

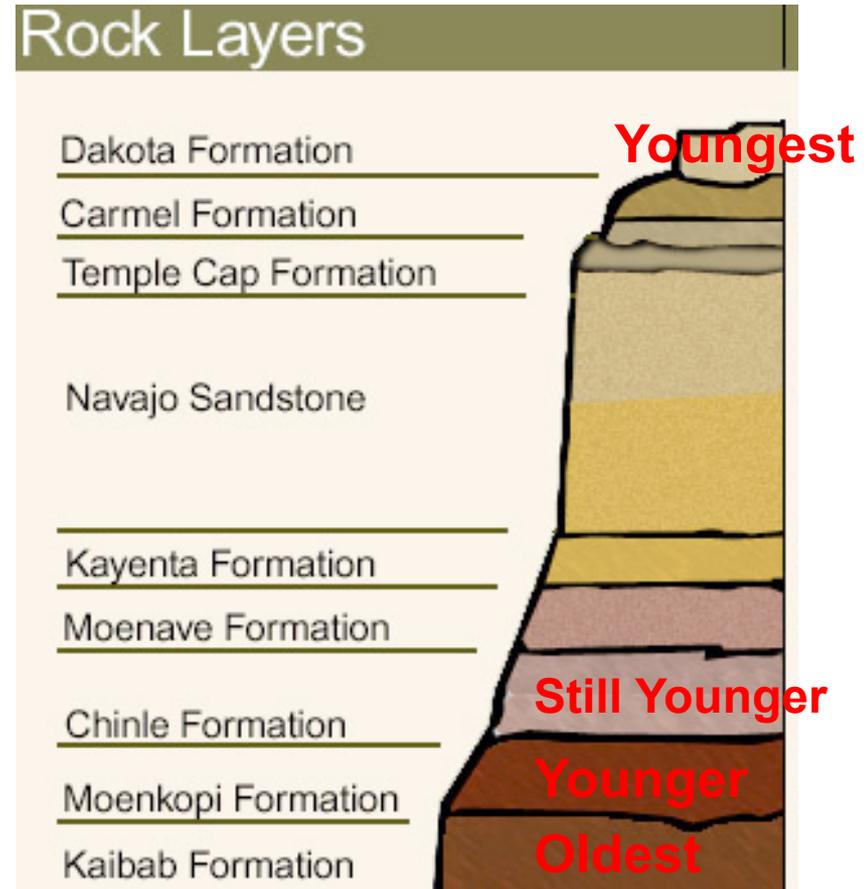
# Relative Dating

# Relative Dating

=process of aging rocks by position comparison

-data is **qualitative**  
(older-younger)

**NOT quantitative**  
(no exact age)



# Uniformitarianism

-infer past geologic activities happen the same way today

(Ex. rounded pebbles collect in a river today = infer a rock made of pebbles (conglomerate) formed in a river)



