COAL AND LIGNITE DEPOSITE IN INDIA

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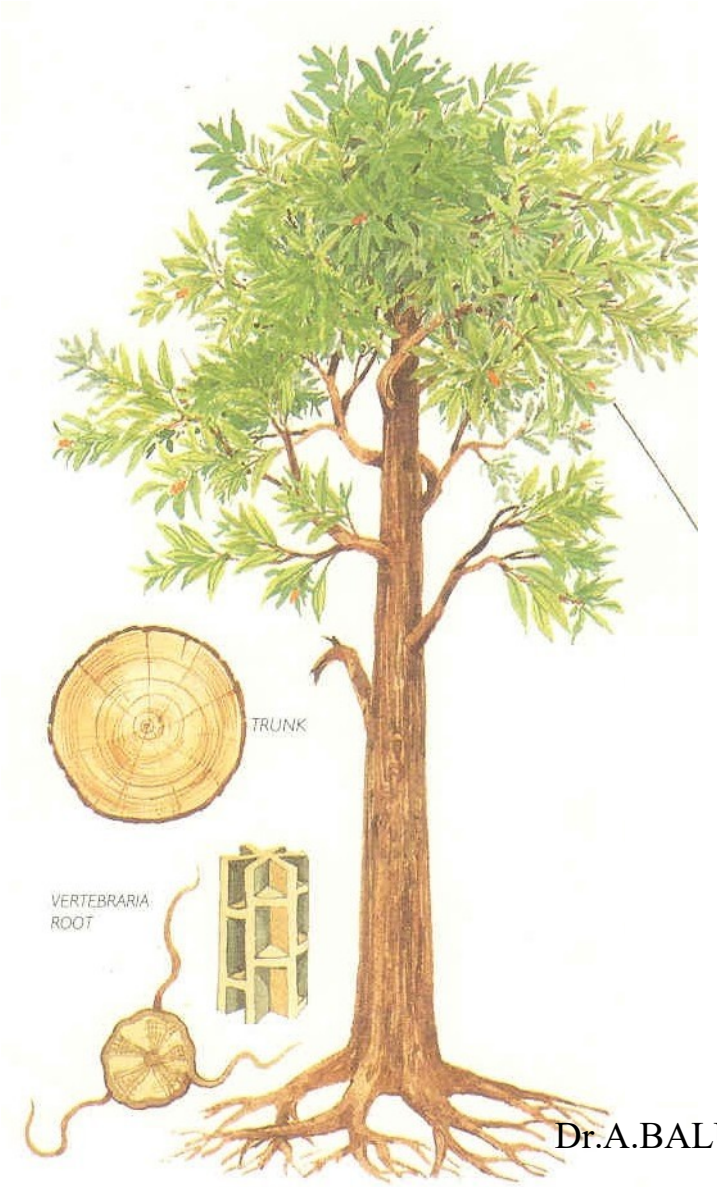
Coal ~ the God's gift as preserved ancient Sunlight

TIME



COAL DEPOSITS WERE NOT FORMED UNTIL 359 MILLION YEARS AGO

NEARLY 312 MILLION YEARS AGO THERE WAS PROLIFIC GROWTH OF GLOSSOPTERIS FLORA

Vegetable origin of Coal

Coalification process

Increase in rank

Woody matter

↓ *Bacterial action, partly oxidising env*

peat

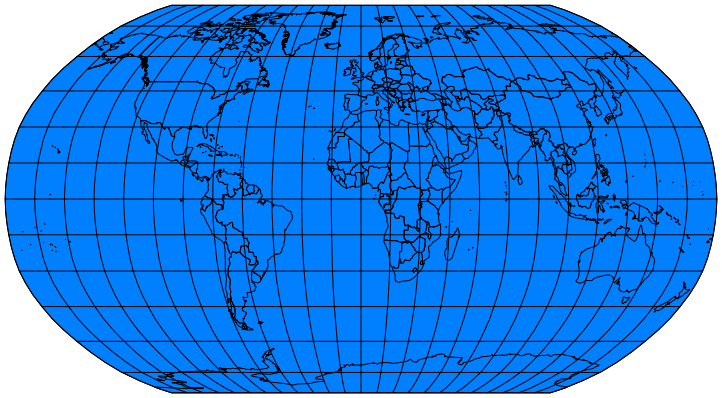
↓ *Continued bacterial action, cover by sediments*

lignite

↓ *Overburden Pressure – Temperature and time*

Coal

Age of Earth > 450 crore years



First plants ~ around 40 crore yrs
(end of Silurian period)

Extensive forests – around 39 crore yrs (middle of Devonian)

