Too Much Coal for a Young Earth?

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ABSTRACT

In view of the Biblically documented Flood, the vast amounts of fossil fuels beg the question whether the biomass represented in the fossil fuels could have existed on the pre-Flood Earth by the time of the Flood. Estimates based on the biomass of current forests leads to the conclusion that, in spite of their considerable productivity, the forests on the Earth's land surface prior to the Flood would not have been sufficient. If, however, Scheven's concept of floating forests of the vegetation belonging to the Carboniferous Period is presupposed, then encouraging perspectives unfold. Although numerous questions concerning details are still unresolved, this initial rough study does not lead to obvious contradictions between the amount of fossil fuels, the facts gleaned from carbon mass balance and biomass calculations, and the Earth's age as deduced from Genesis 1-11, namely 7,000 to 10,000 years.

COAL DEPOSITS WITHIN THE GEOLOGICAL TIME-SCALE

Coal can be found in almost all levels of the geological record from the Devonian to the Tertiary Period (see Table

The biggest coal deposits, however, occur in the Carboniferous Period, especially the upper portion thereof; hence the name (Latin *carbo,* coal). Depending on the degree of carbon concentration and coalification, one differentiates between lignite, bituminous coal and anthracite. The degree of coalification generally increases the further down in the rock record the coal layers are. In the Carboniferous Period one thus finds bituminous coal, and in exceptions where the layers were not so deeply buried, also sub-bituminous coal. Lignite is found predominantly in the Tertiary Period.

These different rank coals were formed within a period of 350 million years according to historical geology. A duration of 30-40 million years is presupposed, for example, for the formation of the bituminous coal of the upper Carboniferous Period.

Does this coal contain the stored solar energy of millions of years?

PERIOD	ALLEGED AGE IN MILLIONS OF YEARS
Quaternary	0 – 1.8
Tertiary	1.8 – 65.0
Cretaceous	65.0 – 142.0
Jurassic	142.0 – 205.7
Triassic	205.7 – 248.2
Permian	248.2 – 290.0
Carboniferous	290.0 – 354.0
Devonian	354.0 – 417.0
Silurian	417.0 – 443.0
Ordovician	443.0 – 495.0
Cambrian	495.0 – 545.0
Precambrian	

Table 1. *Geological time-table with the time-scale of historical geology.* **How much energy is that?**

GLOBAL RESOURCES OF CRUDE FOSSIL FUELS

For raw materials, a difference is made between the guaranteed mineable reserves and the total of all estimated deposits (the resources) — see Table 2 and Figure 1.[2] The estimated global resources of fossil fuels (which only 10 per cent thereof are guaranteed mineable reserves!) are:

$$E_{f\ fossil} = 3.3 \times 10^{23} J$$

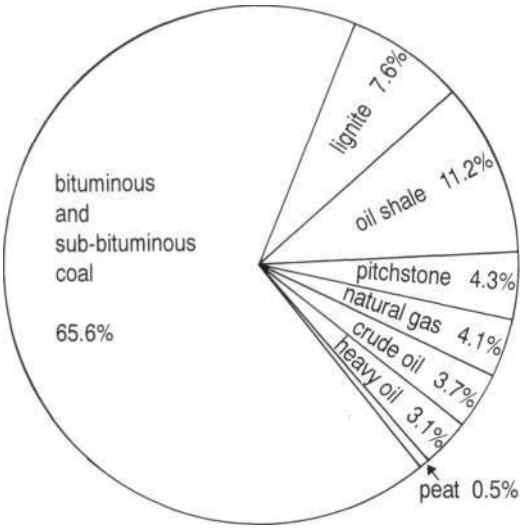

Figure 1. *Global resources of fossil fuels (from Ref. 2).*

COMPARISON OF FOSSIL ENERGY WITH DAILY SOLAR RADIATION

The Earth receives solar energy from the Sun of

$$E_{solar} = S_o r_R^2 \pi \times 1 \text{ day}$$
$$= 1.37 \times 10^3 \text{W/m}^2 (6.37 \times 10^6 \text{m})^2 \pi \times 24 \times 3600 \text{ sec}$$
$$= 1.5 \times 10^{22} \text{ J per day}$$

where

S_o = solar constant,

and

r_R = average Earth's radius

Thus

$$E_{fossil}/E_{solar} = 3.3 \times 10^{23} \text{ J}/1.51 \times 10^{22} \text{ J} = 22$$

That is, during every 22 days the Earth receives solar radiation energy which corresponds to the energy in all the fossil fuel resources.

This fossil fuel corresponds to what area of forest?

