— University of Mosul —
College of Petroleum & Mining Engineering

General Geology2

Lecture 4

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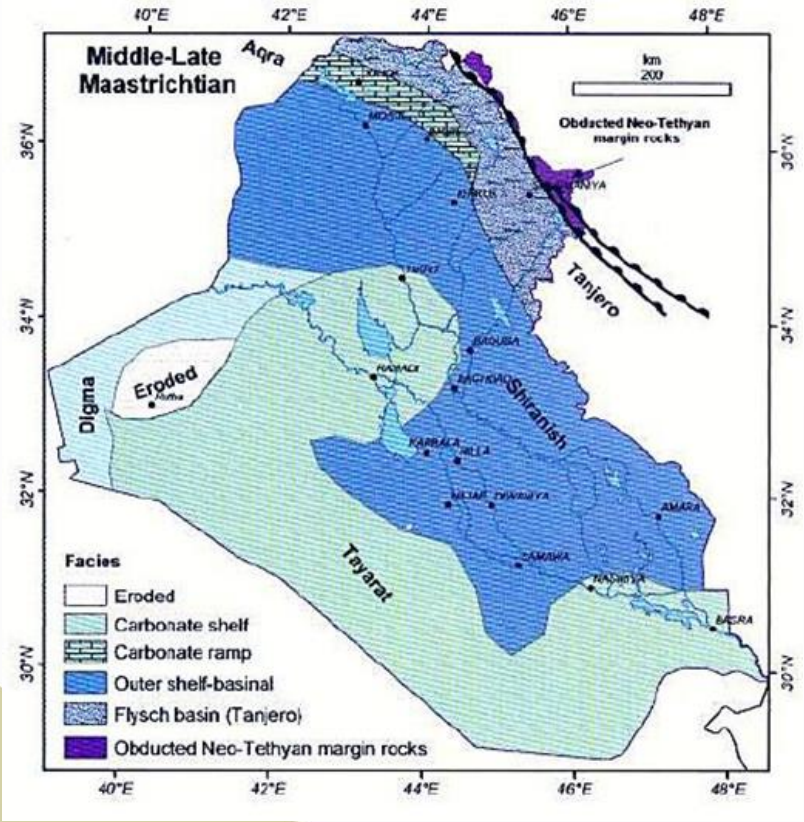
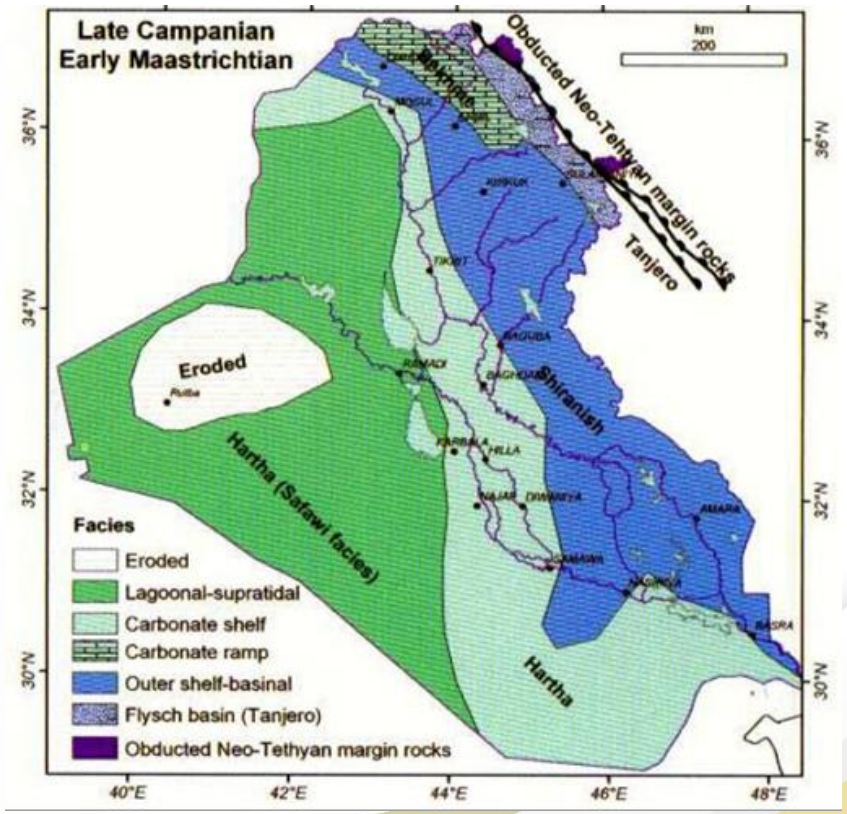
key elements typically shown in geological maps

