

## Precambrian Plant Fossils and the Hakatai Shale Controversy

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### Abstract

Within the global uniformitarian stratigraphic timescale, plant fossils have been found in Precambrian strata dated to approximately 3.5 billion years in age. Evolutionists have not successfully explained when or how life formed to produce these ancient and wide-spread plant fossils. Young-earth creationists have also investigated Precambrian plant fossils, focusing primarily on Precambrian rocks found in the Grand Canyon. Controversy has developed around the plant fossil content of the 1.25 billion year old Hakatai Shale. Several studies suggest that modern and ancient fossilized plant material might be present within the shale. Other Precambrian stratigraphic units in the Grand Canyon contain plant fossils. Precambrian strata

of much greater age than the Hakatai Shale are known to contain plant fossils. However, some young-earth creationists have rejected the presence of plant fossils in the Hakatai Shale, or in abundance in any other Precambrian strata. This position is not required by either uniformitarian or creationist frameworks and it ignores documented evidence of Precambrian plant material. The author proposes that Precambrian plant fossils exist, and reflect the effects of the global Flood on Antediluvian sediment and plant material. However, only the additional study of plant fossils within the various Precambrian outcrops at each locale can determine their specific position within the young-earth Flood model stratigraphic column.

### Introduction

Many creationists have generally followed the framework of the global uniformitarian timescale in attempting to define geologic history within a biblical time frame. Weaknesses in this approach, however have led several young-earth creationists to propose other Scriptural methods of understanding strata (Froede, 1995, 1998; Froede and Reed, in press; Reed and Froede, 1997; Reed, Froede, and Bennett, 1996; Walker, 1994). This foundational change in defining Earth's history offers a different solution to many seemingly complex issues. One of these is the presence of plant fossils within Precambrian strata. These fossils have been a perplexing problem for some creationists, but one which can be resolved within a new biblical framework.

Uniformitarians continue to collect evidence of fossilized plant life further and further down their global stratigraphic column. Creationists can and should assist in this search, but for different reasons. The presence of Precambrian fossils has created controversy for uniformitarians and creationists. One specific stratigraphic unit,

the Hakatai Shale of the Grand Canyon, has been a focus of investigation and controversy among creationists. Why is identifying plant fossils within this shale layer considered a problem by some, and what bearing does it have on the creationist approach to understanding earth history? Some background about these supposed ancient plant fossils is necessary.

### Precambrian Plant Fossils

Uniformitarian geologists divide the Precambrian into two Eons: the Proterozoic, and the underlying Archean (Figure 1). Proterozoic strata have yielded plant fossils which have been investigated for more than one hundred years (Hofmann, 1971; Link et al., 1993; McMenamin and McMenamin, 1990). For some uniformitarians, life did not exist when the underlying Archean strata were deposited because the atmosphere was not believed to have contained sufficient oxygen to allow aerobic life to have formed or developed (Cloud, 1968; 1976; 1983; Knoll, 1992). This concept has recently been challenged with physical evidence of aerobic plant fossils in Archean rocks. At present, uniformitarians have reported plant

