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Scientists Find Building Blocks Of Earth-Like Planets

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Thursday, August 7, 1997 ... Page A11 ©1997 San Francisco Chronicle

Scientists Report Finding Building Blocks of Planets

Clues contained in gas-rich disk orbiting new star

Charles Petit, Chronicle Science Writer

California astronomers today are reporting the discovery of what looks like an immense construction zone for new planets some 450 light-years from Earth.

Combining signals from half a dozen radio telescopes, scientists claim to have found a gas-rich disk of material rotating around a young star known as MWC480 in the constellation Taurus.

Thin disks of dust have been known to exist around older stars. The new discovery, reported in today's issue of the journal Nature, marks the first time the phenomenon has been detected around a very young star -- an age when planets such as those in the sun's solar system could first be forming.

The newly found disk is also denser, and far richer in gas such as the hydrogen that makes up most of Jupiter, than previously known disks around stars.

"We are seeing for the first time a place where conditions are perfect for the formation of planets like Jupiter or the Earth," said Anneila Sargent, director of the Owens Valley Radio Observatory and a professor at the California Institute of Technology in Pasadena, which operates the observatory east of the Sierra near the Nevada border.

The star has a mass about twice that of the sun. It is just a few million years old, about a thousandth the age of the 4.5 billion-year-old sun.

The new sighting bolsters the view that planets form easily, and often, around stars, and that Earth and its eight sister planets in the solar system are not the result of some fluke combination of events.

Sargent said the finding is "a perfect fit" with theoretical predictions about places where planets agglomerate.

The paper's lead author, postdoctoral scholar Vince Mannings, called the disk "a planetary construction site." Still, he conceded, the new observations are not proof of how worlds form, because the instruments have not been able to spot any actual newborn planets floating in the gas and dust around MWC480.

Although the star is well known to astronomers, the big disk became clear to the Caltech team only with the help of instruments finely tuned to the emission frequency of carbon monoxide.

The gas makes up only a tiny fraction of the cloud but is the most easily detected. Most of the material is probably hydrogen gas.

The disk's outer edge is more than 30 billion miles across, or about 10 times larger than the orbits of Neptune and Pluto, and reaches almost to the surface of the star itself in a flat sheet of material orbiting above the star's equator, Sargent said.

So far, the disk appears to be an oblong blob. Analysis of the spectrum of its radiation, which lets the astronomers measure its motions, shows the gas is in a flat sheet tilted at about a 30-degree angle as seen from Earth. It appears to orbit around the star rather than falling into it or forming a spherical cloud around it.

The observation was welcomed by other astronomers.

"This really is consistent with our concept of solar system formation," said Douglas Lin of the University of California at Santa Cruz, an expert on planet evolution theories. "So I am not too surprised by these results. The important thing now is to get higher resolution (sharper focus) to see more of the physical conditions."

The disk is presumably a leftover from the process of gravitational collapse of interstellar gas clouds that formed the star itself. But young stars are so boisterous, spraying strong winds of superheated gas outward and glowing in intense ultraviolet radiation, that it seemed to many astronomers they would blow away any disks of orbiting gas too fast for planets to form in them.

The new observation seems to confirm that, as theorists had hoped, the disks last long enough to spawn planets.

Sargent said one goal now is to use even more radio telescopes, from locations farther apart on Earth, to improve the focus and look for gaps in the rings. Such gaps would indicate where planets are forming and clearing out the gas and dust.

Several teams of astronomers in recent years have found indirect evidence of actual planets around stars similar to the sun. But to see how such planets first form, "we need to catch them in their early stages. That is what we think we are doing now," Sargent said.

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