Brown Dwarfs Encyclopedia Article

Brown Dwarfs

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The existence of brown dwarfs was first suggested in the 1930s, when observers at Swarthmore College noted that some stars followed paths across the sky that deviated from their predicted courses. Rather than moving in a straight line, these stars oscillated slightly about a steady course. Astronomers began to suspect that these "wobbles" were caused by companion objects to the stars that were invisible to ordinary telescopes because they were too faint to see. In 1975 American astronomer Jill Tarter (1944-) dubbed these objects "brown dwarfs" because she theorized they were akin to red dwarf stars, but were darker and smaller.

A brown dwarf is thought to be a ball of matter that goes through the early stages of stellar evolution but fails to complete the process of becoming an actual star. It condenses out of a small quantity of dust and gas, but does not acquire enough mass to produce the tremendous pressure required to initiate nuclear fusion, which makes stars bright and hot. According to astrophysical theory, an object with less than eight percent the mass of the Sun cannot become a star. Very low-mass brown dwarfs will likely be more akin to planets than stars.

Beginning in the 1970s, David McCarthy, an astronomer at the University of Arizona, made infrared observations to search for these objects (because they are cool and should emit most of their radiation in the infrared part of the spectrum). He and his colleagues have discovered a number of objects that could be brown dwarfs, several in the Pleiades star cluster, but no irrefutable evidence for their existence was found.

Definitive evidence for the existence of substellar objects did finally emerge. In 1992, astronomer Alexander Wolszczan discovered two planets orbiting a pulsar. In 1995, astronomers Michel Mayor and Didier Queloz announced the existence of a planet around the star 51 Pegasi. Returning to the technique of analyzing small variations in the star's motion, astronomer Geoffrey Marcy and his collaborators confirmed the result. Marcy and other astronomers have now accumulated evidence for the existence of brown dwarfs or planets around a number of other stars. Our solar system, it now seems, is far from unique.