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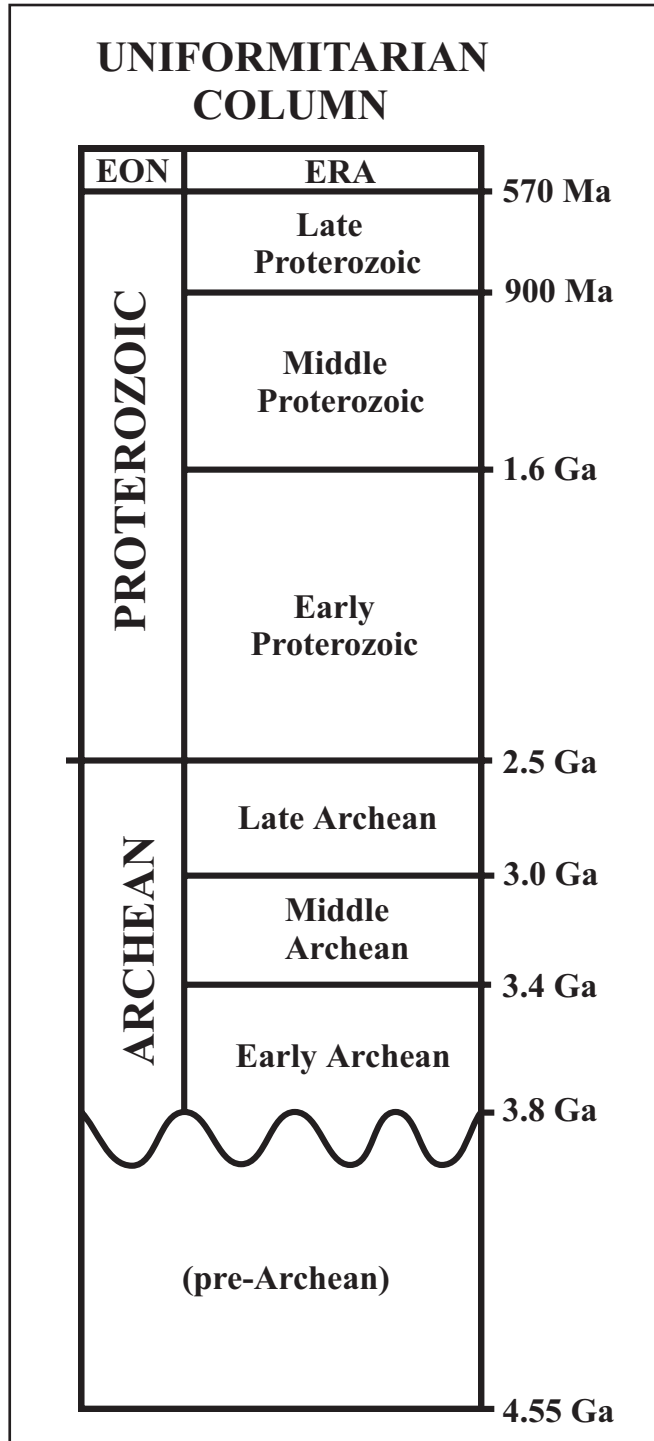


Figure 1. The Precambrian stratigraphic column (modified from Harrison and Peterman, 1982). The lowest and oldest strata have been held out as generally being devoid of fossils—until recently. Uniformitarians continue to find plant fossils in these ancient strata. Presently, plant fossils have been found in Archean rocks dated to approximately 3.5 billion years old. Hence, even by their own evolutionary model, life has been on earth for a very long time, and no one knows how or where it originated.

fossils in 3.4 to 3.5 billion year old (commonly abbreviated Ga) Archean strata in Australia and South Africa (Margulis, 1988; McNamara and Long, 1998; Read and Watson, 1975; Schopf and Walter, 1983; Schopf, 1994; Strother, 1989; Walter, 1983). According to Schopf (1994, p. 193), evidence of plant life in the Early Archean consists of:

- ... (1) megascopic microbially produced stromatolites; (2) microscopic cellularly preserved microorganisms; and (3) particulate carbonaceous matter (kerogen), identifiable on the basis of its carbon isotopic composition as a product of biological activity.

The discovery of these Archean fossils has created a problem for the paleontological community. Fossils of this age contradict models of the origin of life on this planet<sup>1</sup>(Schopf, 1999). Whatever the requirements that evolution might dictate, plant fossils clearly exist within these ancient rocks.

These fossils force uniformitarians to deal with the sudden appearance of life in Earth's supposed very distant past. These plant fossils have been found in Precambrian rocks across the globe (Cooper, Jago, MacKinnon, Shergold, and Vidal, 1982; Glaessner, 1979; Hofmann and Schopf, 1983; Iltchenko, 1972). Within the evolutionary model this suggests that plant life was flourishing very early in Earth's history, and that it must have evolved and expanded rapidly (Schopf, 1982, 1999). No credible explanation of these discoveries has been provided to explain the presence of these fossils through evolution and dispersion.

The organic remains of Precambrian plant fossils are found within ancient sedimentary and metasedimentary<sup>2</sup> rocks and strata found on the continents. However, extracting the organic remains of these plant fossils remains a complicated and exacting science, and contamination is believed to be a serious problem (Schopf, 1999; Schopf and Walter, 1983).

