

Origin of petroleum dilemma

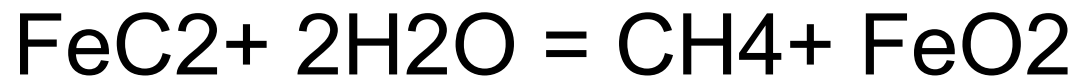
Inorganic or abiotic origin

vs.

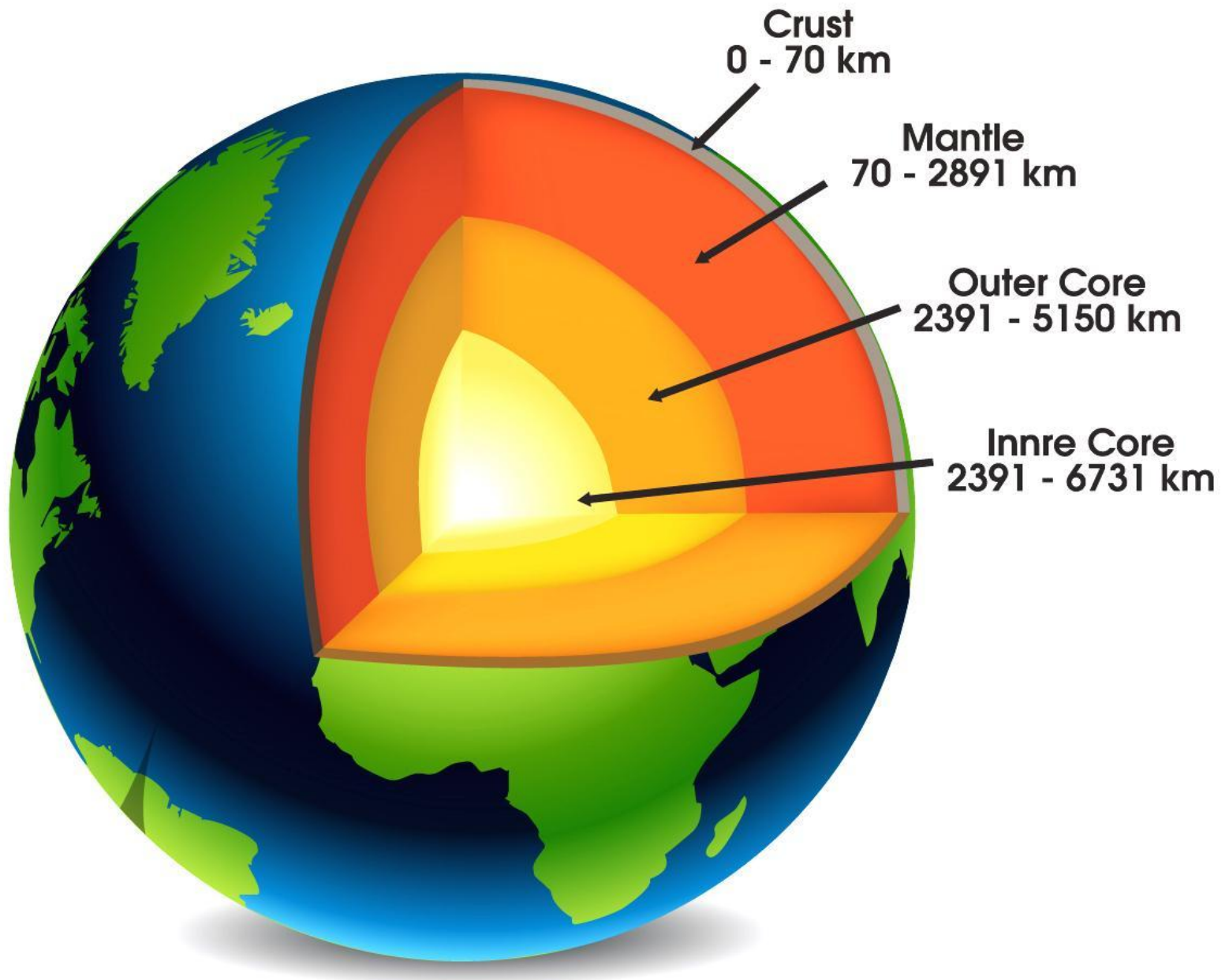
organic origin

In 1877, Dmitri Mendele'ev postulated:
metallic carbides + water + high =
acetylene (C₂H₂) = condensed to heavier
HC.

