

Lunar sample tells ancient story through international collaborative effort

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Curtin University researchers have helped uncover the four billion year old story of a lunar sample brought from the moon to Earth, by the manned Apollo 17 mission more than 50 years ago.

The global research collaboration, involving scientists from the UK, Canada, Sweden and Australia, aimed to analyze the ancient rock sample through a modern lens to find out its age, which crater it came from and its geological trajectory.

That modern lens was provided, in part, by both Curtin's Geoscience Atom Probe Facility and Space Science and Technology Center (SSTC) where the research team was able to use the most advanced analytical equipment to accurately date the sample and perform sophisticated numerical impact simulations to determine the source crater.

Co-author Associate Professor Katarina Miljkovic from the SSTC in Curtin's School of Earth and Planetary Sciences said Curtin's involvement ensured the international team had access to world-class facilities in order to shed new light about Earth-moon origins.

"Through a truly international collaborative effort, we have connected a tiny lunar sample investigated on a microscopic scale with the moment when the moon's surface was smashed by a major impact event. The study showcases the extent of Curtin's analytical and numerical capability to solve complex geological problems on a planetary scale," Associate Professor Miljkovic said.

"Dating techniques (Uranium-Lead geochronology) suggested this sample from the moon's Serenitatis Basin is very old, around 4.2 billion years- that's only about 350 million years younger than the entire Solar System, making it a precious sample for learning about the moon's early evolution and our planet's origins.

"The study also provides a new insight into the atomic scale processes that take place in minerals affected by extreme impact events. The analytical work done at Curtin's Geoscience Atom Probe Facility looked at the distribution of atoms in the sample and found that it experienced not one, but two impact events. The second impact transported the sample near to its resting place where it was collected by astronauts."

Numerical impact simulations made at Curtin's Space Science and Technology Center, supported the analytical findings with detailed understanding of the fate of this sample as it was flung across the moon during the impact events that caused the craters.

Director of the SSTC, Professor Phil Bland said Curtin is proud to have played an integral part in uncovering this important story which provides an invaluable reference point to understand the entire bombardment history of the Earth-moon system.

"This research shows that even the tiniest [sample](#) brought back from space may yield profound results that advance our understanding of the origins and evolution of Earth and planetary bodies in our Solar System," Professor Bland said.

"It is also an excellent demonstration of the need for more space missions that aim to return samples to Earth, given that the scientific return is enormous."

The paper, "Lunar samples record an impact 4.2 billion years ago that

may have formed the Serenitatis Basin," was published in *Communications Earth and Environment* .

More information: Ana Černok et al, Lunar samples record an impact 4.2 billion years ago that may have formed the Serenitatis Basin, *Communications Earth & Environment* (2021). [DOI: 10.1038/s43247-021-00181-z](https://doi.org/10.1038/s43247-021-00181-z)

Provided by Curtin University

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