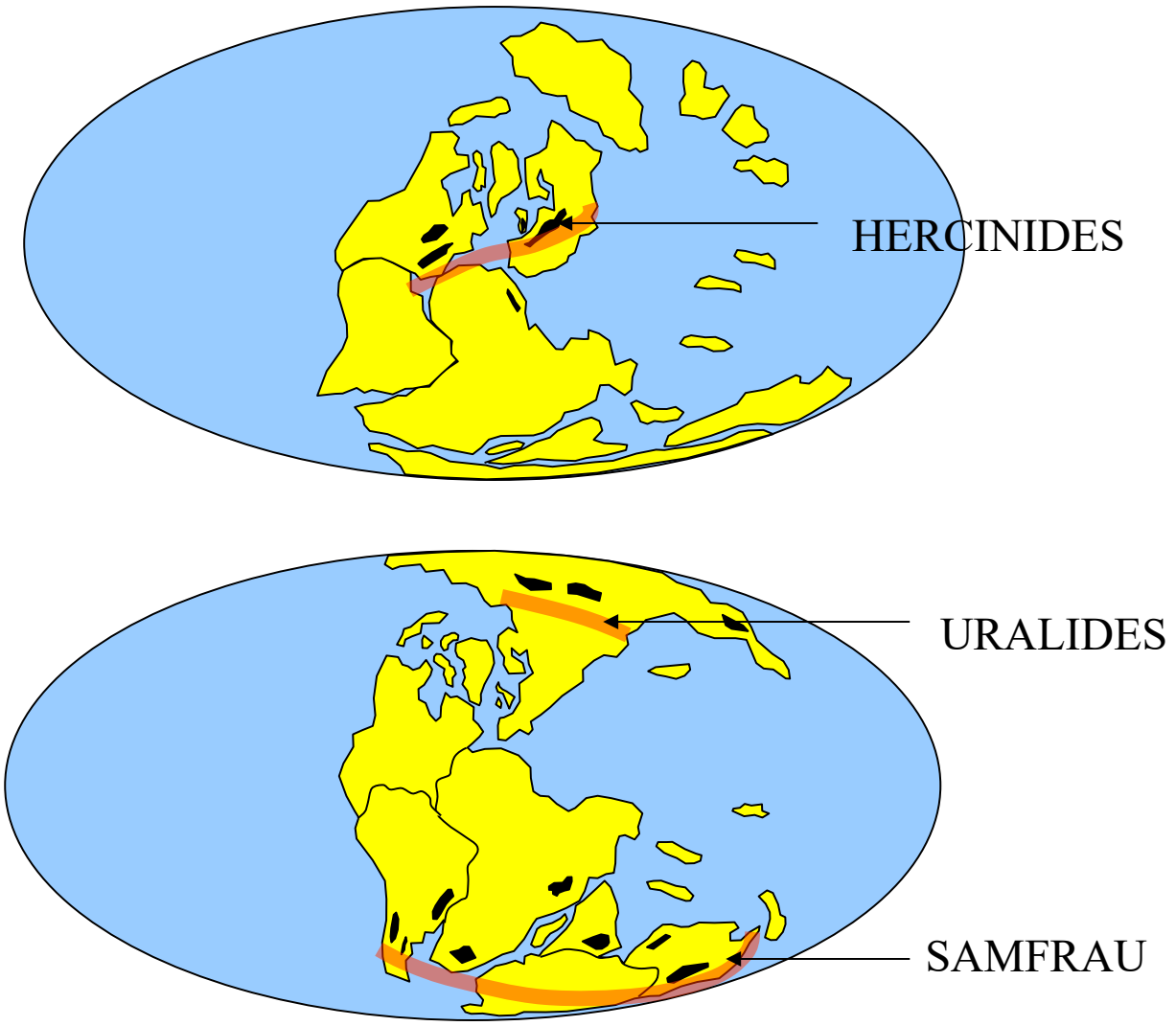
↓ warm and humid environment

Oldest coal ⟶ Found in North America

35 –30 crore yrs (Carboniferous) – tropical to subtropical climate, abundant forests (*vascular plants*), extensive economic coal

In USA, Canada, Russia, UK, Germany, Poland, China

MAJOR COAL BASINS 250-310 MILLION YEARS OLD



29 – 25 crore yrs (Permian period) – vegetation mainly Conifers, coal development in Northern hemisphere declined due to cool climate – coal in China, CIS

In southern hemisphere prolific forest growth – extensive coal development in India, South Africa, Australia, South America

18 – 6.5 crore yrs (Jurassic – Cretaceous) - vegetation mainly Angiosperms, coal development in China , CIS , Western USA, Western Canada

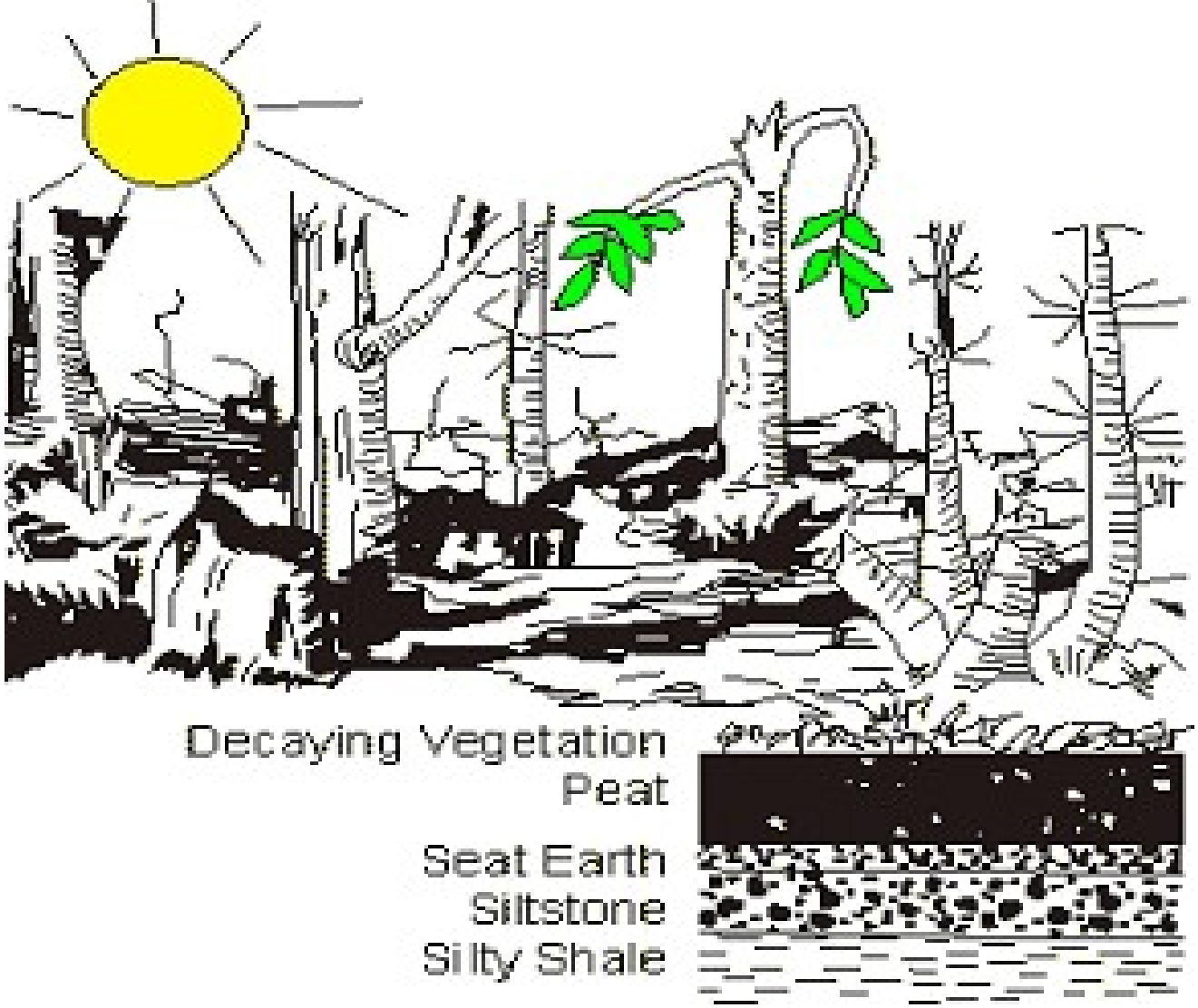
5 – 2 crore years (Tertiary) – mainly brown coal (lignite) world wide, vegetation of modern aspect

GONDWANALAND

Heavy growth of vegetation is needed for the formation of coal.

Organic matter deposited in sedimentary basins, water was shallow.

Basins were either close to the sea, often in the form of large lagoons, or inland in the form of lakes or marshes.



When forested swamps died, they sank below the water and process of coal formation started.

