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Complex organic molecule found in interstellar space

By Michael Eyre

Science reporter

The scientists searched for the molecule deep in the Milky Way

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Scientists have found the beginnings of life-bearing chemistry at the centre of the galaxy.

Iso-propyl cyanide has been detected in a star-forming cloud 27,000 light-years from Earth.

Its branched carbon structure is closer to the complex organic molecules of life than any previous finding from interstellar space.

The discovery suggests the building blocks of life may be widespread throughout our galaxy.

Various organic molecules have previously been discovered in interstellar space, but i-propyl cyanide is the first with a branched carbon backbone.

The branched structure is important as it shows that interstellar space could be the origin of more complex branched molecules, such as amino acids, that are necessary for life on Earth.

Dr Arnaud Belloche from the Max Planck Institute for Radio Astronomy is lead author of the research, which **appears in the journal Science**.

"Amino acids on Earth are the building blocks of proteins, and proteins are very important for life as we know it. The question in the background is: is there life somewhere else in the galaxy?"

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The molecule was detected in a giant gas cloud called Sagittarius B2, an active region of ongoing star formation in the centre of the Milky Way.

As stars are born in the cloud they heat up microscopic dust grains. Chemical reactions on the surface of the dust allow complex molecules like i-propyl cyanide to form.

The molecules emit radiation that was detected as radio waves by twenty 12m telescopes at the **Atacama Large Millimeter Array (Alma)** in Chile.

Each molecule produces a different "spectral fingerprint" of frequencies. "The game consists in matching these frequencies… to molecules that have been characterised in the laboratory," explained Dr Belloche.

"Our goal is to search for new complex organic molecules in the interstellar medium."

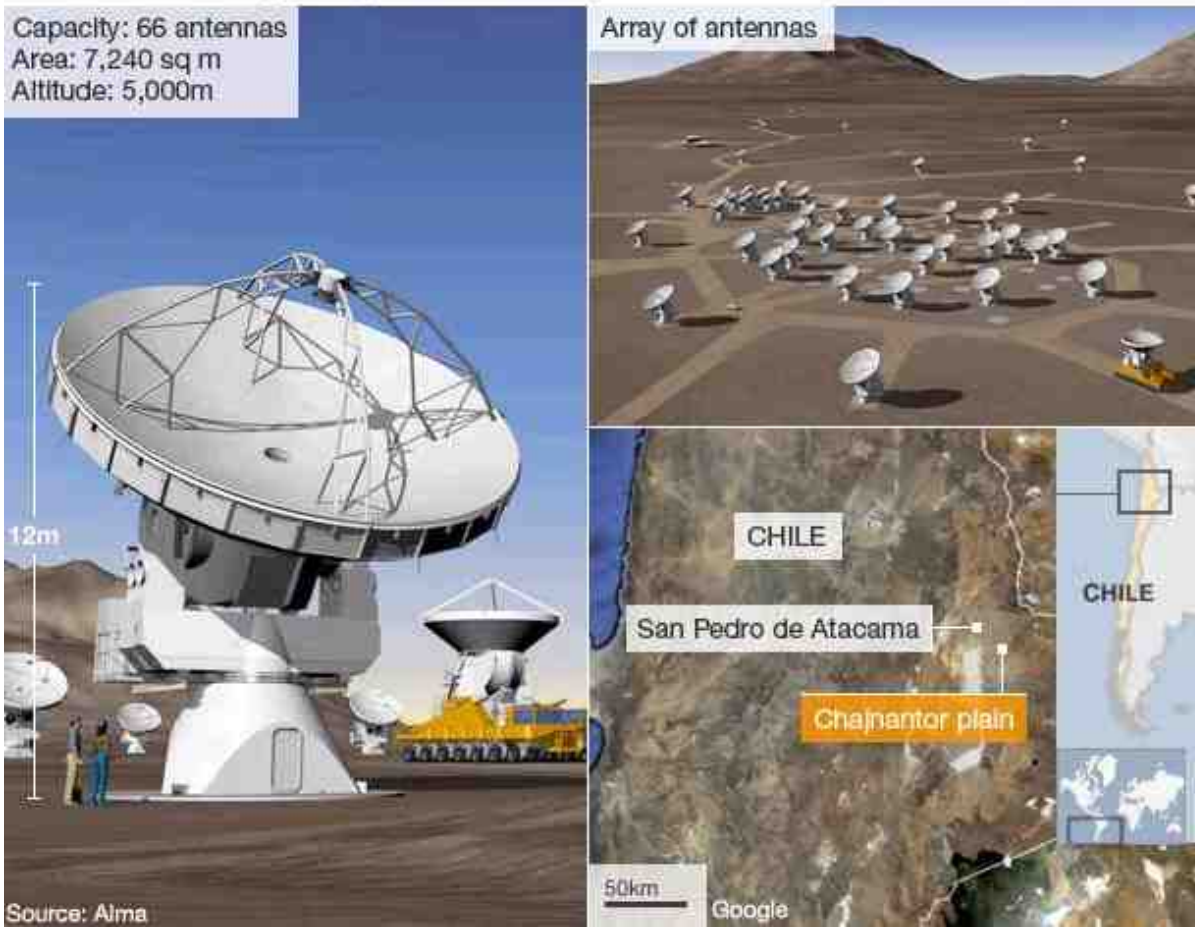
Previously discovered molecules in the Sagittarius B2 cloud include vinyl

