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Microfossils' diversity from the Proterozoic Taoudeni Basin, Mauritania

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Prokaryotes and microscopic eukaryotes are known to have appeared well before the Cambrian's adaptative radiation which flourished perceptibly as a generalized macroscopic world. What do we know about the trigger events which stimulated eukaryotic diversification during the Proterozoic? Biological innovations or environmental changes, and indeed probably both (Knoll et al., 2006), played a fundamental role controlling this important step of life's evolution on Earth. Javaux (2011), proposed a diversification pattern of early eukaryotes divided into three steps and focusing on different taxonomic levels, from stem group to within crown group, of the domain Eukarya.

Here, we present a new, exquisitely preserved and morphologically diverse assemblage of organic-walled microfossils from the 1.1 Ga El Mreiti Group of the Taoudeni Basin (Mauritania). The assemblage includes beautifully preserved microbial mats comprising pyritized filaments, prokaryotic filamentous sheaths and filaments, microfossils of uncertain biological affinity including smooth isolated and colonial sphaeromorphs (eukaryotes and/or prokaryotes), diverse protists (ornamented and process-bearing acritarchs), as well multicellular microfossils interpreted in the literature as possible xanthophyte algae. Several taxa are reported for the first time in Africa, but are known worldwide. This study improves microfossil diversity previously reported by Amard (1986) and shows purported xanthophyte algae contrary to a previous biomarker study suggesting the absence of eukaryotic algae, other than acritarchs, in the basin (Blumenberg et al., 2012). This new microfossil assemblage and others provide, all together, evidences of early and worldwide diversification of eukaryotes.

Thereby, those first qualitative results also provide a basis for further and larger quantitative studies on the Taoudeni Basin. To better understand the palaeobiology (stem or crown group, aerobic or anaerobic metabolism) and palaeoecology (habitat diversity) of early eukaryotes, we are combining morphological, microchemical and ultrastructural studies of microfossils, with high-resolution palaeoenvironmental and palaeoredox characterization.

References:

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