Comments after publication

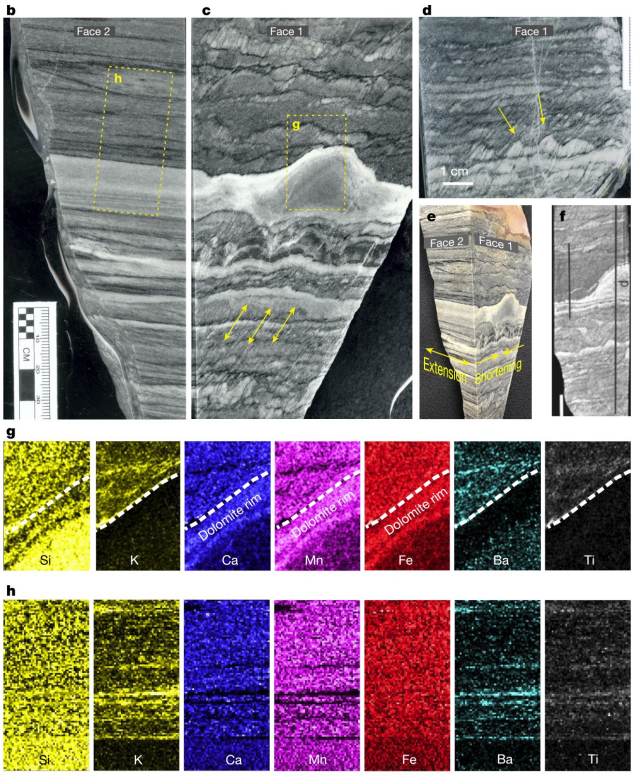
Comments by Prof. Giorgio Bianciardi:

The article is very well done, clear, precise, with a rich bibliography and illuminates a point foundation of biopetrology, so there is no problem. However, I want to point out that legend 2 is not absolutely clear, showing frames a, b, c which do not appear in the figure and a rectangle g which is not explained. Presumably because it is extracted from an image of another Author's Work, but in any case the reader is certainly astonished and cannot follow what he should see in the two figures. Maybe you can still change this point?

—in an email on Dec. 7, 2022

Reply by Ya-Sheng Wu and Hong-Xia Jiang:

Thank you very much! Your comments are very helpful! The original figure in Allwood et a. (2018) is as follows.



The original legend: Fig. 1 | Putative stromatolites of Greenland. a, Seven structures in outcrop (arrows, white dashed line). **b–d**, Sample from site A. **b**, Face 2 shows even, parallel layering. **c**, **d**, Face 1 shows irregularly layered fabric with planar discontinuities (arrows in **c**) and convex-up features (two yellow arrows in **d**). Yellow dashed boxes indicate panels expanded in **g**, **h** as indicated. **e**, Oblique view of the sample. **f**, Sample from the previous study[1], equivalent to face 1. Lines indicate the path of X-ray fluorescence scans in the previous study[1]. The 'd' denotes their scan through the stromatolite. **g**, PIXL element maps of stromatolite and matrix (yellow box in **c**). Dashed line marks the edge of the structure, below which the composition shows a gradient from a Ca–Mn–Fe-rich rim to a Si-rich interior. **h**. PIXL maps of the light-grey layer (yellow box in **b**) show elemental composition, including Ti and K depletion, identical to the 'stromatolite'.

Comments by Prof. Zuo-Zhen Han:

The authors critically discuss the earliest stromatolites in Earth's history found in Greenland 3.7 billion years ago (Nutman et al. 2016), arguing that they are tectonic products rather than stromatolites. Based on the study of Mesoproterozoic stromatolites, the authors propose three basic principles for identifying stromatolites in strata. Based on these principles, the authors concluded that there are unidentified stromatolites in the picture reported by Zawaski et al. (2020).

I think this paper is highly innovative and my concerns are mainly in two areas.

First, some basis should be provided for questioning the 3.7 billion-year-old stromatolites published by Nutman et al. (2016). The authors make a wholesale rejection of Nutman et al.'s basis for judging stromatolites, but some basis may be needed. For example, the authors point out that "The conic structures of their samples have bent top ends, their shape is not that of typical stromatolites because no stromatolite has a curved top", which easily leads to confusion as to why stromatolites cannot have curved tops. The morphology of stromatolites is variable and consists mainly of columnar (conical) and laminated (domed), with various other types belonging to a combination or transition of the two above. In fact, Nutman et al.'s (2016) paper in Nature was published on the same day as a press review in Science (Gramling 2016), which stated that - "Although the overall shapes of the stromatolites have survived—perhaps against all odds—many of the textural and chemical details within them have degraded significantly". Therefore, the researchers concerned are also aware of the lack of relevant structures in the current samples, but it has been very difficult to preserve the original depositional style given that these samples are really old. Alternatively, the characteristics of the Eocene stromatolites may differ from those of the 3.7 billion-year-old samples.

Second, the authors point out three principles for identifying stromatolites. In addition to columnar, domed and conical stromatolites, laminated stromatolites are also a very important one.

In addition to these two issues, there are some details. Problems with the labeling of Figures 1,2,3,5. The letters on the images need to be inconsistent with the description of the images.

individual formatting and grammar issues.

Line 30: Walter 'et al. (1980), remove redundant symbols.

Line 54: Delete redundant symbols.

Line 155: change axis to plural form axes.

—in an email on Nov. 19, 2022

Reply by Ya-Sheng Wu and Hong-Xia Jiang:

Thank you very much! Your comments are very helpful!

Comments by Prof. Timothy Huang :

Here's a thought: since these stromatolitic structures are associated with microbes, doing a "Chemical Fossil" analysis to see if there's any evidence of hopane would be compelling.

—in an email on Nov. 19, 2022

Reply by Ya-Sheng Wu and Hong-Xia Jiang:

Thank you very much! Your suggestion is very helpful!