alcohol and ethyl formate, the chemical that gives raspberries their flavour and rum its smell.

But i-propyl cyanide is the largest and most complex organic molecule found to date - and the only one to share the branched atomic backbone of amino acids.

"The idea is to know whether the elements that are necessary for life to occur… can be found in other places in our galaxy."

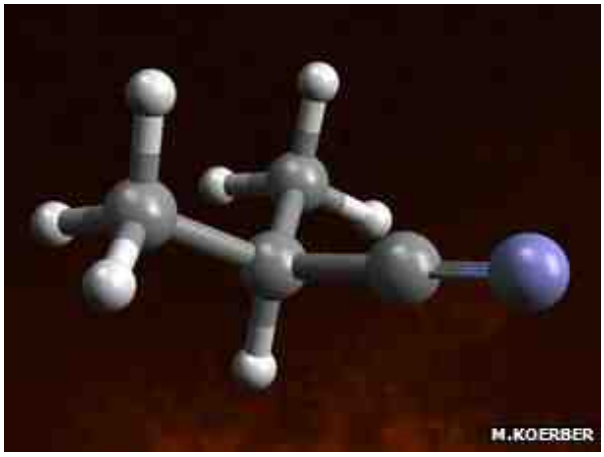
Alma Observatory at high altitude in Atacama desert



Prof Matt Griffin, head of the school of physics and astronomy at Cardiff University, commented on the discovery.

"It's clearly very high-quality data - a very emphatic detection with multiple spectral signatures all seen together."

Prof Griffin added that the quantity of i-propyl cyanide detected is significant.



The molecule i-propyl cyanide has a branched backbone of carbon atoms

"There seems to be quite a lot of it, which would indicate that this more complex organic structure is possibly very common, maybe even the norm, when it comes to simple organic molecules in space.

"It's a step closer to discovering molecules that can be regarded as the building blocks or the precursors… of amino acids."

The hope is that amino acids will eventually be detected outside our Solar System. "That's what everyone would like to see," said Prof Griffin.

If amino acids are widespread throughout the galaxy, life may be also.

"So far we do not have the sensitivity to detect the signals from [amino acids]… in the interstellar medium," explained Dr Belloche. "The interstellar chemistry seems to be able to form these amino acids but at the moment we lack the evidence.

"Alma in the future may be able to do that, once the full capabilities are available."

Prof Griffin agreed this could be the first of many further discoveries from the "fantastically sensitive and powerful" Alma facility.