Stream bed rocks



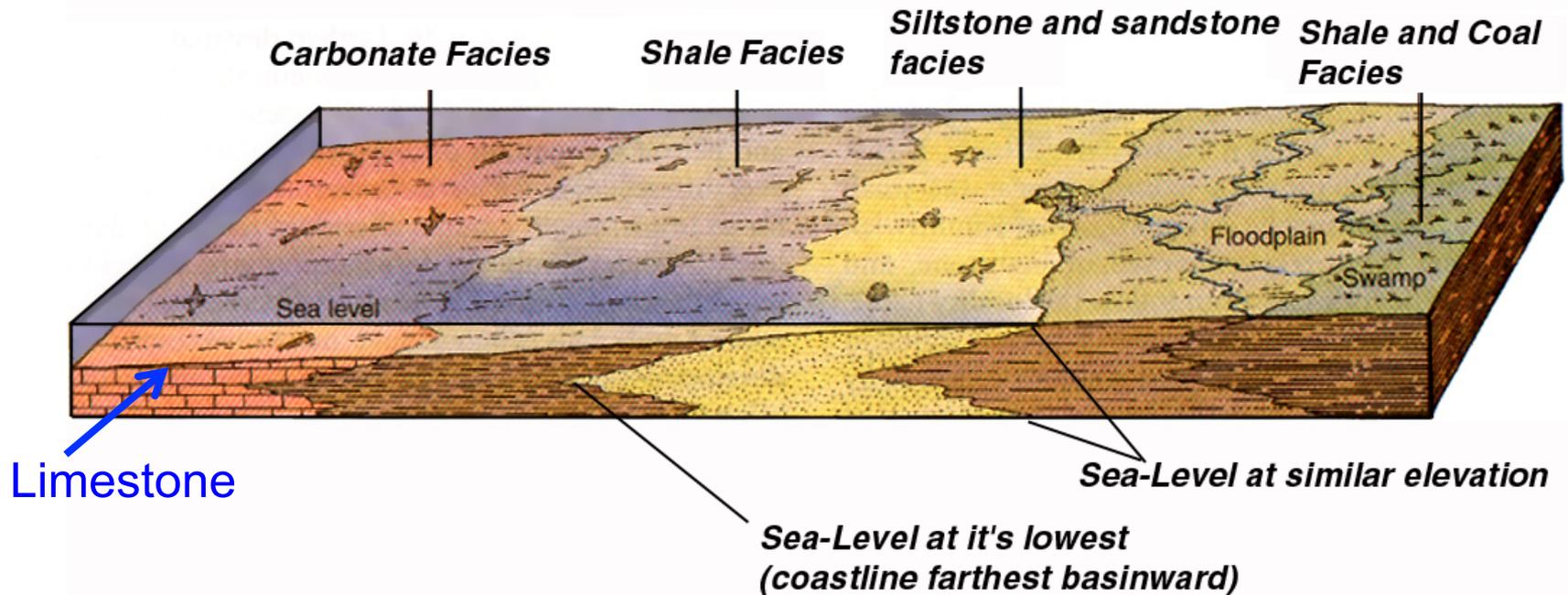
Conglomerate rock

# Uniformitarianism, infer environment type from rock type

Ex. **Limestone**- carbonate shells in shallow sea

**Sandstone**- sand from beach

**Shale**- mud from swamp

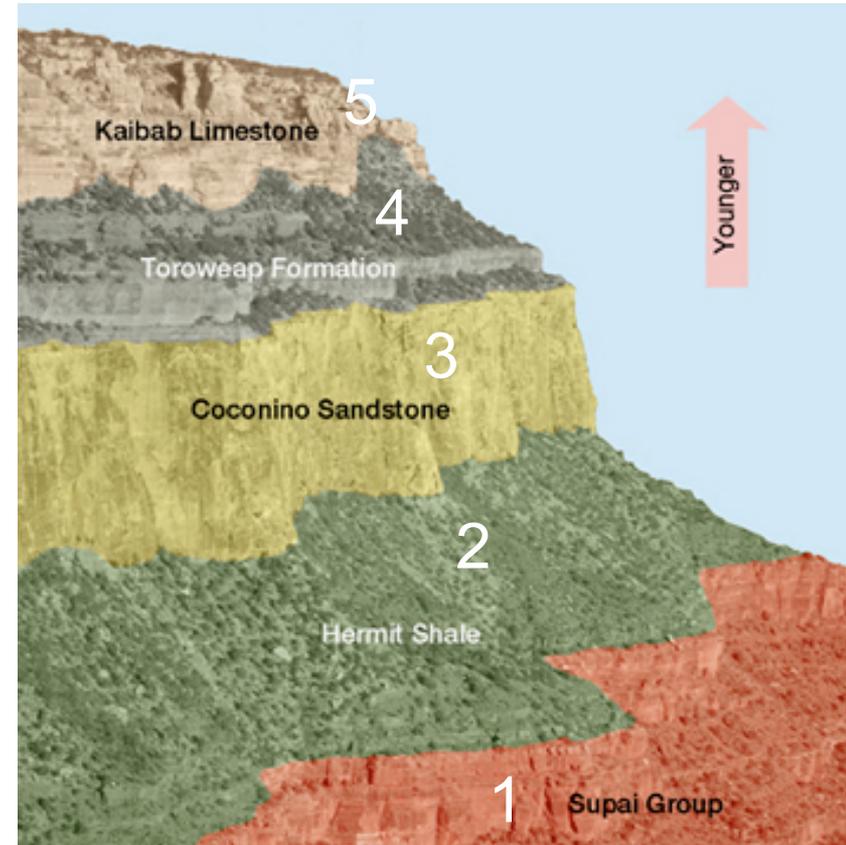


# Superposition

- Rock layers at the bottom occurred first and are older than layers above

Superior-over, above

Position-order or location



Grand Canyon

# Original Horizontality

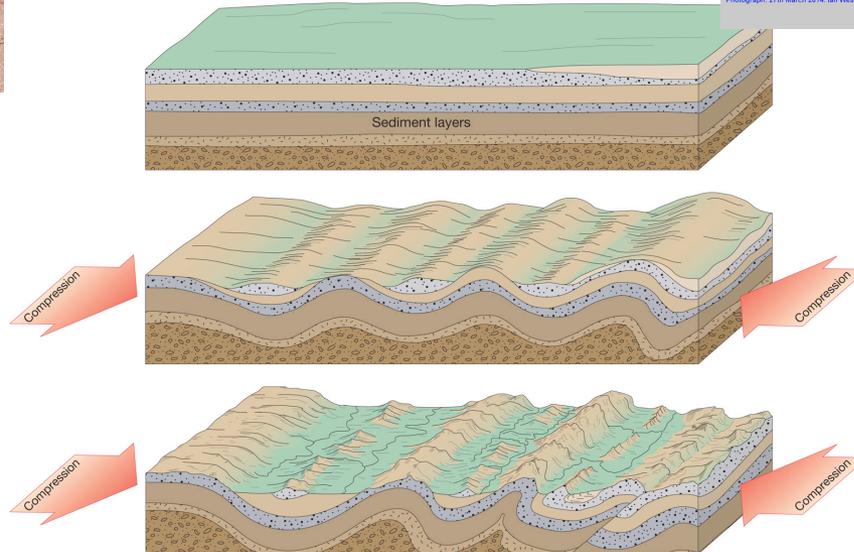
- Sediment is deposited horizontally (flat) due to gravity and can be *later* folded by convergent plate motion