modified by Berthelot in 1860 and by
Mendele'ev in 1902:

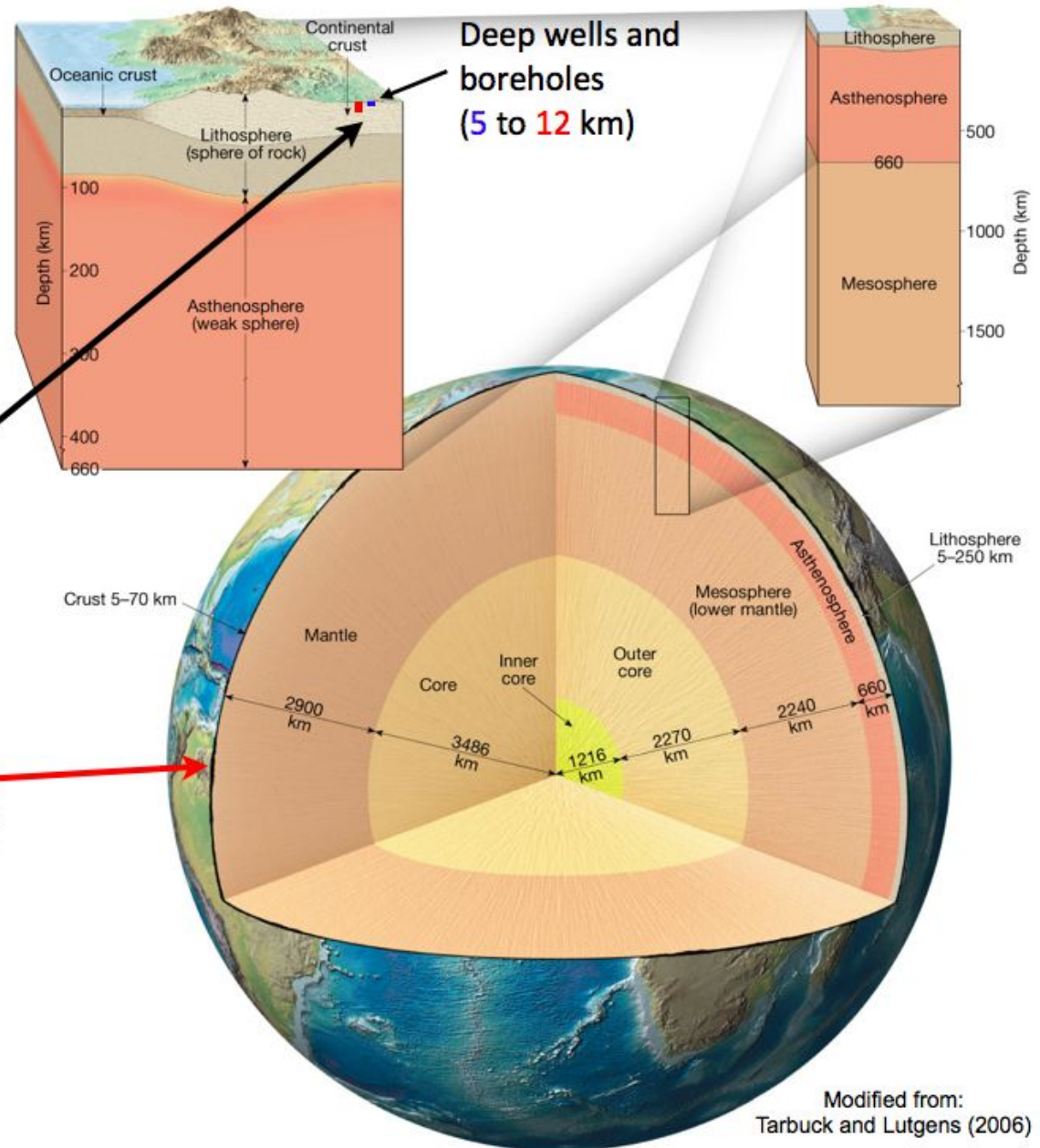


In 1890, Sokoloff proposed a cosmic origin
for petroleum



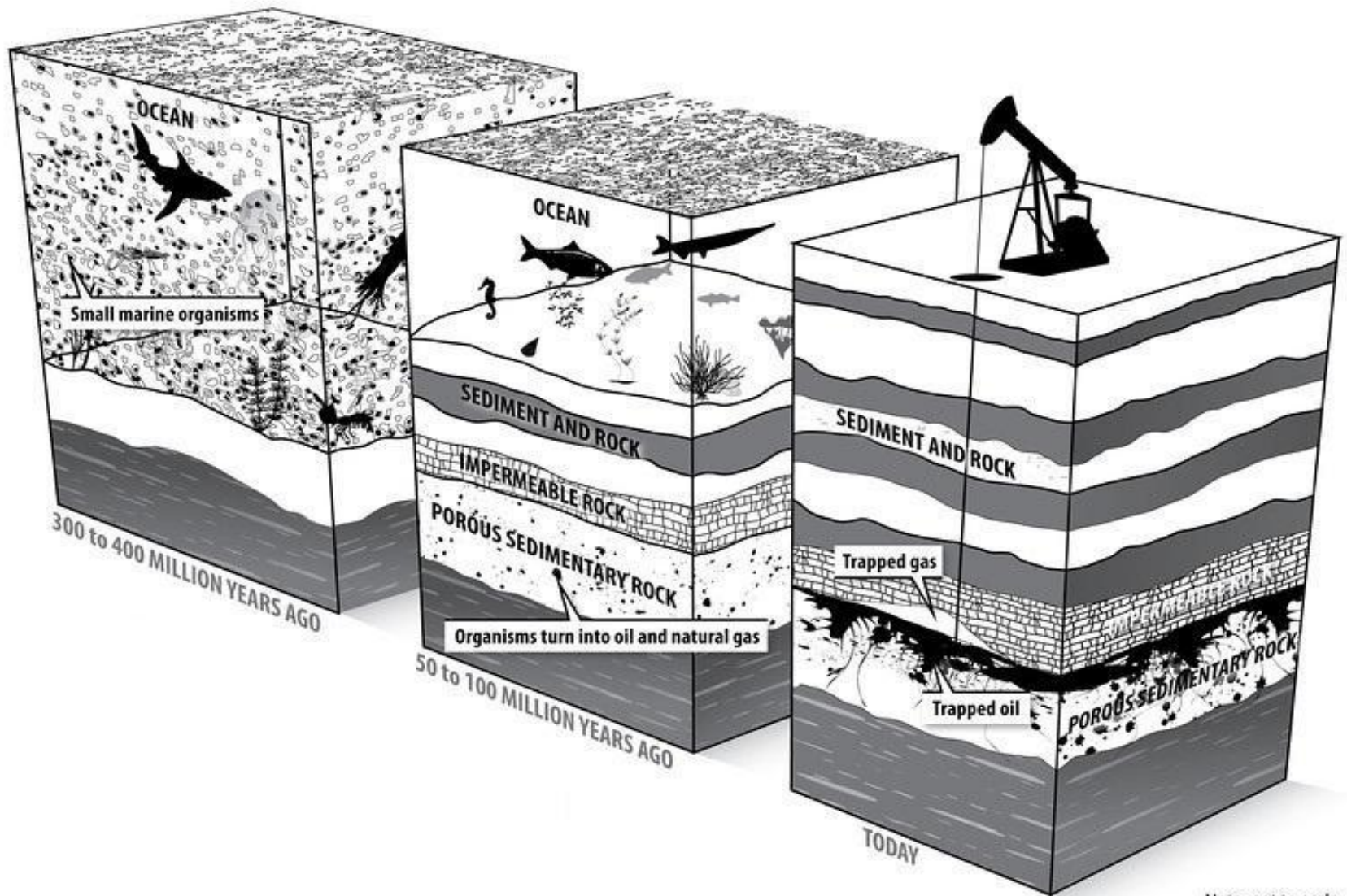
Drilling of wells and boreholes has only penetrated about a third of the way into the Earth's crust.

The crust is this very thin black line at the surface of the Earth.



