

# Barberton Barite Drilling Project: A window on Archean microbial metabolisms

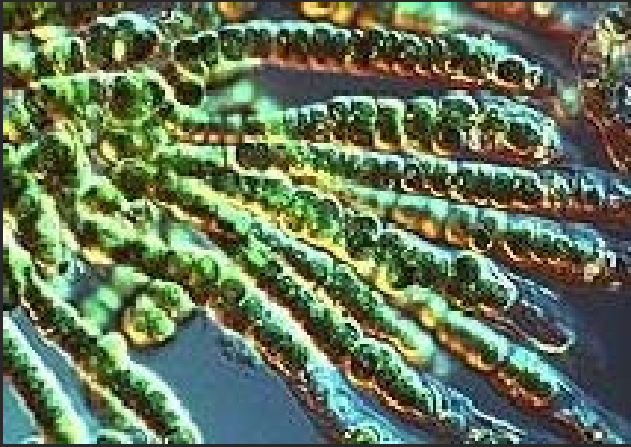
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*IPGP, Paris*

**M. Van Zuilen**  
*now at Center for Geobiology, Bergen*

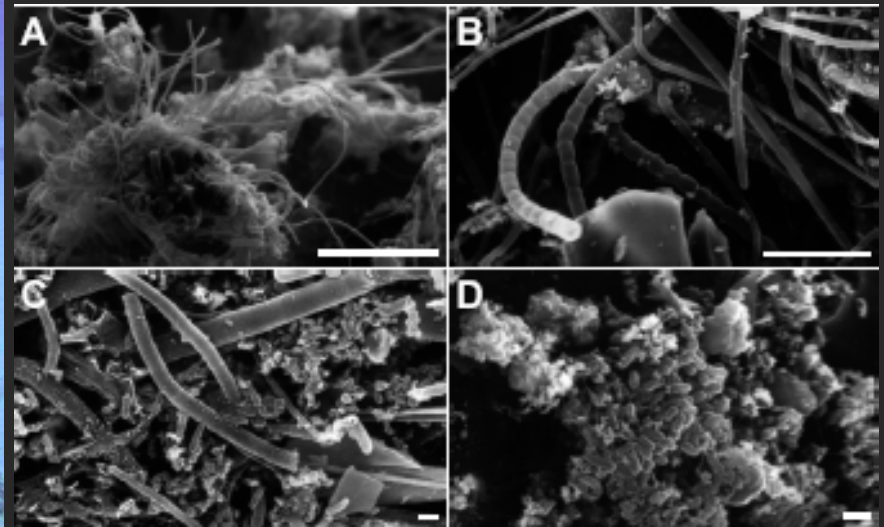
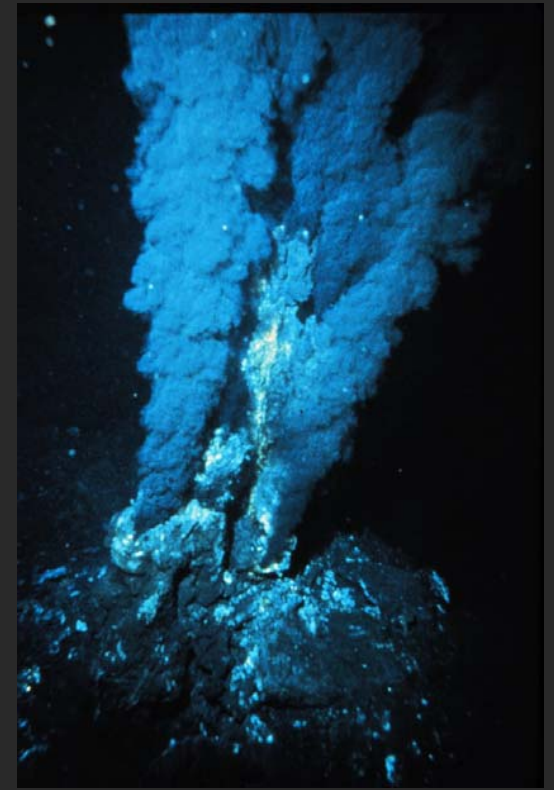
**M. De Wit**  
*AEON, Cape Town*



