EWCE 203

Geology and Geomorphology

Sedimentary Rocks

Types of Sedimentary rocks as per Composition



Clastic Sedimentary Rocks:

Conglomerate:

- Made up of more or less **rounded** fragments.
- 2 to 64 mm average dia
- Space between the **pebbles** is generally **filled with smaller particles** and
- A **chemical cement** **that binds** the rock together

Clastic Sedimentary Rocks:

Breccia:

- Fragments are **more angular** than rounded.
- Spaces between the large fragments can be **filled** with a matrix of smaller particles or **a mineral cement** which binds the rock together.

Tillite:

- Fragments are **laid down by glaciers**





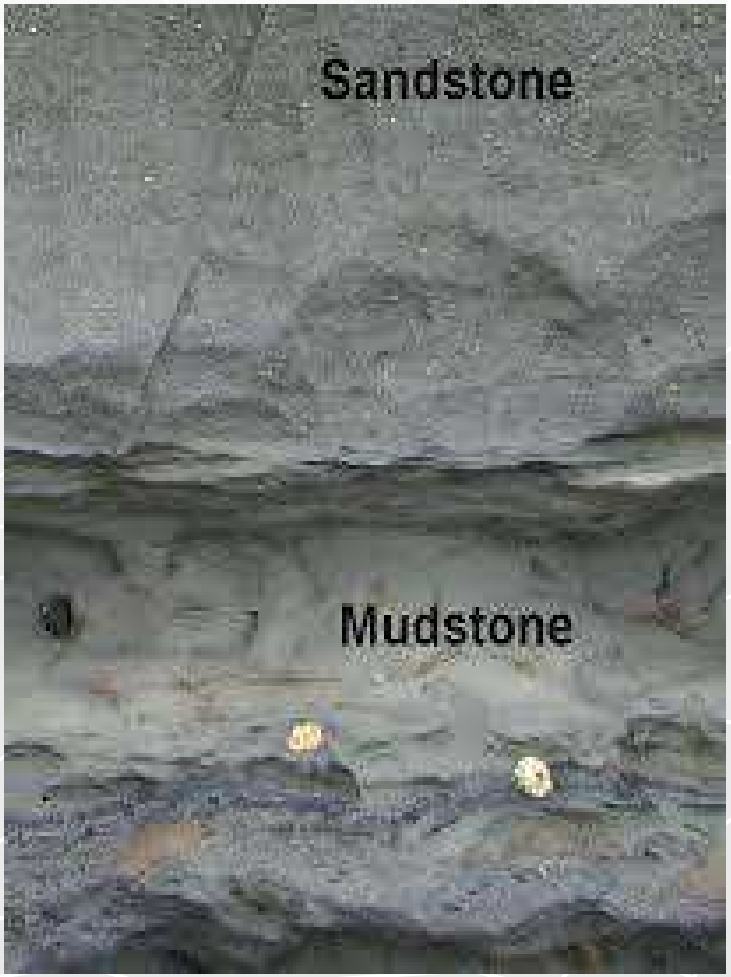
Sedimentary Rocks

Sandstone:

- Formed by consolidation of **sand size particle** ie **0.0625 to 2mm** dia.
- Sizes in between conglomerate and mudstone.

Mudstone:

- Composed of **clay and silt size particles**
- Sizes **less than** 0.0625mm in dia.



Chemical Sedimentary Rocks

Limestone:

- Limestone ($CaCO_3$) is a type of **carbonate sedimentary rock** which is the main source of the material lime.
- Composed mostly of the minerals **calcite and aragonite**
- Limestone forms when **these minerals precipitate** out of water containing dissolved calcium.



Dolomite:

- Also known as "dolostone" and "dolomite rock".
- Composed **primarily** of the mineral **dolomite**, $CaMg(CO_3)_2$.
- Found in **sedimentary basins** worldwide.



Dolomites" are a **mountain range** in northeastern Italy and part of the **Italian Alps.**

Evaporite:

- Rocks formed by the evaporation of water are called Evaporite - **gypsum**, **anhydrite**, **halite** (common salt)

- Composed of **minerals precipitated** from solution with the evaporation of liquid.







