irreversible change in size and/or shape .

Brittle deformation – Fracture

Stress exceeds the ductile limit Irreversible.

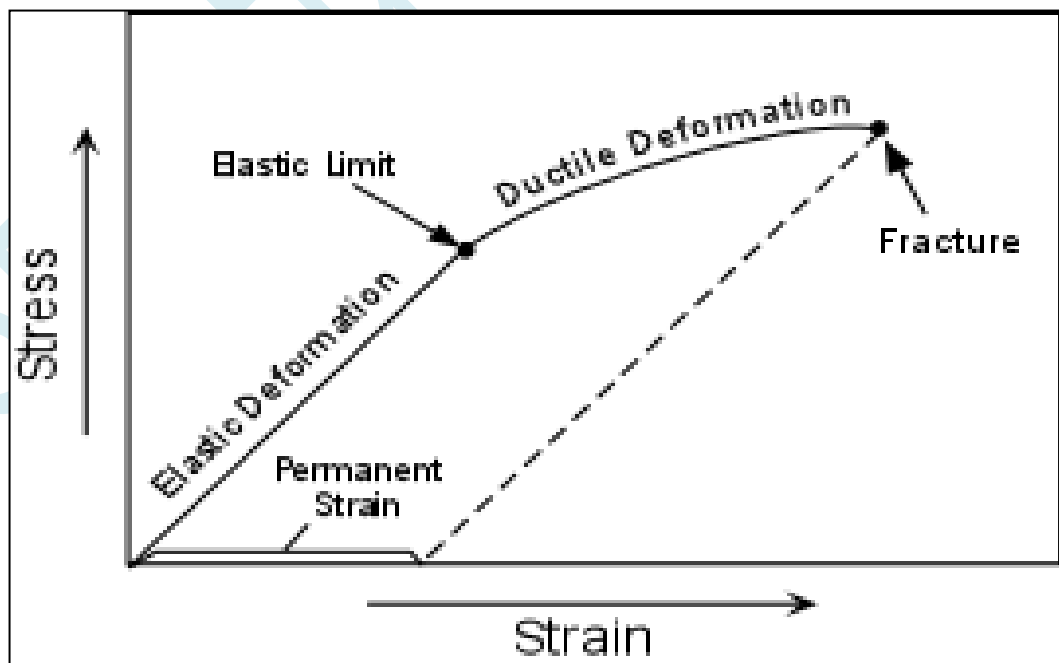


Fig (4) stages of deformation

Fold Structure

Is a structure consists when it becomes flat surface arched or curved as a result of the deformation of happening due to the influence of certain forces. The folding process it is ductile deformation process that can grow without a break, which consists after the deposition process and stiffness rock layers. Longer folds among the tens or hundreds of kilometers to the microscopic size.

Dip : the angle of inclination downward from a horizontal plane.

Strike : a horizontal line where the inclined plane intersects an imaginary horizontal plane .