1. Rock Units (Stratigraphy): Geological maps typically display different rock units or layers, each represented by distinct colors and patterns. These units are often labeled with symbols that correspond to their type (e.g., igneous, sedimentary, or metamorphic rocks) and their age (e.g., Cretaceous, Devonian).
2. Faults and Folds: Faults (fractures where rocks have moved) and folds (bends in rock layers) are critical features that often control the distribution of rock units. Fault lines are often depicted as bold lines, sometimes with ticks to show the direction of movement.
3. Dip and Strike:The orientation of rock layers is an important detail shown on geological maps. "Dip" is the angle at which a rock layer is inclined, and "strike" is the direction of a horizontal line on the rock surface.
4. Legend: Geological maps include a legend that explains the colors, patterns, and symbols used to indicate rock types, ages, and structural features. This is crucial for interpreting the map.

Uses of Geological Maps: Resource Exploration: Geological maps help in identifying areas rich in minerals, oil, gas, and groundwater.
Construction and Engineering: These maps provide critical information on rock stability, which is vital for construction projects like tunnels, bridges, and dams.
Hazard Assessment: Geological maps are useful for identifying areas prone to natural hazards such as landslides, earthquakes, or volcanic activity.

Paleogeographic Maps These maps illustrate the distribution of rock formations or strata across regions at different periods in geological time. They provide insights into ancient environments and how strata were deposited across different regions.



