U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

SLIDE SET DESCRIBING ASPECTS OF THE ORIGIN OF COAL, COAL MINING, AND PEAT FORMATION

by

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Descriptions of slides:

1. Surface mine in the Wyodak-Anderson coal bed in the Powder River Basin, Wyoming. Coal bed is 80 feet thick. [Source: R.W.Stanton]

2. Surface mine in the Appalachian Basin, West Virginia. Coal bed is 8 feet thick. [Source: RWS]

3. Surface mining equipment. Drag line (in top center) removes overburden material to expose underlying coal. Shovel (in bottom left) loads coal into trucks. Front boom on dragline is about 60 feet long. [Source: Pittsburg and Midway Coal Mining Co.]

4. Overlook of brown coal mine in the Turów Basin, southwest Poland. Mining equipment is about 150 feet tall; coal bed is about 250 feet thick; pit depth is about 900 feet deep. [Source: RWS]

5. Woody remains found in Polish brown coal. Cross-section of root. [Source: RWS]

6. Block of bituminous coal (2x4 in) showing bright and dull banding characteristic of Pennsylvanian-age (300 million years old) bituminous coal. [Source: RWS]

7. Position of continents during the Mississippian (320-350 million years ago) and the Permian (245-286 milllion years ago) Periods. The peat which is now coal deposits was formed in equatorial zones. [Source: indicated on slide]

8. Schematic diagramof underground mining to show vertical access shafts and horizontal mining along coal bed horizon. [Source: Bituminous Coal Association]

9. Front end of a continuous mining machine showing cutting bits on front drum which rotates and cuts the coal at the mining face. Coal bed is about 6 feet thick. [Source: Pennsylvanian Electric Company (PENELEC)]

10. Collecting a channel sample on a "rib" section of the mine room. White material is pulverized limestone that is sprayed on the freshly cut coal face to reduce coal dust. [Source: PENELEC]

11. Roof-bolter machine in position ready to drill a vertical hole into roof rock so that a bolt can be inserted and tightened to prevent roof falls. Note the methane-detection lamp hanging from a bolt head to detect any methane produced during the bolting operation. [Source: PENELEC]

12. View of a coal-generated electric power plant and high tension power lines in west-central Pennsylvania. Tall thin stacks are boiler stacks and short stacks are condensing towers from which steam is being released. Over one-half of the electricity in this country is generated by burning coal. [Source: RWS]

13. An impression fossil of the trunk of the Pennsylvanian-age tree Lepidodendron on the top of a bituminous coal bed, West Virginia. [Source: RWS]

14. Sampling a thick, subbituminous coal bed in the Powder River Basin, Wyoming. Note layers of different coal types and mudrock parting in the middle of the bed. [Source: RWS]

15. Hand sample of subbituminous coal from Powder River Basin, Wyoming showing woody texture indicates this coal formed from woody peat. [Source: RWS]

16. An X-ray radiograph of a drill core of bituminous coal showing the layered nature of a coal bed. Coal is transparent to X-rays and mineral layers appear dark on the radiograph. [Source: RWS]

17. Photomicrograph of vitrinite which is the remains in coal of woody plant tissues. Dark cell interiors are filled with resin. The slide was taken in reflected white light, oil immersion. Horizontal length of slide = 240 µm. [Source: RWS]

18. Photomicrograph of resin in vitrinite which is the remains in coal of woody plant tissues. Yellow areas are filled with resin. The slide was taken in reflected light, blue-light fluorescence. Horizontal length of slide = 240 µm. [Source: RWS]

19. Photomicrograph of cuticle layer in cross section of coal composed of compressed leaves. The waxy serrated cuticle appears dark yellow. The slide was taken in reflected light, blue-light fluorescence. Horizontal length of slide = 240 µm. [Source: RWS]

20. Photomicrograph of charred plant tissues preserved in coal. This type of particle is thin and brittle and is called inertinite. Note that cell walls appear high in reflectance. The slide was taken in reflected white light, oil immersion. Horizontal length of slide = 240 µm.[Source: RWS]

21. Photomicrograph of subbituminous coal showing preservation of spring (thick cell walls) and summer wood (thin cell walls) layers (vitrinite). This slide was taken in reflected white light, oil immersion. Horizontal length of slide = 240 µm.[Source: RWS]

22. Photomicrograph of a thin microtome slice of modern wood tissue showing a cell arrangement similar to that preserved in coal. The slide was taken in reflected white light, oil immersion. Horizontal length of slide = 240 µm. [Source: RWS]

23. Photomicrograph of pyrite framboids (circular areas) and marcasite overgrowths 1(bluish-white areas between framboids). The slide was taken in reflected white light, oil immersion. Horizontal length of slide = 175 µm. [Source: RWS]

24. Photomicrograph of pyrite crystals in vitrinite (coal derived from woody plant tissues). The slide was taken in reflected white light, oil immersion. Horizontal length of slide = 190 μm. [Source: RWS]

25. Reconstruction of Lepidodendron (the "scale tree"), the most common tree-like plants of the Pennsylvanian (300 million years ago) and a major contributor to Pennsylvanian peat. Compression fossils of small twigs found in the roof rock of coal beds are mistakenly identified by miners as fossil snakes because the patterns produced by leaf cushions resemble snake skins. [Source: Gillespie and others, 1978, Plant Fossils of West Virginia, West Virginia Geological and Economic Survey Educational Series ED-3A].

26. Reconstruction of the ancestor of modern-day horsetail, Calamites which was a minor contributor to the formation of Pennsylvanian peat about 300 million years ago. This tree reached heights of about 100 feet. Note the underground root system which ran horizontally below the surface and from which a number of tree stems grew. [Source: Gillespie and others, 1978, Plant Fossils of West Virginia, West Virginia Geological and Economic Survey Educational Series ED-3A].

27. Reconstruction of an ancient Pennsylvanian peat swamp showing various plants that contributed to the peat. [Source: Field Museum of Natural History, Chicago].

28. View of modern peat forming environment, Okefenokee Swamp, Georgia, showing major trees which contribute to the modern peat. [Source: RWS]

29. Aerial view of peat forming today in an abandoned meander of the Mississippi River. This meander first formed an oxbow lake which was later covered by floating vegetation, and eventually by shrubs and trees on a layer of peat. Notice the zonation in the vegetation. [Source: RWS]

30. Interpretive model for the formation of thick coal beds in the Powder River Basin, Wyoming. [Source: RWS]