Appendix

Does The Evidence From Coal Support The Present Hypothesis?

The following discussion is largely based on Otto Stutzer's fascinating book, *Geology of Coal*.[1] Stutzer defines coal as "a combustible rock which had its origin in the accumulation and partial decomposition of vegetation."[2] In another place he states simply that coal is "decomposed plant material."[3] But this alone is too simple. The author goes on to clarify that "the plant remains which are found in coal are always land plants. Fresh-water plants are found only in rare cases, while marine plants never occur."[4] Thus, coal is a form of rock, it is made of plants, more specifically of land plants, and they have been wholly or partially decomposed.

The Relationship Between Peat And Coal

The first stage in coal formation today is peat. Peat develops in swamps and moors: "Autochthonous coal deposits originated primarily from forest moors,"[5] i.e., "fossil lowland moors."[6] The relationship between peat and coal is such that there is often a question how to tell the difference between them.

> In many countries peat and bituminous shale belong to the landowner, whereas coal belongs to the state. In the interpretation of the law there must be a clear distinction between brown-coal and peat. The Prussian minister for commerce (*Zeitschrift* für *Bergrecht*, VIII [1867], 545) calls peat "deposits of vegetable fuel which are being formed in the present period of earth history and which appear to be undecomposed and not fossilized, at least at their surface." According to this definition, Pleistocene peat is brown-coal. . . .
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> In the brown-coal mines of the Lower Rhenish districts wood is occasionally picked out of the coal bed and sold as wood. Such Miocene wood is coal, according to mining law.[7]

From the above facts one gains the impression that the formation of coal is very slow business. At least it takes a long time for peat to form.

> Rennie (1807) had observed that a Roman footpath was covered by a peat layer 2.40 meters [6.6'] thick. From the age of this footpath and the thickness of the overlying peat layer it was estimated that at this place 200 years were needed for the formation of 30 cm. [9.9"] of peat.[8]

That is one example. In some peat bogs thirty years are enough to allow a new strippable layer to form. In Ireland thirty years were once enough to allow 4.5 meters (12.3') of peat to form.[9] But that was an exceptional case.

Having a meter of peat does not imply that with enough time one would have a meter of coal. Estimates of the compression ratio between them vary from as low as 1:3 to as high as 1:7. "Lehmann (1884) reports that by the laying-down of a railroad dam between Stettin and

Stargard a peat layer 4.3 meters [11.8'] thick was compressed to 1.6 meters [4.4']. . . ."[10] And the result was not coal but compressed peat. Given enough time it would compress even more in the process of becoming coal. ". . . Ashley concluded that, on an average, 9 meters of old solid peat is necessary for the formation of 3 meters of bituminous coal of the character of the Pittsburgh coal in Pennsylvania."[11]

Quantities of Coal

With this much as background, consider what quantities of coal there are on planet earth. Below I discuss these in terms of the vertical and horizontal extent of individual coal beds and basins and also in terms of production by weight.

Vertical extent

In the Liège basin of France a bed measuring no more than 25 centimeters (8.2") thick was being worked at the time when Stutzer wrote his book.[12] In the Newcastle basin of England coal measures as much as 12 meters (32.9', in 14 beds). In Wales there are 25 meters (68.6', in 45 beds). In Pennsylvania there are 33 meters (90.5', in 30 beds). "On the western edge of the Rhenish foothills thicknesses of individual coal beds amount to 50-100 meters (137.2-274.3') . . . ."[13] In general it is not uncommon to read of local thickness from 30 to 70 meters (82.3 to 192.0'). The key word here is "local": "Most bituminous coal beds are less than 2 meters (5.5') thick, but locally they attain great thicknesses."[14] Beds that extend for hundreds of miles are frequently shallow. According to the *McGraw-Hill Encyclopedia of Science & Technology*, "Most coal beds mined in the eastern part of the United States are between 3 and 8 ft (0.9 and 2.4 m) thick."[15]

Horizontal extent

It is usually not possible to tell just how large a large coal bed is. The Pittsburgh coal bed is thought to cover some 8000 square miles.[16] In another place it is estimated to cover 35,000 sq. km. (21,735 sq. mi.), down from an earlier maximum extent of 70,000 to 80,000 sq. km. (43,470 to 49,680 sq. mi.)[17]

> By means of drill holes on the west side of the Rhine and by the use of index layers it has been established that the Rhenish-Westphalian coal basin and the basins of Aachen (Aix-la-Chappelle), Belgium, northern France, and probably also southern England formed originally a large, extensive, connected coal field.[18]

In the United States the great Appalachian coal basin covers an area of some 70,000 sq. mi. This figure is lower than it used to be. Erosion accounts for the separation of this bed from other related ones.