Flat layers



Folded layers

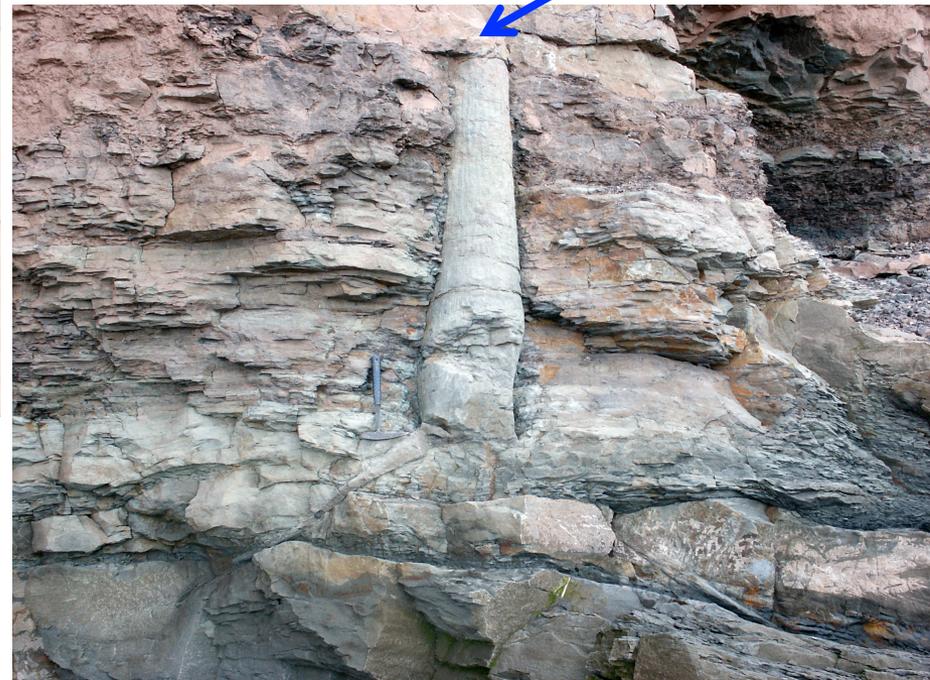
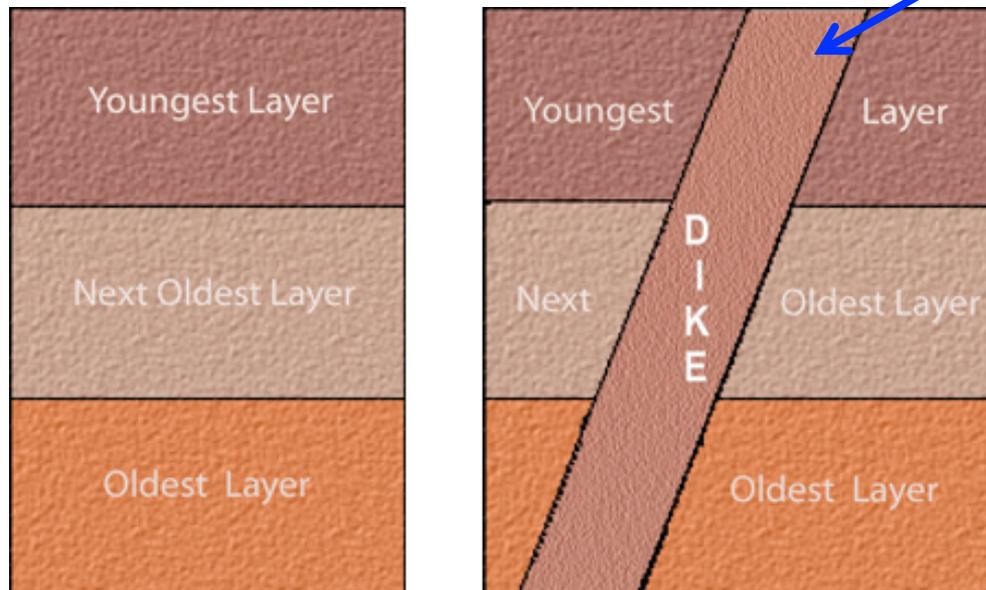


(a)

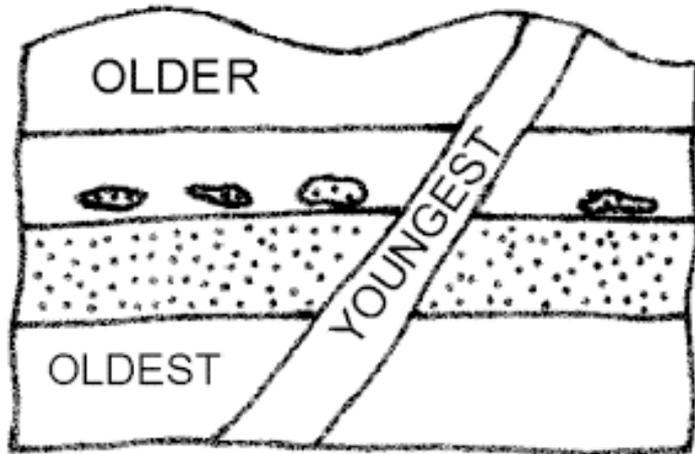
# Cross-Cutting Relationships

-Rocks that are crossed over (cut) are older than the rock/event that cuts them.

