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Oxygen and the Evolution of Eukaryotic Ecosystems - *V.M. Goldschmidt Award Lecture*

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It is generally agreed that eukaryotes evolved into an oxygenated environment. After this, there is very little consensus as to the timing of major events in eukaryote evolution, the history of atmospheric oxygen and whether major evolutionary events were coupled to dynamics in atmospheric oxygen levels. In this talk I will make the case that: 1) stem group eukaryotic ecosystems were in place by 1400 million years ago (Ma), and probably by 1700, 2), that levels of atmospheric oxygen of at least 2-3% present levels (PAL), permissive of eukaryotic ecosystems, where common, if not typical from at least 1700 Ma and onwards, 3) that oxygen levels permissive of animal evolution were in place long before animals evolved, and 4) while oxygen dynamics may not have "enabled" animal evolution, animals evolved into oxygen levels much lower than today. Subsequently higher levels of oxygen may have required animals to evolve internal oxygen regulating mechanisms to combat the ill effects of higher oxygen concentrations.