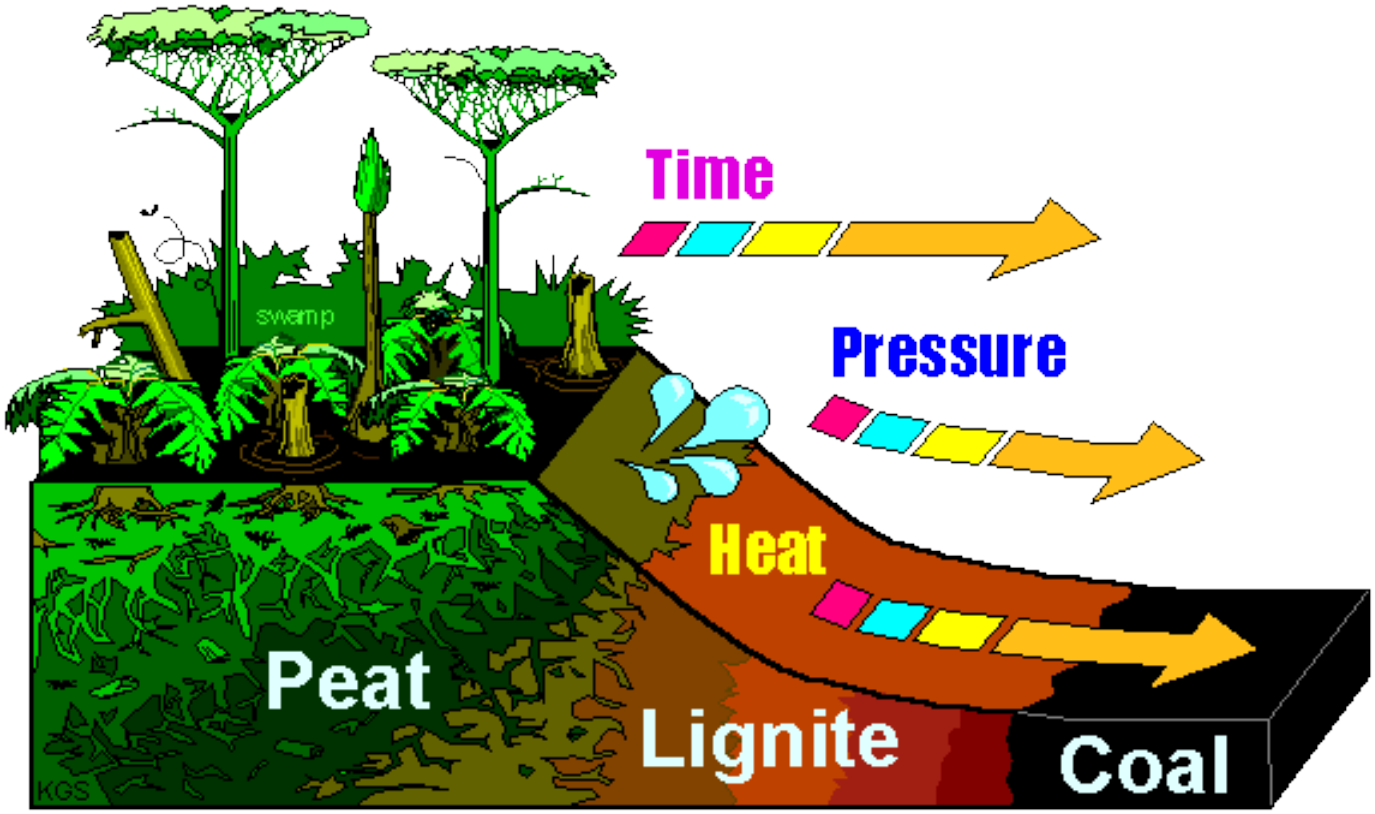
C O A L

COAL SEAMS USUALLY ORIGINATE FROM PEAT DEPOSITED IN SWAMPS

PEAT DEVELOPS FROM ACCUMULATING PLANT LITTERS

NEARLY 40M THICK PEAT COMPACTS INTO ONLY 1M THICK COAL SEAM

Thick layer of sand deposited on the flood plain during a flood bury the accumulating plant debris.



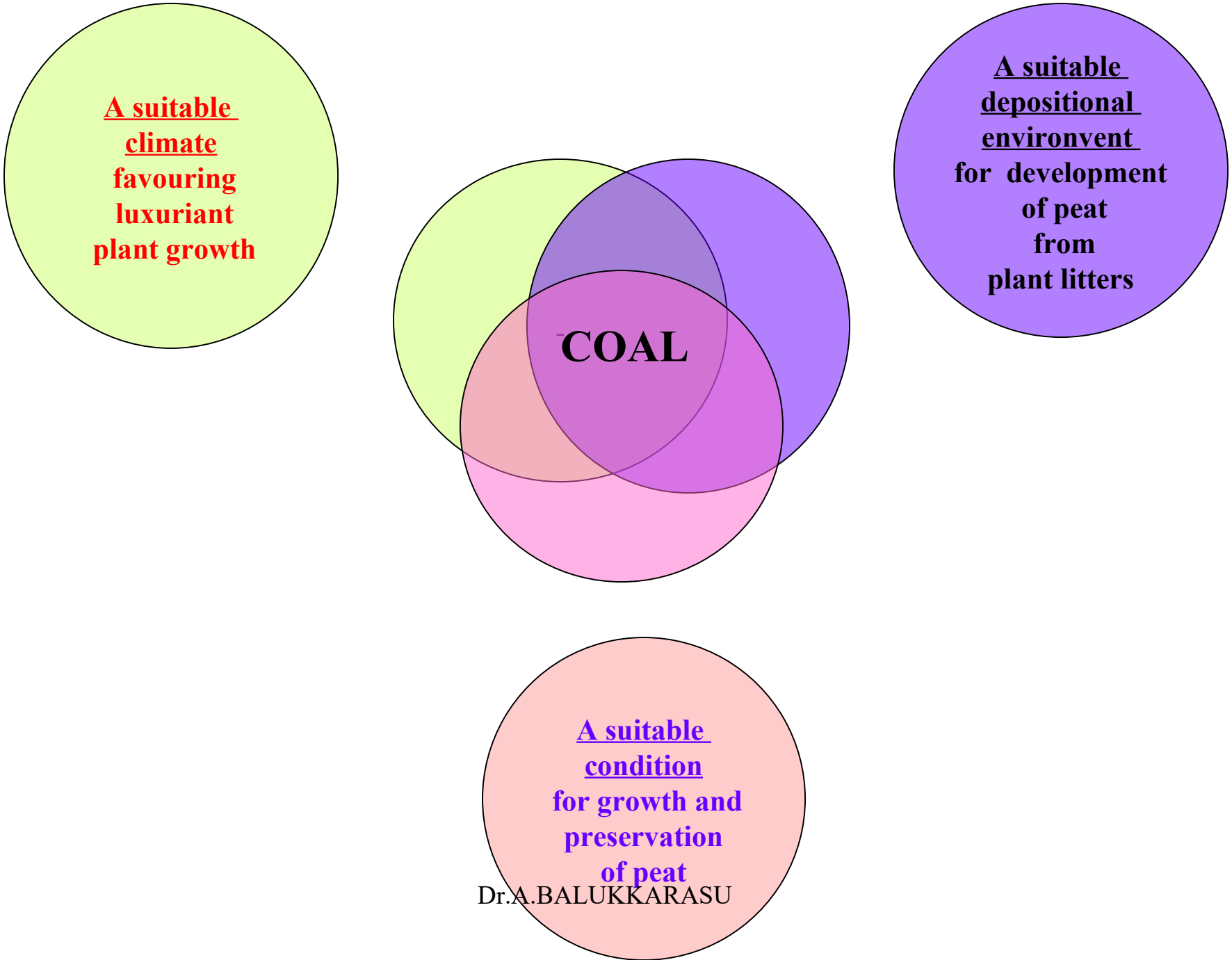
Subsequently the sedimentary basin sinks gradually under the weight of the sediments and the layers of dead plant matter are slowly transformed under conditions of increasing temperature and pressure.
There are four stages in coal formation: peat, lignite, bituminous and anthracite.

Normal coalification process is governed primarily by temperature and time. At the initial stages pressure helps in compaction and expulsion of water from peat. Role of pressure in further development of coal is not well defined. In fact, it has been observed that pressure retards chemical reactions during coalification.

Under normal geo-thermal gradient (3°-4° C/100m), maturation of coal from peat to anthracite generally takes a span of 70 my.

