

# Astronomers identify 12-billion-year-old white dwarf stars

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A University of Oklahoma assistant professor and colleagues have identified two white dwarf stars considered the oldest and closest known to man. Astronomers identified these 11- to 12-billion-year-old white dwarf stars only 100 light years away from Earth. These stars are the closest known examples of the oldest stars in the Universe forming soon after the Big Bang, according to the OU researcher.

Mukremin Kilic, assistant professor of physics and astronomy in the OU College of Arts and Sciences and lead author on a recently published paper, announced the discovery. Kilic says, "A white dwarf is like a hot stove; once the stove is off, it cools slowly over time. By measuring how cool the stove is, we can tell how long it has been off. The two stars we identified have been cooling for billions of years."

Kilic explains that white dwarf stars are the burned out cores of stars similar to the Sun. In about 5 billion years, the Sun also will burn out and turn into a [white dwarf star](#). It will lose its outer layers as it dies and turn into an incredibly [dense star](#) the size of Earth.

Known as WD 0346+246 and SDSS J110217, 48+411315.4 (J1102), these stars are located in the constellations Taurus and Ursa Major, respectively. Kilic and colleagues obtained [infrared images](#) using NASA's [Spitzer Space Telescope](#) to measure the temperature of the stars. And, over a three-year period, they measured J1102's distance by tracking its motion using the MDM Observatory's 2.4m telescope near Tucson, Arizona.

"Most stars stay almost perfectly fixed in the sky, but J1102 is moving at a speed of 600,000 miles per hour and is a little more than 100 [light years](#) from Earth," remarks co-author John Thorstensen of Dartmouth College. "We found its distance by measuring a tiny wiggle in its path caused by the Earth's motion—it's the size of a dime viewed from 80 miles away."

"Based on the optical and infrared observations of these stars and our analysis, these stars are about 3700 and 3800 degrees on the surface," said co-author Piotr Kowalski of Helmholtz Centre Potsdam in Germany. Kowalski modeled the atmospheric parameters of these stars. Based on these temperature measurements, Kilic and his colleagues were able to estimate the ages of the stars.

"It is like a crime scene investigation," added Kilic. "We measure the temperature of the dead body—in our case a dead star, then determine the time of the crime. These two white [dwarf stars](#) have been dead and cooling off almost for the entire history of the Universe."

Kilic was the lead author on the paper accepted for publication in the *Monthly Notices of the Royal Astronomical Society*. Kilic's co-authors include John Thorstensen, Dartmouth College; Piotr Kowalski, Helmholtz Centre Potsdam, Germany; and Jeff Andrews, Columbia University.

**More information:** For more information about Kilic and his research, visit his website at <http://www.nhn.ou.edu/~kilic/>.

Provided by University of Oklahoma

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