A dike is an **igneous intrusion** of lava that melted into existing rocks, cooled and hardened



An igneous (lava) intrusion (“intruder”)



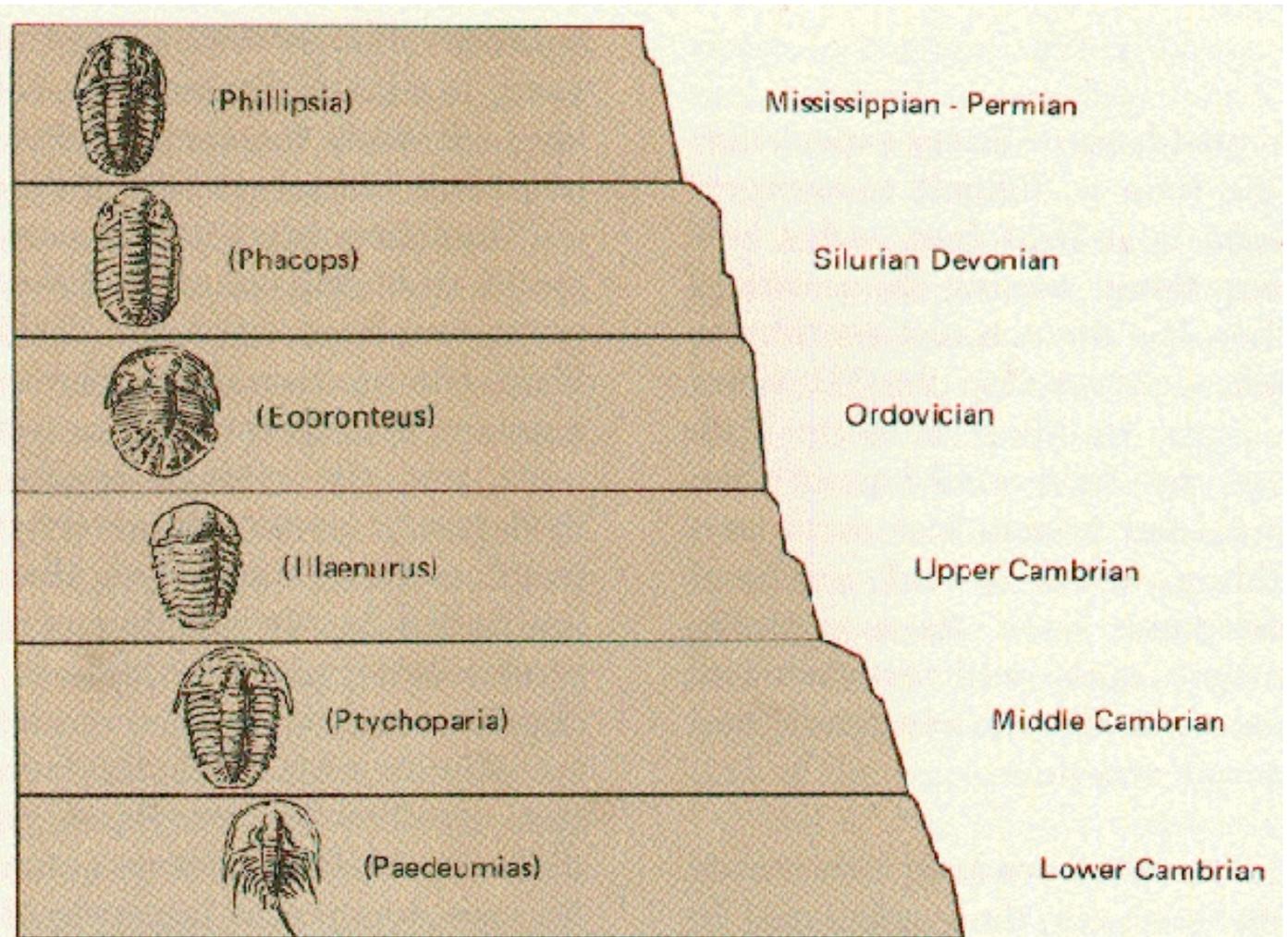


## Cross-cutting example #2

Earthquake faults that break existing rock occur *after* rock layers formed

# Faunal Succession

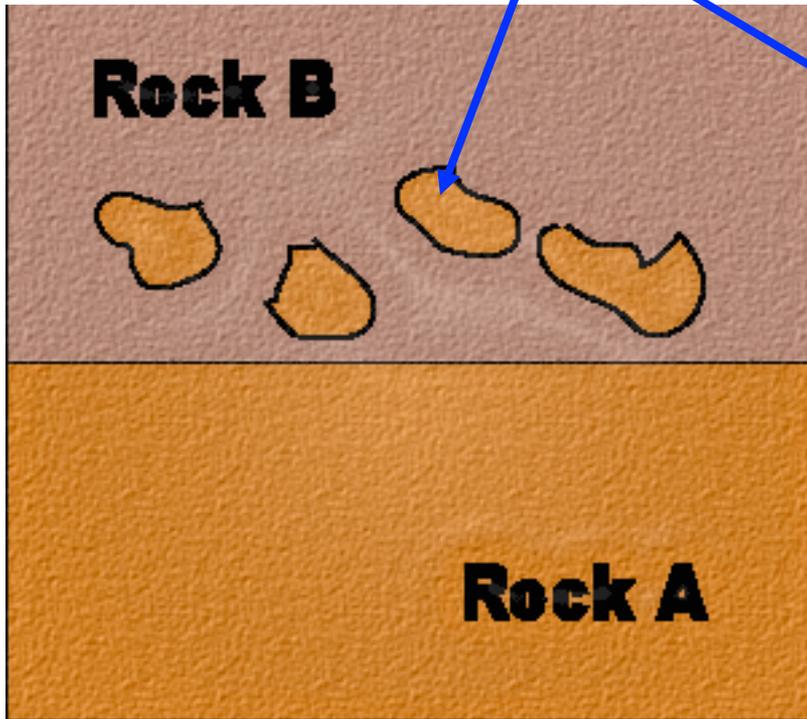
