



## **A field and petrographic guide to the habitat of carbon in the Chinaman Creek area, Pilbara, W. Australia**

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The Chinaman Creek area of the Pilbara represents a key site for studies of the Early Archaean earth and habitats for earliest life, yet until recently it has been poorly described in the literature. For some time this area has been at the centre of the hotly contested 'Apex Chert debate'. Structures resembling remarkably preserved microfossils were first described from the 3.46Ga stratiform Apex Chert [1] and these held their place in Archaean palaeobiology for a number of years.

Interestingly, no detailed geological map was presented with this work and it has since been shown [2] that the geological context was misinterpreted – the microfossil like structures actually occur some 100m down a 1.5km long carbonaceous chert dyke system. Our recent investigations showing these purported microfossils to be pseudofossils that formed from the reorganisation of carbonaceous matter during the recrystallisation of amorphous silica to chalcedony has increased the profile of the Chinaman Creek area still further.

Several years of integrated field and petrographic study by us reveal that the carbonaceous cherts have a distinctive distribution across three structural blocks in which sedimentation was controlled by growth fault movements [3]. A major question of current interest is the source for the abundant carbon in the numerous, putatively hydrothermal dyke systems. One hypothesis is that this carbon was injected downwards from the surface as neptunian infills during fault movement. A second hypothesis is that this carbon originated from biological processes within the hydrothermal dyke system and a third hypothesis would argue that this carbon arises from purely abiotic (Fischer-Tropsch type) synthesis associated with the hydrothermal system. The arguments for and against each of these hypotheses will be examined here. The conclusions will have

important implications for the origins of life itself.

We here present a detailed geological map and give a virtual field excursion and accompanying petrographic descriptions of the important rock units and fabrics of the area.

[1] Schopf, J. W. 1993. Microfossils of the Early Archaean Apex Chert: new evidence for the antiquity of life. *Science* 260, 640-646.

[2] Brasier, M. D., Green, O. R., Jephcoat, A. P., Kleppe, A. K., Van Kranendonk, M. J., Lindsay, J. F., Steele, A. and Grassineau N. V. 2002. Questioning the evidence for Earth's oldest fossils. *Nature* 416, 76-81.

[3] Brasier, M. D., Green, O. R., Lindsay, J. F., McLoughlin, N., Steele, A. and Stoakes, C. 2005. Critical testing of Earth's oldest putative fossil assemblage from the ~3.5 Ga Apex Chert, Chinaman Creek Western Australia. *Precambrian Research*, 140, 55-102.