

Thaxted Astronomical Society

News

Features

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The Great Divide

<https://www.dailymail.co.uk/sciencetech/article-7881793/Great-Divide-solar-caused-pressure-changes-protoplanetary-disc.html>

'Great Divide' in our solar system between rocky inner planets and outer gas giants was caused by pressure changes in a ring of dust and gas around the early Sun

Daily Mail 13th January 2020 >

- Protoplanetary discs form around early stars and lead to planetary systems
- This disc had bands of high and low pressure that split material off into two areas
- One side formed the inner rocky planets and the other the outer gas planets

The 'great divide' in the Solar System that splits inner rocky planets from outer gas giants was caused by a 'ring around the Sun', scientists claim.

The ring, known as a protoplanetary disc, was made up of dust and gas particles which combined to form the planets and moons we have today.

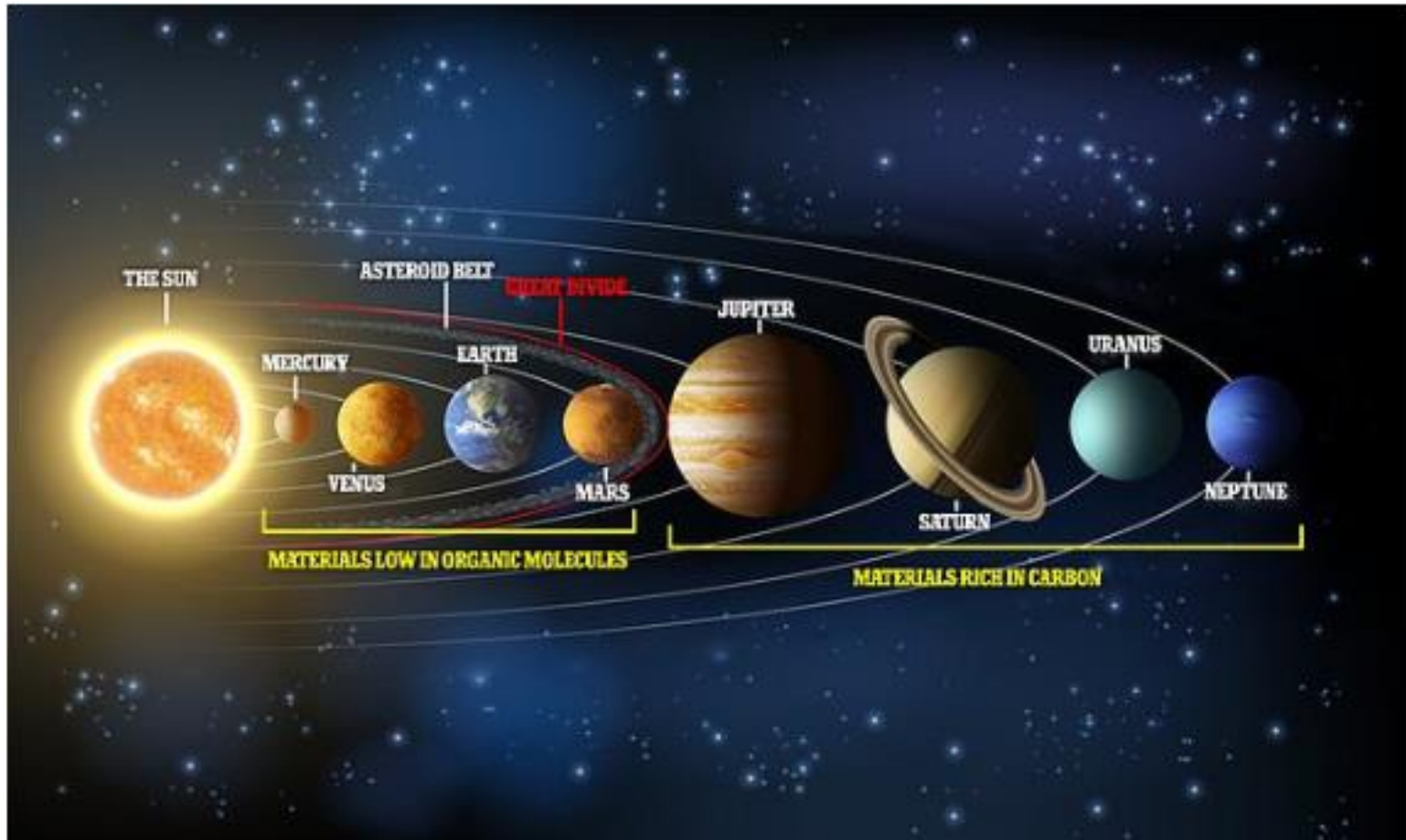
Researchers from Japan and the USA say this disc would have had bands of high and low pressure that split off to create the two distinct regions in the solar system.

One led to Jupiter, Saturn and the other outer planets with high levels of carbon molecules, while the other led to the creation of Earth and Mars.

Some of those high carbon elements likely crossed the divide and may have led to organic molecules, water and then life on Earth, the researchers claim.

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The team, led by Ramon Brassier from the Tokyo Institute with Stephen Mojzsis from the University of Boulder created computer models of the early solar system.

They also examined other young systems in the universe that have active protoplanetary discs surrounding the host star.

Dr Brassier compared the divide in the solar system to the Rocky Mountain range in the USA that splits the country east and west.

In the mountains, 'the Great Divide causes water to drain one way or another,' Mojzsis said. 'It's similar to how this pressure bump would have divided material' in the solar system.

The solar system 'Great Divide' does not look like much today, according to Dr Mojzsis, who said it is now a relatively empty stretch of space.

'You can still detect its presence throughout the solar system. Move sunward from that line, and most planets and asteroids tend to carry relatively low abundances of organic molecules.

'Go the other direction toward Jupiter and beyond, however, and a different picture emerges: Almost everything in this distant part of the solar system is made up of materials that are rich in carbon', he said.

This dichotomy 'was really a surprise when it was first found,' Dr Mojzsis added.

The thinking went that the planet is so massive that it may have acted as a gravitational barrier, preventing pebbles and dust from the outer solar system from spiraling toward the sun, he said.

They were able to dispute this theory using computer simulations that explored Jupiter's role in the evolving solar system.

They found that while Jupiter is big, it was probably never big enough early in its formation to entirely block the flow of rocky material from moving sunward.

This led to their discovery of the 'Great Barrier' likely formed alongside the rest of the solar system out of that early protoplanetary disc.

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What Is Dark Matter?

Dark matter is a hypothetical substance said to make up roughly 27 per cent of the universe. It is thought to be the gravitational 'glue' that holds the galaxies together



(artist's impression)