Probable coalification temperatures may be summarized as follows:

Peat < 50°C, Lignite ≤ 50°C, Sub bituminous – (50 ° -70 °C), Bituminous (70 – 150 ° C), Semi anthracite to anthracite – (150 ° -250 ° C)


A suitable climate favouring luxuriant plant growth
A suitable depositional environvent for development of peat from plant litters
COAL
A suitable condition for growth and preservation of peat

Formative Years

- 'Coal Committee' (1836 -1845) considered as progenitor of GSI. Purpose to identify coal potentiality and to suggest future course of action

- Driving force - John McClelland, its Secretary

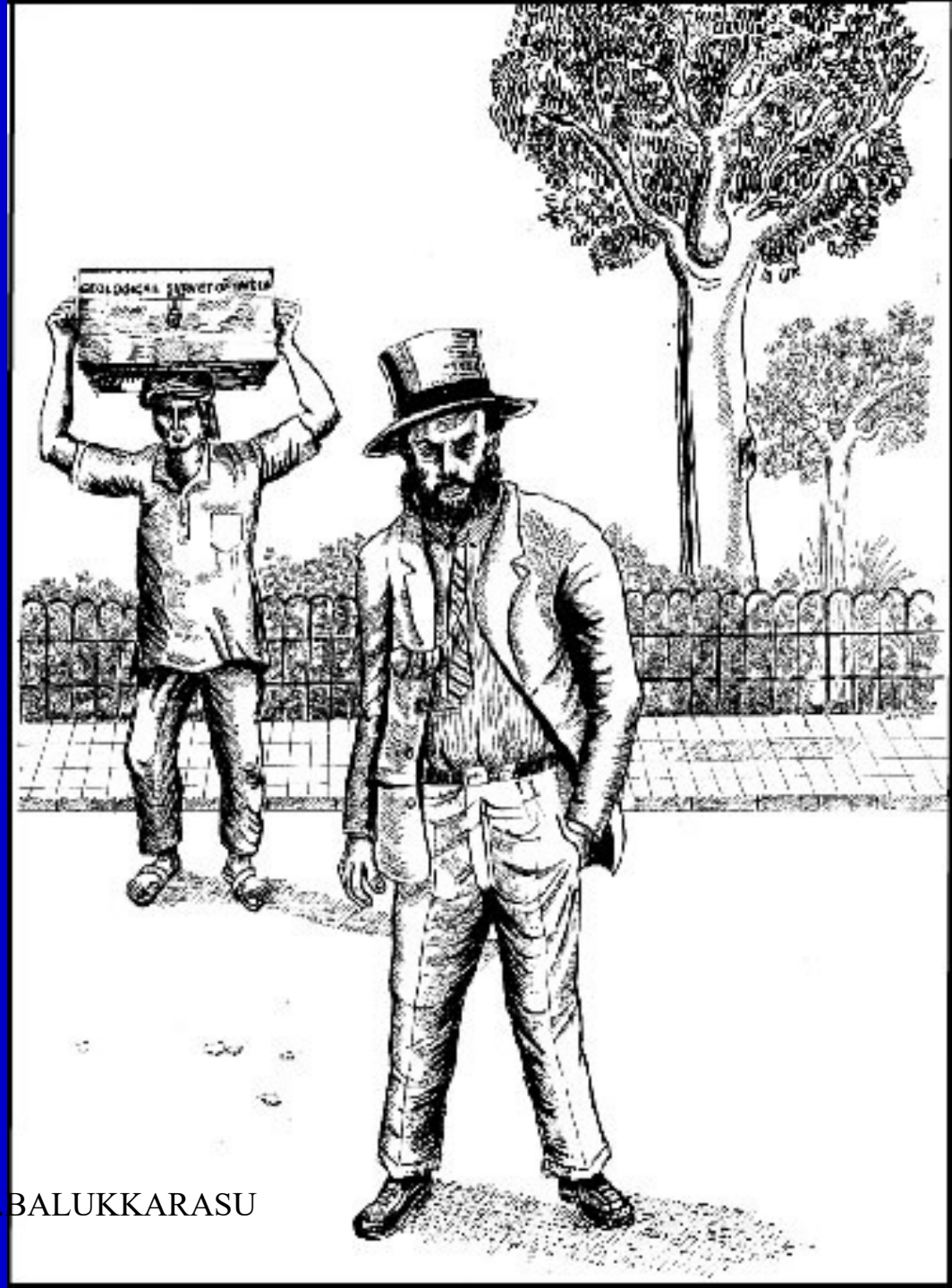
Preliminary Period

- First Geological Surveyor - D.H. Williams joined in 1846(died in 1848)
- Second Geological Surveyor - John McClelland
- John McClelland first used the title "Geological Survey of India"

Beginning of the 'continuous period'

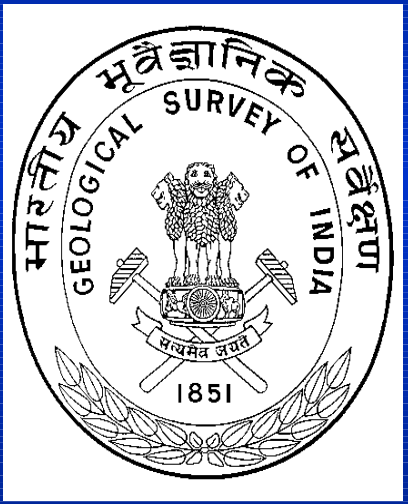
- **Thomas Oldham arrived** on 4th March 1851 **and joined on 5th March and guided** the geological research and **GSI for 25 Years**

150 YEARS AGO



GEOLOGICAL SURVEY OF INDIA

born in 1851

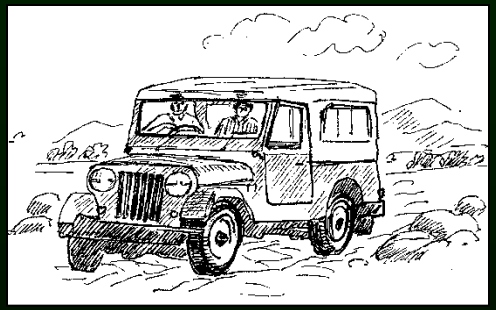


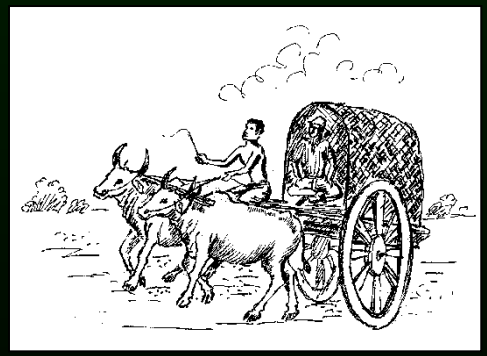
to survey the coalfields of the country

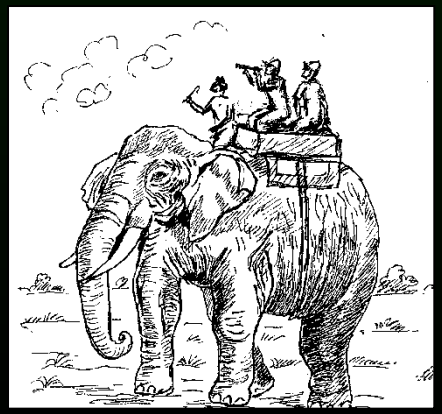
THE IDEA OF GSI WAS CONCEIVED IN 1836 TO IDENTIFY COAL RESOURCES FOR STEAM NAVIGATION AND RAILWAYS