Sedimentary Rocks



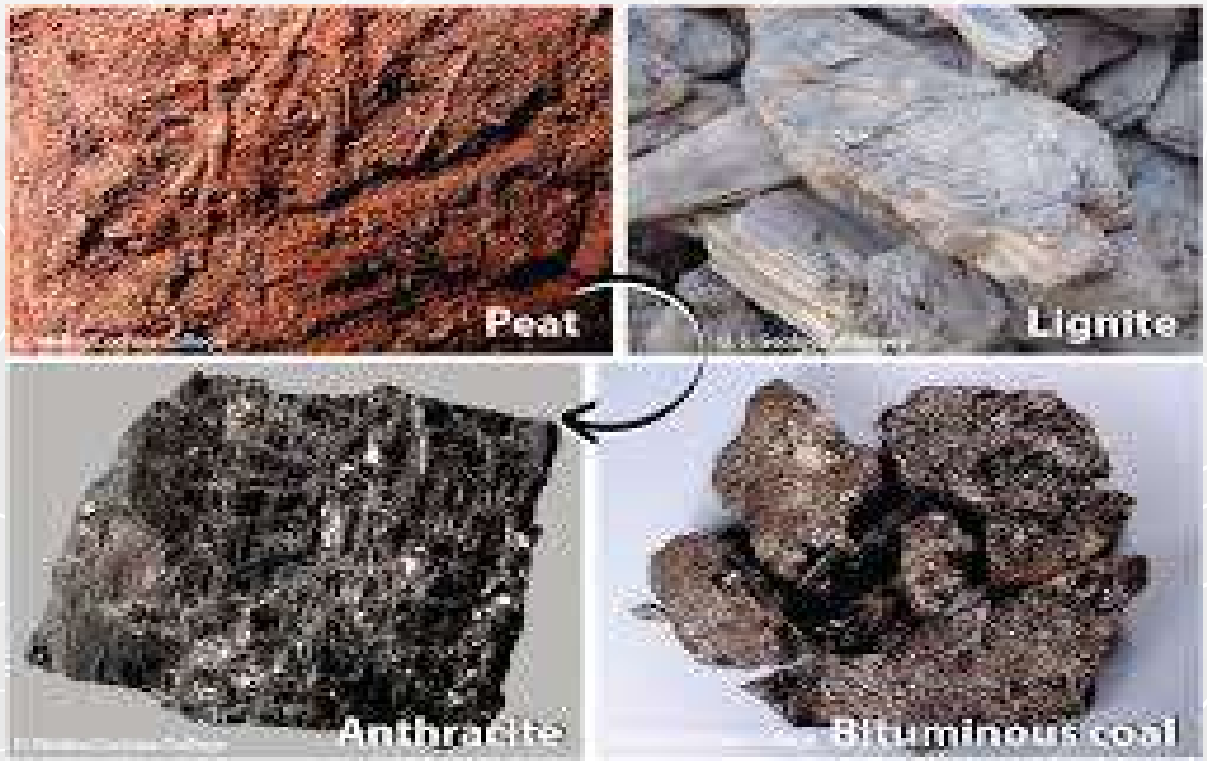


Salt Field in Maheshkhali and Teknaf

Organic Sedimentary Rocks

- Organic sedimentary rocks are those **containing large quantities of organic molecules**, organic molecules contain carbon.

- Such as materials **form from the soft tissues of plants and animals**.