# Early traces of life?

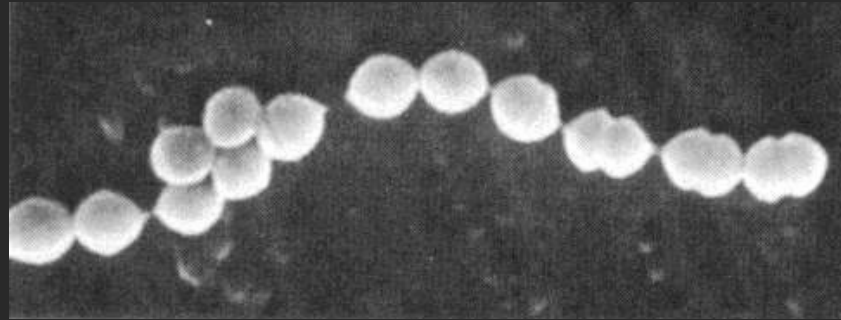
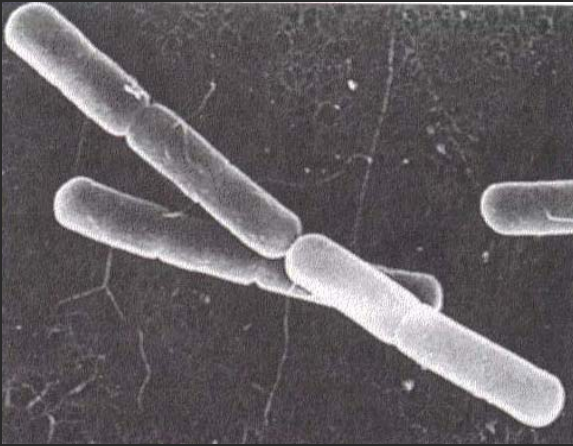


cyanobacteria



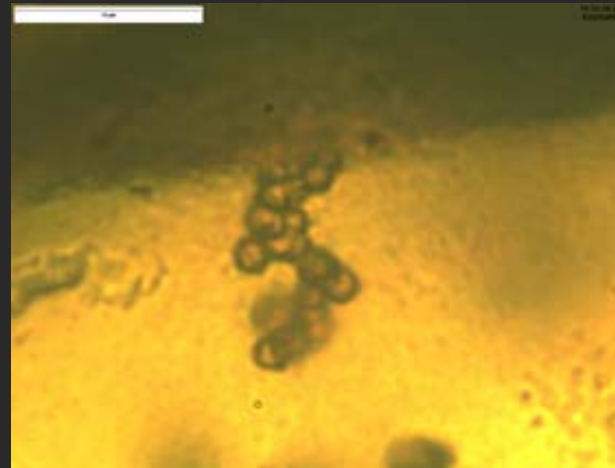
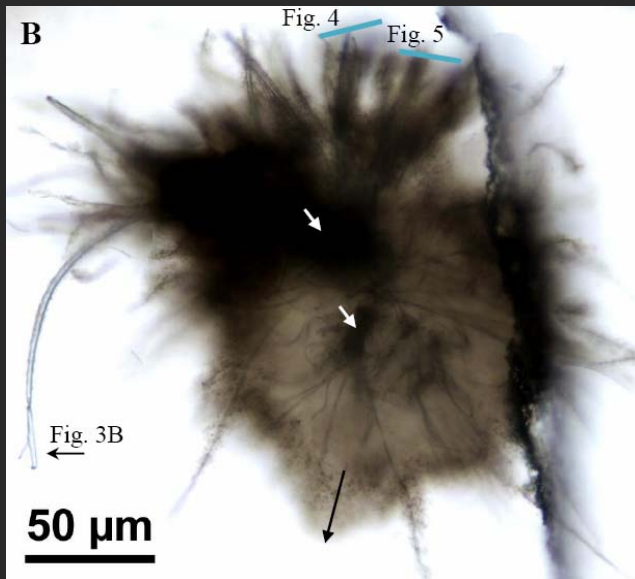
$\epsilon$ -protobacteria

