Sample 12 of 20: 224224

Person submitting samples: Paul Duuring
Affiliation: GSWA
Project Title: Tectonism and Exhumation of the Paterson Orogen and East Pilbara Craton margin
Sample Number(s) (including IGSN if one exists): 224224
Mineral separation required? Yes or No: Yes
Date submitted:

GEOGRAPHIC AREA/ PROVINCE/ BASIN : Paterson Orogen/Yeneena Basin	
1:250k SHEET NAME: Anketell	**NUMBER:** SF51-02
1:100k SHEET NAME: Weenoo	**NUMBER:** 3256
LOCATION METHOD: (GPS: WGS84 / AGD66 / AGD84 / GDA94) GPS GDA94	
ZONE: 51	
EASTING: 392767	**NORTHING:** 7718860
LATITUDE: -20.6264	**LONGITUDE:** 121.97079

STRATIGRAPHIC UNIT FORMAL NAME *: probably either Malu or Puntapunta Formation, but unsure which exactly at present.
STRATIGRAPHIC UNIT INFORMAL NAME:
LITHOLOGY: Metapelite (cordierite-bearing)

DRILLHOLE ID (if applicable): PND004
PROSPECT (if applicable): Obelisk
DEPTH FROM (metres): 248.5 m
DEPTH TO (metres):248.7 m

* Stratigraphic Unit names can be searched and checked within the Australian Stratigraphic Units Database via the following link: https://asud.ga.gov.au/

Dating Objective

What is the geological question $^{40}Ar/^{39}Ar$ analysis will address?
Dating metamorphism in the least-altered metapelite

What type of age(s) are expected? (e.g. magmatic crystallisation, metamorphism, fluid alteration/mineralisation, cooling, shearing etc):
Cooling/exhumation

Mineral target(s) for dating:
Muscovite

Estimated $^{40}Ar/^{39}Ar$ age (e.g. Cenozoic, Mesozoic, Paleozoic, Proterozoic, Archean – provide estimated numerical age range if possible):
Mid- to Late-Neoproterozoic

Sample Information

Location description (e.g. a sample of x was collected from y, z km from abc town):
Sample 224224 was collected from drillhole PND004 at the Obelisk deposit in the Paterson Orogen. Drillhole PND004 is located 351 km E of Port Hedland in Western Australia.

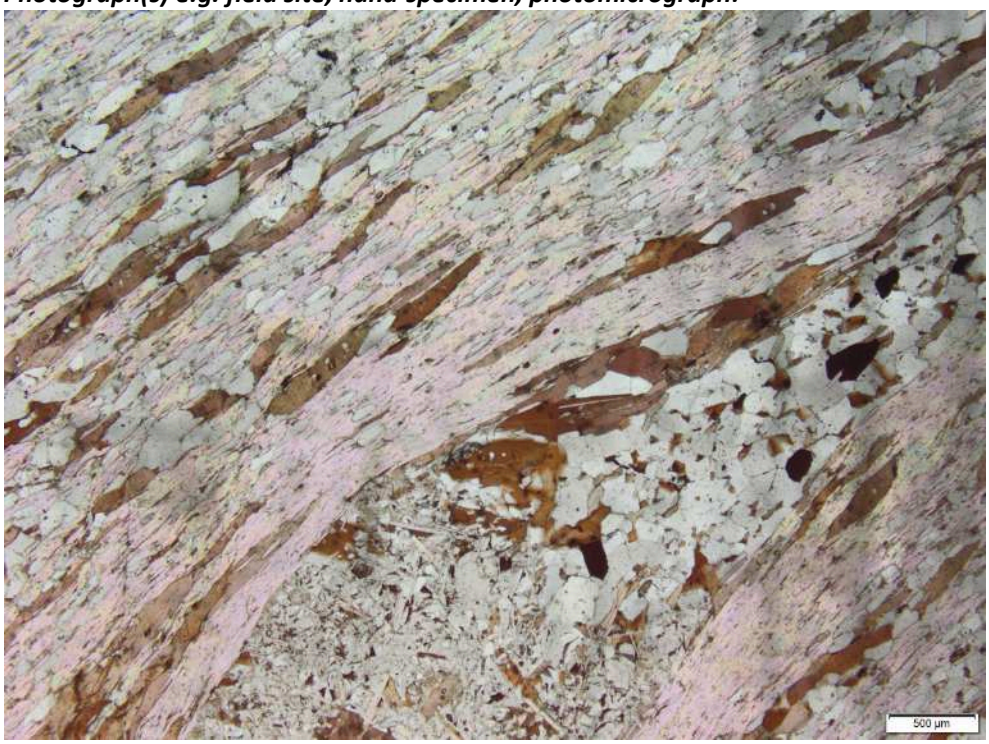
Lithological characteristics (rock description):
Metapelite, least-altered. Muscovite and biotite define a pervasive foliation that wraps cordierite porphyroblasts. Contains 45% muscovite, 20% biotite, 25% quartz, minor plagioclase and cordierite (from normalised TIMA data). It is interpreted that most cordierite has retrogressed to muscovite, biotite and quartz.

