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The Redfield ratio through geological time

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Earth's oxygen history has relied on our understanding of the dynamics that can either promote or impede oxygenation, with oxygenic photosynthesis and carbon burial being the primary mechanism to create free O_2. For geological studies, this biological process has largely trusted the assumption of the composition of organic matter strictly following the canonical Redfield ratio[1]. This ratio has been explored more effectively at present day demonstrating that whilst on average the Redfield ratio is preserved, there are significant deviations depending on ambient environmental conditions[2,3]. In this talk, I will explore this elemental variability which is often overlooked in studies of biogeochemistry through deep time and present a simple biogeochemical model of the Earth surface system that explores the stoichiometry of essential elements in organic matter. In doing so, this model not only offers insight into nutrient availability through time but also an additional layer of complexity in understanding Earth's habitability.

[1]Redfield (1958) *Am. Sci.* **46**, 205-221
[2] Galbraith and Martiny (2015) *PNAS* **112**, (27) 8199-8204
[3] Planavsky (2014) *Nature Geoscience* **8**, 855-856