## Modern microorganisms

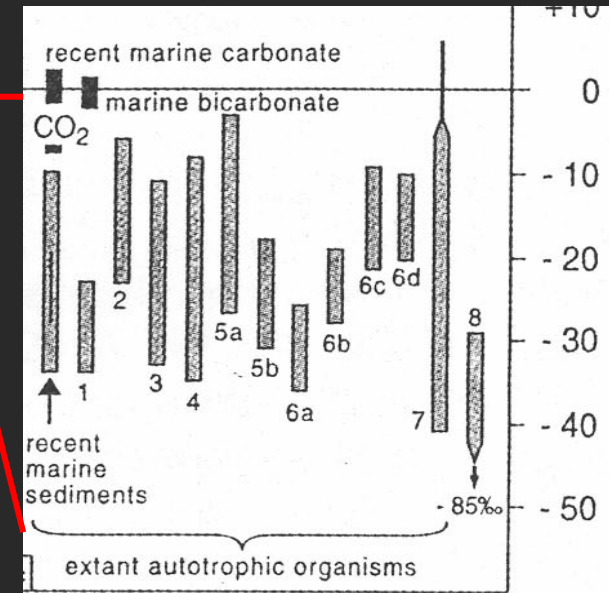
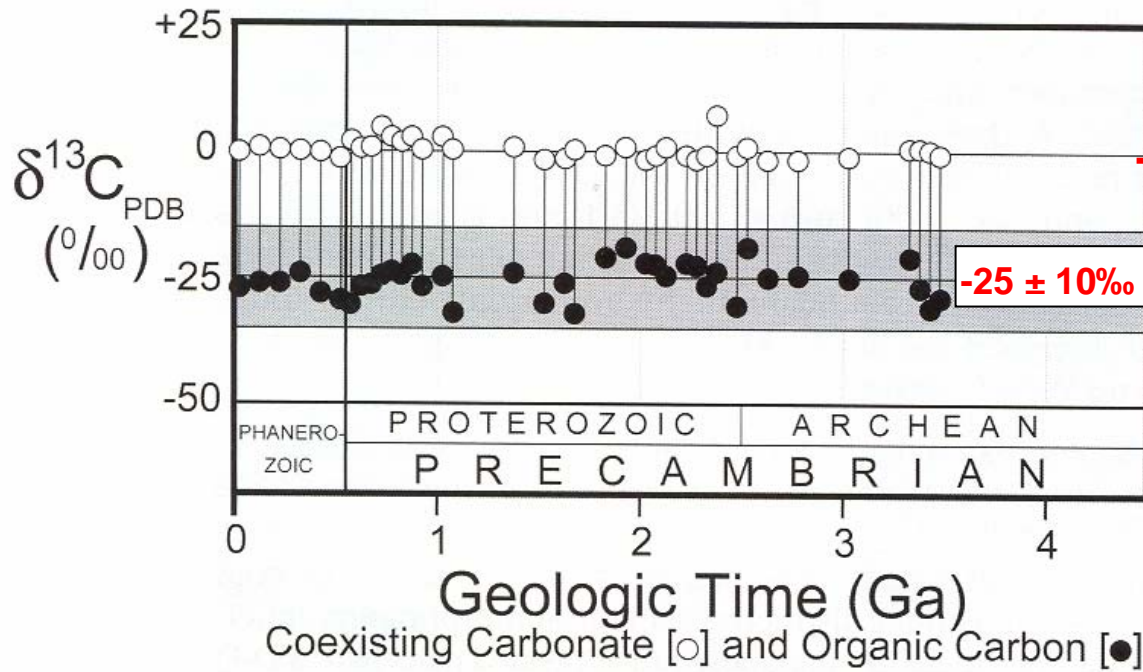


Morphology and the occurrence of organic matter alone are not proofs

## Archean microfossils or mineral artefacts?

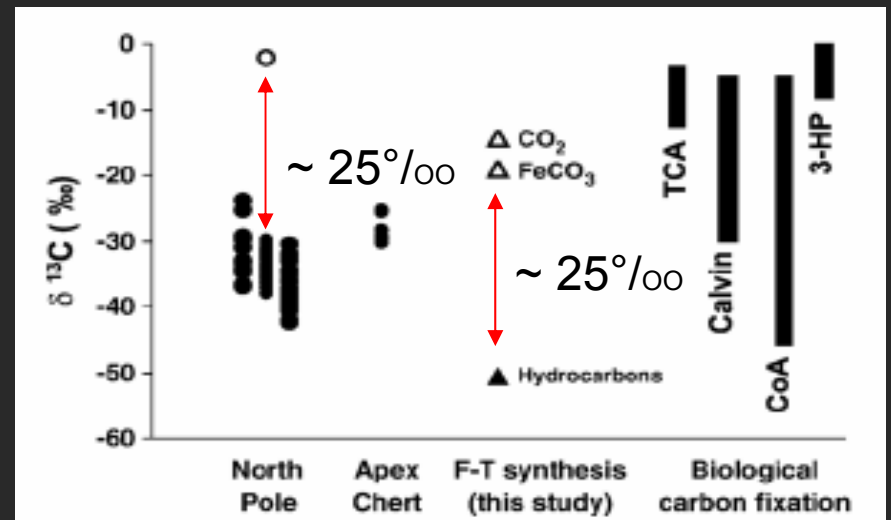






« *C'est la vie* »

