



Biosignatures of modern and fossil cyanobacteria

Catherine Demoulin^{1,*}, Yannick Lara¹, Camille François¹, Emmanuelle J Javaux¹

¹Palaeobiogeology-Palaeobotany-Palaeopalynology, UR GEOLOGY, Geology department, University of Liège, Liège, Belgium.

[*cdemoulin@uliege.be](mailto:cdemoulin@uliege.be)

The Proterozoic is an important eon for the evolution of early life on Earth, and especially for the diversification of cyanobacteria, a major group of photosynthetic microorganisms. In paleontology, much effort and work are devoted to the study of cyanobacteria, due to their key-role in the oxygenation of the atmosphere and oceans during the GOE (Great Oxidation Event, around 2.4 Ga). Moreover, the development of oxygenated ecological niches is one of the factors linked to the diversification of eukaryotes. However, identifying extremely old microfossil structures as cyanobacteria remains often disputed. The oldest fossil cyanobacterium (~ 1.9 Ga) determined so far with certainty is *Eoentophysalis belcherensis* Hofmann, a microorganism forming mats and colonies in silicified stromatolites from the Belcher Islands, Hudson Bay, Canada [1]. Its identification as a cyanobacterium relies mainly on morphological comparison to a modern cyanobacterium, *Entophysalis* Ercegović [2].

In this context, our research project, financed by the ERC StG ELiTE, mainly aims at characterizing the biosignatures of Proterozoic cyanobacteria in order to get new insights into the origin and early evolution of cyanobacteria and oxygenic photosynthesis. Methodologically, we are using optical microscopy, electron microscopy (SEM and TEM) and Raman and FTIR microspectroscopy techniques, applied on modern specimens and microfossils. This approach is expected to test the biological nature of Paleoproterozoic and younger microstructures, to resolve the affinities of possible prokaryotic microfossils and, thus, to assess their taxonomic placement among cyanobacteria.

[1] Hofmann, H. J. (1976). Precambrian microflora, Belcher Islands, Canada: Significance and systematics. *Journal of Paleontology*, 50, 1040 – 1073.

[2] Golubic, S. and Hofmann, H. J. (1976). Comparison of Holocene and Mid-Precambrian Entophysalidaceae (Cyanophyta) in stromatolitic algal mats: Cell division and degradation. *Journal of Paleontology*, 50, 1074 – 1082.