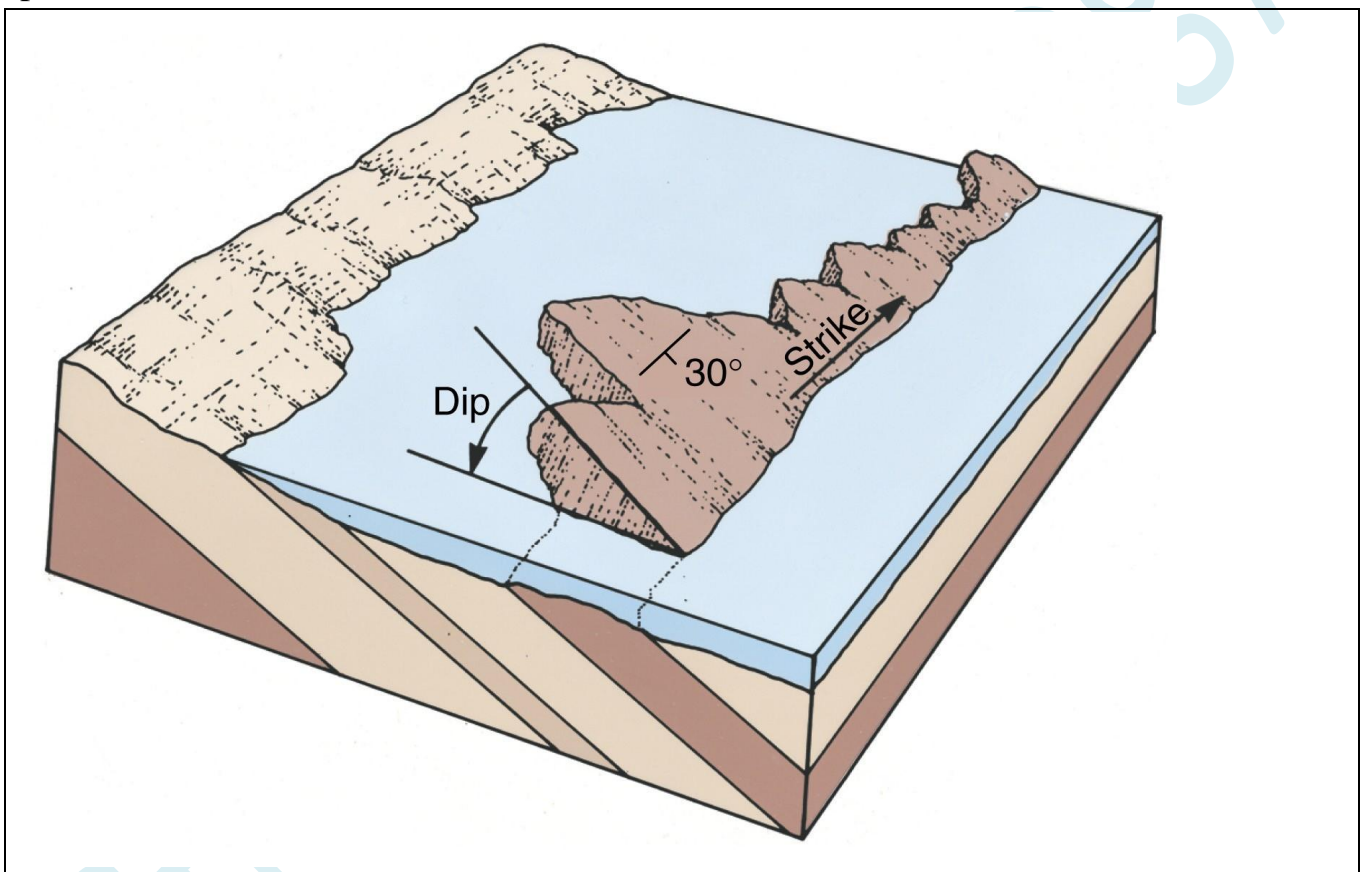


Fig (5) shown dip and strike

Folds are described by:

Hinge line: is the line of maximum curvature in a folded bed. It may be horizontal, vertical and inclined.

Axial plane: is the surface connecting all the hinges.

The axis: is a line parallel to the hinges.