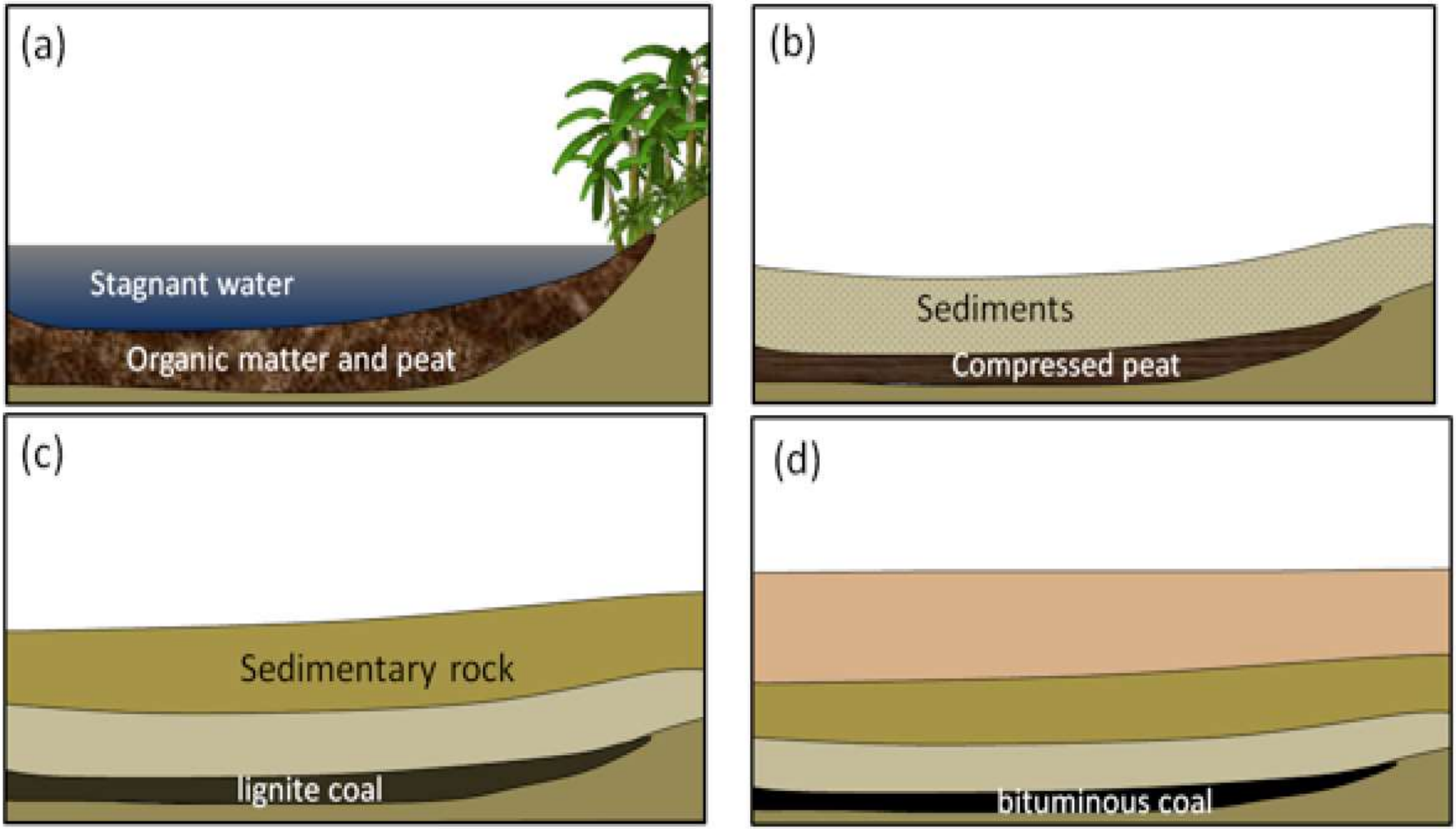


What is coal?

Coal

- Also called **black gold**.
- **Found** in sedimentary strata [layers of soil].
- **Contains carbon, volatile matter, moisture** and **ash** [in some cases **Sulphur** and **phosphorous**]
- Mostly **used for power generation and metallurgy**.
- Coal **reserves are six times greater** than oil and petroleum reserves.

