Universally speaking, Earthlings share a nice neighborhood

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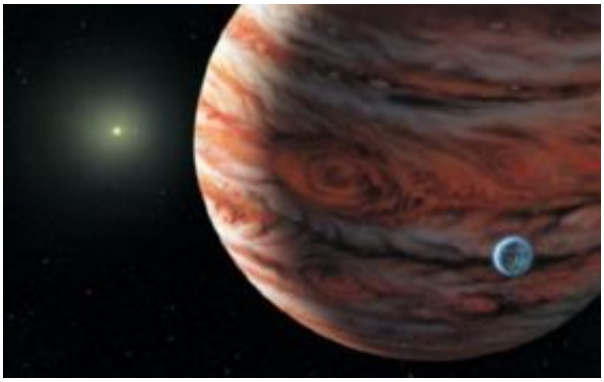

An artist's rendering of a Jupiter-like planet, the larger of the two planets pictured, orbiting a star outside our solar system. Here in our solar system, Jupiter may act as a "junk yard dog," protecting the Earth from comets, maintaining stability and sustaining life as we know it. New research finds stable solar systems such as ours to be the exception, rather than the rule in the universe. Credit: Artwork by Lynette Cook

We don't have spacecraft to take us outside our solar system--not yet, at least. Still, astronomers thought they had a pretty good understanding of how our solar system formed and in turn, how others formed. In the last dozen years, nearly 300 exoplanets have been discovered. Are the solar systems in which they reside indeed like our own?

Without knowledge or observations to the contrary, conventional knowledge said yes. Three Northwestern University researchers

questioned that assumption and explored this question. What they learned is that the solar system in which the Earth orbits our sun is actually uncommon.

Edward Thommes, Soko Matsumura and Frederic Rasio were the first to develop large-scale, sophisticated computer simulations to model the formation of planetary systems from beginning to end. Because of computing limitations, earlier models provided only brief glimpses of the process. The surprising findings of their study titled, "Gas Disks to Gas Giants: Simulating the Birth of Planetary Systems," are detailed in the August 8, 2008 issue of *Science* magazine.

The researchers used a range of computer simulations to explore the formation of extra-solar planetary systems. They were able to show the action of a planet-forming circumstellar disk in three different starting condition scenarios at different intervals from the beginning of the universe to 500 million years of evolution. They found that our solar system represents the rare case in which big gas giants form, but do not migrate to the inner planetary system, and the orbits of all of the planets in the system are circular and stable.

"We now know that these other planetary systems don't look like the solar system at all," said Frederic A. Rasio, senior author of the Science paper, and a theoretical astrophysicist and professor of physics and astronomy in Northwestern's Weinberg College of Arts and Sciences. "We now better understand the process of planet formation and can explain the properties of the strange exoplanets we've observed. We also know that the solar system is special and understand at some level what makes it special."

Source: National Science Foundation