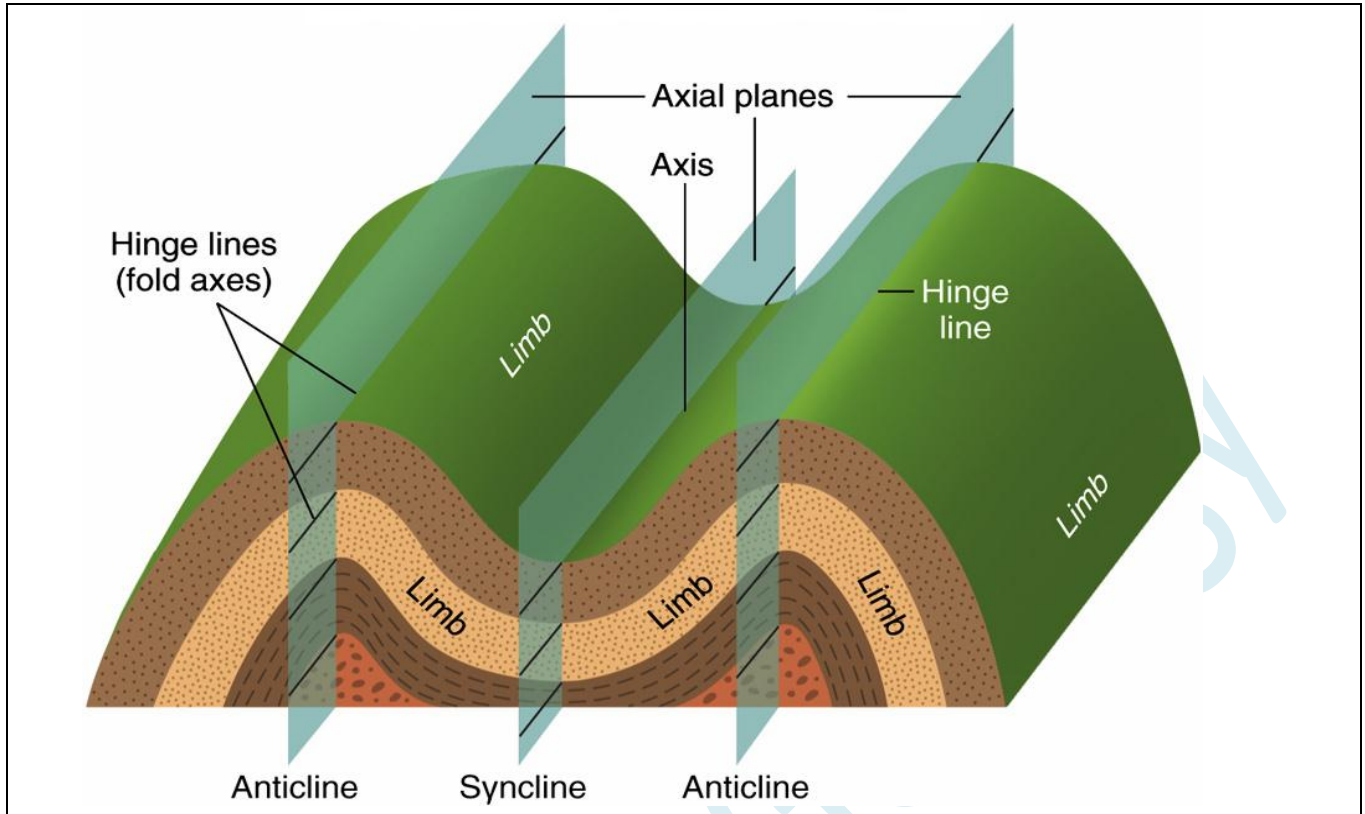


Fig (6) fold Elements

Types of folds:

1. **Symmetrical** : axial surface is essentially vertical.
2. **Asymmetrical** : axial surface is inclined.
3. **Overtured** : axial plane is inclined and both limbs dip in the same direction, usually at different angles.
4. **Recumbent** : axial plane is horizontal.
5. **Isoclinal** : the two limbs dip at equal angle in the same direction.
6. **Chevron** : is one in which the hinges are sharp and angular.
7. **Box fold**: is one in which the crest is broad and flat; two hinges are present, one on either side of the flat crest.
8. **Fan fold**: is one in which both limbs are overturned. In the anticlinal fan fold, the two limbs dip toward each other, in the synclinal fan fold, the two limbs dip a way from each other.
9. **Closed and open fold**: is one in which the deformation has been sufficiently intense to cause flowage of the more mobile beds so that these beds thicken and thin, in open fold the value of the internal angle ($70 - 120^\circ$).
10. **Plunging folds**: when the folds axis is dipping or plunging.

