

Petroleum Traps

E-Content

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M.Sc. Geology Sem - IV
MGELEC-I (Fuel)
Elective Paper

Petroleum Traps

- **Migration in itself will not give rise to accumulation** of oil unless the upward migration is arrested in a petroleum reservoir.
- **Essential elements of petroleum reservoir :-**
 1. **Reservoir Rock**
 2. Existence of **connected pore spaces** that are collectively capable of holding and storing petroleum
 3. **Oil, Water and Gas** – capable of movement
 4. **A Trap – a place where oil & gas are barred from further movement**
- ***Traps are a combination of the pervious & impervious rocks displaying some structural or stratigraphic irregularities which hold oil& gas in place so that they may not escape either vertically or laterally till and until released by drilling.***

3 Main Classes of Traps

i. Structural traps

Structural traps are caused by structural features. They are usually formed as a result of tectonics.

ii. Stratigraphic traps

Stratigraphic traps are usually caused by changes in rock quality.

iii. Combination traps

Combination traps that combine more than one type of trap are common in petroleum reservoirs.

- Other types of traps (such as hydrodynamic traps) are usually less common.

Types of Petroleum Traps

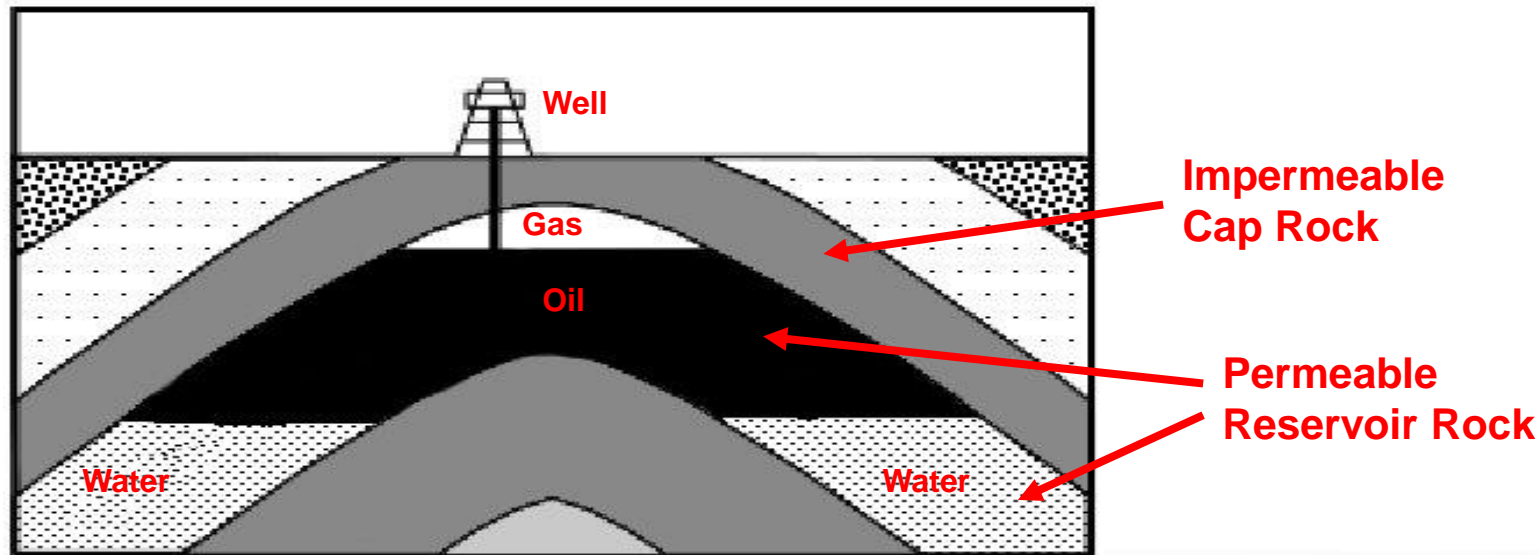
- ❖ **Several geologic structures may act as petroleum traps, but all have two basic conditions in common:**
 - 1) ***Porous, permeable reservoir rock*** that will contain quantities of oil and gas that make it worth drilling.
 - 2) ***Impermeable cap rock*** that traps oil and gas preventing it from escaping to the surface.