-fossils at the bottom are older (ancestors) than those above them. Fossil series can show relationships



# Law of Inclusions

-Section of rock that eroded from a previously existing layer was re-deposited into younger layer

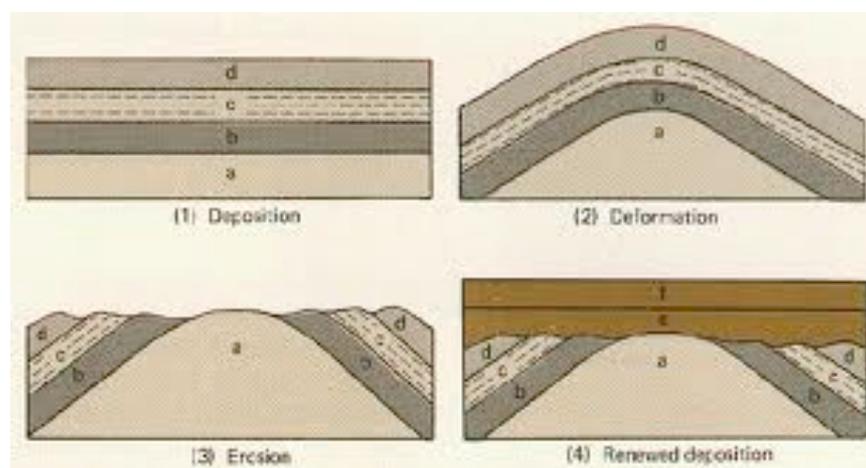
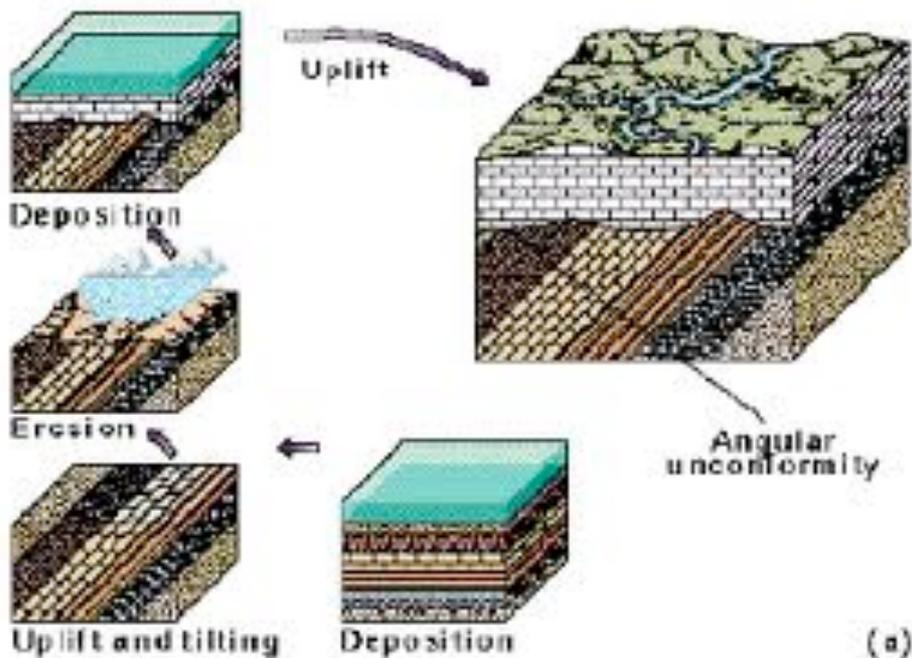
Inclusion is older than rock B



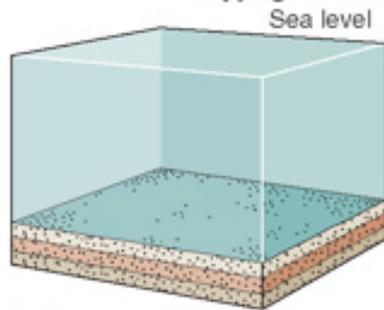
## Unconformities –Gap in the rock record created by erosion