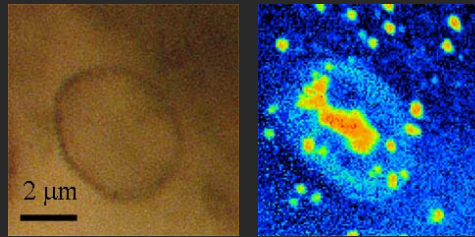
*Not necessarily!*  
*Geochemical indicators*  
*alone are not proofs*



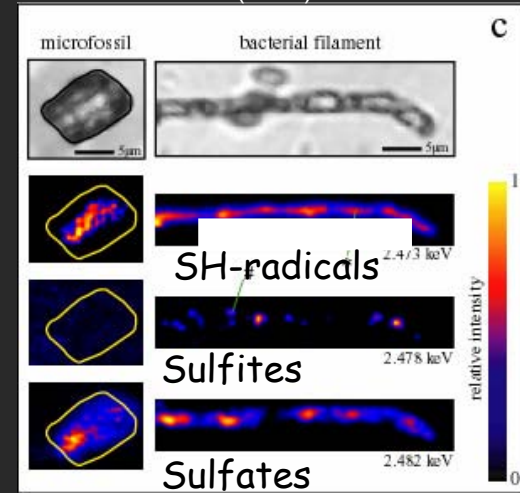
## In situ techniques :

- Laser Raman mapping
- Synchrotron  $\mu$ XANES- $\mu$ SXRF- $\mu$ FTIR- $\mu$ STXM
- SIMS chemical mapping & isotope analysis (C, S, Si)
- SEM-TEM

Robert et al., Astrobiology (2005)



Foriel et al GCA (2004)



## Isotope systematics (C, S, Fe, Se, Si, Mo...):

Carbon ( $\delta^{13}\text{C}$ , PDB):

- photosynthesis
- Methanogenesis, methanotrophy

Sulfur ( $\delta^{34}\text{S}$ ,  $\Delta^{33}\text{S}$ , CDT):

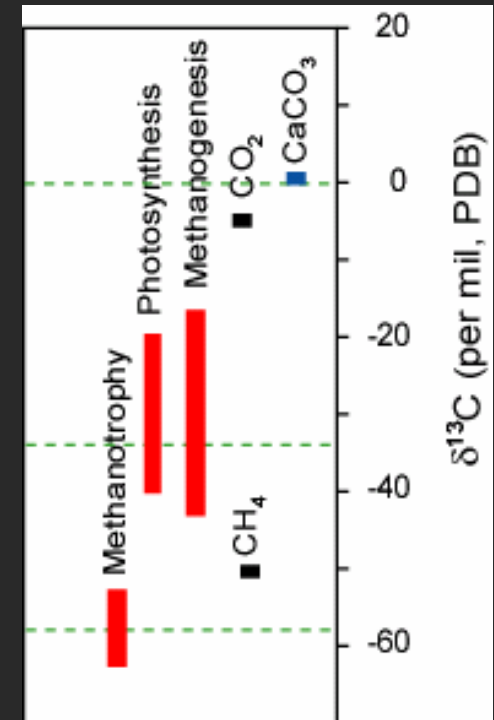
- Sulfate &  $\text{S}^0$  reduction / MIF-S

Iron ( $\delta^{56}\text{Fe}$ , IRMM-14):

