Marine photoferrotrophs and their trace element contributions to precambrian banded iron formations

K. O. KONHAUSER[1*], D. S. ALESSI[1], L. J. ROBBINS[1], Y. LIU[1], R. E. MARTINEZ[2], S. V. LALONDE[3], A. M. MLOSZEWSKA[4], A. KAPPLER[4] AND Y. LI[5]

[1]Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, T6G 2E3, Canada (*correspondence: kurtk@ualberta.ca)

[2]Institut für Geo- und Umweltnaturwissenschaften Mineralogie-Petrologie, Albert Ludwigs Universität, Freiburg, 79104, Germany

[3]CNRS-UMR6538 Laboratoire Domaines Océaniques, European Institute for Marine Studies, 29280 Plouzané, France

[4]Center for Applied Geosciences, University of Tübingen, Tübingen, D-72076, Germany

[5]Department of Earth Sciences, The University of Hong Kong, Hong Kong

Banded iron formations (BIFs) are prominent sedimentary deposits of the Precambrian, consisting of alternating iron-rich (hematite, magnetite and siderite) and silicate/carbonate (quartz, clays, dolomite, ankerite) layers. On the basis of chemical analyses from BIF units of the 2.5 Ga Dales Gorge Member of the Hamersley Group in Western Australia, it was previously suggested that most, if not all, of the iron in BIF could have been precipitated by anoxygenic photosynthetic bacteria (photoferrotrophs) in cell densities considerably less than those found in modern Fe-rich aqueous environments [1]. Here, we expand that earlier work by showing that similar phytoplankton densities could have assimilated and/or adsorbed significant amounts of bioessential trace elements (P, Mn, Co, Cu, Zn, Mo, Cd) from the marine photic zone. Given recent suggestions that Eoarchean BIF were likely precipitated by photoferrotrophs [2], and doubts pertaining to the chemical reactivity of the precursor ferric hydroxide particles during BIF deposition [3], our findings demonstrate that sedimenting phytoplankton could be an underappreciated driver for the transfer of trace elements from the Precambrian water column to the seafloor.

[1] Konhauser *et al*. (2002) *Geology* **30**: 1079-1082. [2] Pecoits *et al*. (2015) *Geobiology* **13**: 1-14. [3] Konhauser *et al*. (2007) *Science* **315**: 1234.