<sup>1</sup>This article will not cover the evolutionary explanation for the origin of life or how theistic evolutionists might interpret these Precambrian fossils. Rather, this article will focus on the supposed extreme age of these plant fossils as they occur within the global uniformitarian stratigraphic column, and their relevance to the young-earth Flood model.

<sup>2</sup>Note that some Precambrian fossils are found within very low-grade metamorphic rocks which were originally sedimentary deposits that experienced burial and subsequent alteration. Their alteration, however, did not completely destroy all evidences of the plant material within the strata.

## Precambrian Plant Fossils and the Hakatai Shale

How do young-earth creationists explain the Precambrian strata that contain plant fossils? Unfortunately, not much has been written about these plant fossils by creationists. The Hakatai Shale, found within the Grand Canyon, has received the most intensive investigation to date. Several varieties of plant fossils have been identified and reported within the Hakatai Shale (Burdick, 1966, 1972, 1974a); however, challenges have been raised causing some to question their relevance within a biblical framework (Rusch, 1968, 1982). Further confusion has resulted from some creationists incorporating a compressed version of the global uniformitarian column in their creationist model<sup>3</sup> (Austin, 1994; Austin and Wise, 1994, and in preparation; Baumgardner, 1990; Snelling, Scheven, Garner, Ernst, Austin, Garton, Scheven, Wise, and Tyler, 1996). One creation scientist has proposed that Precambrian plant fossils might have been created during the creation week to fit them within his model (Wise, 1992). Counter to this uniformitarian-column-based approach, other young-earth creationists have proposed that Precambrian strata containing plant fossils formed during the global Flood, and have no link to the uniformitarian stratigraphic column (Froede, Howe, Reed, and Meyer, 1998; Hunter, 1992; Snelling, 1991; Woodmorappe, 1983).

The most interesting and controversial creationist Precambrian plant fossil study was conducted by Clifford Burdick (Burdick, 1966, 1972, 1974a). He examined the Hakatai Shale strata within the Grand Canyon and reported finding a wide variety of pollen and spores. Following this study, other scientists confirmed Burdick's work (Chadwick, DeBord, and Fisk, 1973). In a later effort to buttress his position, Burdick documented other areas across the planet where Precambrian and Cambrian pollen were reported (Burdick 1974b, 1975, 1982). A subsequent investigation of the Hakatai Shale (Chadwick, 1982), however, found no evidence of any plant fossils, and proposed that contamination was the cause of the earlier findings of pollen and spores. This raised doubts about Burdick's work.

The controversy surrounding Burdick's work centered around his finding *both* modern and ancient fossilized forms of plant spores and pollen in the Hakatai Shale. Evolutionists would not have had any problems with Burdick's work if only ancient fossilized forms were found. Finding modern forms of spores and pollens cre-

ated a serious age issue with this shale layer. In the creationist community Burdick's work creates controversy for those who define the Flood/pre-Flood boundary as the contact between the Precambrian and Cambrian. They should not find plant fossils in rocks which they define as having formed early in the Creation Week (before plants were created). For both these groups Burdick's findings created different problems for different reasons.

To resolve this lingering controversy over the presence or absence of pollen grains and spores within the Hakatai Shale, members of the Creation Research Society (CRS) collected and analyzed their own samples in an effort to confirm or refute Burdick's earlier findings (Howe, 1986; Howe, Williams, Matzko, and Lammerts, 1986, 1988; Lammerts and Howe, 1987). Their results supported Burdick's findings of *modern* spores and pollen within the Hakatai Shale. Of course this confirmation remains counter to the evolutionary model (Chaloner, 1967; Cloud, 1968), and is *very* controversial. The uniformitarian model does not predict or allow for the presence of modern pollen and spores within the Hakatai Shale as it is too old to contain these "advanced" types of plant fossils. The incorrect sequence contradicts the global uniformitarian column, which may explain why certain creationists remain skeptical of the conclusions of this latest confirmatory study. For whatever reason, some creationists have also rejected the possibility of modern or ancient pollen, spore, or any other plant material within the Hakatai Shale (Austin, 1994, pp. 63, 137; Austin and Wise, 1994, pp. 38–39).