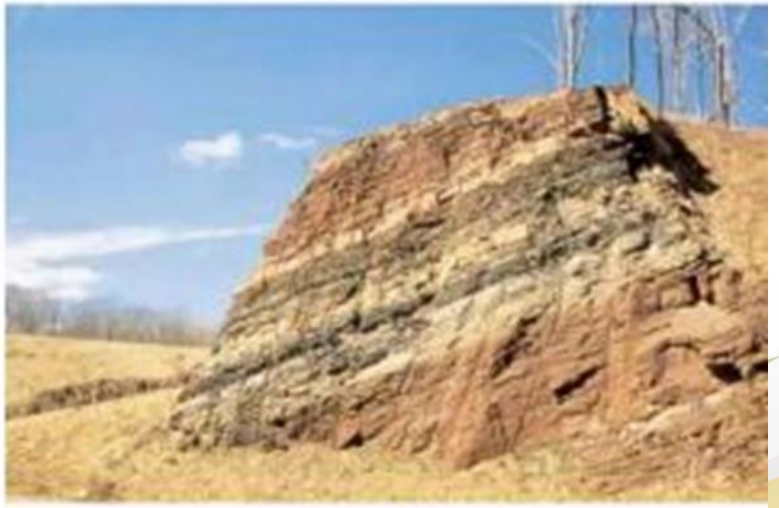


Principles of Stratigraphy

Principles (Laws) of Stratigraphy

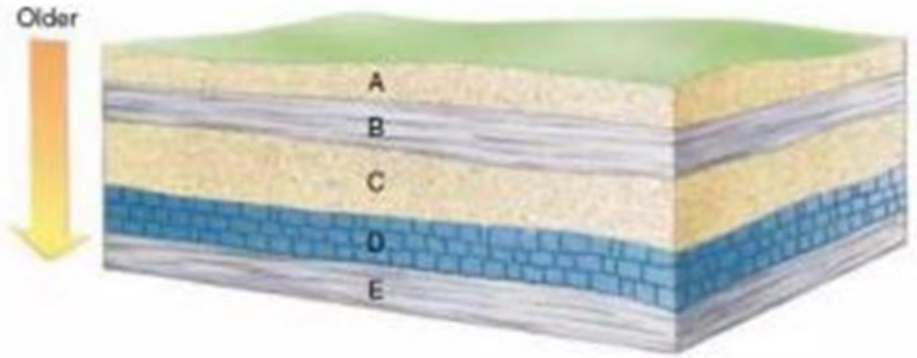
The principle of original horizontality

- It is based on the fact that sediment usually accumulates in horizontal layers. All sedimentary rocks are originally deposited horizontally
- If sedimentary rocks lie at an angle, we can infer that tectonic forces tilted them after they formed



The principle of superposition

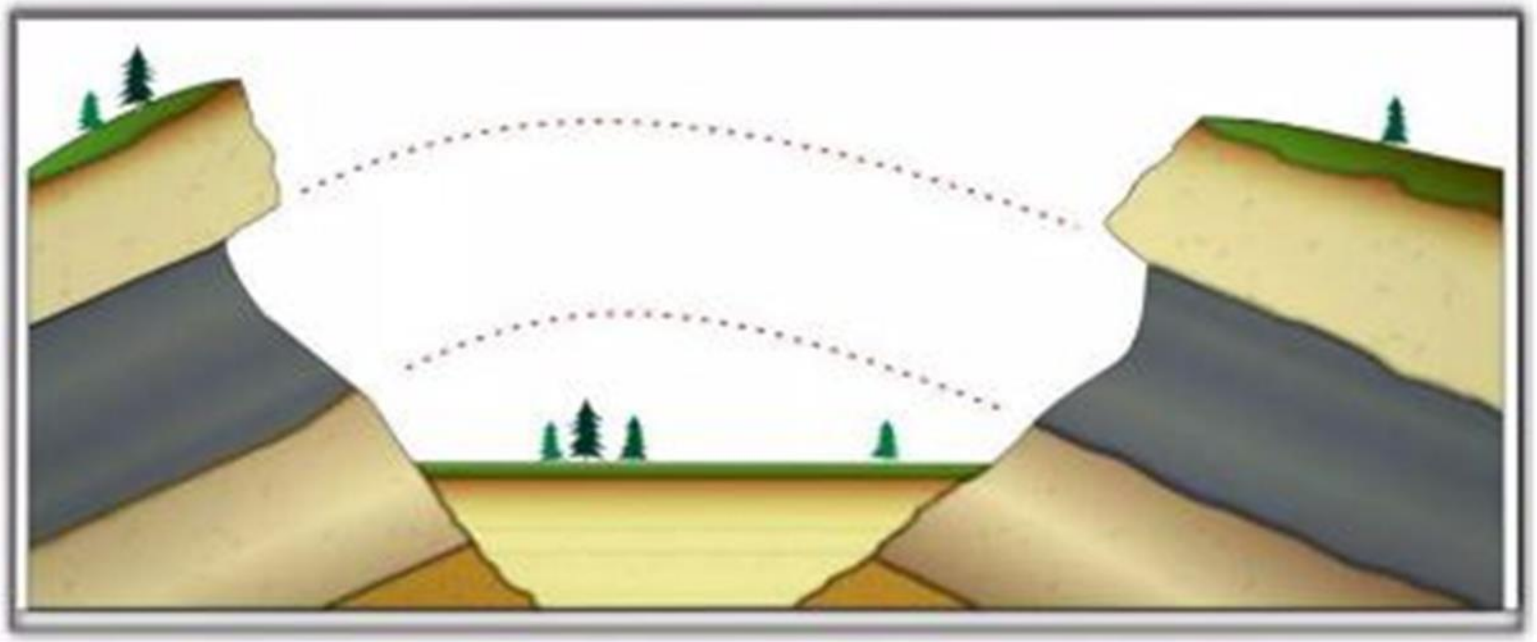
- It states that sedimentary rocks become younger from bottom to top (as long as tectonic forces have not turned them upside down).
- This is because younger layers of sediment always accumulate on top of older layers. In the figure below the sedimentary layers become progressively younger in the order E, D, C, B, and A.