Organic theory

- **First** - carbon-hydrogen-organic matter connection
- **Second** - chemical characteristics of petroleum reservoirs with nitrogen and porphyrins found in all organic matter and in many petroleums.
- **Third** - physical characteristics
- **Finally** -time requirements may be less than 1MM years



Note: not to scale

Petroleum End Product

=

[Raw Material

+

Accumulation

+

Transformation

+

Migration]

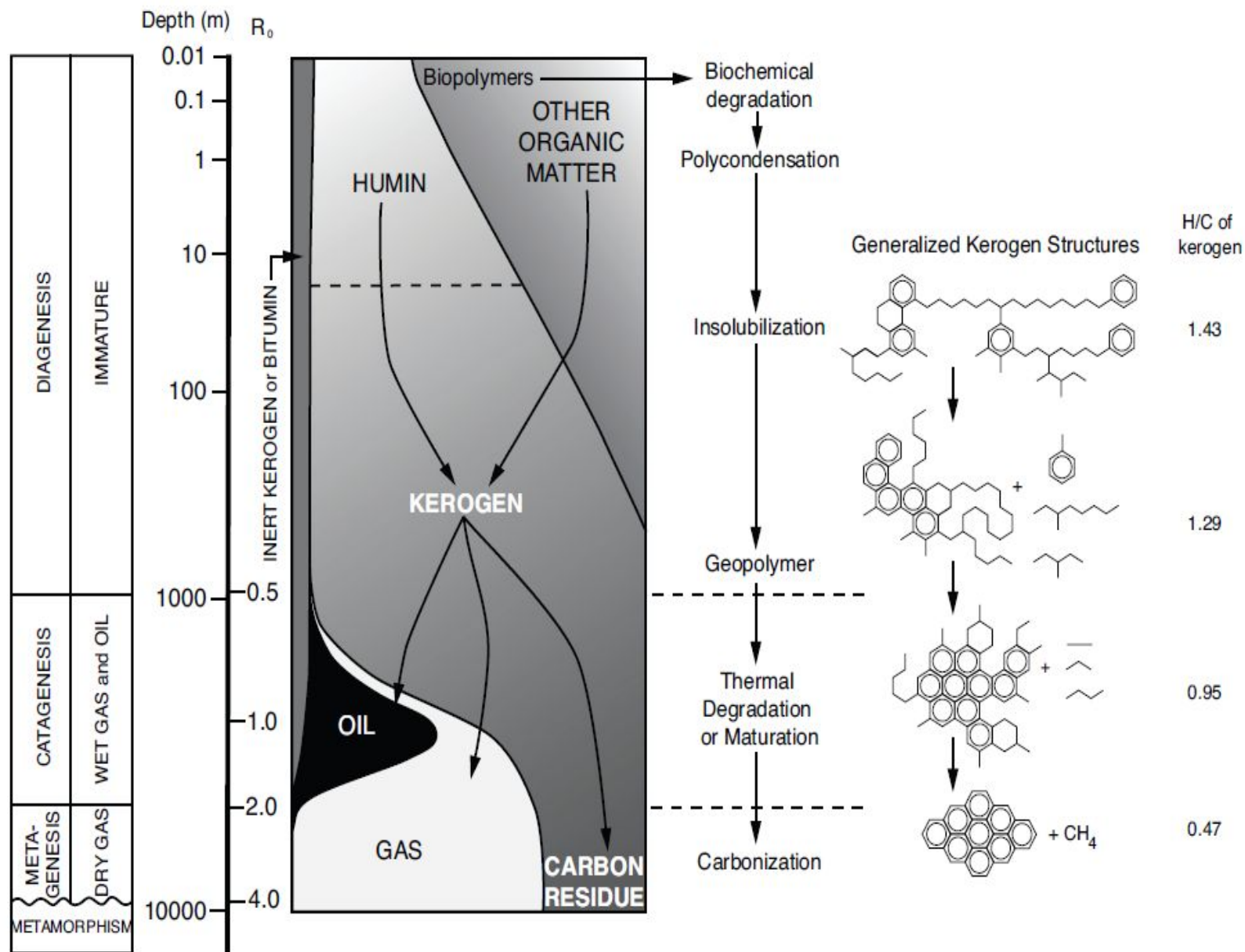
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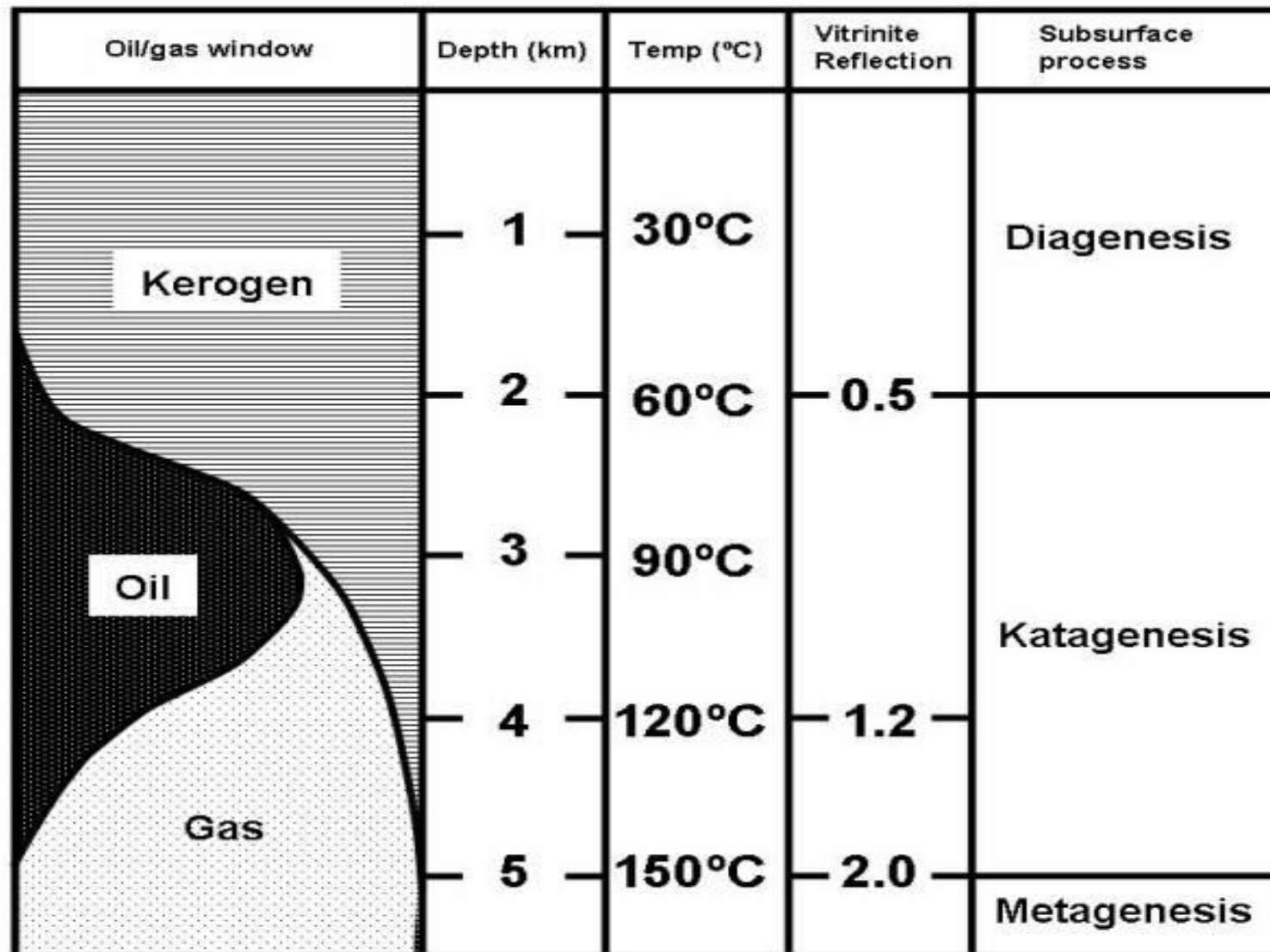
Geologic Time