- **Nonconformity** –original layers were igneous or metamorphic, then eroded and new layers placed on top

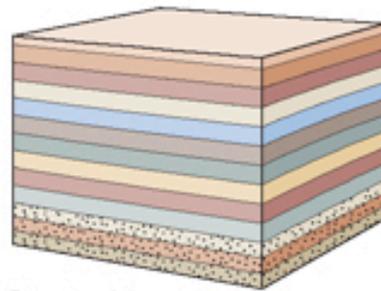
- **Angular Unconformity** –original sedimentary layers were tilted or folded by uplift, then eroded and new layers deposited on top



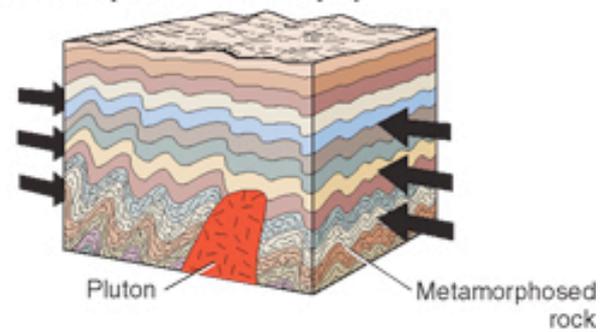
(a)



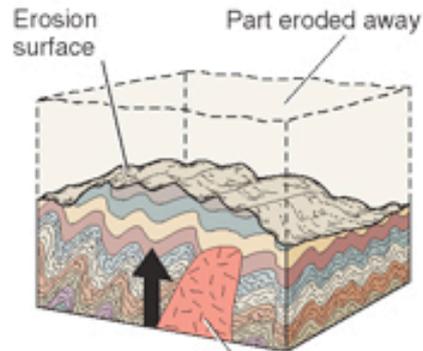
**A** Sedimentation



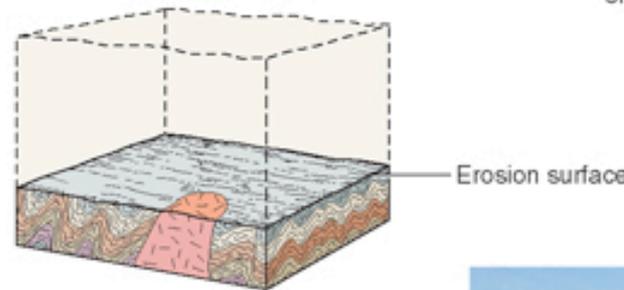
**B** Deep burial



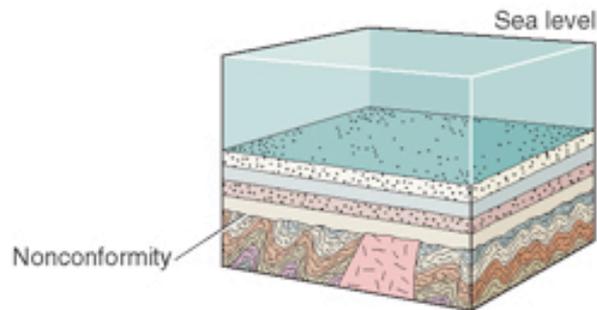
**C** During mountain-building episode: Intense deformation, intrusion of a pluton, and metamorphism of lower rocks



