Earth like planets should be quite common in the universe

By Roger Highfield, Science Editor

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The common mantra that there is nothing special about our place in the universe is questioned today by a simulation of the birth of our Solar System.

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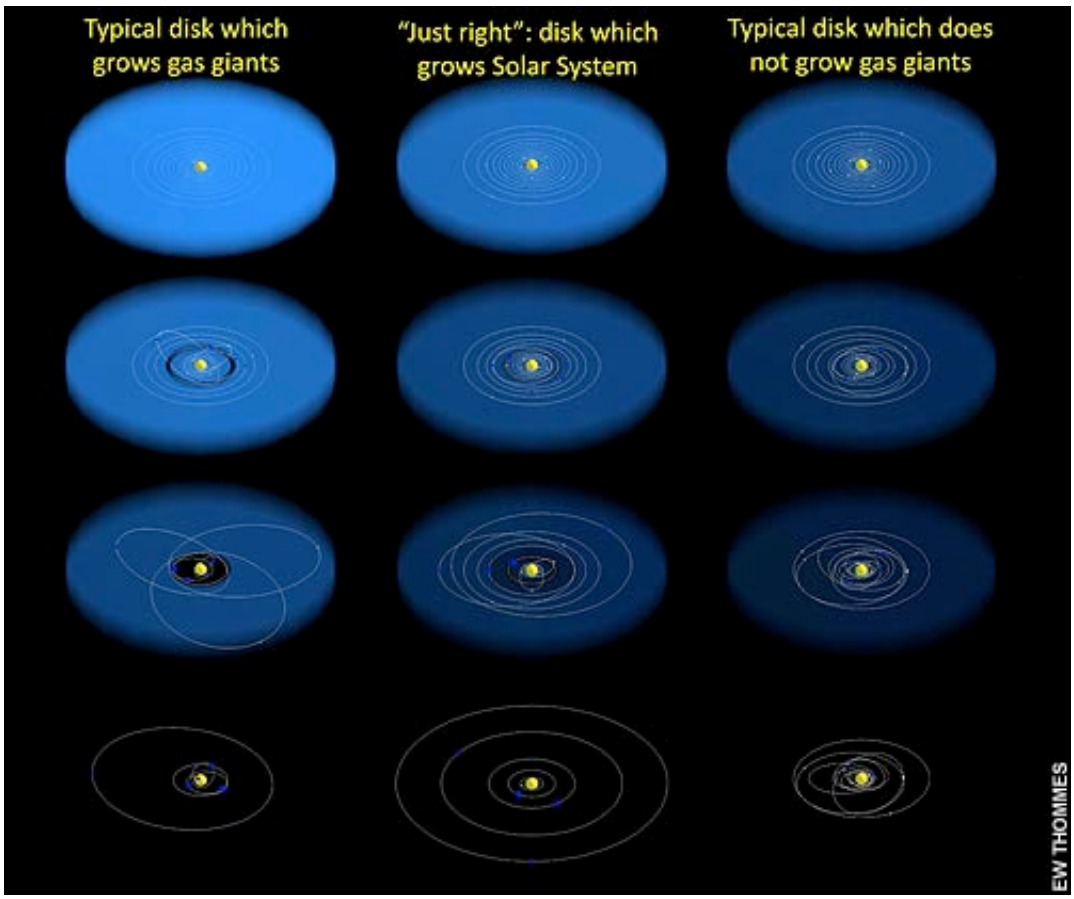
The prevailing theoretical models attempting to explain its origins have assumed it to be average in every way.



Three different key cases of planets forming in a disk. First is a violent version, second is the 'barren' version, third is an in between case

Now a new study by Northwestern University astronomers, using recent data from the 300 planets discovered orbiting other stars, turns that view on its head.

"These other planetary systems don't look like the solar system at all," said Prof Frederic Rasio, senior author of a study in the journal Science.

However, it does suggest that Goldilocks planets such as Earth, which are not too hot and not too cold for life to thrive, could still be common.

The study illustrates that if early conditions had been just slightly different, very unpleasant things could

have happened - like planets being thrown into the sun or jettisoned into deep space.

However, the good news is that it does not seem to make life less likely elsewhere in the cosmos, adds coauthor Prof Edward Thommes of the University of Guelph, Canada: "By themselves, rocky terrestrial planets like the Earth grow very readily; they basically sprout like mushrooms under almost any conditions, we think. So, Earths should be quite common throughout the universe.

"Rather, it's analogues to Jupiter and Saturn that we find are rare. So the question in our minds is, how important are these "heavyweights" to the habitability of a planetary system?"

Using large-scale computer simulations, the researchers are the first to model the birth of planets around a star, starting with the debris disk of gas and dust that is left behind after the formation of the central star and ending with a full planetary system.

Because of computing limitations, earlier models provided only glimpses of genesis.

The researchers ran more than a hundred simulations, and the results show that the average planetary system's origin was full of violence and drama but that the formation of something like our solar system required conditions to be "just right."

The gas disk that gives birth to the planets pushes them mercilessly toward the central star, where they crowd together or are engulfed.

Among the growing planets, there is cut-throat competition for the dust and debris that enables them to grow, a chaotic process that produces a rich variety of planet sizes.

Also, as the planets approach each other, they frequently lock into increasingly elongated orbits. "The shapes of the exoplanets' orbits are elongated, not nice and circular."

Such a gravitational embrace often results in a slingshot encounter that flings the planets elsewhere in the system; occasionally, one is ejected into deep space.

"Planets are not where we expect them to be. Many giant planets similar to Jupiter, known as 'hot Jupiters,' are so close to the star they have orbits of mere days," said Prof Rasio. "Clearly we needed to start fresh in explaining planetary formation and this greater variety of planets we now see."

"Conditions must be just right for the solar system to emerge.," said Prof Rasio. Too massive a gas disk, for example, and planet formation is ananarchic mess, producing "hot Jupiters" and noncircular orbits galore.

Too low-mass a disk, and nothing bigger than Neptune - an "ice giant" with only a small amount of gas - will grow.

"We now better understand the process of planet formation and can explain the properties of the strange exoplanets we've observed," said Prof Rasio. "We also know that the solar system is special and understand at some level what makes it special."

"The vast majority of other planetary systems didn't have these special properties at birth and became something very different."