**Exceptional Preservation of Biosignatures in c. 3.48 Ga Terrestrial Hot Spring Deposits, Pilbara, Western Australia.**

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Exceptional preservation of biosignatures in Archean rocks provides unique insight into the early history of life on Earth and guides exploration for life on Mars. The c. 3.48 Ga Dresser Formation in the Pilbara of Western Australia hosts some of Earth's earliest convincing evidence of life in the form of stromatolites, fractionated sulfur/carbon isotopes and microfossils [1,2,3,4,5]. The depositional setting has been interpreted as a dynamic, low-eruptive volcanic caldera affected by voluminous hydrothermal fluid circulation [5,6,7]. Although life had previously been inferred to have inhabited this volcanic-hydrothermal system, no direct link between life and the surface manifestiations (geysers and hot springs) had been documented.

This study provides direct evidence for the surface deposits of hot springs and geysers, which include geyserite (Figure 1A), sinter terracettes, and the mineralized remnants of the hot spring pools [8]. Importantly, these terrestrial hot spring deposits preserve evidence of ancient life in the form of stromatolites, microbial palisade fabric, and gas bubbles preserved in inferred, mineralized, exopolymeric substance (EPS) (Figure 1B-D) [8]. These findings extend the known geological record of inhabited terrestrial hot springs on Earth by ~3 billion years [9]. Considering much of the Martian crust shares a similar age with the early Earth, such ancient hot spring deposits strongly support the search for fossil life in ancient Martian hydrothermal systems.

**References:**

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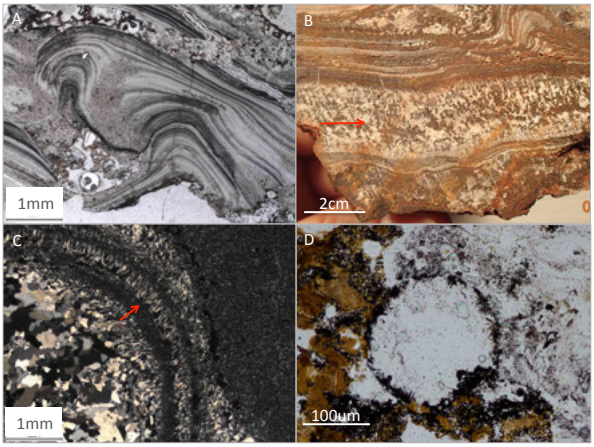


**Figure 1** | Various terrestrial hot spring textures observed closely associated in the c. 3.5 Ga Dresser Formation. **A.** Micrograph showing botryoidal textures within geyserite. **B.** Layer (arrow) of microdigitate stromatolites. **C.** Silicified palisade fabric analogous to microbial palisade fabric found in modern hot springs. **D.** Preserved gas bubbles within inferred mineralized exopolymeric substance (EPS).