# Origin of Life – Panspermia Reading

## The panspermia hypothesis

The term panspermia comes from the Ancient Greek ‘pan’ meaning all and ‘sperma’ meaning seed. This hypothesis links life on Earth with potential life in other parts of the solar system and Universe, but the form of that linkage is a subject of disagreement. The more common view is that the organic molecules that are building blocks for life come from sources outside Earth – comets and meteorites. Other proponents of panspermia believe that bacteria or bacterial spores may have come from extraterrestrial sources.

## Molecules from meteorites

On September 28, 1969, a bright orange ball with a smoky blue tail passed through the night sky in country Victoria before it broke apart with a sonic boom. Several hundred pieces fell around the town of Murchison. Most residents had no idea what the noise was, but some people found strange charcoal-like rocks in their paddocks. These rocks were unusually smelly and immediately caught the interest of geologists. Over time, 100 kg of Murchison meteorite was recovered.

A large fragment of the Murchison meteorite with fusion crust. This carbonaceous chondrite contains a wide variety of amino acids. (J St John 2005, Wikimedia Creative Commons)

Fragments of the Murchison meteorite were analysed and compared to results of the Miller-Urey experiment. These were found to be quite similar and may provide a snapshot of organic reactions in the early solar system.

Research published in 1997 found more than 90 different amino acids, 19 of which are found on Earth. In 2001, sugar and related compounds were discovered in the meteorite. More than 14,000 unique molecular combinations were found in a 2010 study of the meteorite. This body of research indicates that meteorites bombarding early Earth could have provided the organic chemicals that led to life on Earth.

## Bacteria in space?

The Hoyle-Wickramasinghe model of panspermia states that comets seeded Earth with hardy bacteria, viruses or even more complex eukaryotic cells and organisms. The first evidence for their hypothesis was that the light absorbed by interstellar dust matched that absorbed by desiccated *E coli* bacteria.

Methyl chloride ($CH_3Cl$) provides further evidence for the theory. On Earth, methyl chloride is only made by living organisms. It has been proposed as a biomarker to look for on exoplanets. The Rosetta mission found methyl chloride in comet 67P.

Experiments on the International Space Station (ISS) indicate that after 18 months exposed to space, bacterial colonies on Antarctic rocks still contain viable algae and fungi. The dust on the exterior of the ISS contains the DNA of terrestrial bacteria.

### Is panspermia testable?

A valid scientific hypothesis must be falsifiable. Panspermia is potentially falsifiable, but this would require finding evidence of life elsewhere in the solar system that is very different from that on Earth. Space agencies are looking for life on Mars, Enceladus and Europa, so there could be an answer in the future.

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