Recently, questions were raised regarding the validity and methodology of the CRS confirmation study from an Internet post forwarded to the Quarterly Editor. Answers to the post's issues were provided explaining why earlier studies failed to identify the modern and/or ancient plant pollen and spores within the Hakatai Shale (Williams, 1997). The results of this latest study supports the belief that pollen and spores occur within the Hakatai Shale and that they were deposited contemporaneously with the strata.

### Hakatai Shale Comparisons with Other Fossiliferous Precambrian Strata

Uniformitarians view the Hakatai Shale as being deposited during the Proterozoic. It is age dated at approximately 1.25 Ga. Comparison of this Precambrian section to those of similar age found across other sections of the globe suggests that it is *not* out of the question to expect or find fossilized plant materials within the Hakatai Shale (Figure 2). Modern pollen and spores, however, are not expected in strata of this extreme age. In fact it is somewhat surprising that ancient fossilized plant material has

<sup>3</sup>These models place a Flood/pre-Flood boundary at the base of the Paleozoic, strongly implying the absence of fossils in older rocks formed during the creation Week—see Froede and Reed, 1999.

not been identified at an earlier date by uniformitarians for this stratigraphic unit (although it should be noted that Elston [1989, p. 264] hinted at the possibility of stromatolites being present within the Hakatai Shale, and Horodyski [in Link et al., 1993, p. 561] referenced a wide variety of fossils within various Precambrian strata of the Grand Canyon). However, the confirmation of ancient fossilized plant material per se in the Hakatai Shale would not contradict the uniformitarian model, as far older Precambrian strata have been found to contain plant fossils (Figure 2).

### Implications For the Young-Earth Flood Model

The Precambrian Hakatai Shale has been examined four times for the presence of plant fossils. Ancient and modern forms were found in three of those investigations. However, some creationists still reject the presence of any fossilized plant material within the Hakatai Shale as it disagrees with their model (see Austin, 1994, p. 58, Figure 4.1; Austin and Wise, 1994, p. 40, Figure 1). According to Austin and Wise, the majority of the Precambrian strata represent Creation Week deposits and should not contain plant fossils since they formed before plants were created. They suggest that plant fossils would only occur in abundance within Flood deposits (i.e., above their Precambrian / Cambrian–pre-Flood / Flood boundary). By implication their model would need to explain the evidence of plant fossils within Precambrian strata from areas both in and outside of the Grand Canyon (see Appendix). This point is important because Austin and Wise have stated that they support the general framework of the global uniformitarian timescale while denying the old age of the earth (Austin 1994, p. 58, Figure 4.1; Austin and Wise, 1994, p. 40, Figure 1; Snelling et al., 1996). In order to defend their pre-Flood/Flood boundary being globally chronostratigraphically equivalent to that of the Precam-