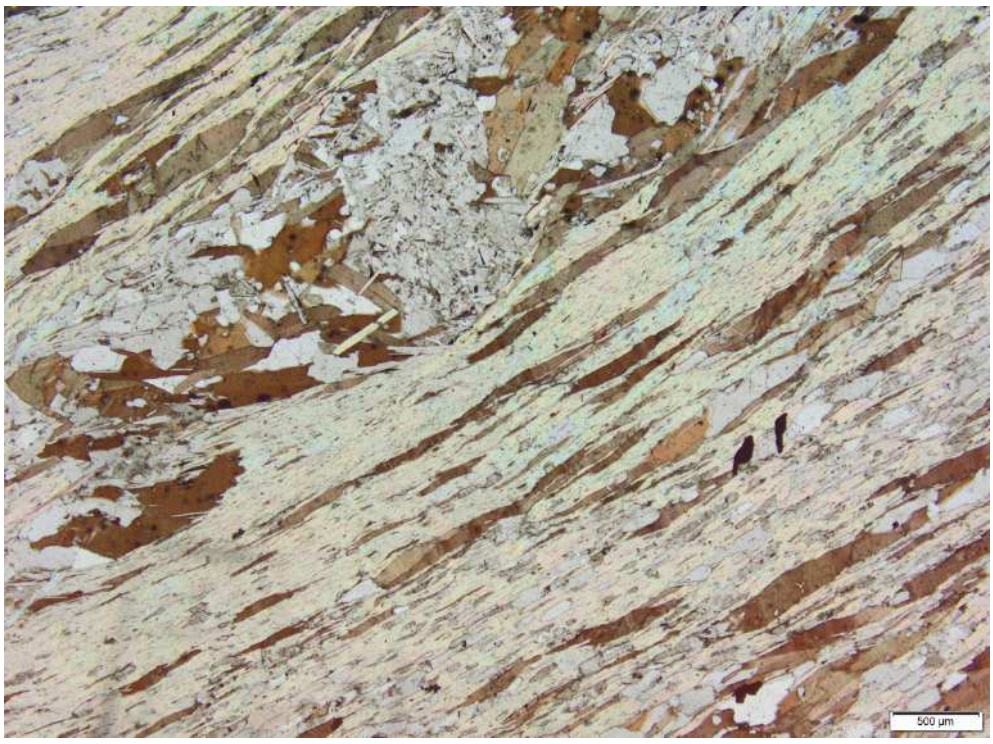
Relative age constraints (pertinent geological relationships with surrounding rock units and any previous geochronology):
The sample is from basement under Canning Basin sediments and currently assumed to be part of the Yeneena Basin. The metamorphism & foliation age is expected to be Neoproterozoic, corresponding to one of either the

Miles (c. 810 – 650 Ma) or Paterson (c. 550 Ma) Orogenies. Sediments of the Yeneena Basin have a maximum depositional age of c. 831 Ma. The metamorphism is shallow contact metamorphism (in work in progress here at GSWA it's been constrained to be <1.5 kbar) related to assumed Crofton Suite granites, so the age of Ar–Ar data is likely to be c. 600–650 Ma or younger.

Thin section description (if available):
The rock contains primary bedding defined by alternating quartz- and biotite–muscovite rich layers. A pervasive foliation defined by biotite and muscovite is oriented subparallel to the bedding direction. Cordierite poikiloblasts (or retrogressed relicts of) are wrapped by the biotite–muscovite fabric.

Photograph(s) e.g. field site, hand-specimen, photomicrograph:





Relevant bibliographic references:
Towner, RR 1982, Anketell, Western Australia (2nd edition): 1:250 000 Geological Series Explanatory Notes: Geological Survey of Western Australia.

Gardiner, NJ, Maidment, DW, Kirkland, CL, Bodorkos, S, Smithies, RH and Jeon, H 2018, Isotopic insight into the Proterozoic crustal evolution of the Rudall Province, Western Australia: Precambrian Research, v. 313, 31–50.
Maidment, D, Huston, DL, Maas, R, Czarnota, K, Neumann, N, McIntyre, A and Bagas, L 2008, The Nifty-Kintyre-Duke Cu-U-Pb-Zn mineralizing events: Links to the evolution of the Yeneena Basin, northwest Paterson Orogen, in *GSWA 2008 extended abstracts: promoting the prospectivity of Western Australia: Geological Survey of Western Australia: Record 2008/2, p. 27–29.*
Bagas, L 2004, The Neoproterozoic Throssell Range and Lamil Groups, northwest Paterson Orogen, Western Australia - a field guide: Geological Survey of Western Australia, Record 2004/15, 18p.
Bagas, L and Nelson, DR 2007, Provenance of Neoproterozoic sedimentary rocks in the northwest Paterson Orogen, Western Australia, in *Proceedings of the Central Australian Basins Symposium (CABS), Alice Springs, Northern Territory, 16-18 August 2005* edited by *TJ Munson, TJ Munson, GJ Ambrose and GJ Ambrose: Northern Territory Geological Survey: Special Publication, p. 1–10.*