ENERGY CARRIER	RESOURCES	ENERGY PRODUCED
bituminous and sub bituminous coal	9.8×10^{12} tonnes	2.2×10^{23} J
lignite	2.3×10^{12} tonnes	0.25×10^{23} J
oil shale		0.4×10^{23} J
pitchstone		0.15×10^{23} J
natural oil	3.4×10^{14} m^3	0.13×10^{23} J
crude oil	2.7×10^{11} tonnes	0.12×10^{23} J
heavy oil		0.1×10^{23} J
peat	2.0×10^{11} tonnes	0.015×10^{23} J
TOTAL		3.3×10^{23} J

Table 2. *Global resources of fossil fuel raw materials (from Ref. 2).*

COMPARISON BETWEEN FOSSIL FUELS AND THE ENERGY CONTENT OF A GLOBAL FOREST

Today, a useful forest in Germany has a maximum of 300 solid cubic metres of wood per hectare.[3] A forest area 100 years old already has up to 1,000 solid cubic metres of wood per hectare (see Table 3). Primeval forests may have yielded even more.

The General Sherman Tree in the Sequoia National Park north of Los Angeles is the biggest tree in the world. It is 83.8 m tall, has a circumference of 31.3 m, and is said to be 2,500 years old. A single such tree would easily yield 2,000 solid cubic metres of wood.

Now the majority of scientists claim that crude oil and natural gas originated primarily from sea plankton. Thus only the coal portion of the total energy in the fossil fuels, or 2.4×10^{23} J, stems from forests.

If one assumes that the primeval forests yielded 600 solid cubic metres of wood per hectare, with an average heating value of 10^{10} J/m^3, this energy mass of coal would correspond to a forest area of

$$2.4 \times 10^{23} \text{ J}/(10^{10} \text{ J/m}^3 \times 600 \text{m}^3/\text{ha}) = 3.6 \times 10^{10} \text{ ha}$$

which is approximately 2.5 times the surface area of the present continents (which together equal 29 per cent of the Earth's 511 million km^2 total surface area).

Primeval forests of modern species would have needed to cover 2.5 times the present continental surfaces prior to the Flood in order to provide the energy amounts in all the coal resources.

How long would it take to produce the fossil fuels from present forests?

TYPE OF WOOD	CUBIC METRE PER HECTARE
Pine	300– 400
Beech	600
Spruce	600– 800
Sequoia	–1000

Table 3. *Solid cubic metre wood of different woods at 100 years of age.*

COMPARISON OF FOSSIL FUELS WITH THE GLOBAL GROWTH RATES OF FORESTS

The annual growth rate of a forest lies between 0.9 (needle wood) and 3.5 (rain forest) tonnes per hectare. For present forests of 2.5×10^9 hectares (in the last five years 85 million hectares were deforested!), which corresponds to 17 per cent of the surface area of the continents, the annual growth amounts to 4.4×10^9 tonnes of dry substance per year. If one takes deciduous and needle forests into consideration, one would arrive at 7.1×10^9 cubic metres of wood per year. For an average heating value of

10^{10} J/m^3, this corresponds to a global annual energy growth of 8 x 10^{19} J.

At the present global growth rates, the fuel energy in all coal could thus have been stored within 2.4 x 10^{23} J/7.8 x 10^{19} J or approximately 3,000 years. This fossil fuel could thus have been stored easily in 3,000 years at the present global growth rates.

BITUMINOUS AND SUB-BITUMINOUS COAL IN THE CREATION MODEL

The Evolutionary/Uniformitarian Scenario

Approximately 65 per cent of the fossil fuels are bituminous coal (including approximately 7 per cent sub-bituminous coal). Bituminous coal is found in all geological systems, but predominantly in the Carboniferous and Permian Periods (see Table 1). It has been deposited primarily in the form of seams, which may extend over hundreds of square kilometres. Imprints of the original vegetation often remain in the bituminous coal. 200-300 seams lie in the north-western coal reserves of Germany, assigned to the Carboniferous Period and distributed through up to 4,000 m of thick sedimentary beds stacked on top of one another. The seams are separated from one another by layers of sediments (for example, sandstone, limestone, shale). According to the evolutionary/uniformitarian model these seams were supposedly formed as a result of repeated transgressions and regressions of the seas of those days (periodic flooding) over coastal swamp forests in the course of a total of approximately 30-40 million years.[45]

Catastrophic Formation of Carboniferous Coals?