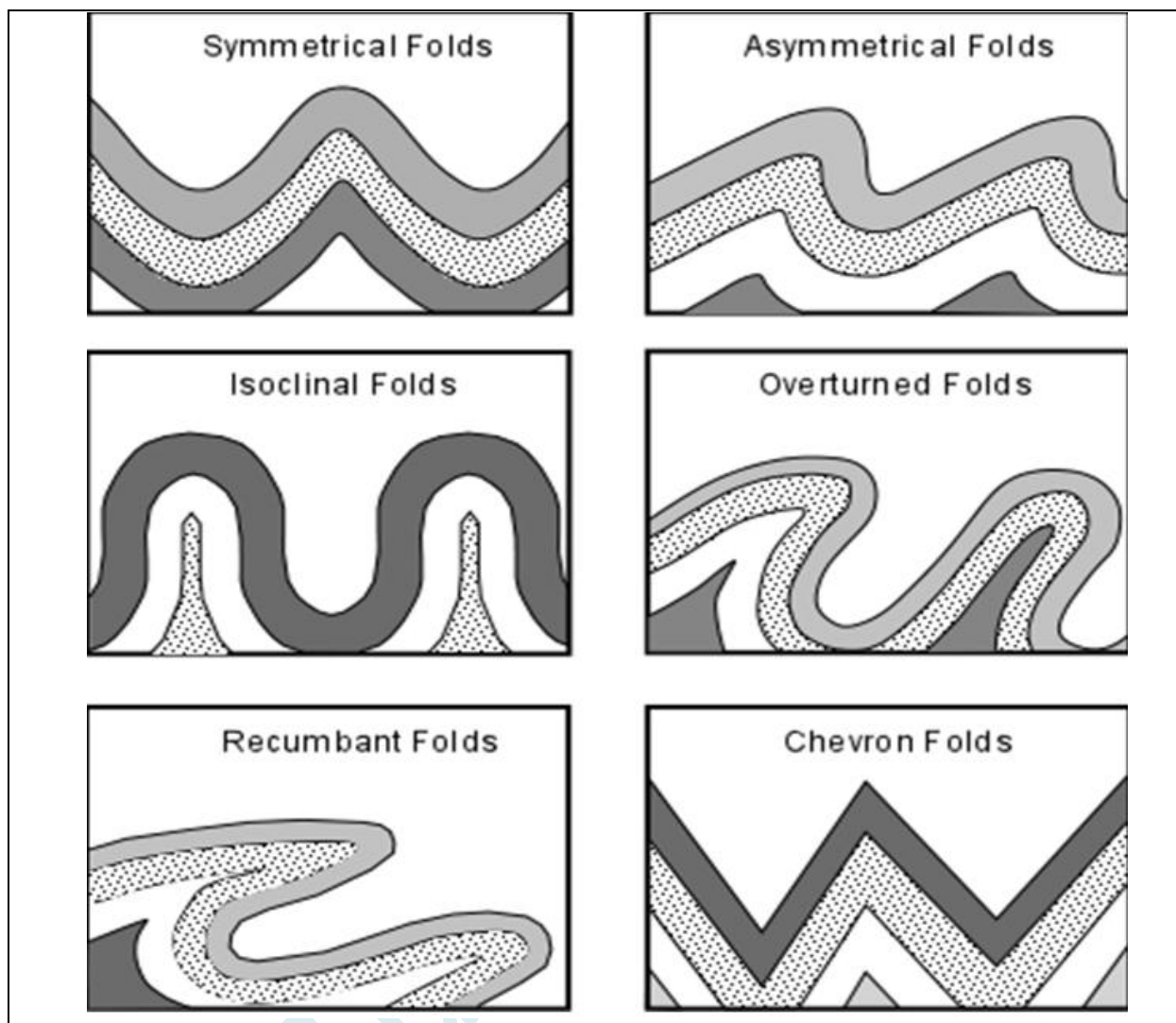


Fig (7) types of folds

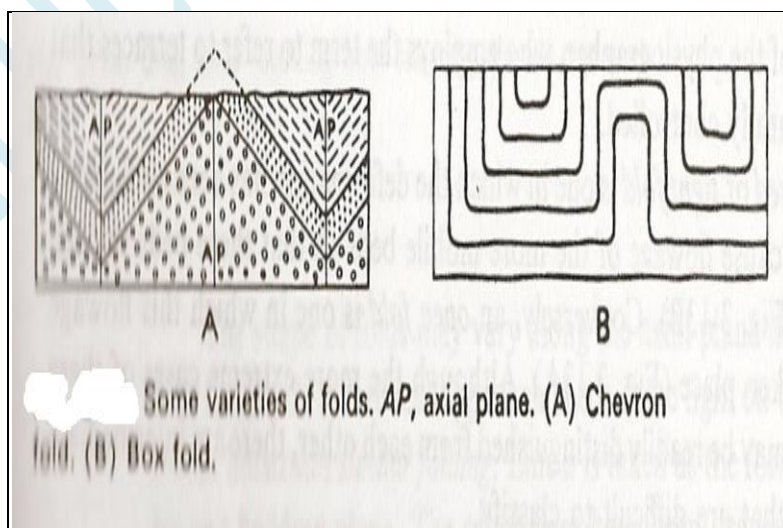


Fig (8) chevron and box fold