> Originally it had an extension of perhaps not less than 200,000 square miles (Stevenson, 1912, p. 424). At the time of its greatest extension it stretched from the southern part of the state of New York in a west-southwesterly direction for 800 miles–far beyond the center of the state of Alabama.[19]

Coal production worldwide

So far I have mentioned only the coal beds of Pittsburgh; Belgium, Northern France, and Southern England; and Appalachia. But coal is by no means confined to Western Europe and North America.[20]

Coal production for an industrialized nation is measured in tens and hundreds of millions of tons per year. Thus, in 1957 China mined 130,730,000 tons of coal. The next year it produced 270,000,000 tons. By 1960 that figure had increased to 420,000,000 tons. In 1955 the Soviet Union produced 513,000,000 tons. These are short tons (2000 lbs.); a metric ton is 2204 lbs.

> Production of the Federal Republic of Germany had reached 240,000,000 metric tons; that of the German Democratic republic 228,000,000. Other important world producers in 1960 included Poland (114,000,000 metric tons), Czechoslovakia (86,000,000) and Hungary (26,000,000) in eastern Europe; France (58,000,000), Belgium (22,000,000) and the Netherlands (12,000,000) in western Europe; Spain (16,000,000); and Yugoslavia (23,000,000). Production in India reached 53,000,000 tons, a figure almost matched by Japan, and both South Africa and Australia produced about 38,000,000 tons.[21]

The above figures are for one year only (1960). Every year similar figures are reported. And there is no end in sight. World coal production is measured not in hundreds of millions but in hundreds of trillions of tons. If paleozoic and tertiary swamps or moors are to account for all of this, we are talking about accumulations of peat beyond all calculation. Recall that peat compresses from three to seven times in the process of becoming coal. And what we are saying is all the more impressive because it does not represent an accumulation stretching back more or less uniformly through all geological time. There was a "coal age" (the Carboniferous, along with the Tertiary) just as there was an "ice age."[22]

I would question whether the sheer existence of this much coal can be accounted for--plausibly or otherwise--under uniformitarian principles alone. Stutzer suggests that "the frequent very good preservation of delicate plant organs in the immediate cover of the coal beds" is evidence for the autochthonous origin of those beds,[23] i.e., that the plants are preserved where they grew. Instead it is evidence for rapid deposition, which fits the flood model perfectly.

Discussion

Consider three points. First, it is not necessary to contradict everything coal geology says in order to affirm everything the Bible says. What specific conditions resulted from the curse on the land in Gen 3:17-19? I do not know every aspect of what was involved. But we should not read those verses too narrowly. There was always a distinction between the earth at large and the garden of Eden (see Gen 3:21-24) and there is a difference between blessing and cursing. The curse is just as much a part of the biblical record as creation or the flood. In the case of coal, I think we need to take both the curse and the flood into account.

Second, notice that decomposition of plant materials is a fundamental aspect of coal formation. What I have talked about elsewhere in the present paper is how some plants and animals avoid decomposition, eventually becoming fossils. Occasionally fossil leaves or entire trees are found in coal beds.[24] Indeed, a good deal of very high quality paleobotany can be

done at the microscopic level using samples drawn from coal. Whenever this occurs it supports my earlier argument, that for any entire living thing to become fossilized the process by which it is preserved must operate faster than the process by which it would otherwise have decomposed. In the case of entire fossil organisms preserved in coal one could argue that instead of faster preservation we have slower decomposition. Such results are always evidence of comparatively rapid deposition, whether or not they are also evidence of catastrophic deposition.[25]

My third point is that unusual things can happen even when it might otherwise seem that the amounts of time required are irreducible. According to Stutzer, "Coal formation begins after peat formation is completed."[26] In another place he points out that "it is the prevailing opinion that brown-coal originated from wood and peat, bituminous coal from brown-coal, and anthracite from bituminous coal."[27] In chap. 6 of his book the same author gives a number of examples of this progression, sometimes within the same coal bed.[28] In any event the impression is that anthracite coal is the result of a very long process: first swamps and moors, then peat, then brown-coal, then bituminous, and only then anthracite. It is not necessary to deny every part of this claim. But how much time and what specific conditions are required to bring about such results? And are swamps really necessary as a first step in every case?