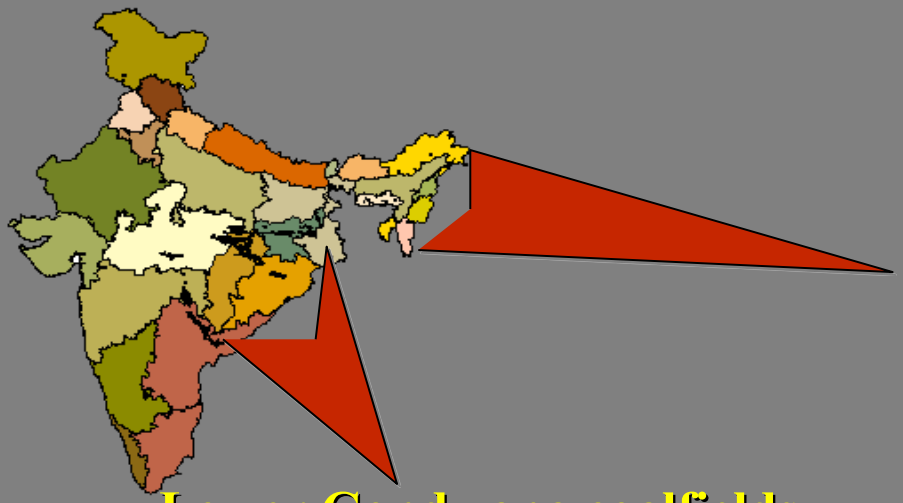
- GEOLOGICAL SURVEY OF INDIA FOUND THE LIGHT OF THE DAY ON THE 4th MARCH, 1851 UNDER THOMAS OLDHAM, THE DOYEN OF INDIAN GEOLOGY

