The Environmental Context of Early Animal Evolution

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Animals originated and evolved during one of the most unique times in Earth history—the Neoproterozoic Era—and early animal evolution has long been causally linked to environmental change during this interval. However, geochemical patterns of change are often noisy, and no stratigraphic section covers the entirety of Earth history; global database studies are required. Here, data from the Sedimentary Geochemistry and Paleoenvironments Project (SGP) will be used to demonstrate how machine learning methods and an increased emphasis on accounting for sampling bias can yield a more resolved pattern of environmental change in deep time. The talk will also discuss the prospects and pitfalls of 'team science' approaches in the geological sciences. The results suggest that early animals evolved in a Neoproterozoic world that had lower oxygen levels and lower primary productivity than the Paleozoic, although the magnitude of oxygen change at the dawn of the Phanerozoic was likely less than commonly hypothesized. Finally, ecosystems along modern natural gradients of oxygen and primary productivity will be used to conceptualize Neoproterozoic ecosystems and deduce the possible role of environmental change in the Cambrian 'explosion' of animal life.

Biography: I graduated with an undergrad and Master's from Stanford University, and after my doctorate and postdoc on the East Coast I feel very lucky to be back in the Bay Area teaching at Stanford again. My research interests are Earth history and the evolution of life, and the interactions between the biosphere and the geosphere. As such, this research can generally be considered paleontology, insofar as paleontology encompasses all aspects of the history of life. My research incorporates multiple lines of evidence, and multiple tools, to investigate questions in the history of life. These lines of evidence include fossil data, molecular phylogenetics, sedimentary geochemistry, and ecological and physiological data from modern organisms. Ultimately, the goal is to link environmental change with organismal and ecological response through the lens of physiology.