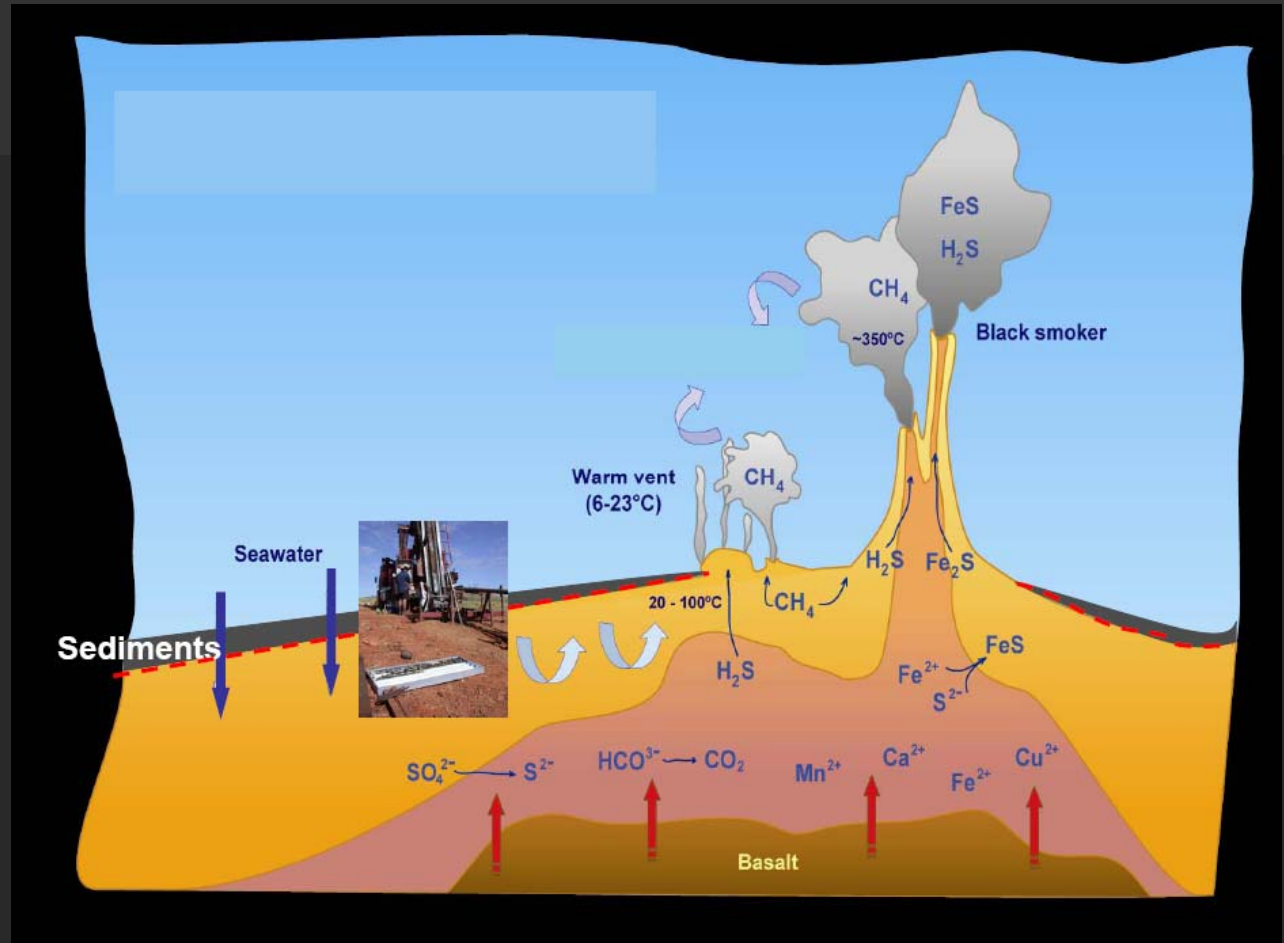
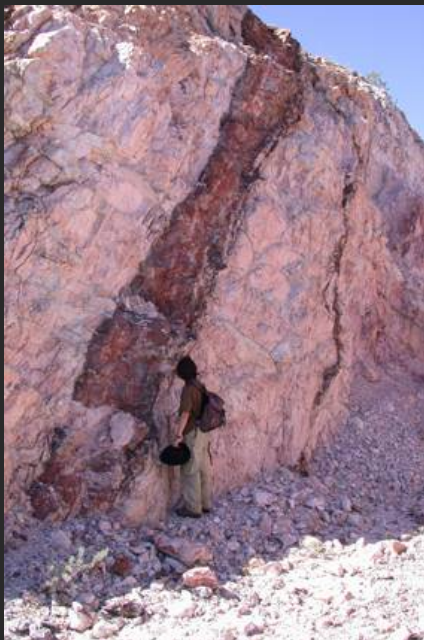
- Dissimilatory Fe reduction
- Anoxygenic photosynthesis

