

Structure

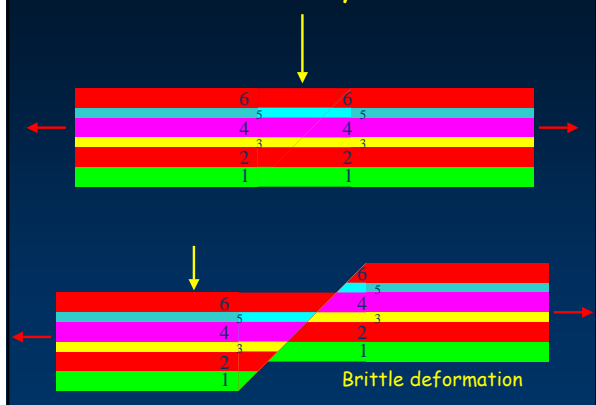


General discussion of deformation



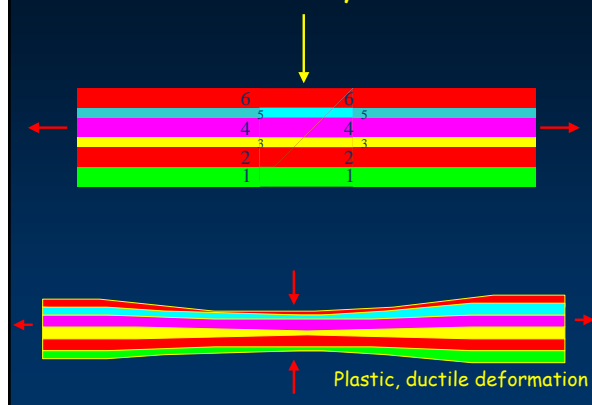
Tilting and Folding of units may Occur

Gravity



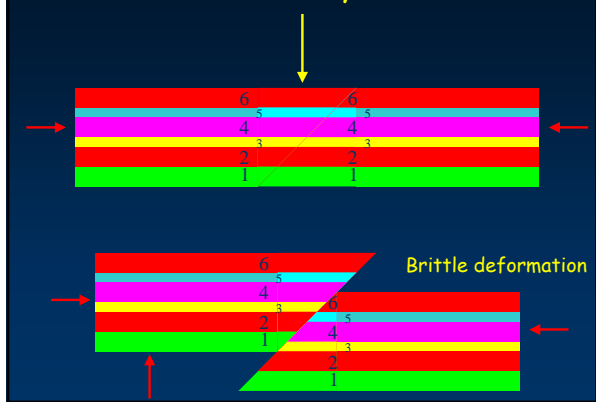
Brittle deformation

Gravity



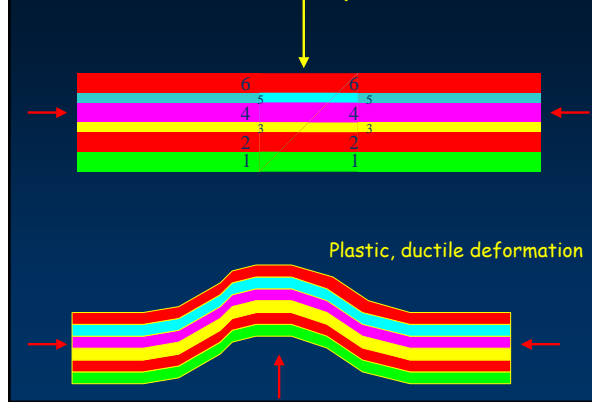
Plastic, ductile deformation

Gravity



Brittle deformation

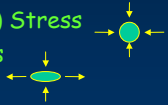
Gravity



Plastic, ductile deformation

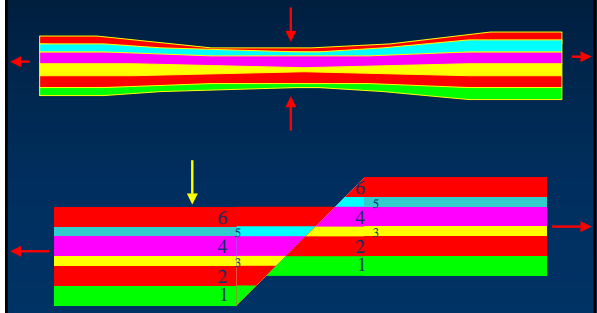
Deformation

- Stress - pressure on rocks
- Pressure increases
- Stress
 - Uniform (confining) Stress
 - Differential Stress



