

Interactive comment on “Three-dimensional Magnetic Resonance Imaging of fossils across taxa” by D. Mietchen et al.

D. Mietchen et al.

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General comments

The authors would like to thank all three reviewers for their thoughtful comments. As their remarks were very similar, we will reply to them en groupe.

Specific comments

Reviewer 1:

The only suggestion that I have is to add one paragraph describing how MRI works, perhaps in section 4 “Magnetic Resonance Imaging and Spectroscopy”. This may seem redundant to MRI veterans. However, as the audience of this paper includes paleontologists who may not be familiar with MRI techniques, a paragraph on MRI-101

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would be very useful.

Reply:

We agree that the intended audience of this paper includes scientists not familiar with MRI. However, the basic principles of MRI have been laid out in the preceding paper (Mietchen et al., 2005, <http://direct.sref.org/1726-4189/bg/2005-2-133>), along with references that provide a comprehensive treatment. Furthermore, the aspects most relevant to fossil applications receive detailed coverage in our sections 5.4 and 5.5, which built upon the earlier review sections 2.1–2.3. Given that the present manuscript thus already contains so extended review sections that Reviewer 3 even described it as a “review paper” (a notion we do not share, because its experimental results have never been published before), we chose not to add a MRI-101.

Reviewer 1:

Page 2970, line 17, “elemental mapping of silicified wood from Neoproterozoic up to Miocene sites (Boyce et al., 2001)”. I do not think there are Neoproterozoic silicified wood. The Neoproterozoic specimens analyzed by Boyce et al. are cyanobacterial filaments from the Draken Formation.

Reply:

Yes, thanks for pointing this out. We are also not aware of any reports of Neoproterozoic wood and will thus rephrase this sentence accordingly.

Reviewer 1:

Page 2976, line 15-19, I am not sure why iron source for glauconite and pyrite formation necessarily came from hemoglobin degradation. It would be nice to show whether there is enough iron in hemoglobin to generate any significant amount of iron minerals. Why sedimentary iron source is excluded?

Reply:

We agree here, too, and will rephrase the paragraph such that sedimentary iron sources are included.

N. Clark:

The only other comment is a follow-up to your comment at the end of your article (section 2980, lines 6-11) where you suggest that the filling of cavities might impede future chemical analysis. In Clark et al. (2004), no impediment to chemical analysis will have resulted as the bone had already been completely removed by porewater diagenesis prior to the application of MRI enhancing fluids. Unless chemical analysis of the sediment is inferred from this, then the treatment will have no effect on future chemical analysis of the bone, because it did not exist at the time of scanning.

Reply:

The comment referred to both fossils and surrounding sediment but certainly does not apply to completely mouldic fossils. We will rephrase that.

Technical corrections

The technical comments will be taken into account when revising the manuscript. Here, we will comment only on a selected few.

Reviewer 1:

"I also found that the title of some references (e.g., Brocks et al., 1999) are capitalized, which is inconsistent with other references in the bibliography."

Reply:

In our bibliography, capitalisation is normally entered as in the original article, and since we used the BG style file for formatting of the references, we assume that variable capitalisation is conform with BG style.

N. Clark:

"I could not find the term "in saxo" in my Latin or English dictionaries. Does it mean "in rock"?"

Reply:

Yes, it does. The Latin word for "rock" is "saxum", and it follows the same declination scheme as "vitrum" (glass), such that "in rock" becomes "in saxo".

N. Clark:

"Section 2972: I noticed that you did not reference Roemer, 1840 as the author of the species *Isselocrinus buchii* (Roemer, 1840) (line 6 under crinoids), but did reference Barnes 1985 as the author of the subfamily Pithanodelphininae Barnes 1985. Is this consistent with the guidelines for referencing in BG?"

Reply:

Consistency should certainly be attempted. As the BG bibliographic guidelines are not explicit here, we will omit those references that defined the species. Just for completeness, the reference for Roemer is here:

Roemer, F. A., 1840-1841. Die Versteinerungen des norddeutschen Kreidegebirges. 8212; Hannover, Hahn'sche Hofbuchhandlung: iv + 1-48, pls 1-7 (1840); 49-145, pls 8-16 (1841).

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