

Are all fossil stromatolites biological?

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From a creation science perspective there are still many details of the rock and fossil record to work out. One such issue is the origin of fossil stromatolites. A stromatolite is defined as:

“An organosedimentary structure produced by sediment trapping, binding, and/or precipitation as a result of the growth and metabolic activity of micro-organisms, principally cyanophytes (blue-green algae)”.¹

Notice in this definition that stromatolites are assumed to be biological. This is a good definition for living stromatolites that are currently found in restricted marine basins, alkaline lakes, and hot springs. However, it may not be such a good definition for fossil stromatolites. Definitions should be descriptive, not interpretive. Whether all fossil stromatolites are a result of biological processes or not is still unresolved.

The stromatolites in the sedimentary rocks typically look like a stack of upside down bowls. They are common in Precambrian carbonate rocks, but are also found in many younger sedimentary layers. Secular scientists believe it takes hundreds to thousands of years for stromatolites to form.

Huge stromatolites in the Green River Formation

Just recently, the largest identified fossil stromatolites ever found were described from the Green River Formation, believed to be the deposits of an early Cenozoic lake.^{2,3} The stromatolites are 5.5 m tall and 7 m in diameter.

They differ from modern stromatolites in a few significant ways, which has caused some researchers to wonder whether at least some stromatolites are truly biological.⁴ First, they apparently grew around tree stumps, making them similar to those from Lulworth Cove along the south-central coast of England (figure 1). This similarity is strongly suggested by the fact the fossil stromatolites encircle a round



Figure 1. A claimed stromatolite around an eroded upright log at the ‘fossil forest’ at Lulworth Cove, southern England

hole where patchy silicified wood was discovered. The researchers suggest that a lake transgressed a forest, the trees died, and the stromatolites formed around the stumps. Second, algae are supposed to bind particles to form layers that are only millimetres thick, but the layers within the Green River Formation stromatolites are a few centimetres thick. Commenting on the research, Frantz states:

“Undoubtedly, some stromatolites form this way [by binding sediments in microbial mats], but analogous structures can form abiotically (Grotzinger and Knoll, 1999), and distinguishing biogenic from abiogenic structures is not straightforward. . . . the colonizing community (if indeed they are biogenic) covered the entire stump.”⁵

Awramik and Buckheim seem to think they were biological stromatolites simply because they are laminated:

“The large, multi-meter-size columns are by far the most unusual stromatolites. They are ‘true’ stromatolites, i.e., they are laminated.”⁶

Just because a sediment is laminated does not necessarily mean that it is a stromatolite, since features similar to stromatolites can be produced abiotically (see below).

Are biological fossil stromatolites a problem for creation science?

The unusually large size of the Green River Formation fossil ‘stromatolites’ calls into question whether they are biological in origin. If they were of biological origin, it seems like it would require more time than is available in the biblical timescale. Snelling and Purdom tend to believe that fossil stromatolites are indeed biological.⁷ They focused on the two most studied areas for modern day stromatolites—Exuma Cays of the Bahamas and Shark Bay in Australia—and compared the modern

stromatolites with those in the rock record.

However, if all fossil stromatolites are biological, they present two major problems for the biblical timescale. First, it would take much more time for biological stromatolites to form than the one-year Flood. There are abundant stromatolites in Paleozoic and Mesozoic rocks that practically all creation scientists attribute to the Flood.⁸

Second, it is difficult to attribute Precambrian stromatolites to the time between Creation Week and the Flood, as Humphreys is forced to do.⁹ Between the Creation Week and the Flood, these sediments would likely have only been able to form under geological conditions similar to (or even quieter than) today. However, such conditions simply do not allow enough time in the 1,700 years that allowed for the formation and fossilization of numerous bands of stromatolites in Precambrian sedimentary rocks, some of which are thousands of metres thick. For instance, the Precambrian Belt Supergroup that contains layers of stromatolites is over 20 km thick.¹⁰

Third, placing Precambrian biological stromatolites in Creation Week, as Snelling¹¹ does, is also problematic. The stromatolites would not only have had to have been created *de novo*, but also buried and fossilized within thick Precambrian sediments.

Reasons why stromatolites in the rocks are not biological

Oard and Froede gave nine reasons why stromatolites in the rocks may not be biological.⁸ Four of them are especially significant. First, it is unlikely that there was enough time during the Flood to produce true stromatolites, nor enough time during Creation Week, unless they were created *de novo*. Most creation scientists believe the Phanerozoic is from the Flood,

except for the continuing debate over the Cenozoic. Stromatolites are not rare in Phanerozoic rocks.^{12–15} Thus, it appears an abiotic mechanism is required for the formation of most, if not all, Phanerozoic stromatolites. It is unlikely pre-Flood stromatolites could be transported into Flood sediments because of the chaos of the early Flood. Moreover, if the stromatolites were transported and not totally destroyed, we would expect the pre-Flood stromatolites to have been broken in pieces and orientated differently from living stromatolites. This all suggests that some Precambrian stromatolites are also a result of abiotic processes.

Second, some stromatolites in the sedimentary rocks are unlike the modern stromatolites from the Bahamas and Western Australia. Stromatolites from the Bahamas and Western Australia are isolated mounds, whereas the stromatolites found in the rocks are generally *continuous* layers of fine-grained laminations with bulbous shapes. Riding states:

“If this is correct, the question arises whether and where modern analogues for Precambrian stromatolites actually exist.”¹⁶

The differences between fossil stromatolites and modern living stromatolites suggest at least some fossil stromatolites are not biological.

Third, there is very little organic matter or organic structures found in fossil stromatolites.^{4,15} The microorganisms that are rarely found could be simply the result of chance, since many Precambrian rocks contain microorganisms.

Fourth, practically all fossil stromatolites are found in carbonates.¹⁷ Modern stromatolites bind all types of sediments, not just carbonates. Moreover, the grains bound by modern stromatolites are sand-sized, while the carbonate in fossil stromatolites is a fine-grained micrite.⁵ The fine-grained micrite suggests an abiotic mechanism during carbonate deposition.

Green River Formation very likely from the Flood

However, the discovery of what is claimed to be giant stromatolites in the Green River Formation creates a paradox. Some creation scientists believe the Green River Formation formed as a post-Flood lake.^{18,19} In contrast, there is ample evidence to suggest that the Green River Formation is a Flood sedimentary rock.²⁰ This would support the deduction that these stromatolites are not biological because they would not have time to grow as large in the one-year Flood. This may also explain the unusual size and thickness of these stromatolite-looking features.

Conclusion

Fossil ‘stromatolites’ are enigmatic structures. Nonetheless, interpreting them all as biological in origin creates numerous difficulties for the biblical timescale, whether stromatolites are placed in the Flood, Creation Week, or between Creation Week and the Flood. This suggests at least some fossil stromatolites formed by abiotic mechanisms, as some secular scientists also claim for some fossil stromatolites. More work is needed to properly elucidate the origin and geological significance of these structures.

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