Do we really know Apex Chert? Newly identified micro- and dubio-fossils

RAYMOND MINEAU[1], DANIELE L. PINTI[2]* AND VALENTIN CLEMENT[3]

[1]Dépt. Sciences de la Terre et Atmosphère, UQAM, Montréal H2X 3Y7, QC, Canada (mineau.raymond@uqam.ca)
[2]GEOTOP-UQAM-McGill, Montréal, H2X 3Y7, QC, Canada (*correspondence: pinti.daniele@uqam.ca)
[3]Now at : Institut du Physique du Globe, 4 place Jussieu 75252 Paris cedex 05, France (clement@ipgp.jussieu.fr)

The 3465 Ma old Apex Chert is probably the most studied Precambrian rock to date, since carbonaceous filaments, interpreted as cyanobacteria, were found more than two decades ago [1]. The occurrence of microfossils has been recently contested on the basis of the mineralogy of the sample and the carbon isotopes of the filaments, which suggests an inorganic, hydrothermal origin for the carbon [2]. Apex Chert has been studied with the most advanced techniques in microscopy and geochemistry, yet there are not evidences of other bacteriomorph structures than the carbonaceous filaments above mentioned.

We analyzed a slightly polished section of Apex chert using a HITACHI S-4300SE/N with field effect scanning at variable pressure at GEOTOP. The sample was collected at the « Schopf Locality » at Chinnaman Creek, Pilbara Craton, Western Australia. SEM-EDX analyses allowed identifying euhedral and anhedral barite; native metals containing Zn, Cu and As; rare euhedral Ca-aluminosilicates; jarosite-alunite. The observed mineral assemblage is consistent with an hydrothermal origin of the chert [2]. We observed isolated sinuous flatted silica filaments and clusters of silica needles (0.1 μm wide; 2 μm long). Silica needles have rounded extremities, smoothed surfaces and several among them show an open tube in the centre. These morphologies are similar to those observed during encrustation of unsheathed microbes by amorphous silica. More interesting, we found ramified, sinuous, tubular structures in cavities previously occupied by sulfates (likely jarosite-alunite). These morphologies look similar to cyanobacterial mats observed in Paleozoic jaspilites. We cannot yet decipher if these silica structures are syngenetic to Apex Chert or of secondary origin. However, these results clearly show that Apex Chert has not yet completely revealed its content and new investigations are neded to resolve its origin.

[1] Schopf (1993) *Science* **260**, 640-646. [2] Brasier *et al*. *Nature* **416**, 76-81.

The origin, nature and consequences of the Circum-Superior 1880 Ma Large Igneous Province

MATTHEW MINIFIE[1]*, ANDREW C. KERR[1], RICHARD E. ERNST[2] AND JULIAN A. PEARCE[1]

[1]School of Earth and Ocean Sciences, Cardiff University, Main Building, Park Place, Cardiff CF10 3AT, United Kingdom (*correspondence: minifiemj@cardiff.ac.uk)
[2]Ernst Geosciences, 43 Margrave Avenue, Ottawa, Ontario K1T 3Y2, Canada

In the last two decades, the advancement in high-precision U-Pb geochronology has led to the recognition of a new Proterozoic (1.88 Ga) large igneous province (LIP) circumscribing a significant portion of the margins of the Superior craton in Canada. This province consists of mafic-ultramafic lavas, sills and dykes, as well as minor felsic, carbonatitic and lamprophyric volcanics and intrusives. Previous petrogenetic models have not considered the various segments as part of the same LIP and instead have invoked several geodynamic origins such as mid-ocean ridge spreading, back-arc rifting and foredeep basin flexure. This project will utilise new geochemical, isotopic and geochronological data to assess the petrogenesis of the 'Circum-Superior LIP' and represents the first attempt to explain its petrogenesis as a mantle-plume-related single entity.

A plume origin is considered a possibility given the presence of a giant radiating dyke swarm with a focal point in the Molson-Thompson promontory of the Superior craton. These dykes extend into the interior of the craton and along with several carbonatite complexes mark the presence of ~1880 Ma magmatism in the craton centre as well as on its margins. Geochemical analyses thus far are in support of a plume origin. Many of the magmatic rocks possess rare earth and trace element patterns similar to Phanerozoic oceanic plateaux such as the Ontong Java and have Nb/Y-Zr/Y consistent with plume-derived magmas. A heterogeneous source region is suggested by the presence of basaltic lavas on the Flaherty Islands with enriched trace element signatures and positive Nb-Ta anomalies.

The Circum-Superior LIP is also of interest as it offers the opportunity to look into the links between LIPs and Ni-Cu-PGE sulphide deposits and is coeval with a major environmental disturbance and several other LIPs or remnants of LIPs in Archaean cratons worldwide.