> Petzoldt (1882) describes very remarkable observations which he made during the construction of a railway bridge at Alt-Breisach, near Freiburg. The wooden piles which had been rammed into the ground were compressed by overriding rocks. An examination of these compressed piles showed that in the center of the compressed piles was a black, coal-like substance. In continuous succession from center to surface was blackened, dark-brown, light-brown, and finally yellow-colored wood. The coal-like substance corresponded, in its chemical composition, to anthracite, and the blackened wood resembled brown-coal.[29]

The above is more than a remarkable observation, i.e., an anomolous exception. It illustrates a very important general principle, i.e., that coal always forms under something--never on the surface. It takes more than time for a lowland moor to become a coal bed. What a lowland moor becomes given enough time is a high moor and high moors do not generally produce coal.[30] There must be an overlying layer of sediment. The moor must be buried.[31] So a corollary to the question why there should be so much coal on our planet is why there should be so much sediment covering it. Igneous rock has no particular association with coal. Instead what we are talking about is sedimentary rock--laid down by water in massive quantities.

It might be possible to offer individual explanations for an entire succession of isolated facts from coal geology, but the Genesis flood offers an entirely natural framework in which to account for the above facts. It is entirely compatible with everything that has been said about fossils elsewhere in the paper.

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[1]Trans. Adolph C. Noé (Chicago: University of Chicago Press, 1940).
[2]Ibid., p. 1.
[3]Ibid., p. 88.
[4]Ibid., p. 89.
[5]Ibid., p. 137.
[6]Ibid., p. 140. Given the right circumstances lowland moors eventually become high moors. Another way to say this is that high moors develop from lowland moors or that lowland moors are younger than high moors. Notice that coal formation is associated with the younger of

the two types of moor and not the older. From this I draw that there is more to coal formation than the accumulation of swamp plants and the passage of time. With the passage of enough time a lowland moor passes out of its coal bearing age, as it were, and enters a comparatively barren stage that does not produce notable quantities of coal.

[7]Ibid., pp. 1-2.

[8]Ibid., p. 179.

[9]Ibid.

[10]Ibid., p. 176.

[11]Ibid.

[12]See ibid., p. 202. This is an unusual case. The cutoff point for commercial operations is usually 30 to 50 centimeters.

[13]Ibid., pp. 198-99.

[14]Ibid., p. 199.

[15]6th ed., s.v. Coal [p. 66].

[16]Ibid., p. 194.

[17]Ibid., p. 202-3.

[18]Ibid., p. 192.

[19]Ibid., p. 193.

[20]Its distribution is not limited when we are going East and West. It is, however, limited North and South: "Approximately 95% of the known coal resources and 85% of recoverable reserves of the world lie in the Northern Hemisphere" (*McGraw-Hill Encyclopedia of Science & Technology*, 6th ed., s.v. Coal [p. 70]).

[21]*Encyclopaedia Britannica*, s.v. Coal.

[22]"Conditions are therefore particularly favorable for especially abundant plant growth after great diastrophic movements, such, for example, as took place during the Tertiary and Carboniferous periods, when there accumulated most of the coal deposits of the United States and Europe" (Stutzer, *Coal Geology*, p. 161. Elsewhere Stutzer uses the term "coal age": "We learn that in the coal age in Europe strong earth movements took place" (ibid., p. 172).

[23]Stutzer, *Geology of Coal*, p. 151.

[24]See ibid., pp. 144-52, 167.

[25]Time is not unlimited, even for flora being trapped in peat. "According to White and Thiessen (1913), an important factor in the formation of sapropel is the decomposition of organic substances by oxygen. It is asserted that this decomposition proceeds so rapidly and violently that in the sediments of such ponds, in general, only the most resistant parts of plants, such as spores and pollen grains, survive. The latter are not decomposed, either by organisms or by chemical reagents . . . . Usually only the most resistant parts of plants accumulate on the bottom of such ponds, chiefly the organs containing wax, resin, and oil. These cause the characteristic qualities of sapropel and of cannel-coal" (ibid., pp. 94-95).

[26]Ibid., p. 95.

[27]Ibid., p. 6.

[28]See ibid., pp. 132-83 passim.

[29]Ibid., pp. 105-6.

[30]See ibid., p. 166. "In the first place, many Carboniferous plants show characteristics peculiar to trees growing in low moors, consisting of a peculiar stratified organization marked by a horizontal spreading of subterraneous organs, and a basal swelling of the trunk" (ibid., p. 169). Thus, many of the trees resembled a modern cypress (see Gen 6:14).

[31]To accomplish this burial Stutzer speaks of the land sinking rather than water rising over it: "It is possible to differentiate subsidence movements which cause the sinking of large areas and those of local character. The former are classified as epeirogenetic. All large coal fields originate by this kind of downward movement" (ibid., p. 166).