- ❖ **Types of Petroleum traps include:**
 - 1) Anticline Trap
 - 2) Salt Dome Trap
 - 3) Fault Trap
 - 4) Stratigraphic Trap

Types of Petroleum Traps

1) Anticline Trap:

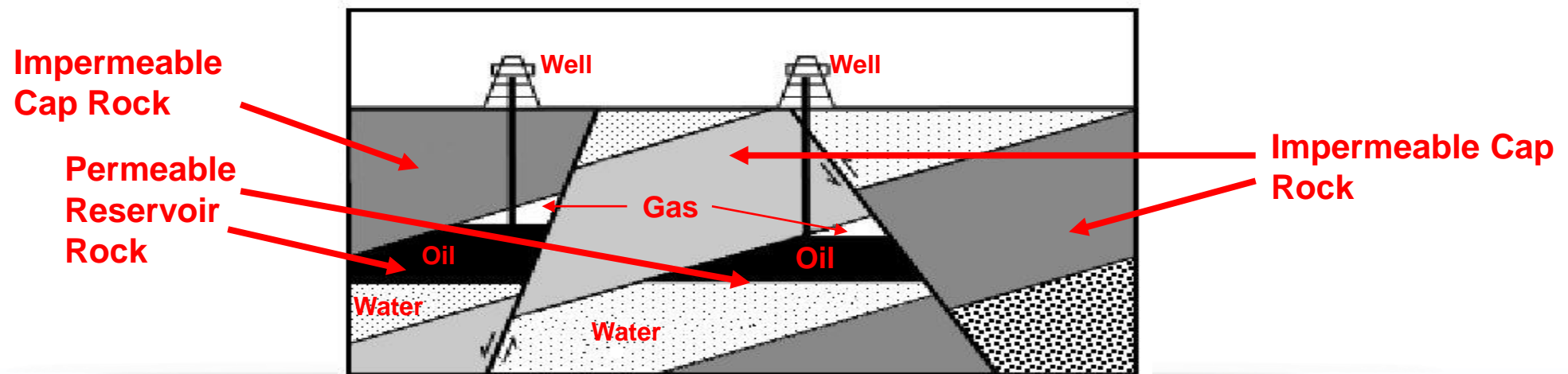
- If a **permeable rock like sandstone or limestone** is located between **impermeable rock layers like shale** and the rocks are **folded into an anticline**, oil and gas can move **upward in the permeable reservoir rocks**, and accumulate in the upper region of the anticline.



Types of Petroleum Traps

2) Fault Trap

- If faulting can shift permeable and impermeable rocks so that the **permeable rocks always have impermeable rocks above them, then an oil trap can form.**
- **Note** that both normal faults and reverse faults can form this type of oil trap.



Types of Petroleum Traps

3) Stratigraphic Traps

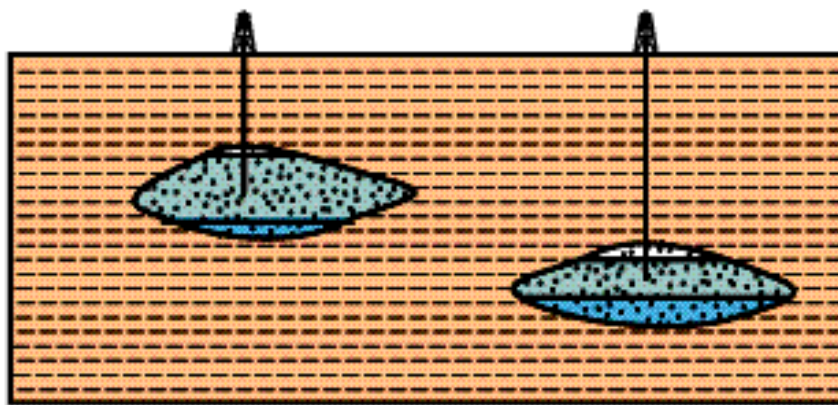
➤ Traps that are result of lateral variation in lithology of the reservoir rock or a break in its continuity.