Diagenesis-catagenesis-metagenesis

The maturation process needs several stages, they are:

- Diagenesis, this stage is the decomposition process occurs and there is a reduction in the oxygen content of organic material with abiotic reactions that produce methane and carbon dioxide kerogen. At this stage the organic material is still immature.
- Catagenesis, burial process continues and the fluid content of hydrocarbons starts out with an initial form of fluid and then the temperature rise resulting gas. At this stage, the percentage of H / C decreases but the O / C is not too reduced.
- Metagenesis, the process continues as a large burial pressure and temperature almost reached metamorphic phase. The end result can be either graphite.



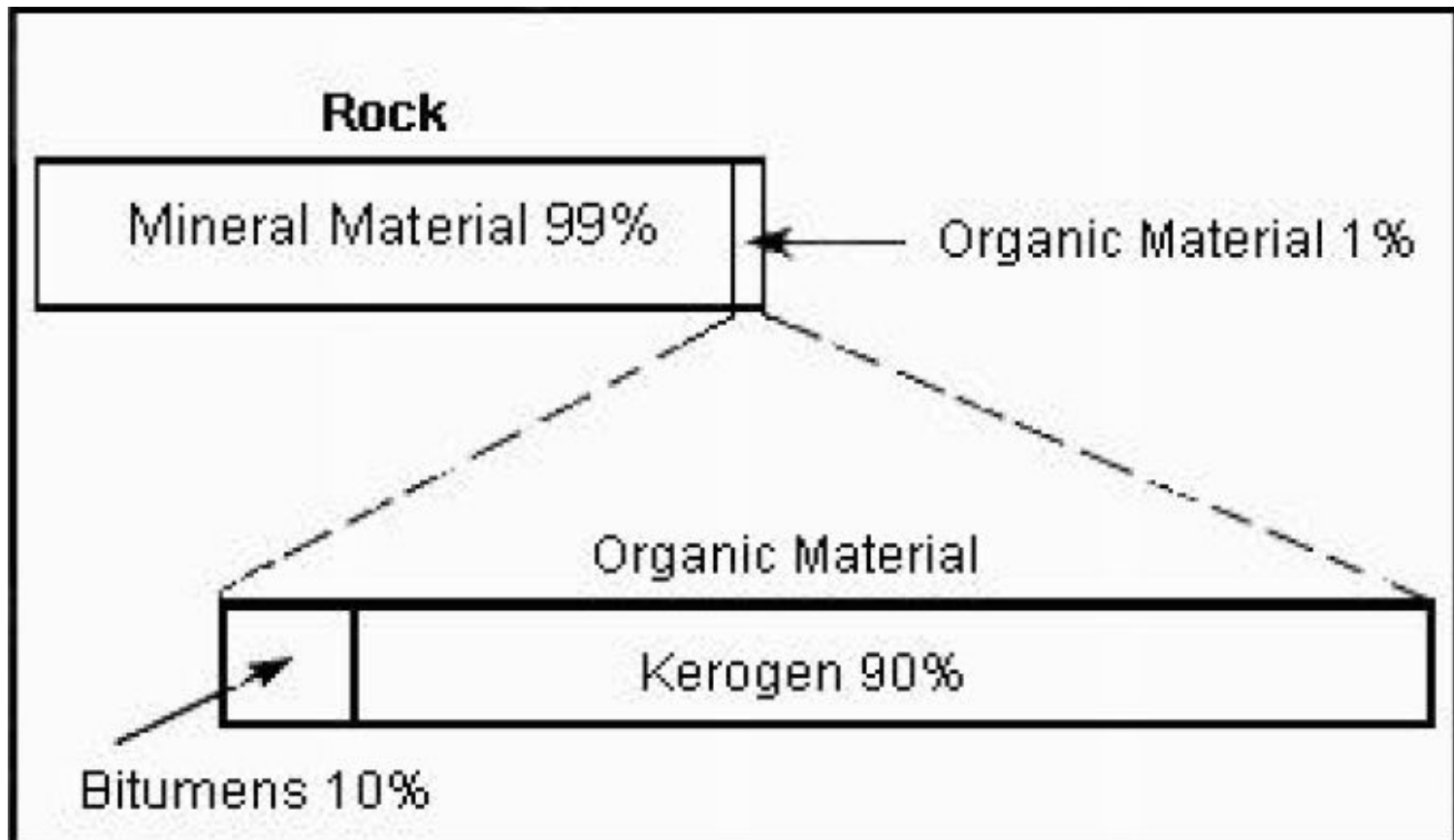


HC generation →

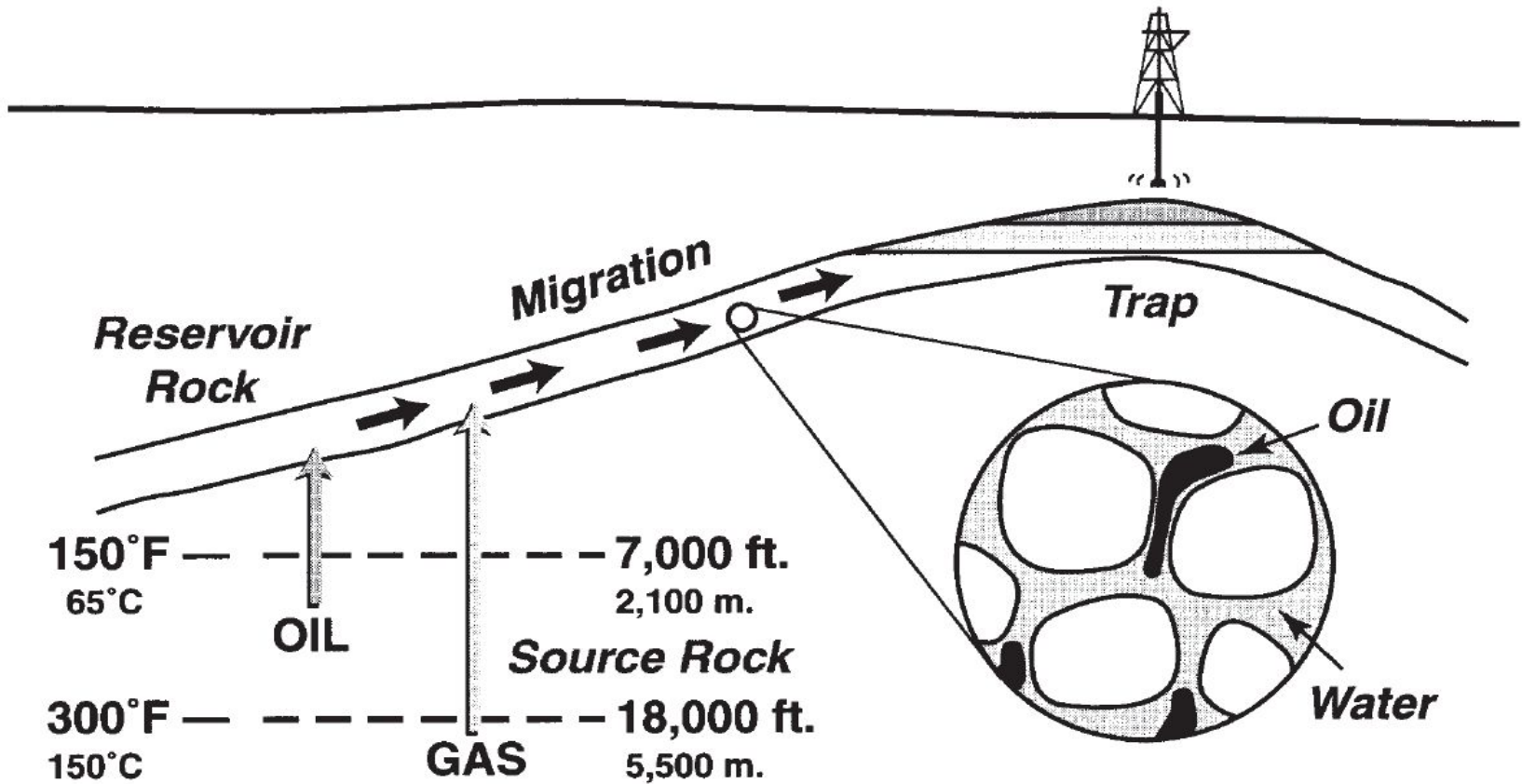
Types of Kerogen and Their Hydrocarbon Potential

Environment	Kerogen Type	Kerogen Form	Origin	HC Potential
Aquatic	I	Alginite	Algal bodies	Oil
		Amorphous Kerogen	Structureless debris of algal origin	
			Structureless planktonic material, primarily of marine origin	
Terrestrial	II	Exinite	Skins of spores and pollen, cuticle of leaves and herbaceous plants	
	III	Vitrinite	Fibrous and woody plant fragments and structureless, colloidal humic matter	Gas, some oil
	IV	Inertinite	Oxidized, recycled woody debris	Mainly gas
				None