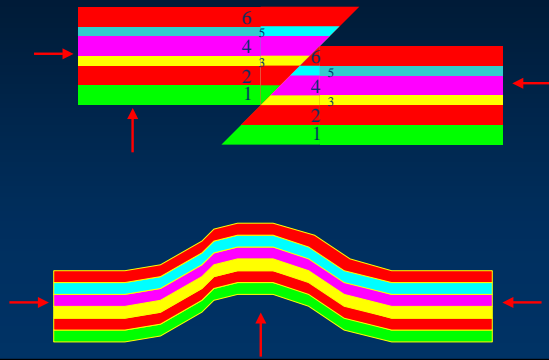
• Three types of differential stress in Rocks

1. Tensional - pulling apart



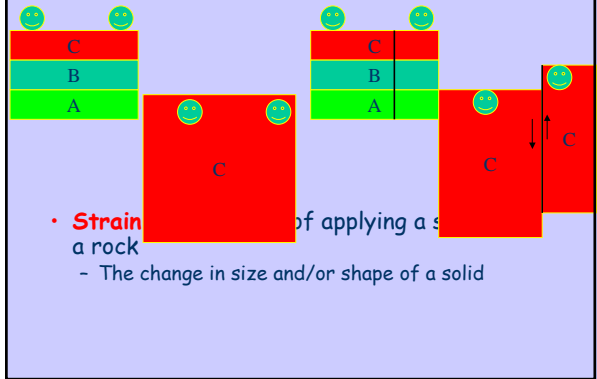
Three types of differential stress

2. Compressional - squeezing together

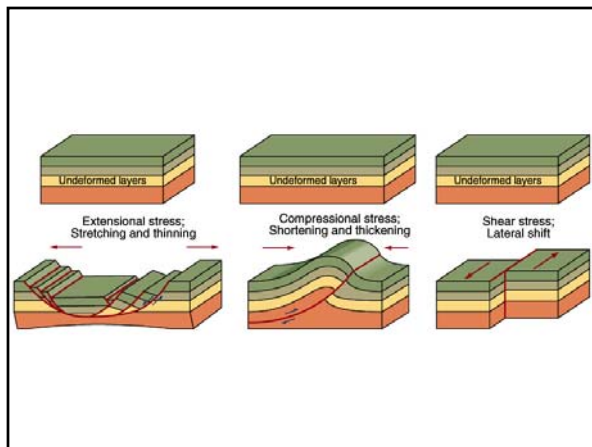


• Three types of differential stress

3. Shear - slipping, twisting, or wrenching



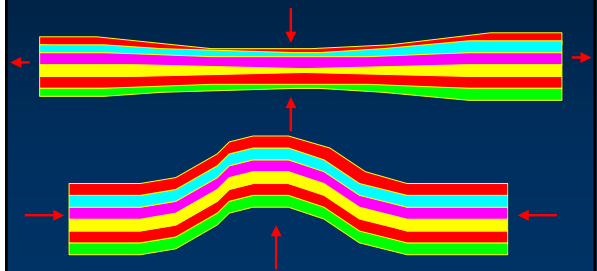
- **Strain** - change in shape of a rock
 - The change in size and/or shape of a solid



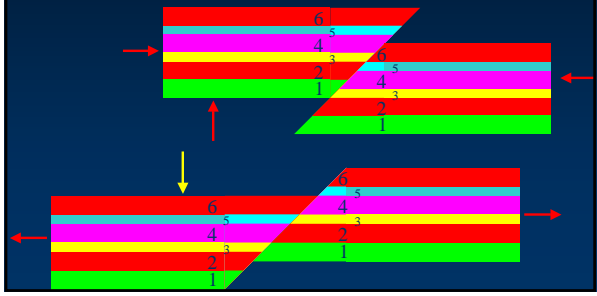
• Strain produces:

