



## ***Interactive comment on “Comets, carbonaceous meteorites, and the origin of the biosphere” by R. B. Hoover***

**R. B. Hoover**

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Reply to Comments by Prof. A. Rozanov (Referee) regarding the manuscript “Comets, carbonaceous meteorites, and the origin of the biosphere”

I want to thank Prof. Rozanov for his review of the manuscript and these insightful comments. As Prof. Rozanov is well aware the field of Bacterial Paleontology is still young and not yet thoroughly understood in spite of the many very important contributions of paleontologists who have carefully studied the extensive assemblages of bacterial fossils that are found in Phanerozoic, Proterozoic, and Archaean rocks all over the Earth. A review of the literature clearly reveals that the great majority of the validly accepted microfossils of bacteria are of the organisms that belong to the Cyanobacteriaceae. This is due in part to their great antiquity and the fact that they are often well preserved in the fossil record. It is also extremely important that many of them are large, complex, and highly differentiated filamentous forms that exhibit very distinctive

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and recognizable morphologies. And it is the existence of these similar and highly recognizable morphologies present in the biomorphic microstructures that may be found in the carbonaceous meteorites that provides to me the clear and convincing evidence that these remains are in fact biotic rather than abiotic. This startling conclusion is then strongly augmented by the EDS analysis that shows that in some cases the sheaths of the remains have very high carbon content, whereas the trichomes and the interior of hollow sheaths of the filaments are more typically replaced with minerals associated with known components of the meteorite matrix.

I am well aware that these results are controversial, largely because of the profound implications of indigenous microfossils in meteorites. However, I agree with you that there should be no “forbidden fields” in Science, which must always remain the objective study of the natural world. If microfossils do not exist in carbonaceous meteorites, they will not be present just because results are published asserting that they are. However, if the remains of extraterrestrial microorganisms do exist in meteorites, they will not cease to be there merely because they are ignored or are not carefully investigated and understood. If anyone can duplicate by abiotic means both the morphologies and the elemental compositions of the biomorphic microstructures that can be found in the carbonaceous meteorites, I will readily agree that the complex and well-preserved microstructures do not represent biology. However, the only way we now know that forms such as these presently occur on Earth is by the miracle of life. It does not do justice to either Science or Logic that we should identify these forms as cyanobacteria and prokaryotic components of cyanobacterial mat communities if they had been found either living in benthic mats or fossilized in Earth rocks, but then deny that they can be considered biogenic simply on the basis of the fact that they are found in meteorites.

The Author very sincerely appreciates the thought provoking comments of the Referee.

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Interactive comment on Biogeosciences Discussions, 3, 23, 2006.

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