**D** Uplift accompanied by erosion



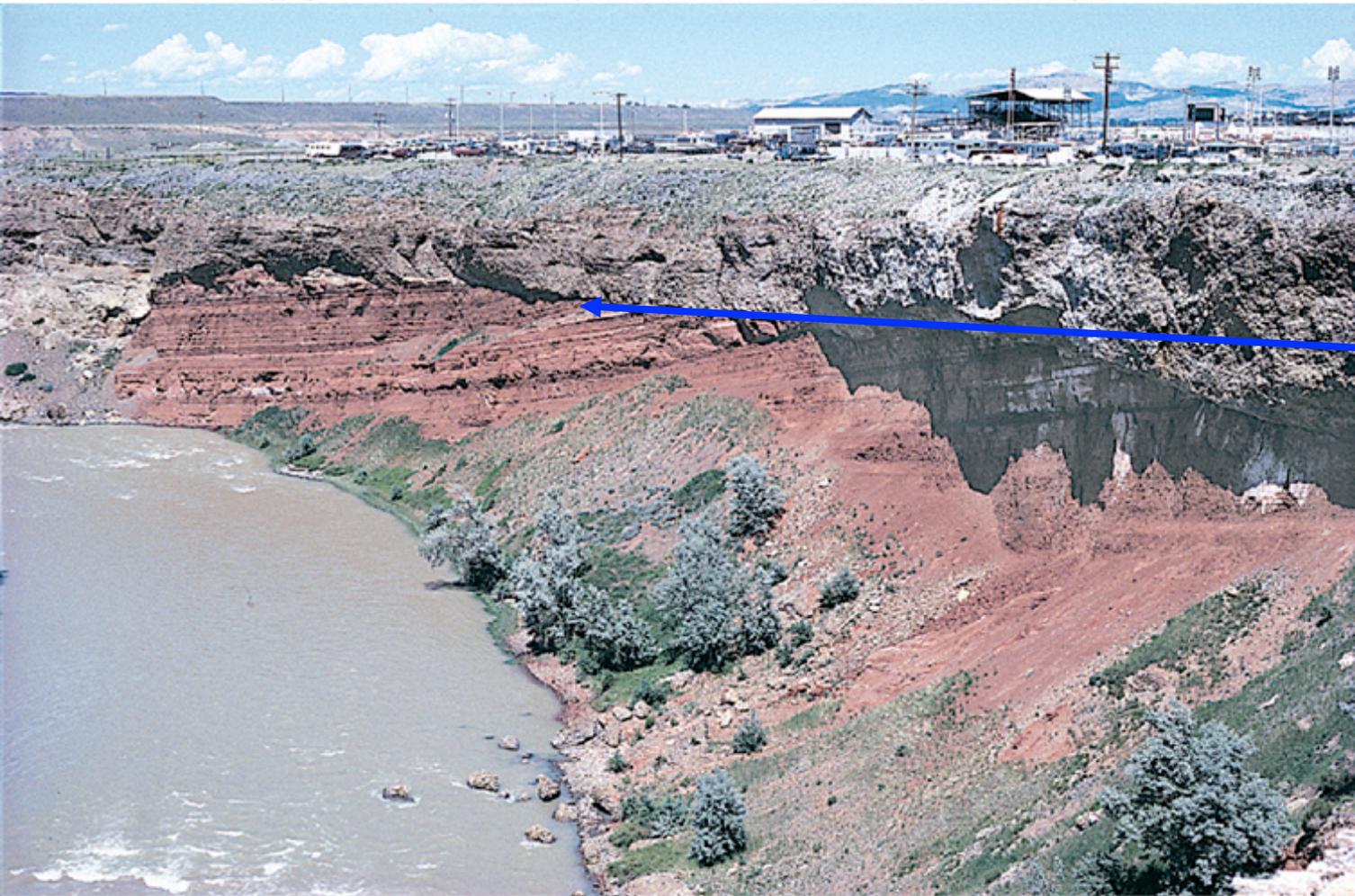
**E** Continued erosion



**F** Renewed deposition



**G**



## Angular Unconformity

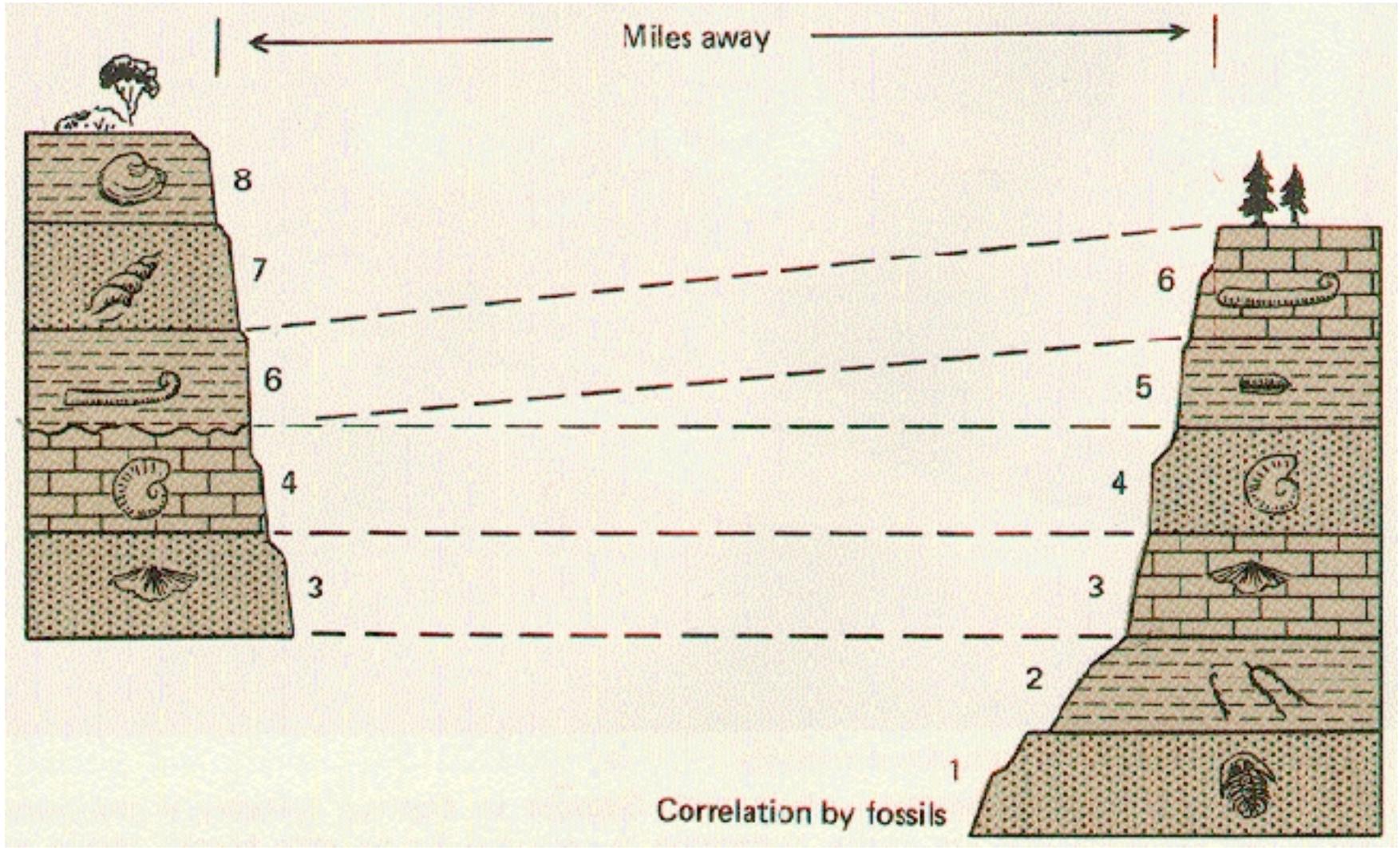
- deposition
- uplift
- erosion
- new deposition