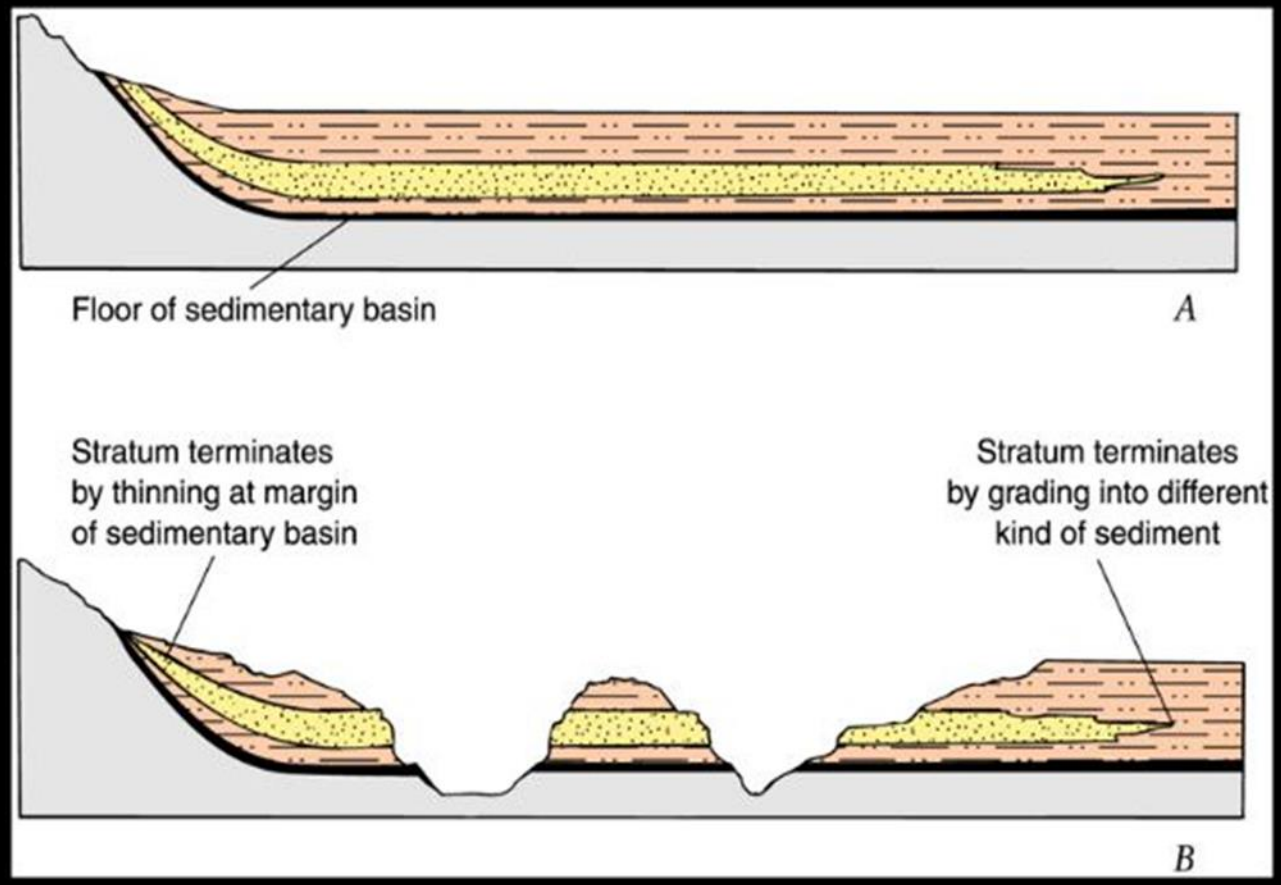
Principle of Lateral Continuity

- It states that if layers are deposited horizontally over the sea floor, then they would be expected to be laterally continuous over some distance.