1. Ductile deformation

- Irreversible shape change
- Volume and density may change



- Strain produces:
 2. Brittle deformation - Fracture
 - Stress exceeds the ductile limit
 - Irreversible break



Joints

- Fractures created by tension
- No shear or displacement

Faults

- Fracture into blocks that move
- Usually Linear Features

Change in orientation of beds, related to angle of faulting

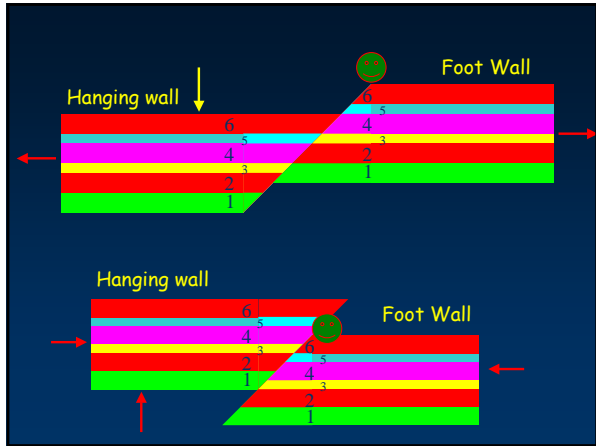
Geometry of Rock Structures

- Dip - the angle of inclination

- Strike - 90° from direction of dip

Faults

- Fault geometry
- Imagine a horizontal tunnel cutting through a fault in cross-section



3 Types of Faults

1. Normal faults

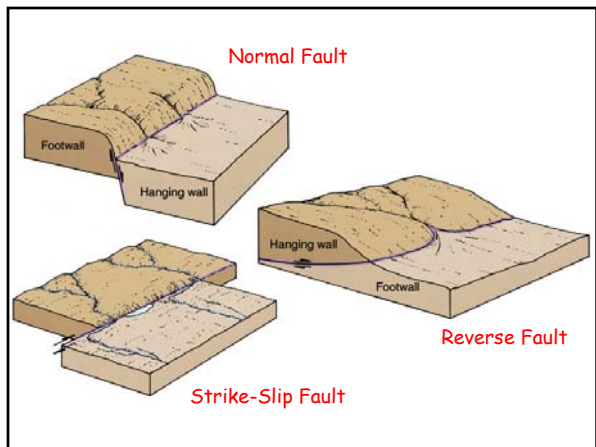
- Hanging wall moves down relative to foot wall
- Hanging wall slides down fault

2. Reverse faults

- Hanging wall moves up relative to foot wall
- Hanging wall block moves up fault

3. Strike slip (Transform) faults

- Lateral displacement
- Movement is parallel to strike direction



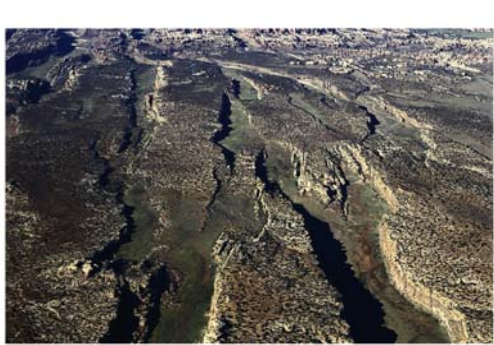
Normal Faults

- Normal faults created by tension

The diagram shows three stages of rock layers under different stresses: Undeformed layers, Extensional stress (stretching and thinning), Compressional stress (shortening and thickening), and Shear stress (lateral shift).