ODYSSEY Continues

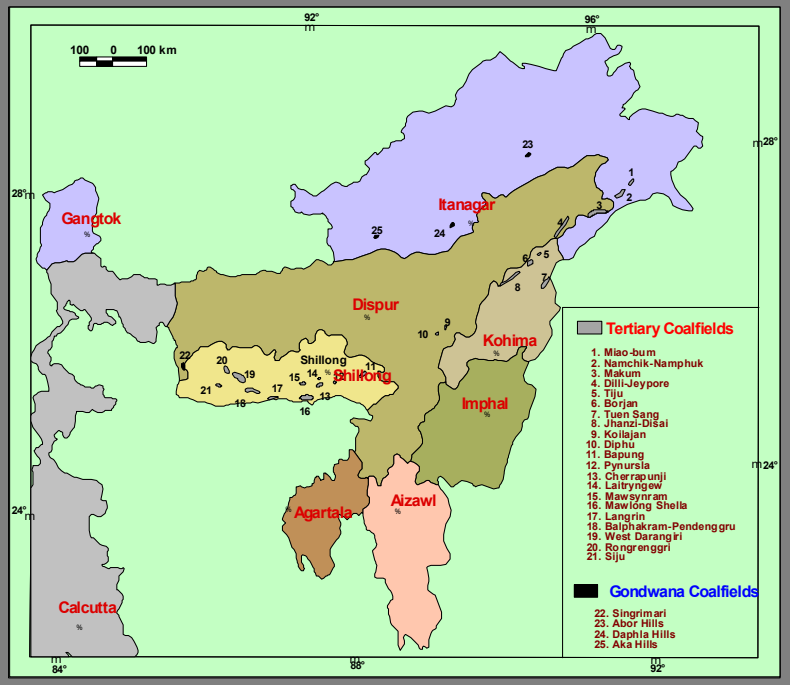




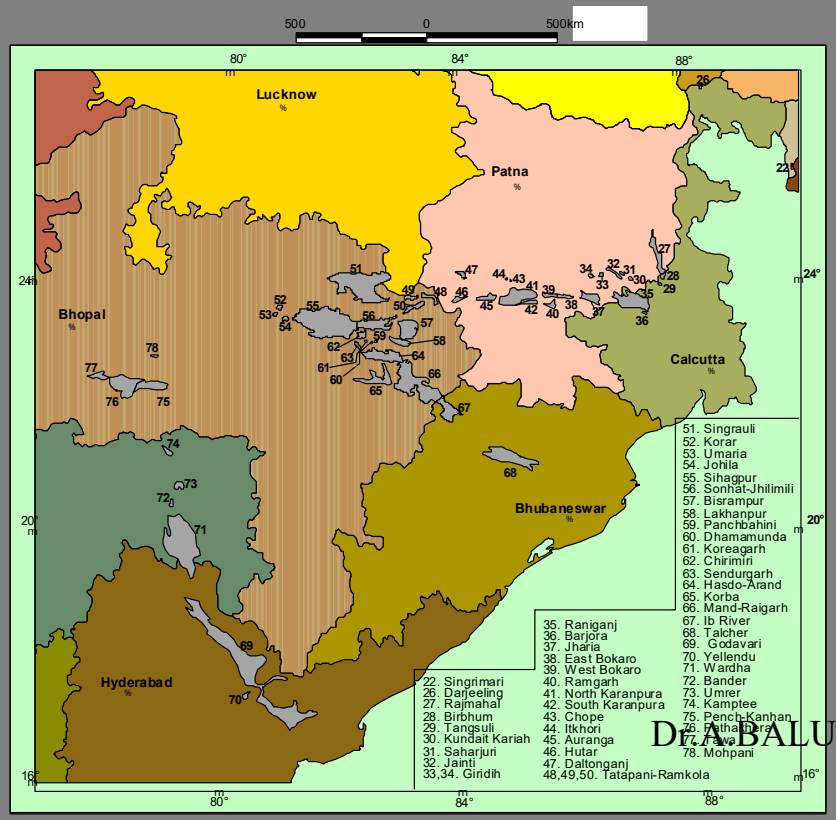




Tertiary coalfields



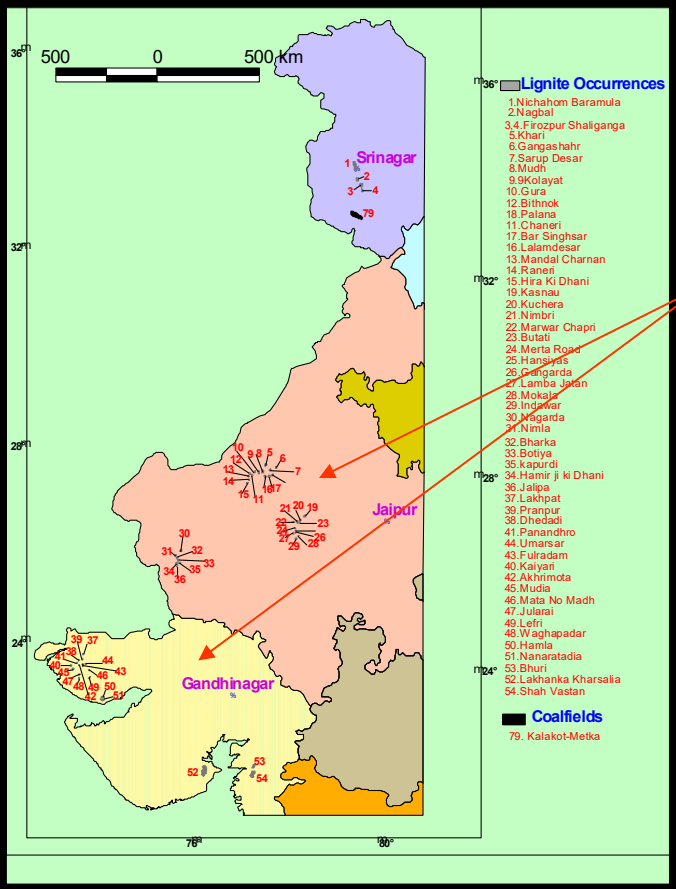
Lower Gondwana coalfields



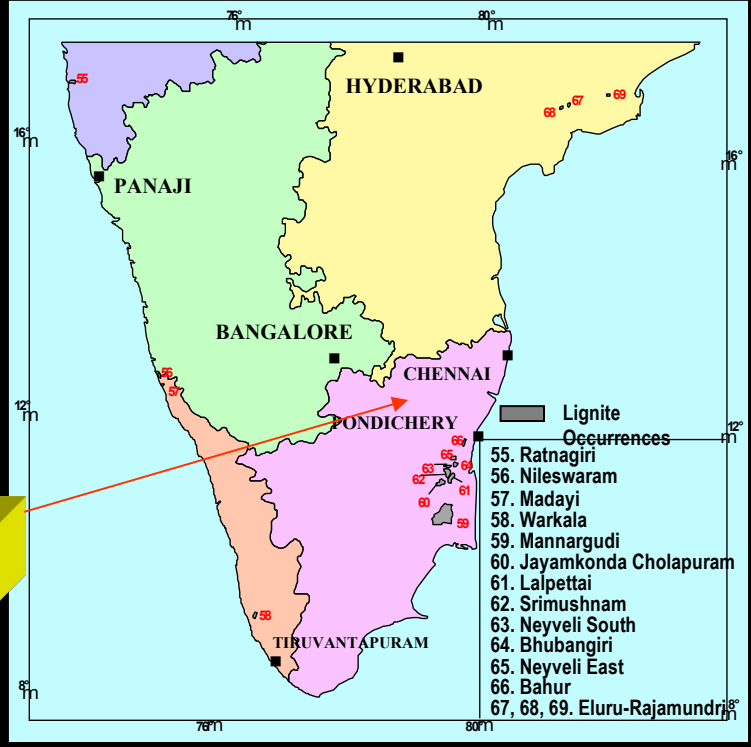
Distribution of coalfields

- Coal occurs in two stratigraphic horizons
- Permian sediments mostly deposited in Intracratonic Gondwana basins
- Early Tertiary near-shore peri-cratonic basins and shelves

Lignite Occurrences



Workable deposits



Geological milieu

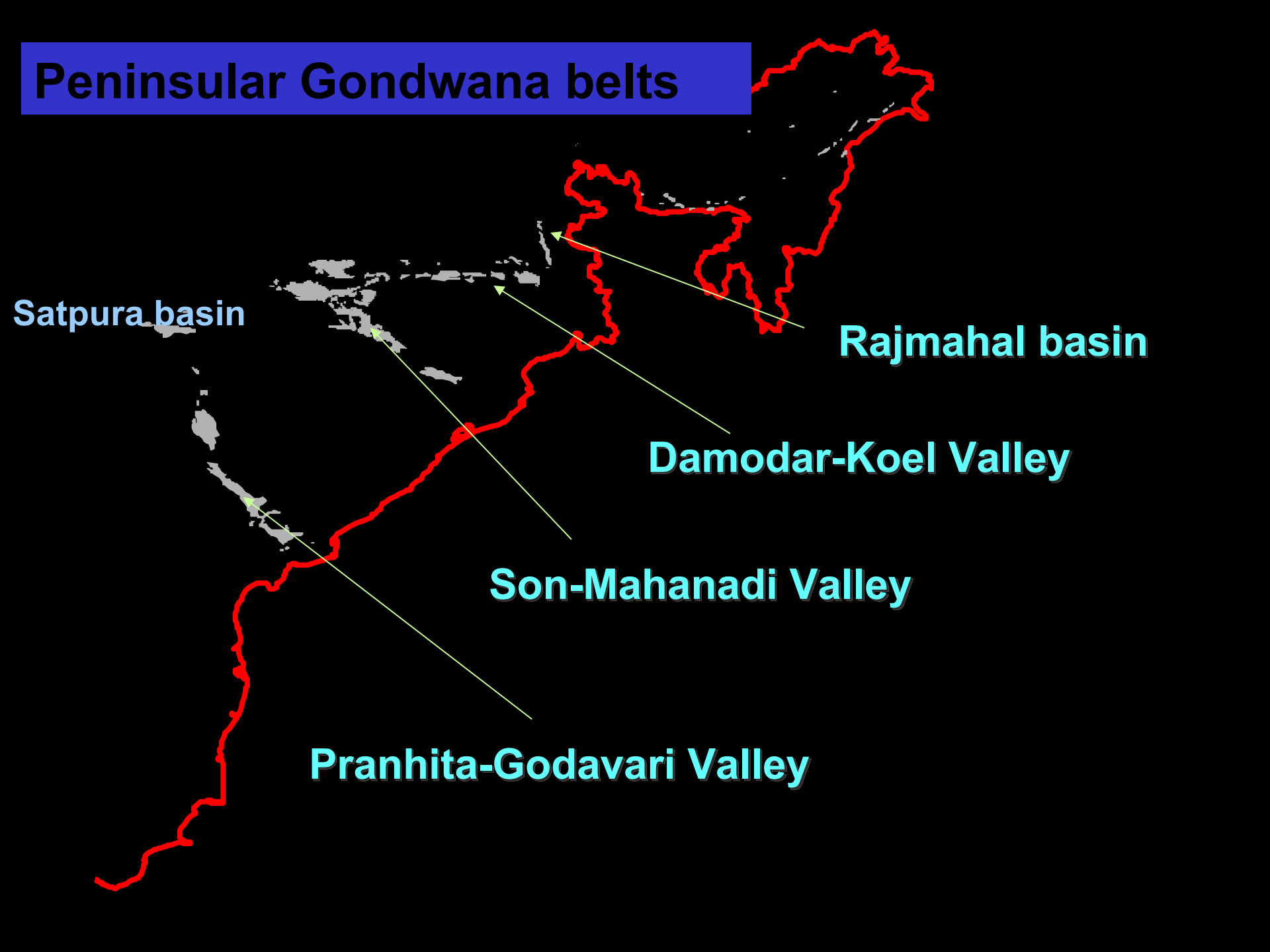
Broadly Indian coal occurs in two stratigraphic horizons

- Permian sediments mostly deposited in intracratonic Gondwana basins
- Early Tertiary near-shore peri-cratonic basins and shelves

In Gondwanas, coals are mainly contained in three Lower Gondwana formations --

- Raniganj Formation (Late Permian) – best developed in easternmost part of Damodar Valley basin. In Raniganj coalfield, its resources surpasses that from the Barakars.
- Barakar Formation (Early Permian) – main repository of coal in almost all Gondwana coalfields
- Karharbari Formation (Early Permian) – best developed in western part of Damodar-Koel Valley basin, Giridih and Deogarh coalfields

Peninsular Gondwana belts



Tertiary coals are available in --

- Oligocene sediments –
  - Tikak Parbat Formation in Upper Assam, Nagaland and Arunachal Pradesh
- Eocene sediments –
  - Turra Sandstone, Lakadong Sandstone in Garo, Khasi and Jaintia hills of Meghalaya
  - Sylhet Limestone in Mikir hills of Assam
  - Lower Subathu Group in Jammu

