Life on Earth before 3.83 Ga?
Carbonaceous Inclusions from Akilia (West Greenland)

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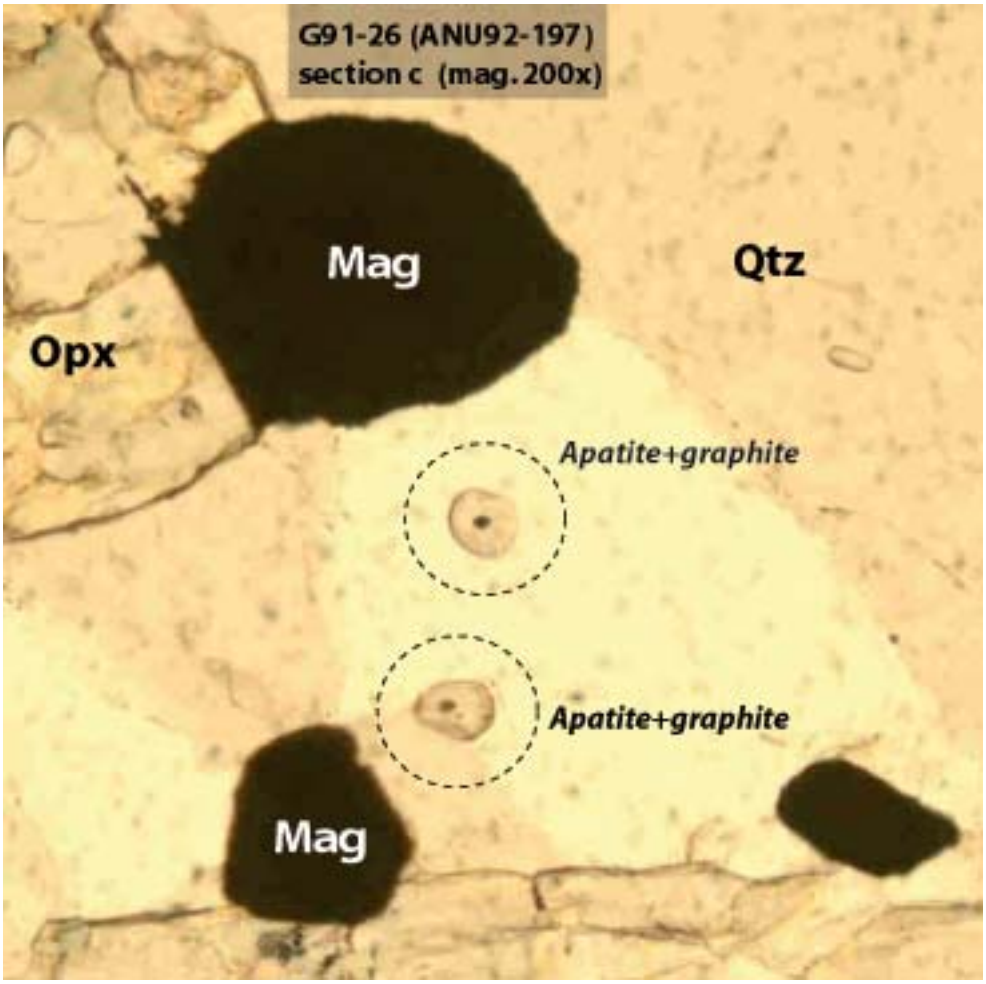
The earliest records of life on Earth have been obscured by the intense metamorphism experienced by terranes older than ~3500 Ma; fragile microfossil shapes become obliterated, and chemical/isotopic biosignatures are potentially blurred, overprinted, mimicked or erased. Prior studies sought to overcome this dilemma utilizing *chemofossils* – biosignatures resistant to physical and chemical change since formation – in the search for possible traces of a biosphere in pre-3.8 Ga rocks. Interpreting the geology, age and origin of the oldest rocks is fraught with difficulty, yet new field- and laboratory-based techniques permit direct assessment of proposed evidence for early life in the >3.83 Ga *Akilia association* on Akilia (island) in southern West Greenland.

We have completed a comprehensive program of sampling guided by mapping at the appropriate scale (1:100) of these units. This new work, coupled with comprehensive structural, geochemical and geochronological analyses, provides a detailed understanding of the petrogenesis of the Akilia rocks. Our findings (i) corroborate a sedimentary (rather than 'metaigneous') origin for Fe-rich quartz pyroxene (*Qp*) units as supported by separate trace element, REE, $\delta^{18}O$, $\Delta^{33}S/\_^{34}S$ and $\delta^{56}Fe$ isotope studies; (ii) validate a >3.83 Ga age for *Qp* units on Akilia, the oldest known rocks of sedimentary origin; and (iii) verify by optical mapping, _FTIR characterizations and further geochemical analyses, the presence of apatite-hosted graphite in *Qp* units (Figure 1; *cf.* Lepland et al., 2005). These results lend support to our original view that the simplest explanation for depleted ^{13}C in carbonaceous inclusions in apatite from Akilia metasediments is that life had emerged on Earth prior to 3.8 Ga (Mojzsis et al., 1996).

Figure 1.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