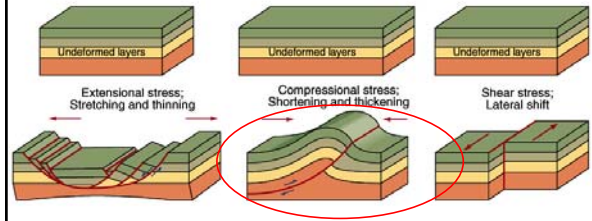
- Rift Valleys

- Down-dropped blocks are grabens
- The Rio Grande valley



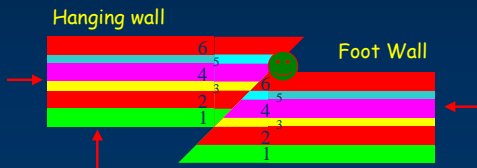
Reverse or Thrust Faults

- Compressional



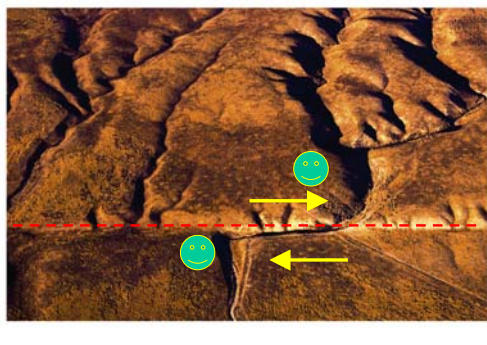
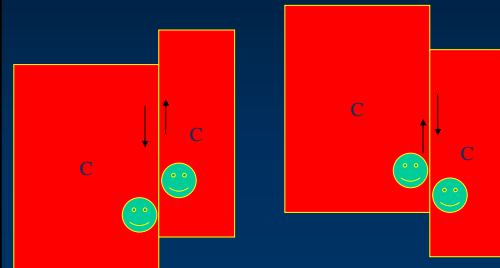
Reverse or Thrust Faults

- Common at convergent plate boundaries
- Reverse faults cause a thickening of the crust as rocks are piled up
- Older rocks thrust above younger rocks
- sequence of the same rocks are repeated



Strike-Slip Faults

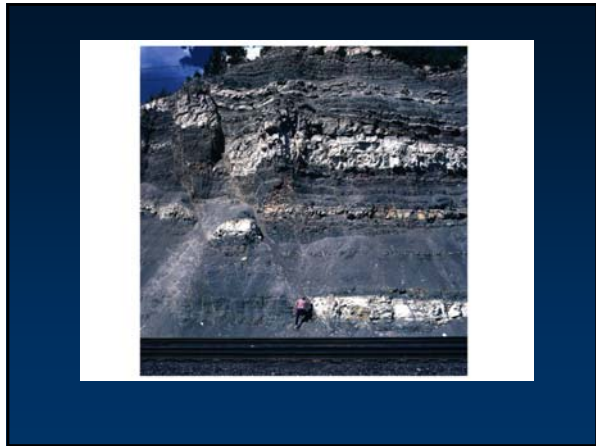
- Principle movement is horizontal
- Left or Right Lateral
- Little or no vertical movement
- Shear stress



Indicated by abrupt changes in drainage patterns

Movement Along Faults

- < few meters per movement
- Total displacement may be many km
- Tectonic creep



Folds

- Ductile warping of strata
 - Various scales

- Normally compressive stress

- Folds are described by:
 - Strike of hinge line
 - dip angle dip of their limbs