Formation of Coal



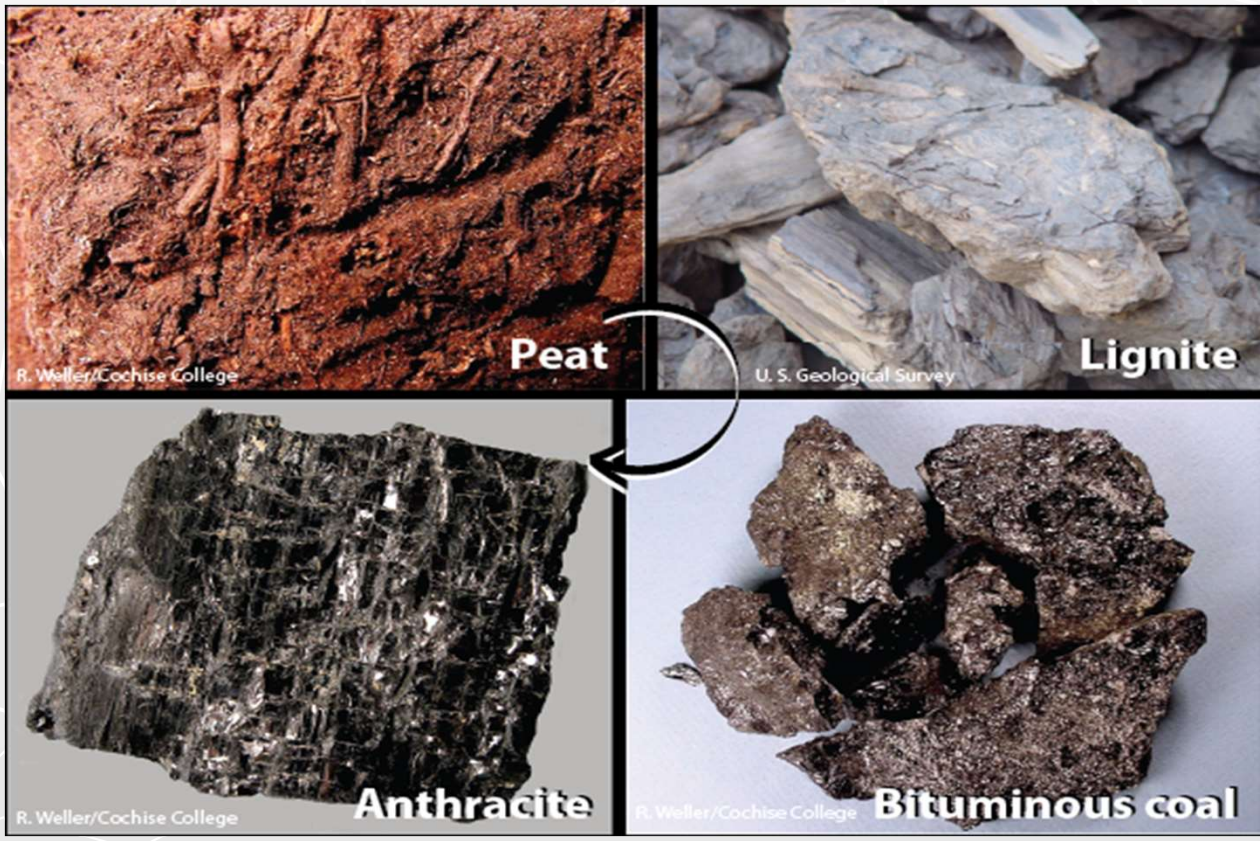
Formation of Coal

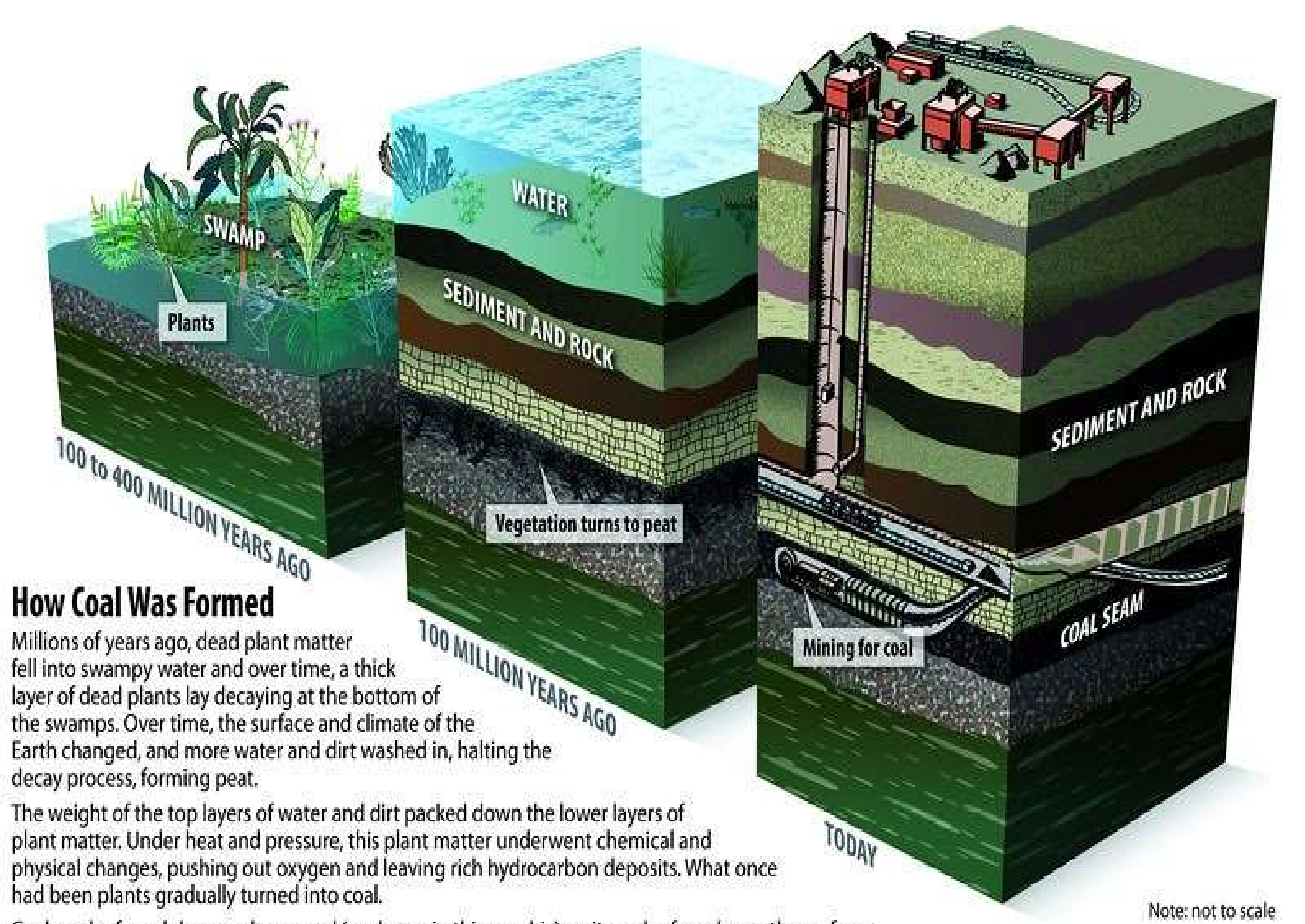
- **Begins** when **plant matter** is prevented from decaying by accumulating in low-oxygen, acidic water.

- **Accumulation** within **a swampy area** forms a layer of **peat**;

- **Buried under sediment**; heated and compressed peat; with greater burial, **lignite** coal forms;

- **At even greater depths**, **bituminous** and eventually **anthracite coal** form as **pressure and temperature increases**.





How Coal Was Formed

Millions of years ago, dead plant matter fell into swampy water and over time, a thick layer of dead plants lay decaying at the bottom of the swamps. Over time, the surface and climate of the Earth changed, and more water and dirt washed in, halting the decay process, forming peat.

