Rock Varnish at Hickman Impact Crater: Potential Key to Understanding the age of Rock Art production in the Pilbara in the late Pleistocene and Holocene

Dating Murujuga's Dreaming
CLIMATE · CULTURE · CHRONOLOGY

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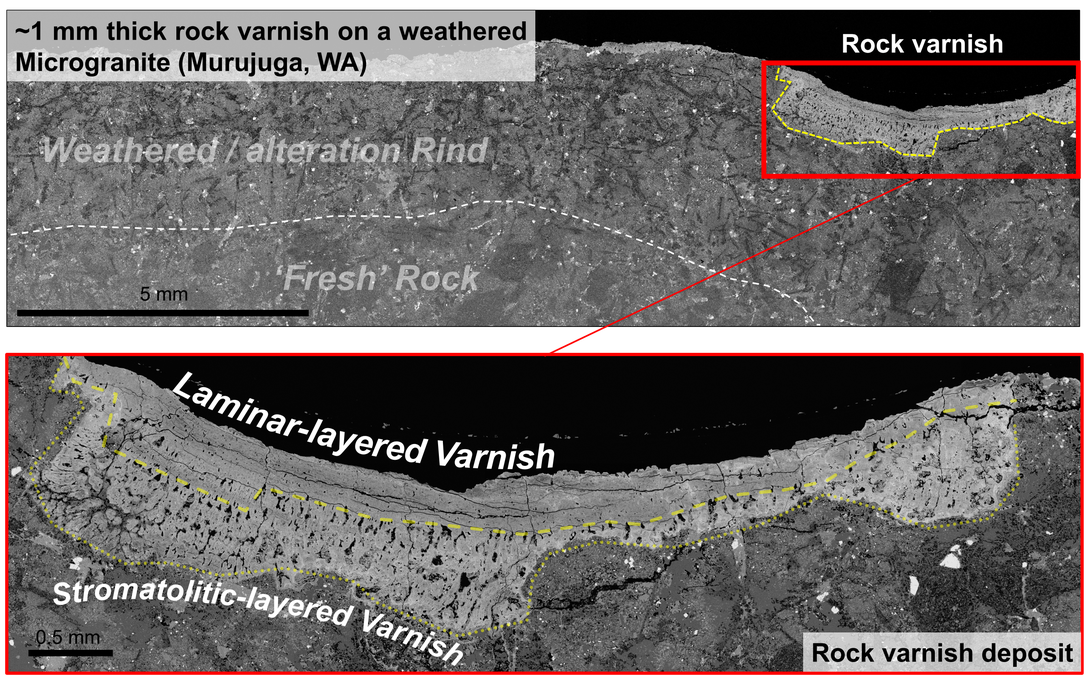
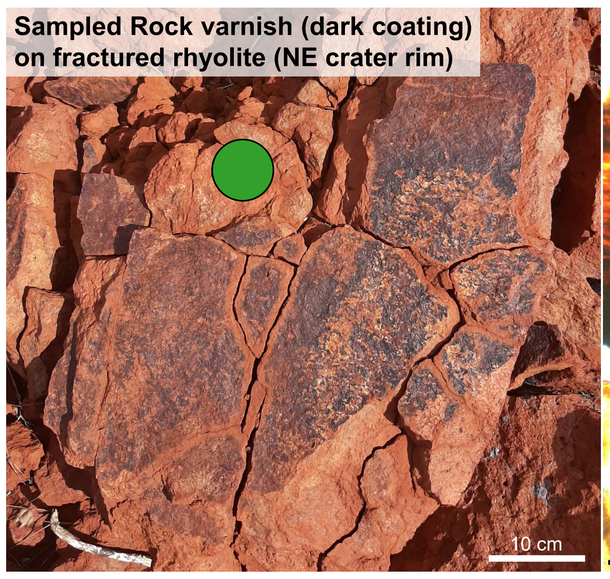
Introduction

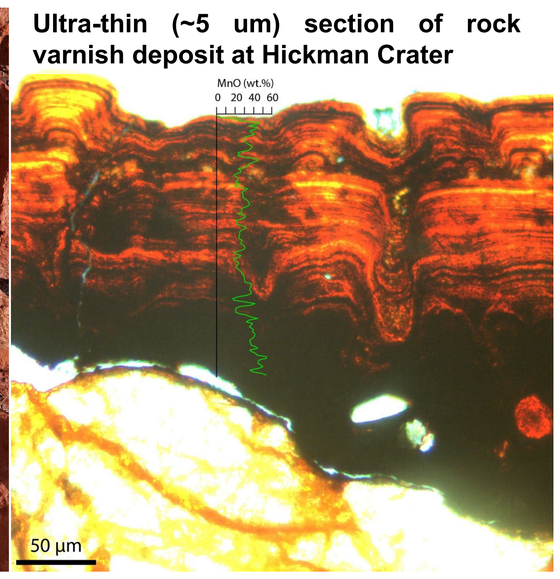
- Rock varnish forms on exposed rock surfaces and may preserve long-term environmental changes spanning ~100 Ka.
- By studying varnish at the Hickman Crater, the results can calibrate a varnish sequence which can be applied to other sites across the Pilbara with no available Pleistocene dates.

What is Rock Varnish (a.k.a. Desert Varnish)?

- A dark, thin (~100 um) coating that forms on exposed rock surfaces in arid environments.
- Made of layers that build up slowly over time, often taking 1000s of years to form one layer (rates of **~1-10 um/Ka**).
- Alternating layers are very rich in **Mn** and **Fe** (5-50 wt%) and Clay (10-70 wt%) and forms through a mix of wind-blown dust and microbial activity.
- May have different internal morphologies reflecting the formational setting, environment and chemistry.