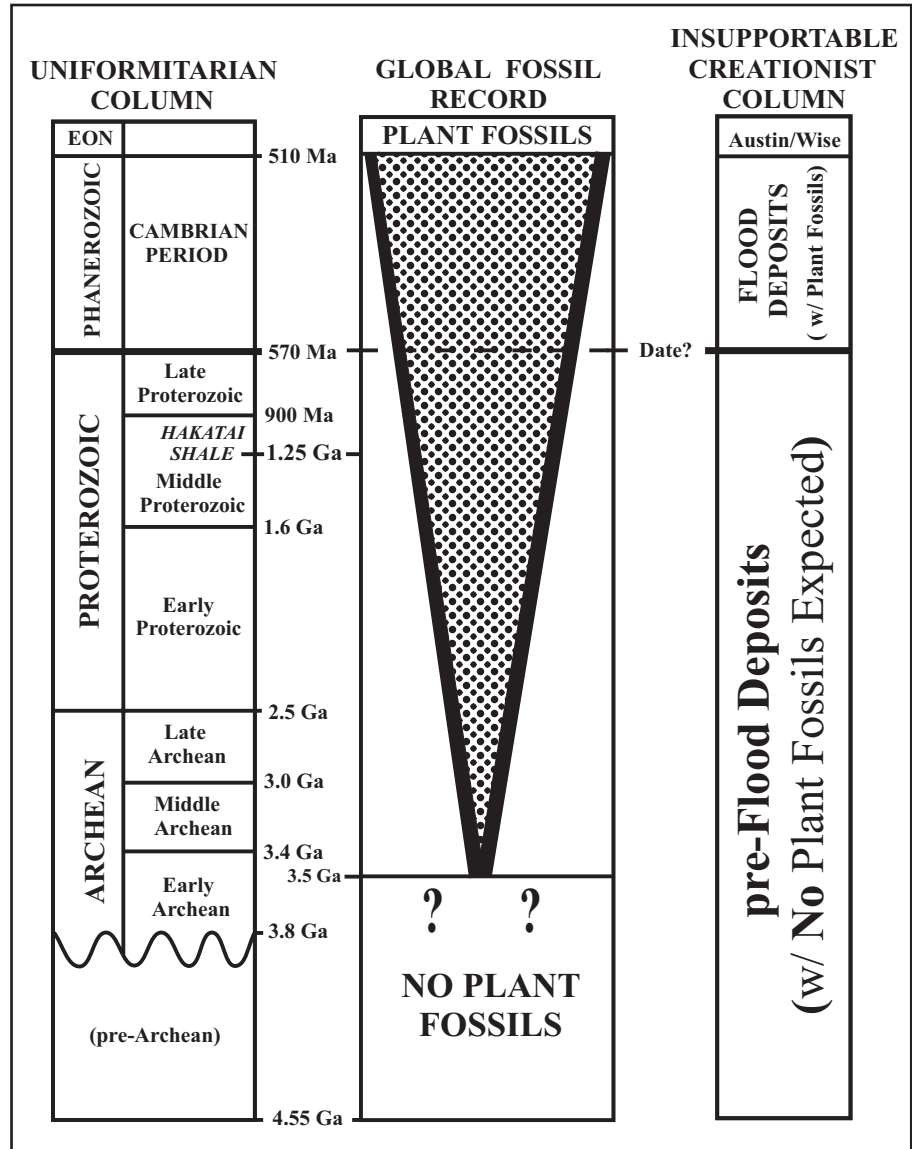


Figure 2. Within the global uniformitarian stratigraphic column the Precambrian/Cambrian boundary is located at 570 million years ago. One group of creationists has proposed that this boundary marks the end of the Antediluvian deposits and the beginning of the Flood deposits, and they use the lack of fossils and/or the transition to more advanced life forms to define this boundary (Austin, 1994; Austin and Wise, 1994; Baumgardner 1990; Wise, 1992). However, evidence of fossilized plants extend much deeper within the global uniformitarian stratigraphic column (modified from Schopf, 1994, Figure 1, and Schopf and Walter, 1983, Figure 1). Notice that the occurrence of plant fossils extends to 3.5 billion years ago—the lowest point where they have been identified and dated by uniformitarians. Fossilized plant material within the Precambrian is in violation of the Austin/Wise model.

brian/Cambrian boundary they should undertake palynological studies to prove that fossilized plants do not exist within any Precambrian strata. Their model of the stratigraphic column in the Grand Canyon remains questionable if they continue to deny the presence of Precambrian plant fossils.

