

**Potential controls on evolution  
of complex eukaryotic  
organisms by bio-essential trace  
element availability in  
Proterozoic oceans: Evidence  
from the McArthur Basin,  
Northern Australia**

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Three marine black shale formations, Wollgorang Fm. (~1730 Ma), Barney Creek Fm. (~1640 Ma), and Velkerri Fm. (~1400 Ma), from three different groups Tawallah Gr., McArthur Gr., Roper Gr., of the McArthur Basin respectively, have been studied in terms of their sedimentary environment and marine pyrite trace element (TE) chemistry. This study aims to track changes in TE availability in the ocean during the 1800 to 1350 Ma time span and relate nutrient TE variations with biologic activity using available paleontological information.

Results of the study provide for the first time, concentrations of a set of bio-essential nutrient trace elements in three different formations, which allow speculations on the factors that controlled their concentrations and variation. This study concludes that a combination of geochemical and tectonic processes operative during the Mesoproterozoic from 1730 Ma to 1400 Ma in the McArthur Basin is responsible for the TE trends we observe. This nutrient TE trend is an additional factor to help explain the evolution of eukaryotic organisms in the McArthur Basin.