

Prevailing views on the co-evolution of life and oxygen

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Our current community's understanding of the co-evolution of Earth's surface and the biosphere is built on 50+ years of interpretations, which makes it necessary to critically review and continually assess the status quo of our field. Here we provide results of an expert elicitation study, addressing the current paradigm of the evolution of oxygen, the interplay between the evolution of both microscopic and macroscopic life with environmental oxygen concentrations, as well as the most sought-after avenues for future research. With over 130 individual responses from our community including: geochemists, palaeontologists, Earth system modellers, field-based geologists, and palaeobiologists, we take note of the current disciplinary diversity and inclusion within the field, as well as the promising active participation of early career researchers. Nuances such as the nature of oxygenation events and their principally defining proxies, the predominantly viewed evidence for first occurrences, and the driving mechanisms for evolution, are all considered as part of our community's collective opinion. We also actively discuss the role various uncertainties play in our understanding and the degree to which each of these impacts our interpretations. While cohesion of survey results within subdisciplines is apparent, there is a clear lack of discussion and interdisciplinary conversation when regarding the role oxygen did, or did not, play on the evolution of the biosphere.