Aims of this Study

I. Date the formation of Hickman Crater using ***(a)*** *established rock varnish sequences*, ***(b)*** *optically stimulated luminescence (OSL)*, and ***(c)*** *cosmogenic isotopes.*
II. Characterise varnish composition, age, and growth patterns on crater surfaces to understand local climatic processes.
III. Develop a regional varnish model that can be applied to other surfaces, such as Rock art at Murujuga.

Pilbara, Western Australia

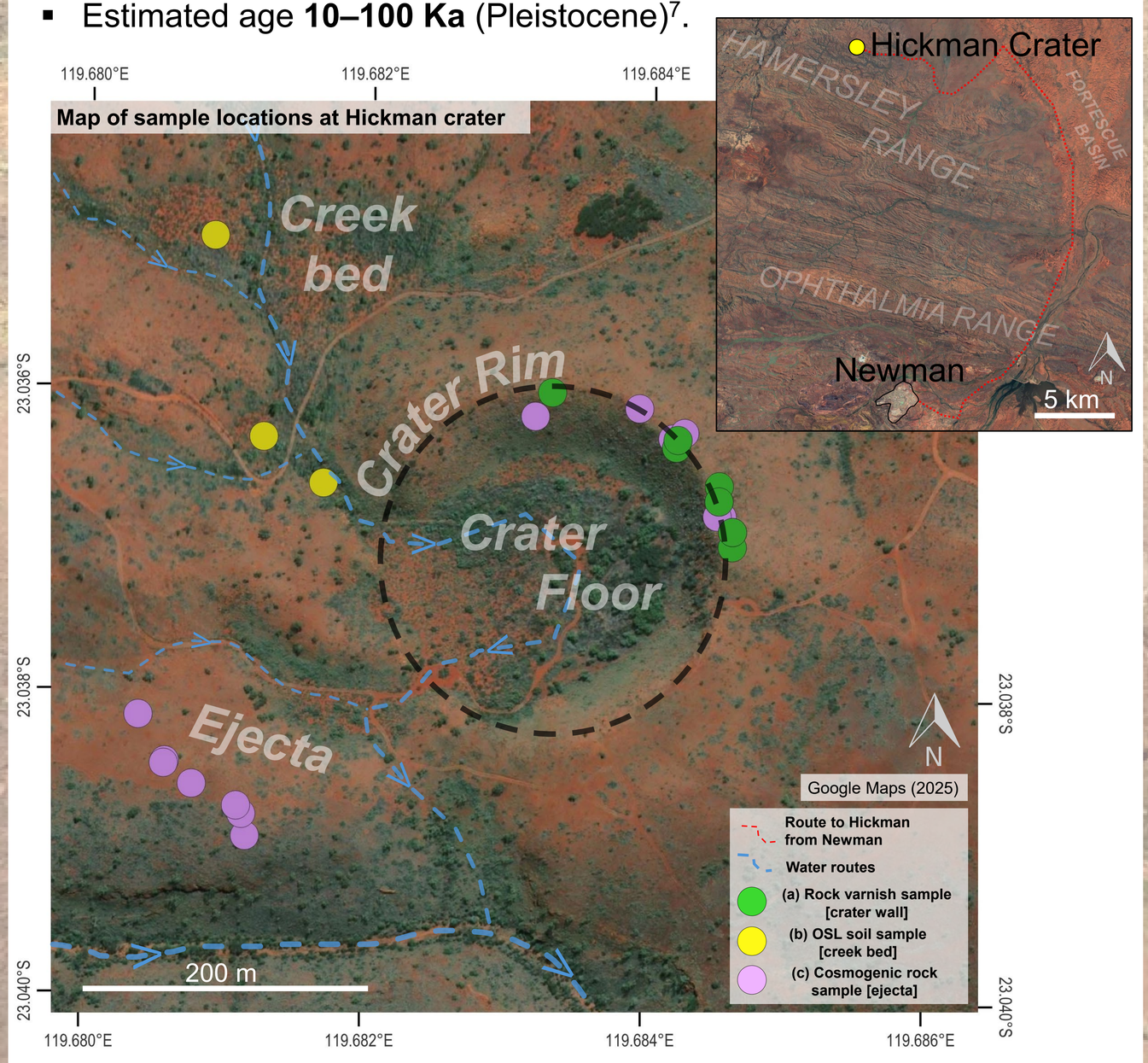
- one of **Earth's oldest geological regions** with rocks > 3.5 Ga and home to some of the world's oldest evidence of life (fossil stromatolites)
- **Arid** to sub-tropical climate, with very high temperatures and very low rainfall and **Fe-rich dust**.
- Contains countless indigenous painted and engraved **rock art**

Murujuga (The Dampier archipelago)

- It holds one of the world's largest collection of **engraved rock art** with carvings dating back **~40 Ka**.
- The landscape is dominated by red weathered rocks where many are **coated with rock varnish**.

Hickman Impact Crater *(diameter ≈ 250 m)*

- Discovered in 2007 and drilled in 2012 (diamond core is at GSWA).
- Estimated age **10–100 Ka** (Pleistocene)[7].



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The University of Western Australia acknowledges that its campus is situated on Noongar land, and that Noongar people remain the spiritual and cultural custodians of this land, and continue to practise their values, languages, beliefs and knowledge. We also acknowledge and pay our respects to the Ngarda Ngarli and the Ngayarta peoples of where we do our field work.

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