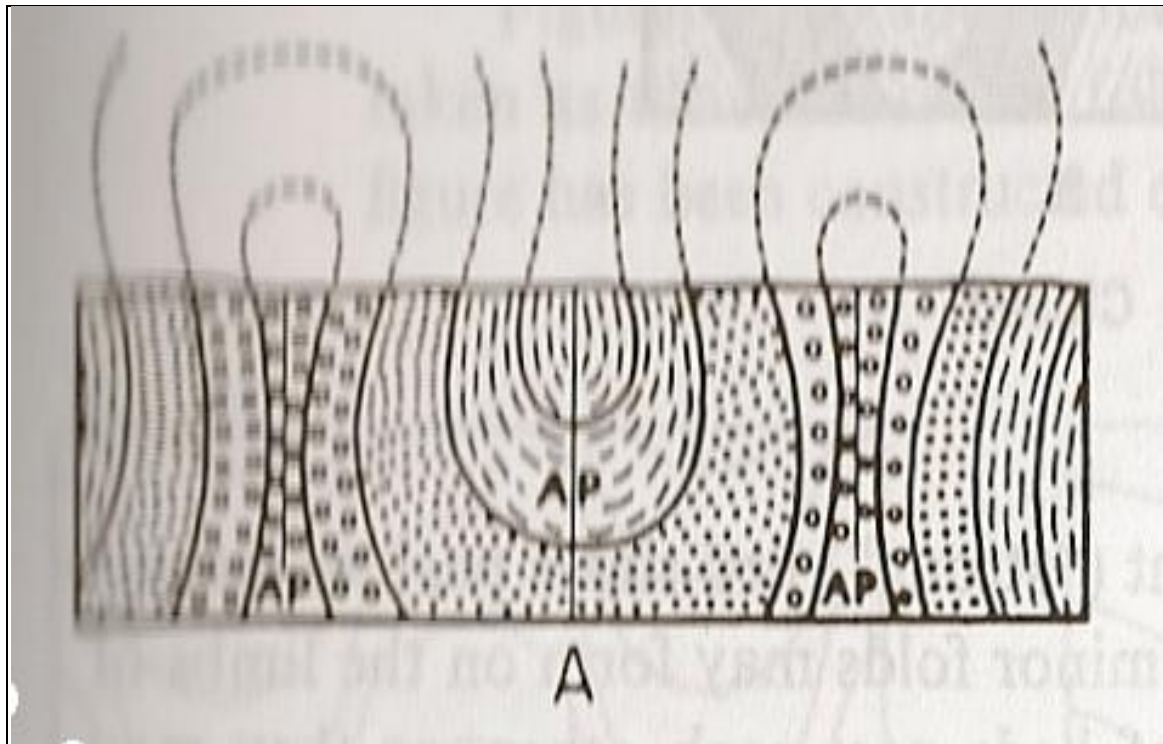


Fig (9) fan fold

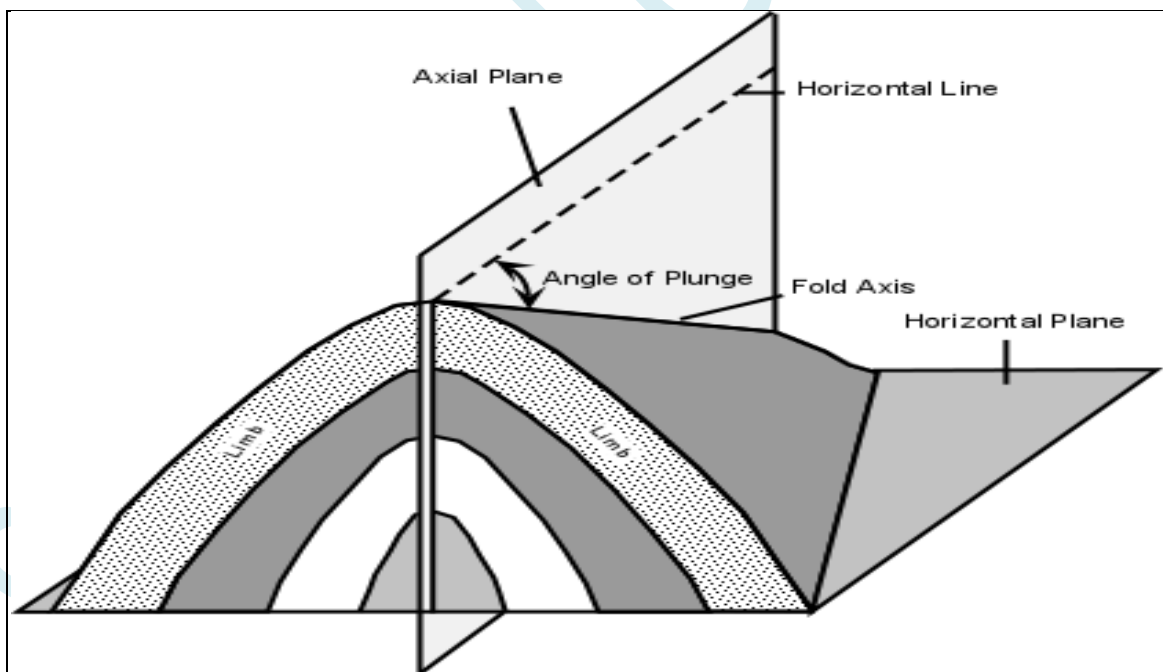


Fig (10) Plunging fold