The weight of the top layers of water and dirt packed down the lower layers of plant matter. Under heat and pressure, this plant matter underwent chemical and physical changes, pushing out oxygen and leaving rich hydrocarbon deposits. What once had been plants gradually turned into coal.

Coal can be found deep underground (as shown in this graphic), or it can be found near the surface.

Note: not to scale

Ranking and Types of Coal

Coals are **ranked based on the % of hydrocarbon, ash and moisture content:**

Peat:

- Plant matters
- A **soft, spongy** and **brownish** deposit
- **Plants' textures** are easily recognizable.

Time coupled with pressure by deep burial, sometimes by earth's movement, **gradually transformed peat into coal**.

During this process, **the % of carbon increases** as the volatile **hydrocarbon** and **water** are forced out of the deposit.

Organic Sedimentary Rocks

Peat:

- **First stage** of transformation.
- Contains **40 per cent carbon** **& more impurities.**
- Contains **sufficient volatile matter** and **lot of moisture.**
- Left to itself, it **burns like wood**, gives less heat, emits more smoke and leaves a **lot of ash.**





Lignite:

- Intermediate stage.
- **Known as Brown coal.**
- Lower grade coal.
- **50 to 65 per cent hydrocarbon.**
- **Dark to black brown.**
- **Moisture content** is high (over 35 per cent).
- It undergoes **Spontaneous Combustion** [Bad. **Creates** fire accidents in mines]

Bituminous Coal:

- Most widely available and **used coal**.
- Derives its name after a liquid called **bitumen**.
- **Less than 80% hydrocarbon.**
- **Moisture** and volatile content (15 to 40 per cent)
- Dense, compact, and is usually of **black color**.
- **Does not have traces of original vegetable material.**
- Calorific value is **very high** due to high proportion of carbon and low moisture.
- Used in production of **coke and gas**.
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Anthracite Coal

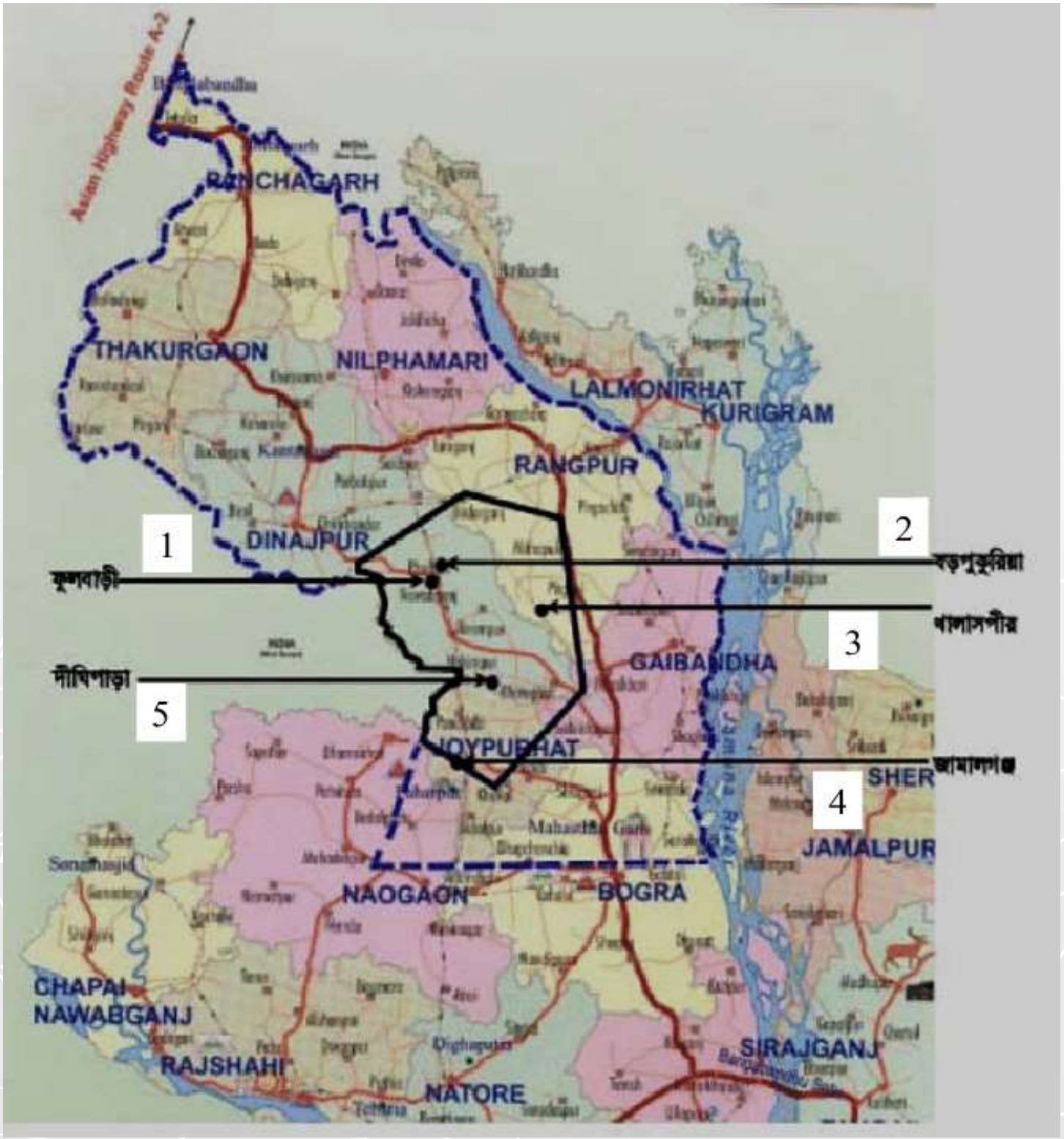
- **Best quality**; hard coal.
- **80 to 95 % carbon**.
- **Very little volatile** matter.
- Negligibly small proportion of **moisture**.
- Semi-metallic **luster**.
- Ignites slowly and burns with a nice **short blue flame.**



