Can white dwarfs help solve the cosmological lithium problem?

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For the first time, hard-to-find lithium has been identified and measured in the atmosphere of burned out stars called white dwarfs, according to a study led by the University of North Carolina at Chapel Hill published

online in the journal *Science*.

Despite its many uses on Earth to power electronics and stabilize moods, scientists have been stumped by what's become of the lithium expected from the Big Bang, a discrepancy known as the "cosmological lithium problem."

The new finding by UNC-Chapel Hill, University of Montreal and Los Alamos National Lab may provide a new target for measuring how much lithium is out there.

The discovery was made possible by using a unique spectrograph mounted on the Southern Astrophysical Research telescope. Study author and UNC-Chapel Hill astrophysicist J. Christopher Clemens led the design of the Goldman Spectrograph which measures how much light is emitted by a white dwarf.

White dwarfs are the leftover cores that remain when stars die, and they can be surrounded by rocky worlds.

In the study, researchers describe detecting the crushed-up remains of large asteroid-like objects in the atmospheres of two very old white dwarfs whose planets formed 9 billion years ago—long before our own sun, Earth and solar system developed.

The team was able to measure the chemical make-up of the asteroids, and for the first time identified and measured both lithium and potassium from an extrasolar rocky body.

"Our measurement of lithium from a rocky body in another solar system lays the foundation for a more reliable method of tracking the amount of lithium in our galaxy over time," Clemens said.

The Big Bang, the leading explanation for how the universe began 13.8 billion years ago, produced three elements: hydrogen, helium and lithium. But lithium measurements in sun-like stars have never added up to scientists' predictions.

Of the three elements, lithium presents the biggest mystery. But the new study provides clues for tracking its galactic evolution.

"Eventually with enough of these white dwarfs that had asteroids fall on them, we will be able to test the prediction of the amount of lithium formed in the Big Bang," said Ben Kaiser, first study author and graduate research assistant at UNC-Chapel Hill.

More information: B.C. Kaiser el al., "Lithium pollution of a white dwarf records the accretion of an extrasolar planetesimal," *Science* (2020). science.sciencemag.org/lookup/ … 1126/science.abd1714

Provided by University of North Carolina at Chapel Hill

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