Synclines warp downward

Anticlines warp upward

Monoclines dip in one direction

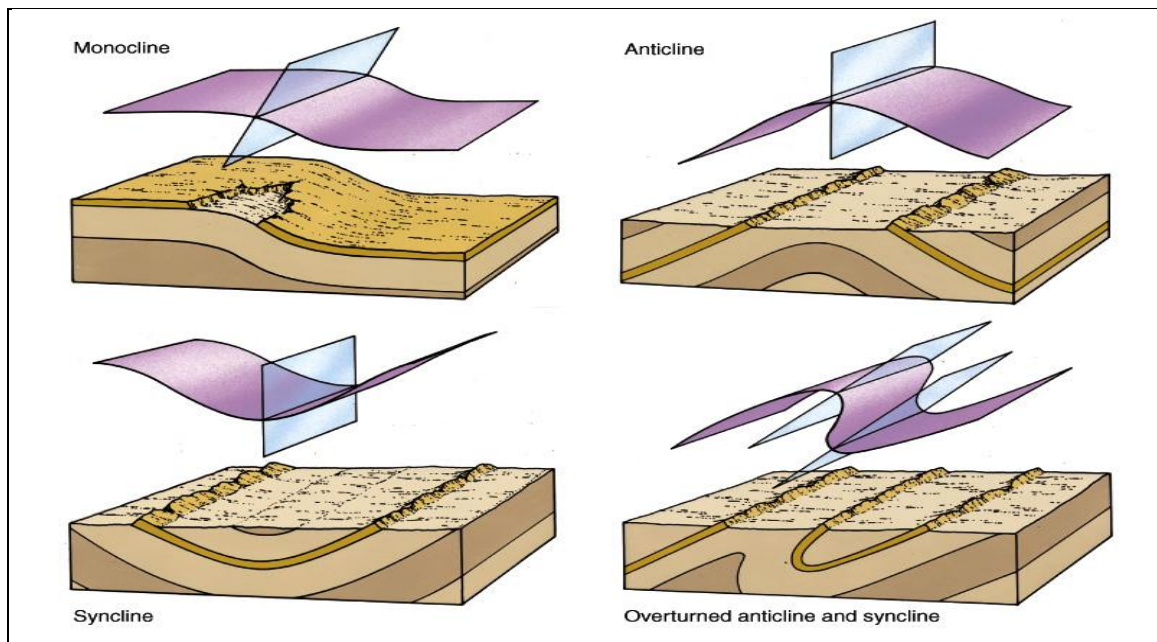


Fig (11)