➤ This break / variation may be due to **3 ways** :

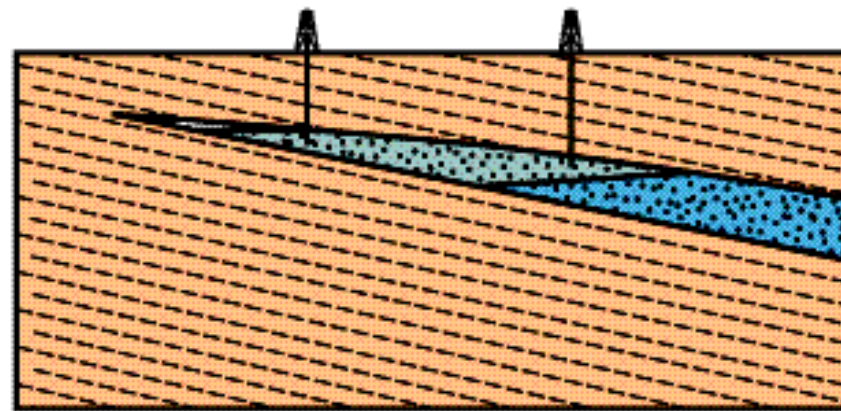
1. When **permeable RR changes to less permeable / impermeable RR**
2. When **RR is truncated by unconformity & overlapped**
3. When **RR along its bedding and boundary between the 2 kinds of rocks determine the extent of the reservoir.**