- Sedimentary rocks are laterally continuous over large areas



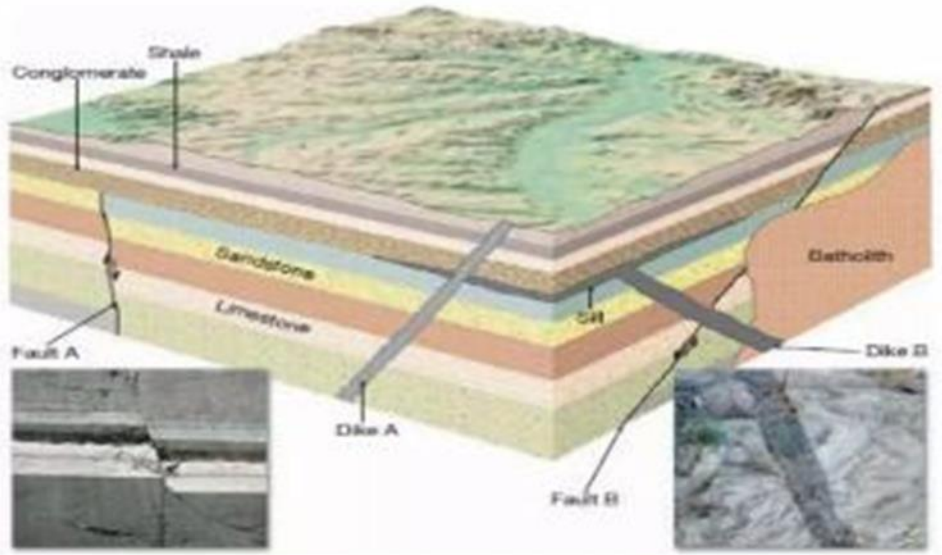
3. Principle of Lateral Continuity



Principle of Lateral Continuity: Layers of sediment initially extend laterally in all directions until they thin out or encounter a physical barrier. This principle suggests that similar layers found in different locations were once part of a continuous deposit.

