

# Emerging picture of a pre-Cryogenian eukaryotic community based on immature molecular fossils

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Steranes, the molecular fossil of eukaryotic organisms, are exceedingly scarce in the pre-Ediacarian Neoproterozoic. Only the ~740 Ma Chuar Group of the Grand Canyon in Arizona has yielded clearly indigenous steranes so far [1]. However the distribution of steranes in the Chuar Group is unique with a predominance of the C<sub>27</sub> sterane approaching 100%, a pattern never observed again in the geological record. But it remains unclear whether this unusual distribution is global and representative of the evolutionary state of mid-Neoproterozoic Eukaryotes or, conversely, the signal of an unusual local ecology.

Here we present exceptionally well preserved indigenous steranes from the Buldya Group of the Officer Basin in Western Australia, aged 725-820 Ma [2]. In this time period, the Officer Basin was presumably located in the north of the supercontinent Rodinia, distant from the Chuar Group of thousands of kilometers. The group mostly consists of finely laminated dolomites, mudstones and sandstones deposited in a shallow marine to subaerial environment. The samples show fine sedimentological features and some are barely consolidated despite their age. Maturity indicators based on sterane and hopane isomer ratios and other organic compounds place the sediment in the immature range of petroleum generation. The biomarkers are probably the best preserved hydrocarbons of Precambrian age that are currently known. The sterane distribution reveals the same strong C<sub>27</sub> sterane predominance observed in the Chuar Group, suggesting this is a global and time diagnostic signal that represents the state of eukaryote evolution in the mid-Neoproterozoic.

[1] Summons et al. (1988) *Geochimica et Cosmochimica Acta* **52**, 2625-2637. [2] Grey et al. (2005) *Geological Survey of Western Australia Report* **93**, 89p.