➤ Classification – 2 classes – **Primary & Secondary Stratigraphic Traps**

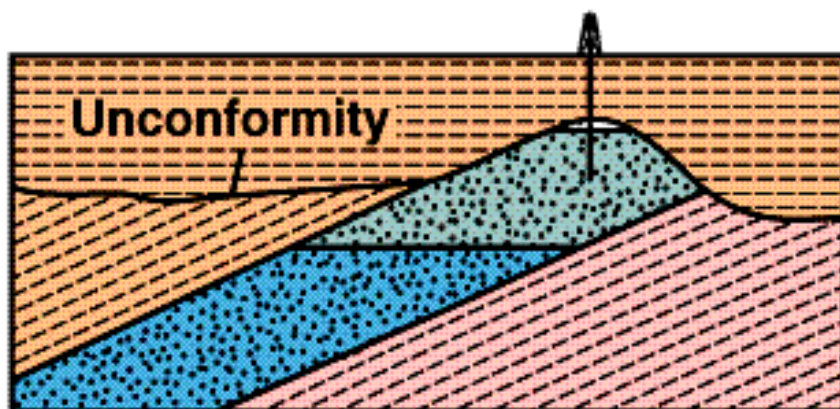
Stratigraphic Oil Traps



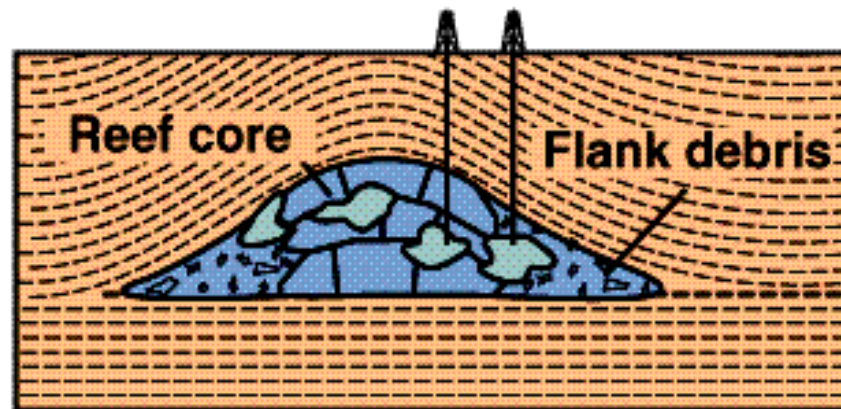
D Sandstone lenses



E Sandstone pinchout

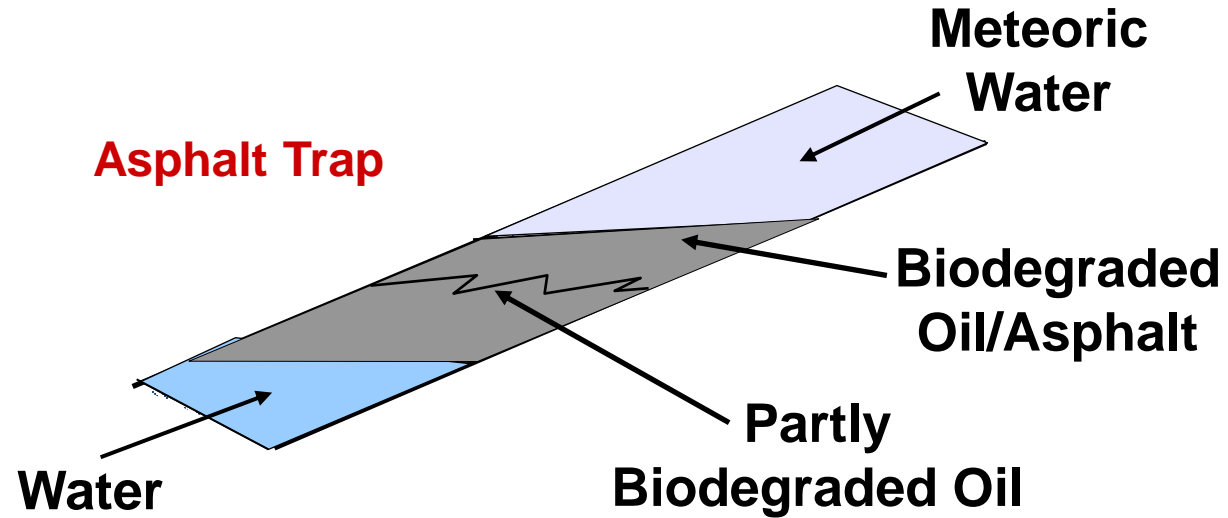


F Unconformity