Glacial pavement, Irai, Penganga river section, Wardha valley

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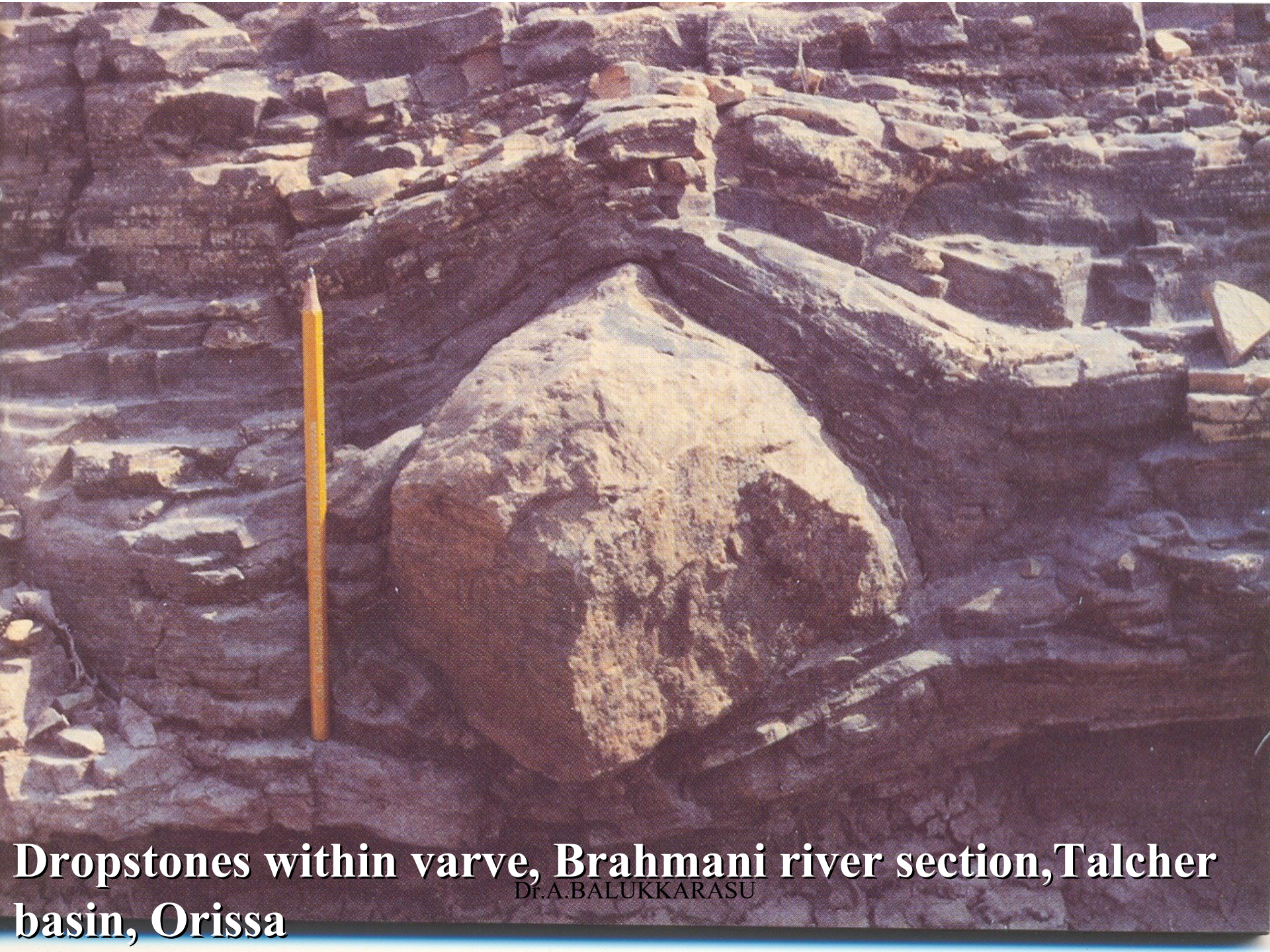
Lodgement and ablation till at the basal part of Talchir Formation, Jharia Dr.A.BALUKKARASU



Dropstones within varve, Brahmani river section, Talcher basin, Orissa

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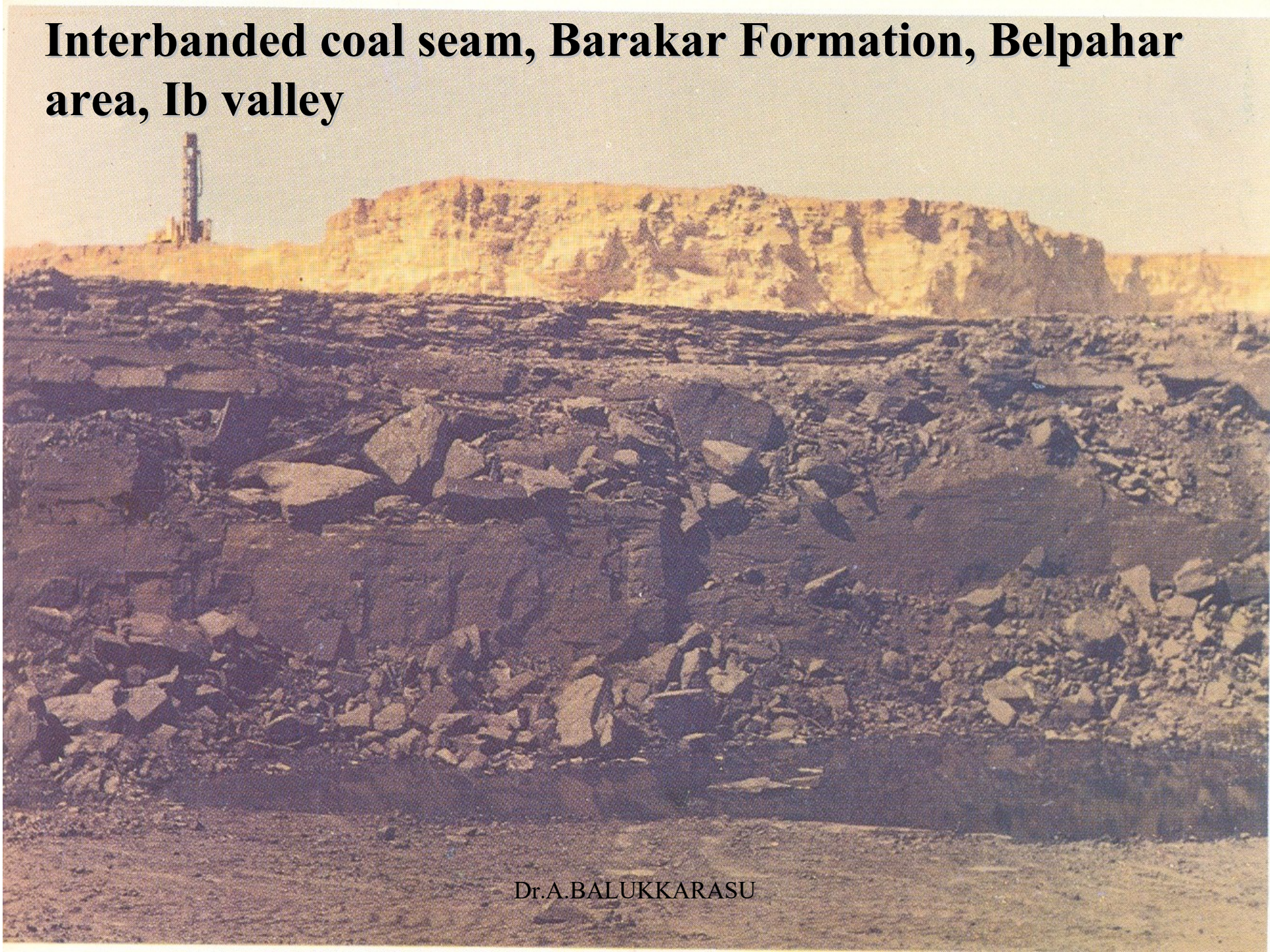
Interbanded coal seam, Barakar Formation, Belpahar area, Ib valley



