

Regulation of phosphate, nitrate and oxygen in the ocean over geologic time

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Paying homage to Redfield's work on "The biological control of chemical factors in the environment" (Redfield, A.C. (1958), *American Scientist*, **46**, 205–21), my talk will re-examine what controls the amounts and proportions of phosphate, nitrate and oxygen in the ocean over geologic timescales. Simple models of the coupled N, P, C and O₂ biogeochemical cycles will be used to reconstruct changes in ocean composition over the Phanerozoic (the past 550 million years) and in more detail over the past 130 million years, for which there is a global phosphorus burial record.

I will focus in particular on times of increased ocean anoxia when the concentrations of NO₃, PO₄, and O₂ are predicted to have deviated further from the Redfield ratios. A causal mechanism will be put forward to explain the series of quasi-periodic Oceanic Anoxic Events (OAEs) that occurred in the mid-Cretaceous warm period (120–80 million years ago).