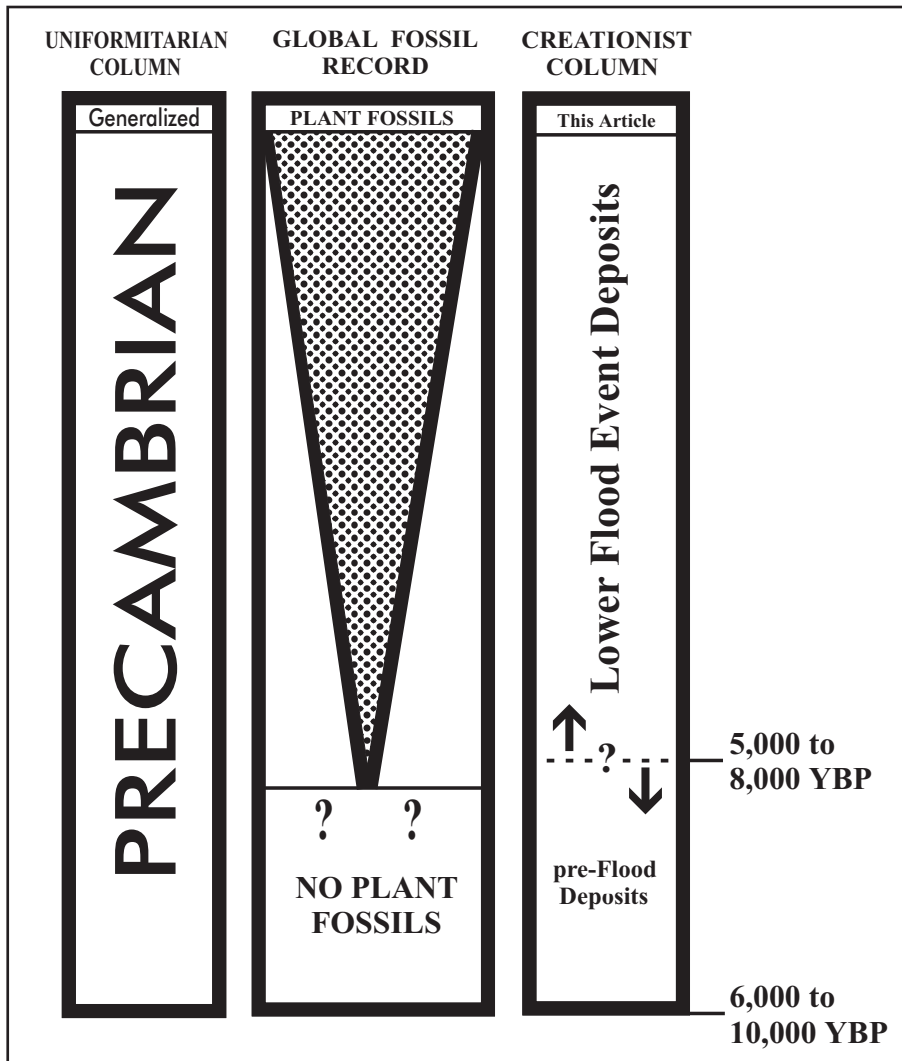


Figure 3. Recently, several creationists have advanced a different interpretation which proposes that Precambrian plant fossils represent Flood deposits (Froede, Howe, Reed, and Meyer, 1998; Snelling, 1991; Woodmorappe, 1983). These plant fossils have nothing to do with evolution or time, rather they reflect Antediluvian sediments and organic material buried in the global Flood. The exact location of the pre-Flood/Flood boundary would be determined at the specific outcrop based on changing energy levels and not on paleontology.

The identification of plant fossils within Precambrian shales has been documented. In fact, several uniformitarian geologists have commented that:

...in the light of results summarized here [for the Grand Canyon] together with important discoveries recently reported from other Precambrian shales, it seems reasonable to conclude that shaley facies represent a promising, but as yet largely untapped, source of new evidence on the diversity, evolution, and biostratigraphic usefulness of the Precambrian biota (Bloeser, Schopf, Horodyski, and Breed, 1977, p. 679).

I urge creationists to undertake studies to find fossilized plant materials in all Precambrian strata in an effort to help delineate the impact which the Flood had on the Earth's stratigraphic record.

## Conclusion

A variety of Precambrian plant fossils have been documented in rocks as ancient as the Archean (Figure 2). Presently, any specifics about the kind of plants from which these fossilized remains were derived cannot be ascertained. Each new discovery of ancient fossilized plant material pushes back the timing of evolution of life on this planet. This creates difficulties for evolutionary models of life's origin and early history. Young-earth creationists hopefully will keep abreast of this interesting and relevant work. In addition to highlighting weaknesses in the evolutionary model, it helps us to define and refine our own framework of Flood-dominated stratigraphy.

It is important to note that proving the existence of generic plant material in the Hakatai Shale within the Grand Canyon will *not* affect the uniformitarian model of Earth history; it would only add a new location where Proterozoic plant material has been found. It is the evolutionary stage of Burdick's discovery that contradicts the global uniformitarian column. With time new "older" Archean outcrops containing plant fossils may be

found. The problem which uniformitarian geologists and paleontologists must address remains that of explaining life's point of origin and rapid dispersion across the planet.

