

Dim Dwarfs

The new record-holder for dimmest known star-like object in the universe goes to twin brown dwarfs, each of which shines feebly with only one millionth the light of our sun, according to a new study by NASA's Spitzer Space Telescope. Hello, I'm Daniel Brennan.

This Spitzer Space Telescope podcast is part of a series highlighting recent discoveries in infrared astronomy. It's produced by NASA's Spitzer Science Center at the California Institute of Technology in Pasadena. The Spitzer mission is managed by NASA's Jet Propulsion Laboratory.

Brown dwarfs are known as "failed" stars -- objects which form like stars but did not have enough mass to ignite nuclear fusion. Without nuclear fusion driving light and heat, these Jupiter-sized objects cool as they age. The name "brown dwarf" comes from the fact that these small, star-like bodies change color over time as they cool, and thus have no definitive color, and most would appear reddish if they could be seen with the naked eye. Their feeble light output also means that they are hard to find. The first brown dwarf wasn't discovered until 1995.

The newfound dim duo of brown dwarfs, while notable for their exceptional faintness, will probably not be remembered for their name. They are called 2MASS J09393548-2448279 after the Two Micron All-Sky Survey, or "2MASS," the ground-based mission partially funded by NASA that first detected them in 1999.

Prior to the Spitzer observations, astronomers thought the pair of dim dwarfs was just one typical, faint brown dwarf with no record-smashing titles. But when a team led by Dr. Adam Burgasser of the Massachusetts Institute of Technology observed the source with Spitzer, they were able to accurately measure the object's extreme faintness and low temperature for the first time. The low temperature and brightness compared to the amount of light actually coming out of the source led the team to realize that the brown dwarf is, in fact, twins.

The data revealed an atmospheric temperature of 565 to 635 Kelvin (that's about 560 to 680 degrees Fahrenheit). While this is hundreds of degrees hotter than Jupiter, it's still extremely cold as far as stars go.

To calculate the object's brightness, the researchers had to first determine its distance from Earth. After three years of precise measurements with the Anglo-Australian Observatory in Australia, they concluded that the twin dwarfs are 17 light-years away, making them the fifth-closest known brown dwarfs. This distance, together with Spitzer's measurements, told the astronomers the object was both cool and extremely dim.

But the brightness of the object was twice what would be expected for a brown dwarf with this particular temperature. Burgasser and his team concluded that the object must have twice the surface area. However, brown dwarfs are all very similar in size. The only way to resolve the conundrum was to conclude that the one brown dwarf was, in

fact, twins, with each body shining only half as bright, and each with a mass of 30 to 40 times that of Jupiter. Both bodies are one million times fainter than the sun in total light, and at least one billion times fainter in visible light alone.

The twin dwarfs' record as the dimmest probably won't stand for long. Burgasser and his team believe there are even dimmer brown dwarfs scattered all throughout the universe, most too faint to see with current sky surveys. Those discoveries will have to wait for the next generation of telescopes. For the Spitzer Science Center, I'm Daniel Brennan.

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