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**SCIENCE NEWS STARS**

**Chandra Finds X Rays from Petite Brown Dwarf**

One of the smallest brown dwarfs known is producing an outpouring of x rays and helping to close the gap between stars and planets.

by Kelly Kizer Whitt



A brown dwarf is intermediate in size between the sun and a gas giant planet.  
CXC / M. Weiss

The Chandra X-ray Observatory has imaged emissions from one of the least massive brown dwarfs known. The [brown dwarf](#), named TWA 5B, has an estimated [mass](#) of between 15 and 40 times that of Jupiter. The theoretical lowest limit of a brown dwarf is about 12 Jupiter masses, placing TWA 5B near the boundary between planets and brown dwarfs.

"This brown dwarf is as bright as the sun today in x-ray light, while it is fifty times less massive than the sun," says Yohko Tsuboi of Chuo University in Tokyo. Tsuboi is the lead author of the April 10 *Astrophysical Journal Letters* paper that details the findings. "This observation, thus, raises the possibility that even massive planets might emit [x rays](#) by themselves during their youth."

Brown dwarfs are "failed stars," or objects that are more massive than planets but not massive enough to begin the characteristic [nuclear fusion](#) of a [star](#).

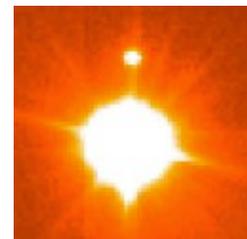
TWA 5B is still an adolescent at about 12 [million](#) years of age. This brown dwarf helps astronomers further trace the timeline from young, active brown dwarfs at 1 million years of age to their older, calmer stages at 500 million to a [billion](#) years. A brown dwarf in its early years has a turbulent interior, similar to young stars. If rapid [rotation](#) is also present, the magnetic field of the brown dwarf becomes tangled and heats the upper [atmosphere](#), or [corona](#), which is the region that emits x rays. Chandra measured TWA 5B's x-ray-producing corona at about 3 million degrees Celsius. In comparison, the temperature of the sun's corona is only about 2 million degrees Celsius.

TWA 5B is part of a [multiple star system](#). The brown dwarf orbits a pair of sun-like stars, named TWA 5A, at a distance of about 83 [astronomical units](#), or almost three times the sun-Pluto distance. The Chandra observation marks the first time a brown dwarf and star in this close of quarters has been resolved in x rays. TWA 5B glows 200 times fainter than its host stars and lies just 2 arcseconds away from the stellar pair from Chandra's point of view.

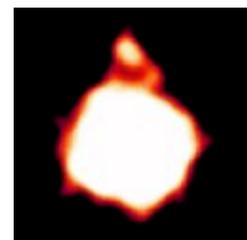
TWA 5B's multiple star system lies 180 light-years from Earth within a group of a dozen young stars in the [constellation](#) Hydra.

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The 8.2-meter VLT Kueyen telescope took this optical image of TWA 5A and 5B.  
NASA / CXC / Neuhauser et al.



Brown dwarf TWA 5B (near top) lies just 2 arcseconds from the binary star TWA 5A.  
NASA / CXC / Chuo U. / Y. Tsuboi et al.

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