Coal Reserve in Bangladesh:

Till date **five major gondwana (600mya) coal fields** have been discovered in Bangladesh.

Coal field (district)	Year of discovery	Discovered by	**Depths of coal seam (in meter)**	No. of coal seam	Reserve (million ton)	Status
Jamalganj (Joypurhat)	1962	SVOC	640-1158	7	1053	Minig not feasible economically
Barapukuria (Dinajpur)	1985	GSB	118-506	6	303	Underground mine started production
Khalashpir (Rangpur)	1989	GSB	257-451	8	147	Undeveloped
Dighipara (Dinajpur)	1995	GSB	250	7	200	Undeveloped
Phulbari (Dinajpur)	1997	BHP	152-246	1	380	Open pit mine feasibility study undertaken in 2004


Asian Highway Route A-2
PANCHAGARH
THAKURGAON
NILPHAMARI
LALMONIRHAT
KURIGRAM
RANGPUR
DINAJPUR
1
2
ফুলবাড়ী
বড়পুকুরিয়া
থালাসপীর
3
GAIBANDHA
দীঘিপাড়া
5
JOYPURHAT
আমাগাছি
SHER
4
JAMALPUR
NAOGAON
BOGRA
CHAPAI
NAWABGANJ
RAJSHAHI
NATORE
SIRAJGANJ

Why Coal Mining is difficult in Bangladesh?

Facts that make coal mining difficult in Bangladesh is:

- ***Greater depths*** of coal seams
- Occurrence of a **100-200 meter thick loose water bearing sandy layer covering the coal deposits**.

Coal Quality (Barapukuria):

Characteristics:

- Mainly of **homogeneous type** having dirt band and vitreous to sub-vitreous luster **weakly coking coal**.

- **Rank**: In accordance with USA Ranking System (ASTM Method) Barapukuria Coal is **Highly Volatile Bituminous Coal**.
- So, this is an **Industrial Standard Coal**.