## Pristine drill cores :

- Non weathered samples
- No to low modern microbial contamination



# Drilling the outback

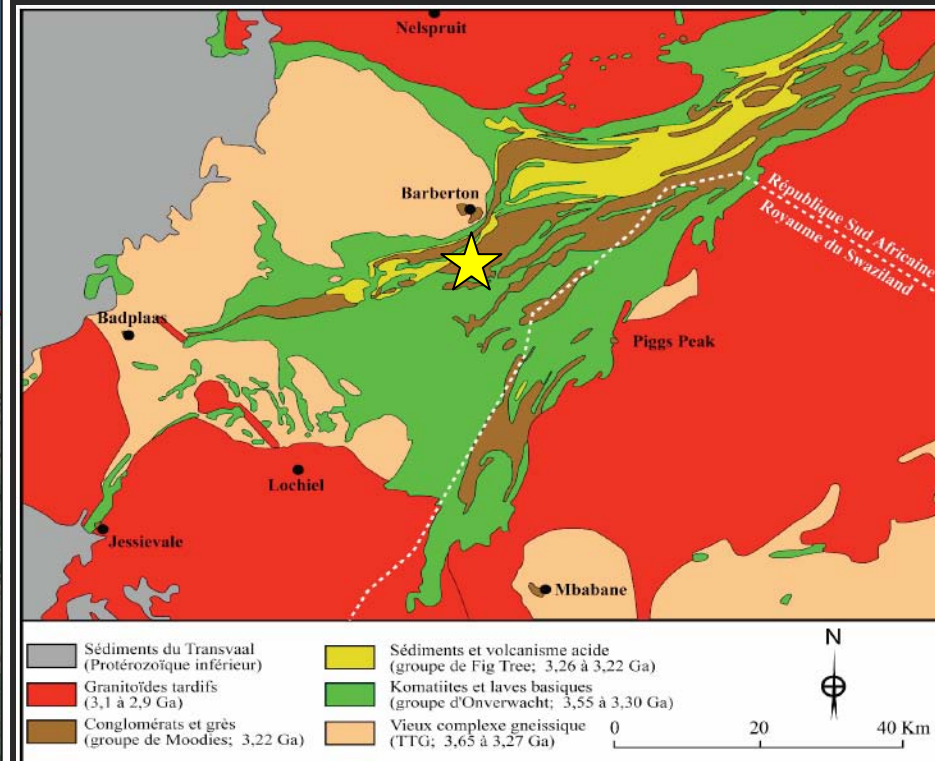
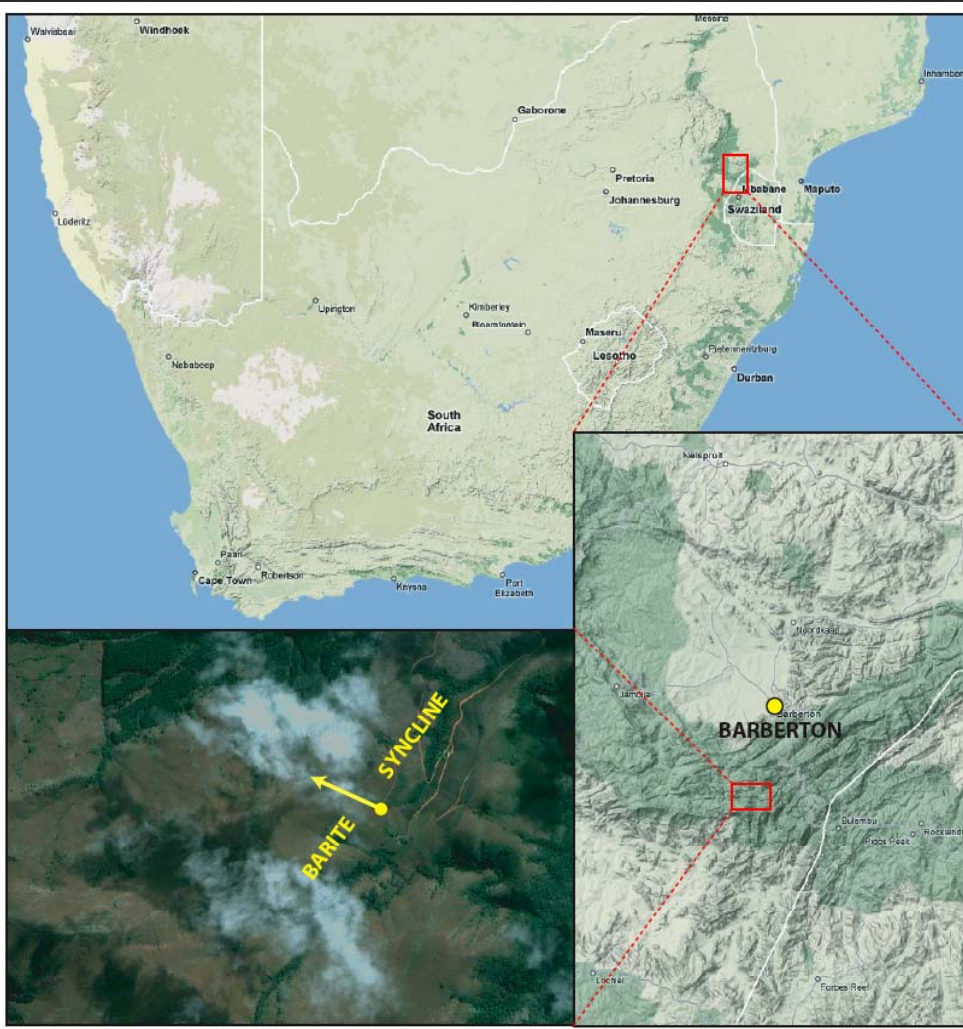