This evolutionary/uniformitarian hypothesis has been questioned. The structure of the intermediate sedimentary layers clearly indicates their formation due to a catastrophe; the so-called root horizons are not fossil soils with roots in them suitable for the growth of the Carboniferous plants;[6] and the anatomy of the vegetation of the Carboniferous Period *(Lepidodendron* and *Sigillaria)* indicates floating plants.[7-9] Based on this data, Scheven postulated that the Carboniferous vegetation had the characteristics of a floating forest, an alternative to swamp forests[10] (see Figure 2[11]).

Scheven's Flood model within the creationist framework for Earth history presupposes that the floating forests of the so-called Carboniferous Period, as a habitat of pre-Flood ecosystems, were buried either during or shortly after the year of the Flood. According to this model, they grew prior to the catastrophe of the Flood and were then broken up and deposited on top of one another during the Flood. Subsequent to burial the layers of forest debris subsided to great depths, where they were subjected to pressure conditions which led to a rapid formation of coal.[12]

Too Much Coal in Too Short a Period?

This depiction of coal formation within the creationist framework for Earth history suggests that at least the

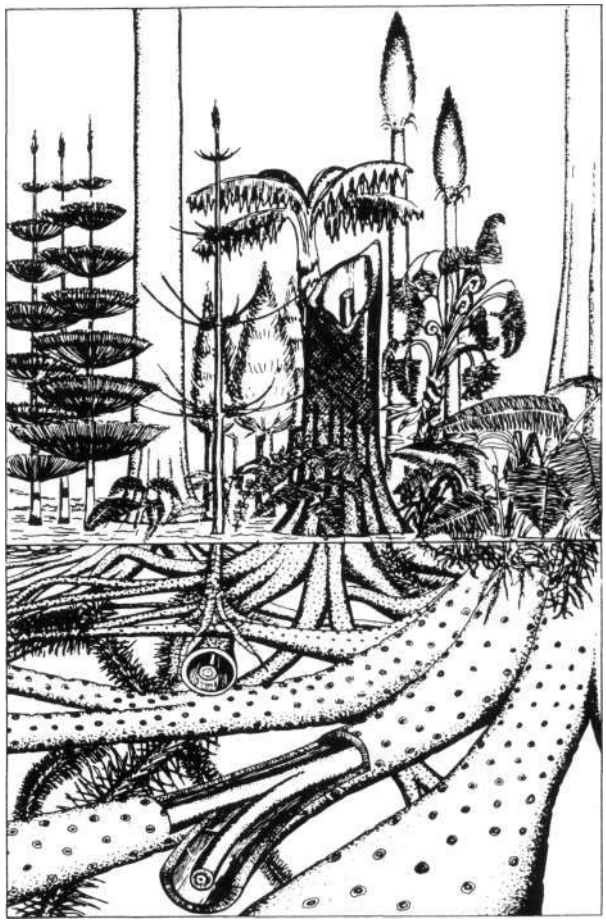

Figure 2. *Model of a floating forest (according to Scheven) of the pre-Flood world attributed to the so-called Carboniferous Period by evolutionists.*

biomass of the plants which are present today as bituminous coal, but probably more than this, was present on the Earth prior to the Flood. Since floating forests could not grow in the way they are found buried today as coal seams (namely, stacked on top of one another), they had to live on the water surface next to each other prior to the Flood. Is this at all possible given the size of the Earth? Earlier, it was shown that even if forests of present-day structure were to cover the entire surfaces of today's continents, they would yield only approximately 40 per cent of the estimated coal portion of the fossil fuels.

A short, very rough estimate can give us an answer. In order to do so, we presuppose the following:

(1) We assume that the coals stemming from the Carboniferous and Permian Periods originated entirely from floating forests.
(2) Bituminous coal is found in seams of varying thicknesses. We assume an average thickness of 50 cm (this is probably a conservative estimate).
(3) Bituminous and sub-bituminous coals vary in composition and density. We assume an average density of 1.8 g/cm^3.
(4) We assume a total amount of bituminous and sub-

bituminous coals of 10^{13} tonnes (see Table 2).

The assumed density of the coal yields a surface mass of approximately 10 tonnes per square metre of coal seam if the seam thickness is 0.5 m. A total mass of 1.0×10^{13} tonnes thus yields a surface of approximately 10^{13} m^2 or 10×10^6 km^2. For a total Earth's surface of 511×10^6 km^2, this yields a fraction of approximately 2 per cent of the Earth's surface. This figure is probably too low, since one cannot assume that all the floating forests were fossilised; and also, some of the vegetation destroyed by the Flood would probably have been destroyed by the natural processes of decay.

