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Space

Did Earth grow from an alien rock?

A new idea could explain how our planet began to form billions of years ago

Jonathan O'Callaghan

INTERSTELLAR objects may have seeded the creation of planets in solar systems like our own, potentially solving a key problem with planet formation theories.

In 2017, researchers observed an object from another solar system passing through our own for the first time. They named it 'Oumuamua, and the general view is that it was some sort of asteroid or comet ejected from its host star system.

A second interstellar object, comet Borisov, was seen in 2019. The detection of 'Oumuamua and Borisov suggests that there are many interstellar objects travelling around our galaxy at any given moment.

This further indicates that such objects could play a role during the birth of solar systems. The slow speed of young stars relative to their neighbours, coupled with the braking effect of the dust and gas that surround them, could cause these objects to enter orbit around a star rather than simply passing through like 'Oumuamua and Borisov.

Amaya Moro-Martín and Colin Norman at the Space Telescope Science Institute in Baltimore, Maryland, modelled this process to estimate how many objects might become trapped by an average young star. They suggest that, over a period of maybe 10 million years, 600 billion objects about 1 metre in size would be captured, along with a further 200 million that are 10 metres wide, 60,000 that are 100 metres across and 20 that are 1 kilometre wide (arxiv.org/abs/2110.15366).

"We were surprised that these numbers were pretty high," says Moro-Martín. "But it is very uncertain, because we don't really know how much material is out there."

The figures suggest that interstellar objects could seed the birth of planets. These are thought to form by the accumulation of matter, gained either by accreting small, seed-like objects known as pebbles or through the collision of asteroid-like bodies known as planetesimals. But how you grow from dust in a disc to these larger objects is an open problem, known as the metre-size barrier.

NASA/ESA/STSCI/JPL

An artist's illustration of the interstellar object 'Oumuamua

"When dust particles become larger, their collisions are more energetic," says Moro-Martín. "When they collide, they start bouncing [off one another] rather than aggregating."

Interstellar objects could enable this material to accumulate, a little like the process through which dust in a cloud on Earth seeds raindrops. "These bigger bodies effectively act as condensation nuclei," says Michele Bannister at the University of Canterbury in Christchurch, New Zealand.

This might indicate that we owe our very existence to material from another star, says Alan Fitzsimmons at Queen's University Belfast in the UK. "It's possible that Earth was started by an interstellar object sitting in the sun's protoplanetary disc," he says. The object would form only a tiny fraction of our planet's bulk and almost certainly wouldn't be detectable today.

Some of these trapped objects could remain in the outer reaches of our solar system, however, perhaps in the Kuiper belt or Oort cloud beyond Neptune. But identifying one would be "pretty tough", says Fitzsimmons. ▮

Palaeontology

Penis worms lived in borrowed shells long before hermit crabs

HUNDREDS of millions of years before hermit crabs existed, penis worms took on a similar lifestyle – suggesting that the world's earliest animal ecosystems were more ecologically sophisticated than previously thought.

Marine animals similar to some that are still alive today appeared during the Cambrian explosion, about half a billion years ago. But early marine ecosystems are thought to have been simple, which makes the discovery of fossils showing priapulids – known as penis worms for their phallus-like shape – hiding inside snail-like shells a surprise. "Grabbing a shell… takes a level of behavioural complexity to say, 'Well, I need to find a shell that I fit in'," says Martin Smith at Durham University, UK.

He and his colleagues at Yunnan University in Kunming, China, discovered the fossils in 530-million-year-old rocks from the Guanshan biota, a fossil deposit in southern China. Four of the penis worms were found nestled down inside the conical shells of hyoliths (of the genus *Pedunculotheca*), an extinct, mollusc-like animal (*Current Biology*, doi.org/g49v).

This marks the earliest evidence of such behaviour: hermit crabs didn't adopt this sort of lifestyle until about 170 million years ago in the middle of a later evolutionary "explosion" called the Mesozoic marine revolution. During this time, predation stepped up a notch, says Smith – a little like the invention of a new technology for waging war.

"Finding hermit crab-like behaviour in these animals is like finding a cannon in the Bayeux Tapestry"

Finding hermit crab-like behaviour in animals that lived far earlier in geological time is "like finding a picture of a cannon in the Bayeux Tapestry", says Smith. ▮

Christa Lesté-Lasserre