# Location of the Barberton Barite Drilling Project

## 3.26 Gyr old barite-jasper sequence of the Mapepe Formation, Fig Tree Group, Barberton, South Africa





BBDP2



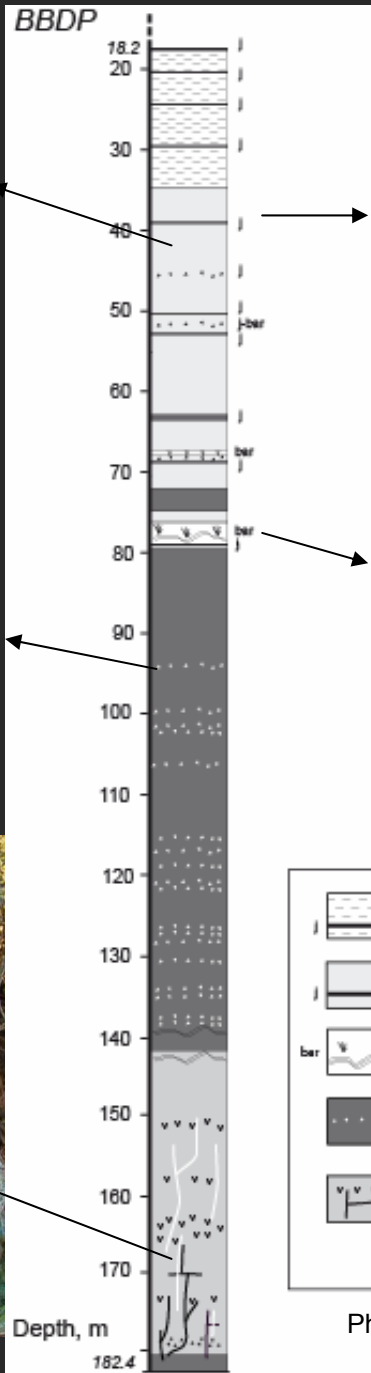
**DRILLERS IN TRAINING CC**



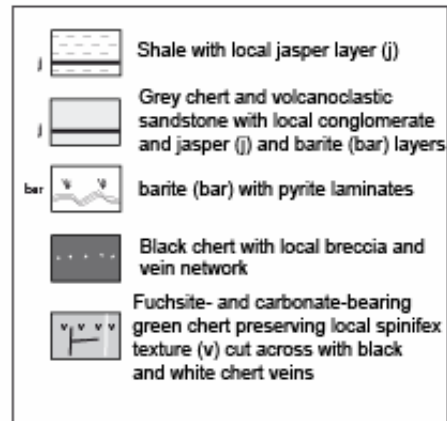
(BRGM)







**Drill core BBDP**



# Acknowledgments

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BRGM for splitting the core in halves (diamond sawing)