LIGNITE IN THE CREATION MODEL

Lignites, like bituminous coals, can be found at various levels in the geological record, but occurs predominantly in the Tertiary Period (see Figure 1). However, lignites were formed from very different plants to those in the bituminous coals, the vegetation responsible more or less corresponding to today's angiosperms and gymnosperms.

Just as the formation of bituminous coal seams is viewed as the result of swamp growth over millennia, so also is the origin of lignite. A study of the actual structure of the Tertiary lignites, however, indicates that here, too, their formation is due to a catastrophe.[13] Scheven's premise is that the Tertiary lignite deposits consist partially of pre-Flood plants, but that they were only deposited a century or more after the year of the Flood (in particular old-Tertiary lignites with sub-tropical flora). Prior to their final deposition and burial, they are presumed to have drifted on the post-Flood oceans as 'inhabited depots'. On the other hand, new forests may have grown in the centuries following the Flood within the framework of mega-successions (successive recolonisation of the land surfaces and ocean bottoms), which were then uprooted, crushed and buried by later catastrophes.[14]

According to the calculations above, there would have been enough space on the Earth's surface during the pre-Flood period for some of the vegetation in today's lignite deposits to have grown. But would there have been sufficient surface area available on the pre-Flood Earth for all the necessary vegetation?

Given the following parameters, we can estimate the answer:-

(1) The total amount of lignite amounts to approximately 2.5×10^{12} tonnes (see Table 2).
(2) The lignite originated from pre-Flood forests with a biomass of approximately 40,000 tonnes of dry wood per km^2 (for example, 600 solid cubic metres per hectare, see Table 3).

The pre-Flood forests thus covered a surface area of at least 60×10^6 km^2 (2.5×10^{12} tonnes divided by 40,000 tonnes per km^2), that is, approximately 40 per cent of today's continents. This estimate seems low, however, since one can hardly assume that this entire mass of plants was fossilised during the Flood. On the other hand, it is also possible that an unknown portion of Tertiary lignites was formed during post-Flood mega-successions,[15] the vegetation thus being buried by catastrophes subsequent to the Flood.

CONCLUSIONS

(1) If the productivity of today's forests is used as the basis for calculations, then the stored energy of some thousands of years of plant growth is found in fossil fuels. The mineable reserves, which amount to only 10 per cent of the resources, contain the solar energy that could be stored by today's forests in some hundreds of years. This shows the significance of solar energy and its contribution to the forests of the Earth. These estimates show that the Flood model may not be sufficient to account for the fossil fuels if they all originated in forests similar to those of modern times.
(2) If, however, Scheven's model of Carboniferous floating forests is applied, the following estimates of pre-Flood biomass result:
    (a) Bituminous and sub-bituminous coals could have originated from the floating forests which might have covered 2 per cent of the pre-Flood surface of the Earth.
    (b) Lignites from predominantly pre-Flood(?) vegetation represent a biomass which could have existed on approximately 40 per cent of current continental surfaces.
(3) In spite of many unsettled details, the existence of approximately 1.3×10^{13} tonnes of carbon in the form of coal may be reconciled with a Flood as documented in the Bible and an age of the Earth of more or less 6,000 to 10,000 years.
(4) The formation of crude oil still needs to be modelled quantitatively in a creation/Flood framework.
(5) It should be mentioned that the bulk of reduced carbon on Earth is sediment-bound kerogen, which, due to its $^{13}C/^{12}C$ ratio, most probably is of biological origin. It is estimated that 10^{22} g kerogen exist in sediments, only 2 per cent of which is coal plus oil plus gas. The origin of this kerogen also needs to be discussed in a creation/Flood model.

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***Gerhard Schonknecht** was called home by his LORD in 1994 when hiking in the German alps. He was a devoted Christian and an indefatigable co-worker of the Studiengemeinschaft Wort und Wissen.

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QUOTABLE QUOTE:
Subjectivity in Scientific Interpretation

'. . . And scientists, contrary to the myth that they themselves publicly promulgate, are emotional human beings who carry a generous dose of subjectivity with them into the supposedly "objective search for The Truth".

In fact, a completely unbiased, unprejudiced exploration of nature is a methodological impossibility, as a biologist and philosopher of science Sir Peter Medawar is fond of pointing out. Without a set of expectations to act as a guide, such a search would be a chaotic and largely unprofitable enterprise. Moreover, the way in which scientists typically report their findings, informal papers submitted to learned journals, is, he says, "notorious for misrepresenting the process of thought that led to whatever discoveries they describe." Preconceptions are rarely acknowledged, because this, after all, would be "unscientific." . . .

The anonymous aphorism "I wouldn't have seen it if l hadn't believed it" is a continuing truth in science. . . !

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