How much was eroded and lost?

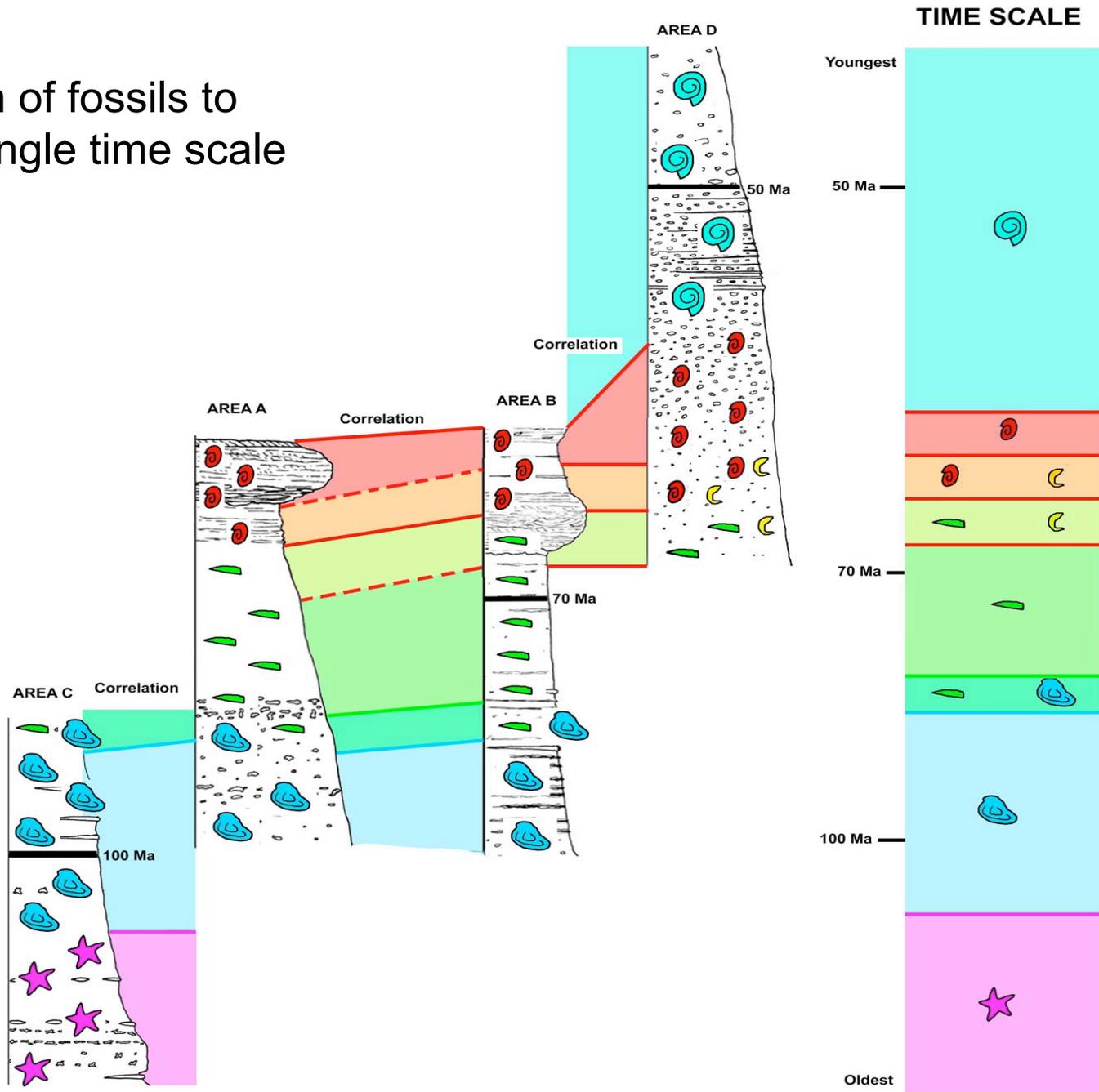
**E**  
Photo by C. C. Plummer



# Rock Layer Correlation- match fossil or rock layers to determine sequence between locations



Correlation of fossils to create a single time scale sequence



**What is the sequence of events/layers observed here?**

