

A meteorite's rocky start

This cross-polarized light image magnified about 100 times shows an olivine-rich grain in the 21-kilogram Artracoona meteorite, which was discovered in South Australia in 1914. The meteorite is an ordinary chondrite belonging to the L group, an astronomical family of thermally metamorphosed meteorites that are likely fragments of a planetary body from the early solar system. One clue about the meteorite's origin comes from its thermal history. Previous investigations, however, have found large ranges of cooling rates too imprecise for testing competing evolution models. Now Michael Lucas of the University of Tennessee, Knoxville, and his colleagues have used a suite of geochemical thermometers to determine the thermal rate of change over the geologic history of the ordinary chondrite's parent body.

The researchers determined that the chondrite samples reached a peak temperature of about 900 °C and then cooled at least 0.3 °C per year. That thermal evolution is inconsistent with the canonical onion-shell model in which the outer layers of an ordinary chondrite's parent body cool more rapidly than the insulated inner layers. Instead, the data point toward a process that cooled material rapidly at high temperatures and then more slowly at lower temperatures. That evolution is more consistent with the fragmentation–reassembly scenario: Parent bodies initially resembled an onion shell that had a catastrophic collision, broke apart, and then accreted to form a body of jumbled fragments. (Image courtesy of Michael Lucas and Nick Dygert; M. P. Lucas et al., *Geochim. Cosmochim. Acta* **290**, 366, 2020.) —AL

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