

## PRE-EDIACARAN MULTICELLULAR LIFE: HARBINGER OF A PHANEROZOIC RADIATION.

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Multicellular organisms must have had a substantial pre-Ediacaran history, but the fossil evidence is sparse and often equivocal. The taxonomic resolution necessary to constrain phylogenetic hypotheses is limited largely to Lagerstätte-grade fossils that retain evidence of diagnostic cell division patterns. Uniseriate and multiseriate filaments in the 1267-723 Ma Hunting Formation, Somerset Island, derive from transverse and longitudinal intercalary cell division programs indistinguishable from those of the modern red alga Bangia, and establish a significantly pre-Ediacaran datum point for the Rhodophyta. Likewise, on the basis of a distinctive "segregative cell division", three taxa of siphonocladalean green algae (Chlorophyta) are identified in the ca. 750 Ma Svanbergfjellet Formation, Spitsbergen. Process-bearing vesicles in the Svanbergfjellet sequence further compare with the germinating zoospores of the modern chromophyte alga Vaucheria, while convincing Vaucheria-like thalli are reported from ca. 900 Ma deposits in Siberia. The broad co-occurrence of multicellular Rhodophyta, Chlorophyta, and Chromophyta by at least 750 Ma ago accords well with molecular evidence that suggests the three principal algal clades diverged from a common ancestor during a brief but marked radiation relatively late in eukaryote evolution.

Complex multicellularity featuring cellular and tissue(?) differentiation is also encountered in the pre-Ediacaran fossil record. A large ornate form in the Svanbergfjellet succession preserves at least six readily distinguishable cell types and, despite its taxonomic uncertainty, can be characterized as at least as complex as the most complex modern algae or fungi. No cellularity is preserved in the late Proterozoic macrofossil Tawuia; however, SEM and light microscopy of its isolated wall reveal a complex histology suggestive of a relatively advanced grade of multicellularity. Another Svanbergfjellet macrofossil has a distinct wall structure and bears a terminal pair of large reniform structures; if these prove to be truly bilaterally symmetrical, this fossil represents a grade of organization otherwise not recognized until the Ediacaran. Further analysis of these and other pre-Ediacaran 'problematica' may clarify their taxonomic relationships and promises to resolve at least some of the 'Cambrian explosion' into a meaningful sequence of evolutionary change.