Ediacaran fossils suggest a role for chemosynthesis in early animal evolution

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Characterizing the affinities and mode of life of large, enigmatic members of the Ediacaran biota, such as those found at Mistaken Point, Newfoundland, has been challenging. Many Ediacaran animals, such as the enlarged rangeomorphs, were non-motile and had extensive surface areas in close contact with the seafloor, which likely constituted a redox interface given the absence of bioturbation at that time. We argue that these animals had a simple, diploblastic body plan and probably derived nutrients from chemosynthetic bacteria thriving at the sediment–water interface. The large surface area of some Ediacaran animals was likely an adaptation for maximizing a phagocytotic or chemosymbiotic surface, as observed in many living chemosymbiotic animals. Oxygen could have been transported along the ventral surface of Ediacaran animals by diffusion through mesenchyme or by ciliary pumping, effectively stimulating the productivity of chemosynthetic microbes along this surface. This oxygen transport could simultaneously restrict the build-up of sulphides in the pore waters below the bodies of these animals, and enhance their food source.