Coal composition is given below:

S.N.	ITEM	PERCENTAGE
1	Ash	12.40%
2	Moisture	10.00%
3	**Fixed Carbon**	48.40%
4	**Volatile Matter**	**29.20%**
5	Sulpher	0.53%

Features of Sedimentary Rocks

Stratification of Sedimentary Rocks

- Single most characteristic features.
- **Beds or layers** are separated by **bedding planes.**
- Each bedding plane **marks the termination one deposits** and **beginning of another**.



Types of beddings

Parallel Bedding:

- bedding planes are horizontal and parallel.



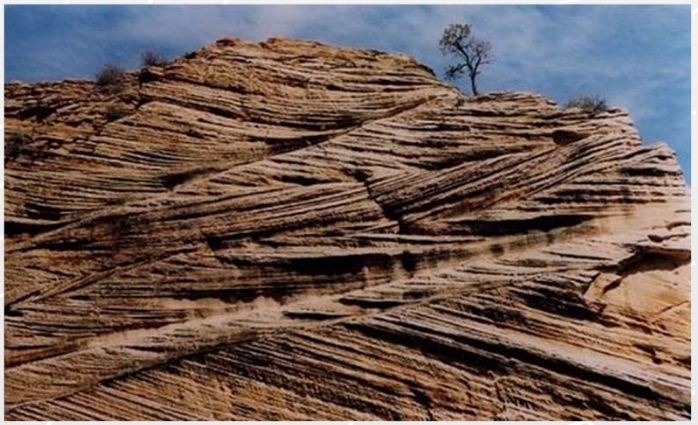
Laminated Bedding:

- Closely spaced bedding



Crossed or inclined bedding:

- beds are **laid down at an angle** of horizontal.



Graded bedding:

- **Coarse particles at bottom** and fine particles at top.



Ripple Marks:

Are **little waves of sands** that are commonly develop on the surface of **sand dune**, along of **beach**, on the **bottom of streams**.



- **Bedding Preserved in sedimentary** rocks often **furnish clues** to the **conditions that prevailed** when sediments are originally deposited.



Mud cracks:

- On dried surface of the muds, **cracks left exposed** by subsiding water of a river or ponds.
- **Make their appearance** when a **deposits of silts or clay dries out and shrinks.**





Concretions:

- **Local concentration of cementing materials** that has **lithified** a deposits in to a sedimentary rocks.
- Range in size from a fraction of **cm to a meter or more**.
- Cementing materials may be **calcite, silica** etc.

Geodes:

- Roughly **spherical hollow structure** **up to** **10 cm or more dia.**
- **Outer layer is lined with the crystals** and **projects inward** toward the hollow centers.
- Occurs most commonly **in limestone**.



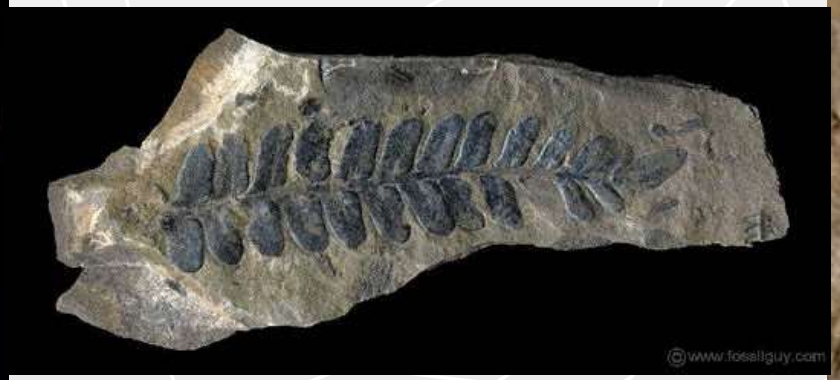
Fossils:

- Means any **direct evidence of past life**.
- Abundant in sedimentary rocks like **mudstone**, shale and **limestone**.
- Example**: <u>bones of dinosaurs</u>**, **<u>Footprints</u>** of long extinct animal, delicate **<u>impression of leaf</u>**.

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Thanks