

Ask an Astronomer

Question: "What is a brown dwarf?"

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We know that stars are common in our galaxy, and we assume planets, moons, asteroids, and comets are, too. But if you were to take a cookie-cutter slice of the Milky Way galaxy near the Sun, are these the only objects you'd find? Believe it or not, the answer is "no."

There's a kind of object known as a "brown dwarf" that's at least as common as your average star. These objects form the same way that stars form -- in a collapsing cloud of gas and dust -- but they're unable to shine for billions of years the way stars do.

Brown dwarfs also have traits in common with planets. Oddly, all brown dwarfs have roughly the same size -- about the size of the planet Jupiter. Also, as brown dwarfs cool, they begin to develop complex atmospheres with clouds of methane and, in the coolest cases, water. So in that respect they also resemble planets. However, planets are formed in a disk around a star -- quite unlike the birthing process for brown dwarfs.

So brown dwarfs are like stars... but not really. They're also like planets... but not really. They're the duckbilled platypus of the cosmos. The platypus defies easy classification as either a mammal or a reptile; brown dwarfs defy classification as either a star or a planet.

So, how did brown dwarfs stay hidden for so long?

Brown dwarfs continually cool with time after they're born, so they don't emit very much light. Because they're so dim, they're very hard to detect even when they're relatively close. However, what little light they do emit is concentrated at infrared wavelengths -- which correspond to colors redder than your eyeball can detect.

Astronomers have developed new detectors -- infrared eyeballs, if you will -- that show a multitude of brown dwarfs that were hidden to our eyes.

Quite amazingly, astronomers have uncovered hundreds of these objects in the neighborhood of the Sun, and we now believe that in our own galaxy there are twice as many brown dwarfs as there are stars.

For "Ask an Astronomer" this is Davy Kirkpatrick in the Infrared Processing and Analysis Center at the California Institute of Technology.