

A SMALL, PRECIOUS HANDFUL OF DIRT



On 20 October, 2020, a robot spacecraft took a sample of surface dust from asteroid Benu. On 4 September, 2023, as it passed by the earth enroute to asteroid Apophis, it dropped off a capsule carrying that sample. This entered our atmosphere and successfully soft-landed. The sample has is being carefully examined under highly sterile conditions, to avoid contamination, and has been found to contain chemicals important in the creation of life as we know it.

This space mission, known as OSIRIS-APEX, went ahead because the only way to understand how the Solar System came about and what made possible the appearance of life would be to get hold of samples of the raw materials from which the Solar System was made. Thanks to 4.5 billion years of geological processes, and on at least our planet, billions of years of work by living creatures, none of that primordial material remains here on Earth or the other planets. There is a lot of it in the outer reaches of the Solar System, beyond the orbit of Neptune, left over from the formation of the sun and planets. However, with the current state of our space



technology, that region is very hard and time-consuming to get to. It is better if that material were to come close enough for us to reach it more easily with one of our spacecraft. One other, equally important objective of the project was to see closely how the asteroid is put together, which will be help us work out the best way to deal with any asteroid that is likely to hit our planet.

Our radio telescopes have revealed that the great, cold gas and dust clouds between the stars, which contain the raw materials for making new stars and planets, also contain carbon-based molecules that are important in life processes and are the building blocks of life as we know it. However, a lot has to go on to get those chemicals from the clouds to the surfaces or oceans of new planets.



There is a major star and planet nursery visible in the sky at the moment. Find the three stars marking the belt of the constellation of Orion, The Hunter, and scan down from the belt, where his sword would be, That silvery glow is the Orion Nebula, where part of a great cloud of gas and dust is collapsing the form new stars and planets. The nebula is glowing because of the intense radiation from newly born stars.

This shows the first of two problems with delivering those seeds of life to new planets. While the star is enjoying its turbulent youth, it gives off lots of ultraviolet light, which can destroy complex molecules. However, the leftover material from star and planet construction, far from the star and relatively safe from the radiation, forms a reservoir of those chemicals.

The second problem is due to the energy released from the in-falling material forming the planet. Young worlds are balls of molten rock; any organic molecules arriving would be destroyed by the heat. Eventually the star settles down to maturity and ceases to radiate as much ultraviolet radiation, and the planets will have cooled off enough to have solid surfaces and hopefully liquid water oceans. The planets are now ready for those biomolecules.

Occasionally, the asteroids and other bodies containing those organic molecules, orbiting safely far from the star, collide. This can put one or more of them into new paths, taking them inward toward the planets, where they may collide with one of them, delivering a consignment of the seeds of life. No doubt some deliveries happen too early, but eventually some would arrive in the ocean of a young world, starting it on the path to life.



Deliveries continue. There was a big one 65 million years ago in the Gulf of Mexico, and a smaller one in 1908, in Siberia, and others in between.

The planetary line-up continues. Saturn lies low in the southwest sunset glow. Moving to the left, that is eastward, find brilliant Venus, then Jupiter, almost as bright; finally Mars, conspicuously red. The moon will be Full on the 12th

Ken Tapping, 11th February, 2025.

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