

Report

Ancient steroids establish the Ediacaran fossil *Dickinsonia* as one of the earliest animals

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Science 21 Sep 2018:
Vol. 361, Issue 6408, pp. 1246-1249
DOI: 10.1126/science.aat7228

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- RE: Dickinsonia steroids not unique to animals.
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(3 October 2018)

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(October 3 2018)

Bobrovskiy et al. (1) have assembled impressive biomarker data which rules out three of five alternatives for the biological affinities of the problematic Ediacaran fossils Dickinsonia and Andiva. The cholesterol extracted from the fossils do indeed rule out affinities with lichenized fungi such as Ascomycota and Basidiomycota, and also with Rhizaria. This does not mean that Dickinsonia and Andiva were necessarily animals,

because a third fungal phylum, Glomeromycota, also produces cholesterol without ergosterol (2). The living lichenized glomeromycotan, *Geosiphon pyriformis*, is unusual in housing the photosymbiont inside enlarged cells (3), and its fossil record may include Precambrian problematica such as *Horodyskia* (4) and *Diskagma* ranging in age back 2.2 Ga (5). Glomeromycotan fungi are also known from Ediacaran acritarchs with attached hyphae, stalked vesicles, complex wall ultrastructure, and chitin composition demonstrated by FTIR (6). A glomeromycotan lichen fragment preserved by cellular permineralization also has been described from Ediacaran rocks of China (7). Cholesterol in *Dickinsonia* and *Andiva* permits both glomeromycotan and animal affinities, but additional observations provide a test of these alternatives. Bobrovskiy et al. (1) also found that the proportion of cholesterol relative to stigmaterol (a chlorophyte biomarker) increased in larger compared with smaller *Dickinsonia*. This is not what would be expected for a slow-moving or sessile animal increasingly fouled with algae as it grew, nor would such a regular decline be expected from vagaries of animal-feeding on algae. Declining stigmaterol with increasing cholesterol is compatible with building of fungal biomass by controlled populations of photosymbiotic algae. *Dickinsonia* and *Andiva* may have been glomeromycotan fungi lichenized with green algae. Undisputed Ediacaran animals trace and body fossils are small (< 5mm diameter) and vermiform with chitin or calcite skeletons, and have been characterized as Ediacaran Wormworld (8). In contrast, *Dickinsonia* and *Andiva* are part of a diverse group of large (up to 1.4 m) and unskeltonized, crustose to foliose, quilted organisms, from very different sedimentary facies (9), and could be characterized as Ediacaran Mattressland.

References and Notes

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Competing Interests: None declared.

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