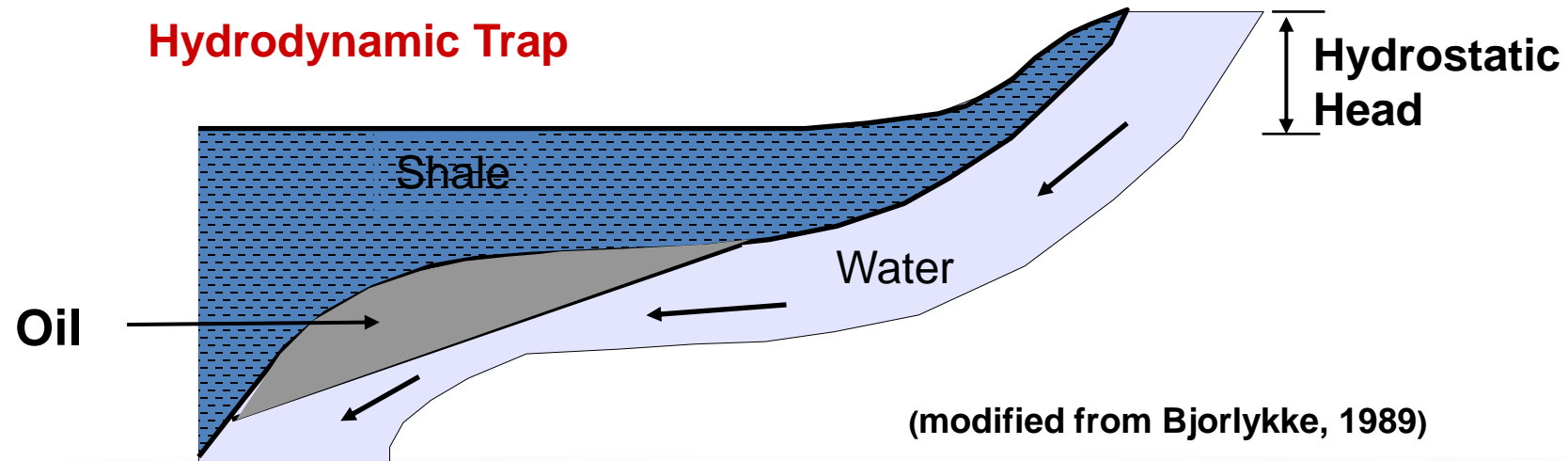


G Reef (a small "patch" reef)

Other Traps



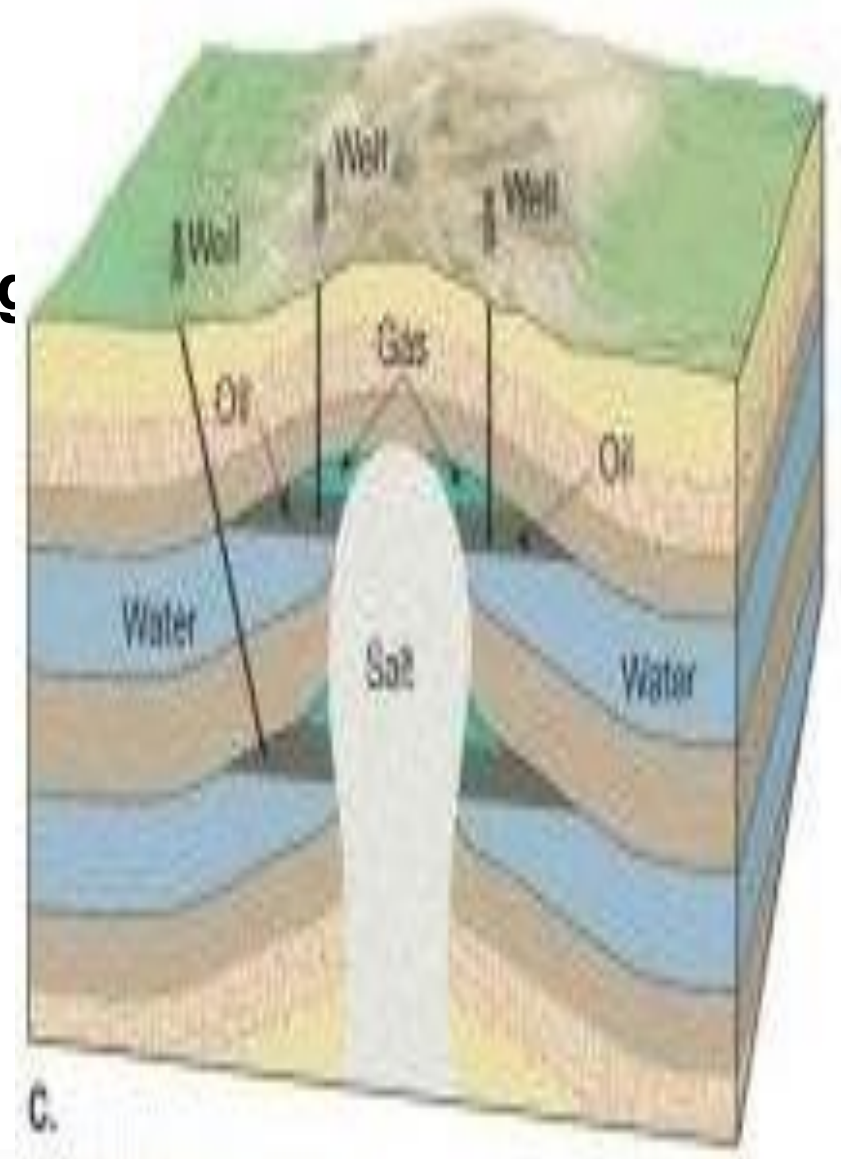
In hydrodynamic traps, the hydrocarbon is trapped by the action of water movements. Tilted contacts are common in this case. The water usually comes from a source such as rain falls or rivers.



