

Review of: 3D-Analysis of a non-planispiral ammonoid from the Hunsrück Slate: natural or pathological variation?

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This paper uses micro-CT to reconstruct an ammonoid from the Hunsrück Slate. The authors make a convincing case for the encrustation of the ammonoid being in vivo, and it's lovely to see more CT work on Hunsrück fossils. The paper is solid, and I have no major changes to suggest. There are a couple of points I think, if added, could strengthen the conclusions:

- What does micro-CT actually add here? Presumably the second surface of the fossil, and thus evidence for encrustation on both sides and hence in vivo encrustation. Right? If so, I suggest this is explicitly stated somewhere - either in the abstract or conclusions, to highlight how CT actually helped in this study.
- I'd welcome more comment on the evidence of causality of the encrusters on the trochospiral coiling shell, i.e. discussion of why this is pathological. At the moment, this is implied in places, but a few sentences somewhere directly outlining evidence the encrusters changed the coiling, rather than this being part of the natural variation of the species, and that the encrusters just happened to settle here, would be useful for non-ammonoid experts like myself.

I also recommend the authors re-render the video, and suggest they do it using ImageJ. If they take the image stack from SPIERS, load it as an imagestack in ImageJ (file → import → image sequence; tick virtual stack if you're low on RAM), they can then save it as a jpg encoded AVI (file → save as → avi). This will remove the stamp in the top left corner, reduce compression artefacts which are currently fairly strong, and still be below PeerJ's filesize limits.

Beyond these changes, I note a number of minor alterations below - almost all linguistic, nothing major.

I'm happy to be identified as reviewer, and to answer any questions the authors have regarding my review.

-- Russell Garwood

Abstract

-- "We herein investigate the only known non-planispirally coiled early ammonoid specimen to test if its trochospiral coiling is part of the natural variation within this species or it is rather pathological – induced by encrustation with epicoles during its life-time." - this needs some commas in it, in particular before to test, as otherwise the sentences parses as this being the "only known non-planispirally coiled early ammonoid specimen" that tested something, rather than the test referring to your investigation.

-- "the historical collected specimen" → "the **historically** collected specimen"

-- "Despite, these anomalies in coiling and multiple generations of epizoa" - don't need a comma here

-- "This is to our knowledge the first support" → "This is, to our knowledge, the first support"

Introduction

-- In the abstract and throughout the rest of the manuscript, you refer to this species as *Ivoites opitzi*, but when introduced in the introduction, you say it is *Ivoites schindewolfi*. I assume some taxonomy is involved here that explains the alternative names, but it left me reading the introduction wondering why you were spending so much time talking about another species entirely. Please can you clarify why, if it is correct to use *schindewolfi* here, why that is, and highlight that this is the same as the species mentioned in the abstract?

-- "Ammonoids are a now extinct group" - the now is implied with extinct: I suggest deleting it.

-- "Early ammonoids are still loosely" → "Early ammonoids **were** still loosely"

-- "exterior of any more or less hard object" does this mean an object that was more or less hard (i.e. fairly hard, but with error bars), or more or less hard than itself. I suggest you reword to clarify.

- "using various lines of evidence" this is a bit vague - is it possible to list one as an example for researchers that have not come across this before?
- "including foraminifers, bivalves, sponges, corals and many others" → "including foraminifers, bivalves, sponges, and corals" - the many others is implied by the "including".
- "But it necessarily a symbiosis in every case." I assume you mean a long term interaction here, rather than a long term beneficial one?
- as the rotate - as **they** rotate?
- "locomotion, it might have been" - the it in this case is profit for the settler, but that is not immediately clear. I suggest rewording to - this might have been or similar.
- "on the ammonite during life-time," → "on the ammonite during **its** life-time,"
- "during lifetime" → "during **life**"
- "reveal remarkable preservations," → "reveal remarkable **preservation**,"
- "This is for example illustrated by the only known specimen and holotype of *Palaeoscorpius devonicus*," - yeah, this was a pain!
- "These is also" → "**This** is also"
- "flattened hampering also their" → "flattened, **which also hampers** their"
- "we want to use micro-CT to create a three-dimensional model to answer these questions" - you don't just want to, you have done! I suggest "we elected to" or similar.
- "Tomographic studies in ammonoids have" - and ontogeny: Lukeneder, A., 2012. Computed 3D visualisation of an extinct cephalopod using computer tomographs. Computers & geosciences, 45, pp.68-74.

Materials

- "and breakage of the shell supported by fracture patterns and similar preservation in Jurassic bioturbated shales" this implies the breakage of the shell was supported by fracture patterns, rather than that fracture patterns are evidence of support in this - clarify.
- "also in the Hunsrück Slate" → "**including** in the Hunsrück Slate"
- "Micro-Computer-Tomography" → "micro-computed tomography" at least, as computer tomography isn't a thing. X-ray microtomography, as a name, probably has more widespread usage though [and is used in the next section], so this could be put here instead.

Methods

- Can I suggest you put the scanning parameters first, and then highlight that slices were reconstructed using the Phoenix software (I assume), to create a data volume with voxel size of 118.1114µm. As currently written, this could be read as the pixel size for each projection, rather than voxel size of reconstructed data. Also, I'd present the voxel size as a max of one decimal place - the actual accuracy of these things is relatively low - it could be a micron or two out.

Results

- "Nor the dacryoconarids" → ""**Neither** the dacryoconarids"

-- "do show a preferential orientation with respect to the spiral axis" - which is? I suggest this is stated clearly.

-- "in each colony give rise to two" → "in each colony **gives** rise to two"

-- "Part of variation" → "**Some of this** variation"

Discussion

-- "during their life-time" - lifetime is one word

-- "clayey"- clay rich would be less clunky.

-- "their little streamlined" → "their poor streamlining" or similar.

-- "which could speak they already encrusted the ammonoid during its lifetime too" → "which could **suggest** they already encrusted the ammonoid during its lifetime too"

-- "There is least no evidence" → "There is no evidence"

-- "interpreted to encrust" → "interpreted **as encrusting**"

-- "should be further test with μ CT" → "should be further **tested** with μ CT"

-- "Additional studies" - are there enough fossils to do this?

-- "of the species which are based" - "of species which are based" or "of the species which is based"

-- "neotype(De Baets et al. 2013). We are however confident that original type specimen belong to same species as the neotype" → "**neotype (De Baets et al. 2013)**. We are, however, confident that **the** original type specimen **belongs** to same species as the neotype"

Conclusion

-- "part of the natural variation of as it was observed Mesozoic heteromorphs" this doesn't make sense, and I don't know what to suggest to make it do so! Can you clarify what you actually mean?

-- "the effects on its mode of life were probably negligible" I'm not sure this is what you mean. We wouldn't expect it's mode of life to change dramatically! We would expect it to struggle more due to the increased burden of having these, but that does not equate to a mode of life. Reword?

-- "would be necessary" → "**are** necessary"