3 Fold Types

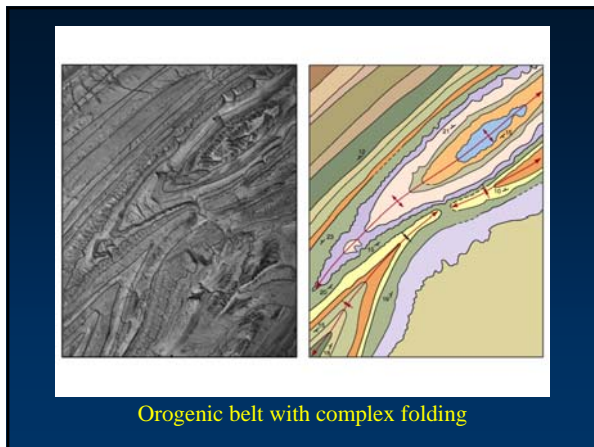
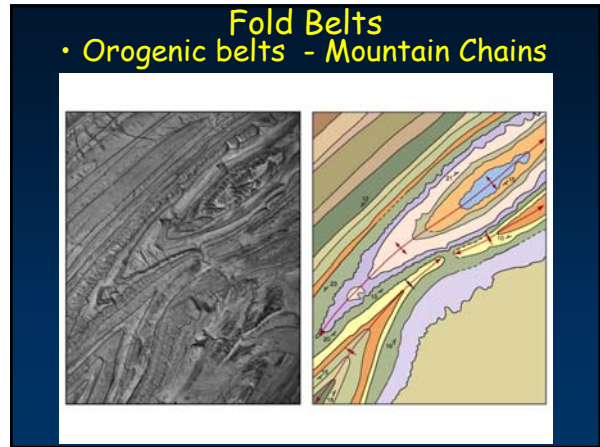
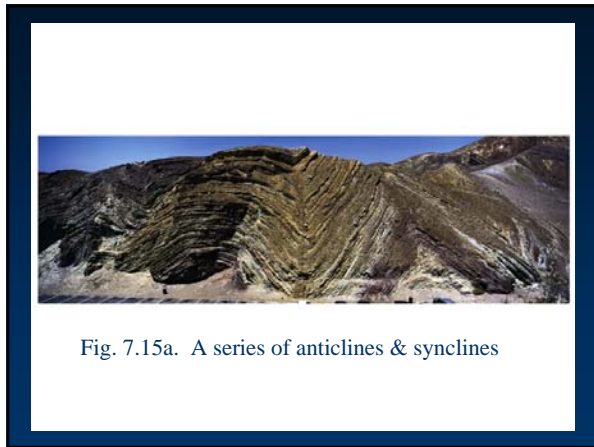
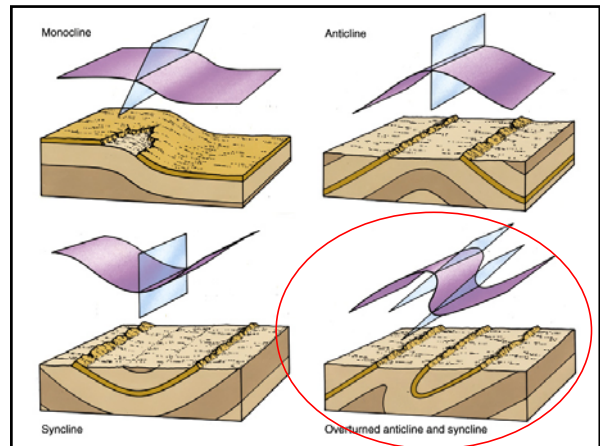
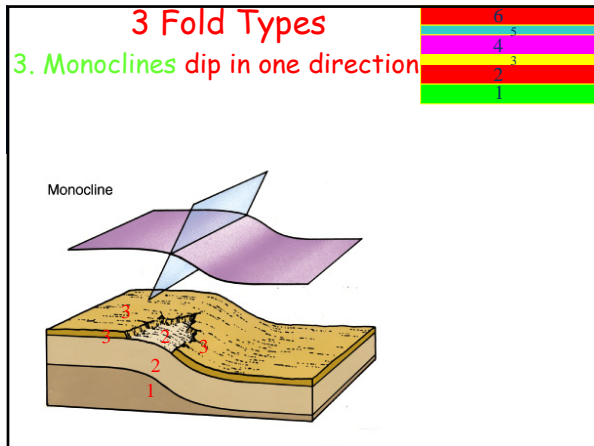
1. Synclines warp downward

Syncline

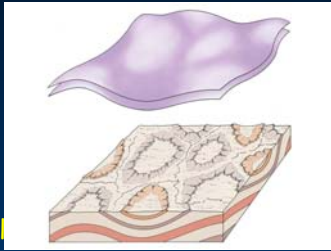
3 Fold Types

2. Anticlines warp upward

Anticline



- Domes & Basins
- Continental interiors

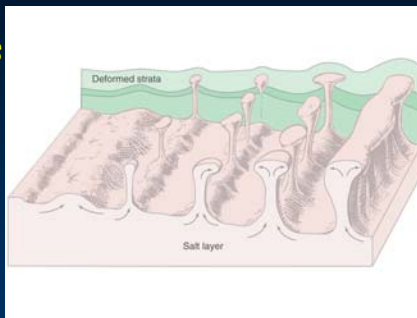


- Broad
- Roughly circular pattern of deformation



Complex Folds

- Diapirs



- Diapirs



End of Chapter 7

Exam No. 1

58 students took test

Average Score: 50.3/70, **72%**

Top Score: 65/70, 93%

58/70	A
51/70	B
44/70	C
37/70	D
<37	F