Types of Petroleum Traps

3) Salt Dome Trap

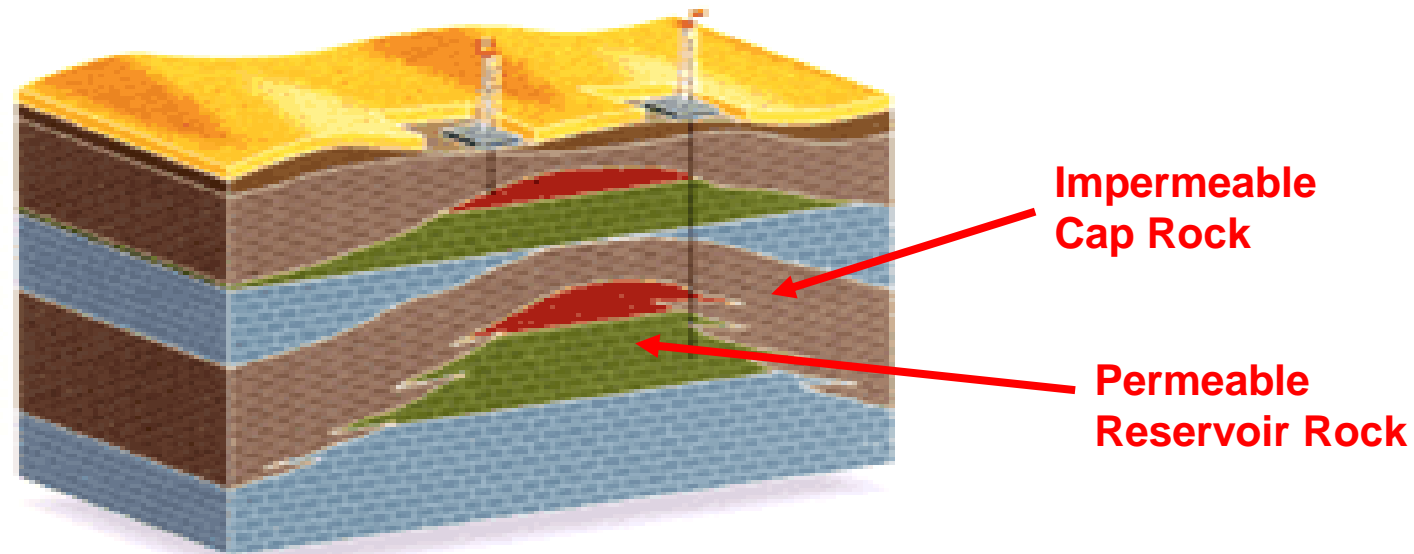
- **Rising plug of salt** through the Earth, punching through mostly sands- **fracturing, faulting & folding rock on sides** along the way.
- **RR is broken into blocks of oil traps.**
- **Oil can come to rest right up against the impermeable salt**, which makes salt an effective trap rock.
- Resulting traps – **stratigraphic, structural & combination.**
- Oils are **generally heavy – low API gravity ;**
- **Pressure is very high**
- **Drilling oil is expensive , but high yields result**



Types of Petroleum Traps

4) Limestone Reef Trap

- Limestone reef trap is a type of stratigraphic trap.
- When coral reefs become buried by other impermeable sediments they can form excellent oil sources and reservoirs.



Role of Density in Petroleum Traps

- **Density** is the physical property that distributes petroleum in a reservoir.
- Water is denser than oil and oil is denser than gas.
- Therefore, when drilling into a petroleum trap, gas is encountered first, followed by oil and then water.
- Some reservoirs may have all three components, whereas some reservoirs may only have two components or one component.

