Paper Number: 1802

Multicellular macrofossils from the Tonian Liulaobei Formation, North China

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Multicellularity arose independently multiple times in the evolutionary history of eukaryotes and simple multicellularity may have a deep history tracing back to Paleoproterozoic [1]. However, complex multicellular organisms with cellular and tissue differentiation did not appear in the fossil record until the Mesoproterozoic [2], and it is not until the Ediacaran Period when diverse assemblages of complex multicellular eukaryotes evolved [3][4]. In the intervening Tonian Period, the fossil record of multicellular organisms is poorly documented. To address this knowledge gap, we investigated carbonaceous macrofossils from the Tonian Liulaobei Formation in North China, using a combination of optional and electron microscopy. Our study revealed direct evidence of multicellularity in carbonaceous compression fossils that are in gross morphology similar to, but microstructurally distinct from *Chuaria* and *Tawuia*. These multicellular structures were revealed by backscattered electron microscopy (BSEM), indicating that the application of backscattered electron microscopy (BSEM) has the potential to open a floodgate of new microstructural information about seemingly simple Precambrian carbonaceous compressions [5] and to unveil the hidden diversity of multicellular organisms in the Tonian Period.

Keywords: Multicellularity, *Chuaria*, *Tawuia*, Liulaobei Formation, Backscattered electron microscopy

References:

[1]Butterfield N (2009) *Precambrian Research* 173: 201-211
[2] Butterfield N (2000) *Paleobiology* 26: 386-404
[3] Yuan X et al. (2011) *Nature* 470: 390-393
[4] Xiao S et al. (2014) *National Science Review* 1: 498-520
[5] Muscente A and Xiao S (2015) *PALAIOS* 30: 462-481
[2] Butterfield N (2000) *Paleobiology* 26: 386-404
[3] Yuan X et al. (2011) *Nature* 470: 390-393
[4] Xiao S et al. (2014) *National Science Review* 1: 498-520
[5] Muscente A and Xiao S (2015) *PALAIOS* 30: 462-481
Butterfield N (2009) *Precambrian Research* 173: 201-211
[2] Butterfield N (2000) *Paleobiology* 26: 386-404
[3] Yuan X et al. (2011) *Nature* 470: 390-393
[4] Xiao S et al. (2014) *National Science Review* 1: 498-520
[5] Muscente A and Xiao S (2015) *PALAIOS* 30: 462-481