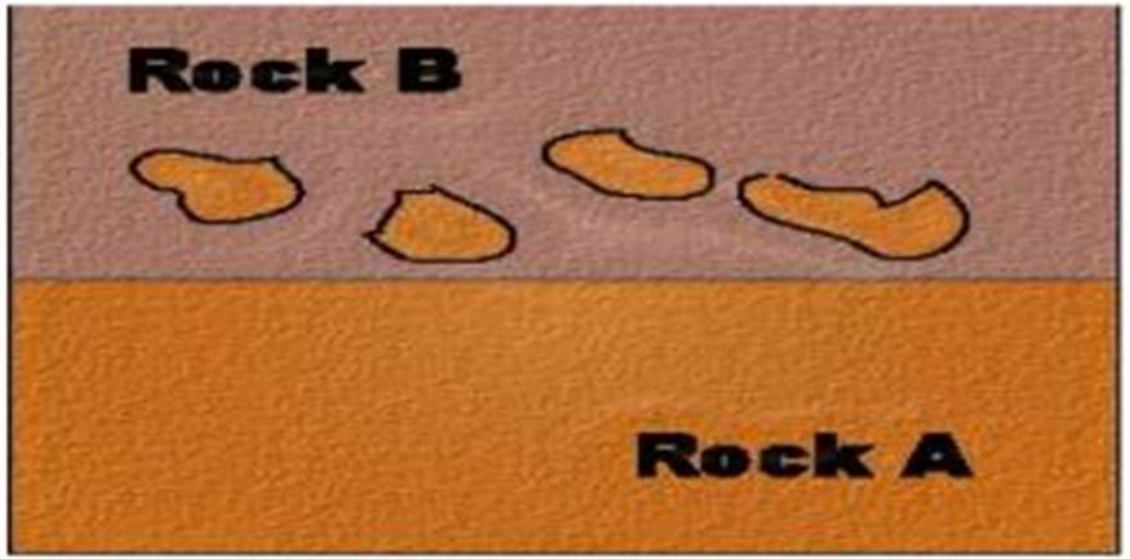
Principle of crosscutting relationships

- If one geologic feature cuts across another, the feature that has been cut is older. Younger features are truncate (cut across) older features.
- It states that a rock must first exist before anything can happen to it.



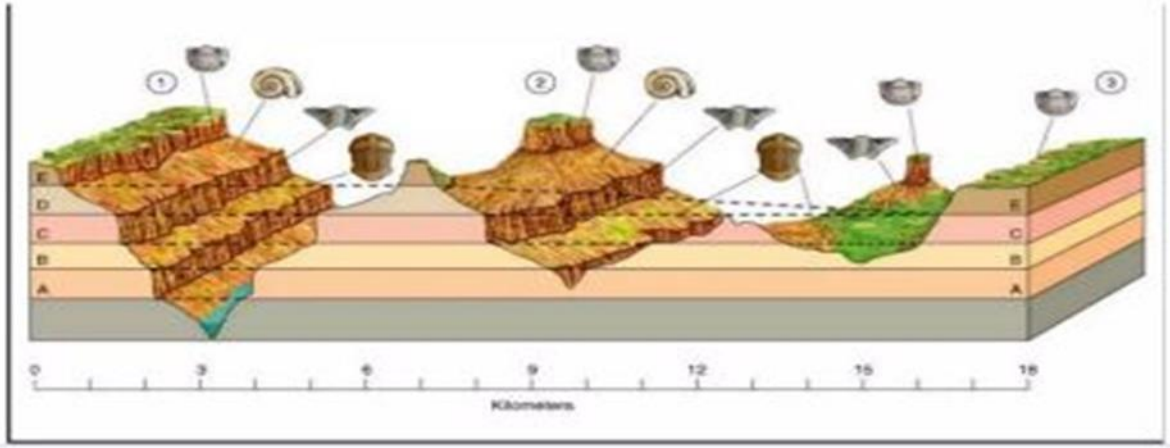
Principle of Inclusions

- The Law of Inclusions states that if a rock body (Rock B) contained fragments of another rock body (Rock A), it must be younger than the fragments of rock it contained.



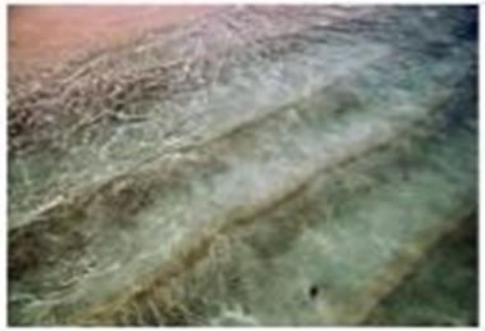
Principle of Faunal Succession

- Law of Faunal Succession states that fossils occur in a definite, invariable sequence in the geologic record.
- Fossils represent living creatures that have evolved through time, so when we found a fossil of the same type in two different areas (sections) that are not laterally continuous, we are pretty sure that the rocks are about the same age.



Principle of Uniformitarianism

- Was postulated by James Hutton (1726-1797)
- The features like mud cracks, ripple marks, graded bedding and so on, where the same features that could be seen forming in modern environments, and that past geologic events can be explained by phenomena and forces observable today
- Hutton concluded that processes are currently operating on the Earth must be the same processes that operated in the past. Later on stated as "the present is the key to the past".



Present

Past