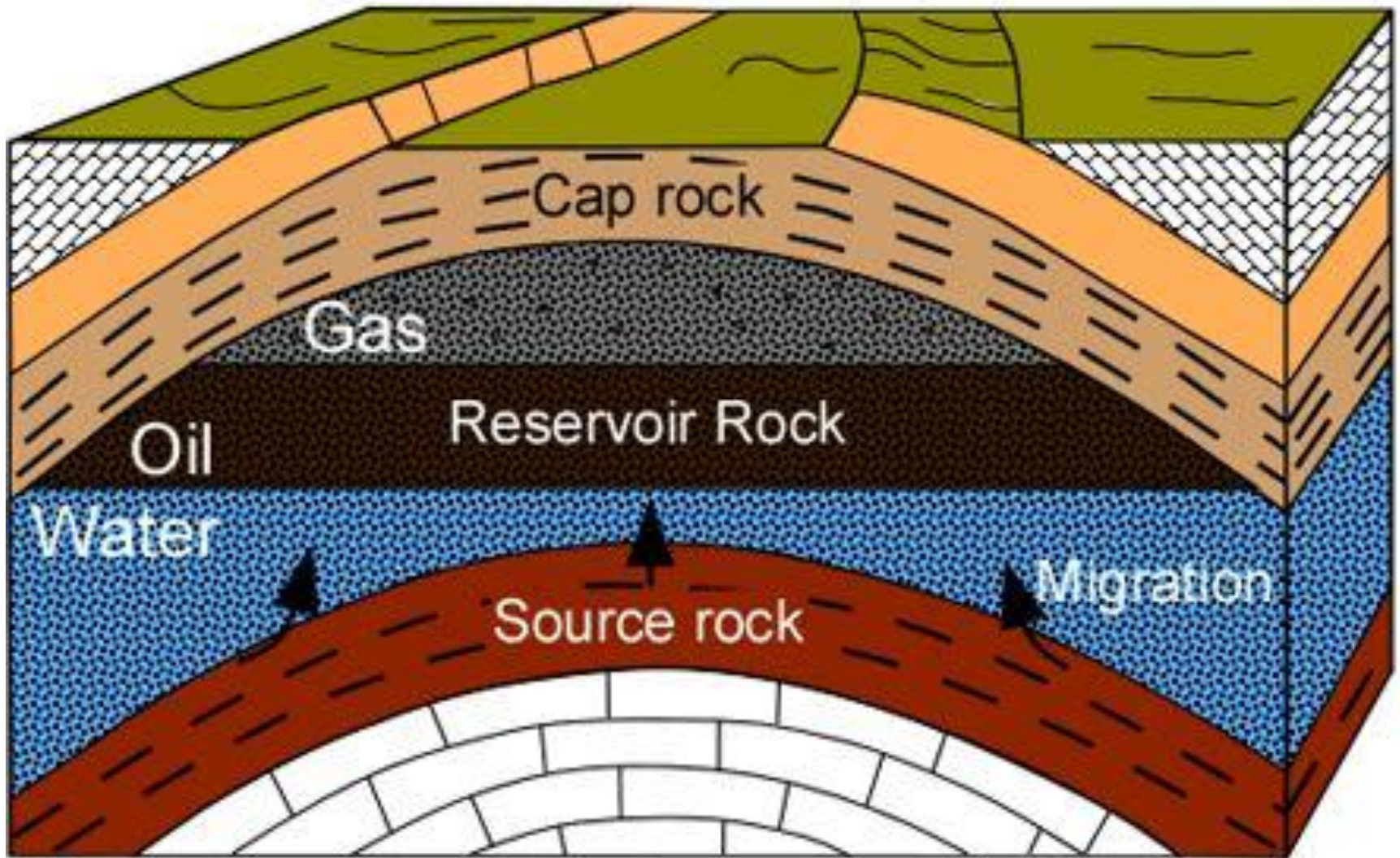
- **Kerogen**



Migration of oil



Petroleum system



To organize their knowledge about the occurrence of oil and gas discoveries, explorationists defined the ***petroleum system*** as the geologic elements and processes that are essential for the existence of a petroleum accumulation:

- ***Trap***—a barrier to the upward movement of oil or gas
- ***Reservoir***—porous and permeable rock to receive the hydrocarbons
- ***Source rock***—a rock formation containing organic matter
- ***Generation***—temperature and pressure conditions to convert the organic matter into hydrocarbon fluids
- ***Migration***—buoyancy conditions and pathways for the fluids to move from the source rock into the reservoir
- ***Seal***—an impermeable cap to keep the fluids in the reservoir
- ***Preservation***—conditions that maintain the nature of the hydrocarbons.

When these elements and processes occur in the proper order, chances are good that a petroleum accumulation exists

TYPES OF OIL AND GAS TRAPS

STRUCTURAL

Anticlinal

Fault

STRATIGRAPHIC

Facies Change