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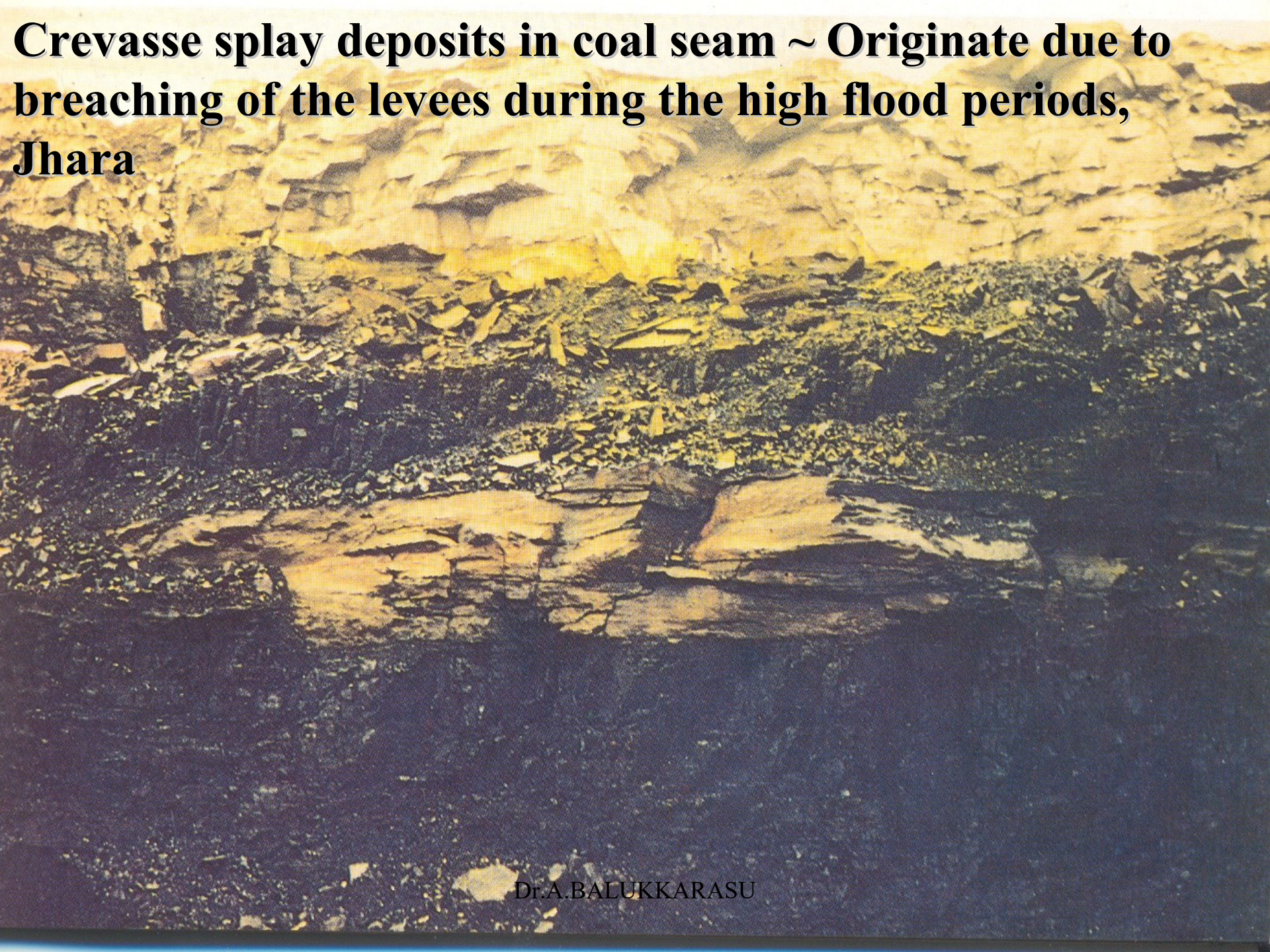
Crevasse splay deposits in coal seam ~ Originate due to breaching of the levees during the high flood periods, Jhara



DEPARTMENT OF REMOTE SENSING
SCHOOL OF EARTH SCIENCES
BHARATHIDASAN UNIVERSITY
MTIGT 705-COAL GEOLOGY Six Year Intgrated M.Tech. Course. Model Examination, November, 2018
Time 3hrs Maximum 75Marks

PART-A (10X2=20 Marks (20X1=20))

Answer all Ten Questions

1.a.Where is Gondwana land located in the Glob?
b.Where is Gondwana land located in India?
2. a.Define: History of Gondwana region of India.
b.What is Jharia famous for?
3. a.Where is anthracite coal found in India?
b.Which type of coal is used in thermal power plant?
4. a.Which form of coal burns the hottest?
b.What is the purest form of coal?
5. a.Which coal has highest ash content?
b.What is the percentage of ash content in Indian coal?
6.a.What is the formula for coal?
b.How is coal rank determined?
7.a.What is the element of coal?
b.What is proximate analysis of fuel?
8.a.What is the process of coal formation called?
b.Where are located Jaisalmer basin, Barmer basin and Bikaner-Nagaur basin of Tertiary age?.
9.a.What are the ages for coal and lignite in India.
b. What is inertinite?

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10.a. Which is the mixture of coal gas?
b. where are located Kachchh Basin,Saurashtra Basin and Cambay Basin

PART-B (5X5=25 Marks) Answer any five Questions

11. Describe the Gondwana Coalfields in Andhra Pradesh.

(OR)

Briefly state the Tertiary Coalfields in Assam, Arunachal Pradesh and Meghalaya

12. Explain the Gondwana Coalfields in Madhya Pradesh.

(OR)

Tertiary Coalfields in Himachal Pradesh, Jammu and Kashmir

13.Explain the problems of Coal Mining in India.(OR)

Elucidate the Gondwana Coalfields in Odisha.

14.Explain the Gondwana Coalfields in Jharkhand.(OR)

15. Describe the Gondwana Coalfields in Chhattisgarh.(OR)

Explain the Gondwana Coalfields in West Bengal.

PART-C (3X10=30 Marks) Answer any Three Questions

16.Write about the Gondwana Coalfields in Maharashtra and Madhya pradesh.

17.Describe the the Gondwana group of rocks- three-fold classification and two-fold classification

18.Define the significance of various Parameters in Proximate and Ultimate Analysis

19. Write about Cauvery Basin and its mineral solid fuel deposits in Tamil Nadu.

20. Define coking and non-coking coal and Write about the industrial applications.