The Austin/Wise stratigraphic model for the Grand Canyon appears questionable as it denies the known presence of Precambrian plant life found both within the canyon and globally. Further clarification is required in order to reconcile these conflicts in their model. The presence of plant fossils within the Hakatai Shale, documented on three occasions, also casts doubt on their approach to defining the strata within the Grand Canyon.

Hopefully these issues will be addressed in the near future.

Young-earth creationists should consider the paleontological potential of all sedimentary and metasedimentary Precambrian strata. Finding fossilized plant life within these “ancient” rock layers might be expected within the young-earth Flood model. Several creationists have proposed that some Precambrian strata were deposited during the global Flood of Genesis (Figure 3).

Creationists should take an active part in paleontological studies locating “ancient” Precambrian fossils across the earth. By doing so we accomplish two objectives: 1) We extend the depth of strata likely affected by the Flood, and 2) we push evolutionists to explain how life arose “fully-formed” across the earth so rapidly, and so very long ago. We need to aggressively pursue paleontological studies if we wish to demonstrate the weaknesses of evolution and uniformitarian geology in explaining the stratigraphic record. This is what the global uniformitarian stratigraphic column is based on (evolutionary biology/paleontology and *not* radiometric dating!) and this is where we need to focus our efforts (Froede, 1994, 1997). Precambrian plant fossils provide excellent evidence of Flood deposition within the young-earth Flood model.

## Appendix

The controversy over the paleontology and stratigraphy of the Hakatai Shale (or any other Precambrian strata) raises a larger question than the mere presence or absence of fossilized plant material in the Precambrian. Rather, the core issue is whether or not young-earth creationists should use the global uniformitarian column to define biblical history. Austin and Wise follow the general framework of the global uniformitarian column (Austin, 1994, p. 58, Figure 4.1; Austin and Wise, 1994, p. 40, Figure 1; Snelling et al., 1996, p. 333, Figure 1). They have also proposed that the pre-Flood/Flood boundary should occur at the uniformitarian Precambrian/Cambrian boundary (Figure 2). This is based on their definition of the Paleontological Discontinuity criteria:

The slow deposition in the pre-Flood world would have made fossilization of plant, animal and fungal remains unlikely. Also, it is very likely that the initial erosion of the Flood destroyed or reworked virtually all of the fossils which were present in pre-Flood sediments. Consequently, below the pre-Flood/Flood boundary, sediments capable of preserving fossils might, at best, contain only traces

of the most abundant and easily fossilized life forms—bacterial, algal, and protist fossils—and *probably in very low abundance*. Plant, animal and fungal fossils might be expected to be found in high abundance only above the pre-Flood/Flood boundary. (Austin and Wise, 1994, p. 40) (Italics mine)

This statement is inconsistent, however, when dealing with the evidence of plant fossils in the uniformitarian Precambrian strata, and runs counter to what Schopf (1994, p. 194) has stated about the presence of plant fossils found within the Precambrian, Proterozoic Eon:

Stromatolites are virtually ubiquitous in Proterozoic carbonate terranes, represented by hundreds of taxonomic occurrences reported from a large number of Proterozoic basins. ...literally hundreds of microfossiliferous formations and nearly 3,000 occurrences of bona fide microfossils have been discovered in Proterozoic-age strata...

These creationists appear to have overlooked the record of plant fossils taken directly from the Precambrian strata within the Grand Canyon! They do not believe that plant fossils are abundant within the Precambrian strata of the Grand Canyon, and yet uniformitarians have documented them in several places and in abundance (see Bloeser, Schopf, Horodyski, and Breed, 1977; Elston, 1989; Elston and McKee, 1982; Ford, 1990; Horodyski, 1993; Knauth, 1994; Link et al., 1993; Nations and Stump, 1996; Schopf, Ford, and Breed, 1973). Since the Austin/Wise stratigraphic model for the Grand Canyon is inconsistent with the physical evidence, perhaps they should reexamine the role of the global uniformitarian column in their model. The global uniformitarian stratigraphic column is not required within the young-earth Flood model (Froede and Reed, 1999). I recommend that the use of the global uniformitarian column to define Flood geology in the Grand Canyon (or anywhere else) be rejected.

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