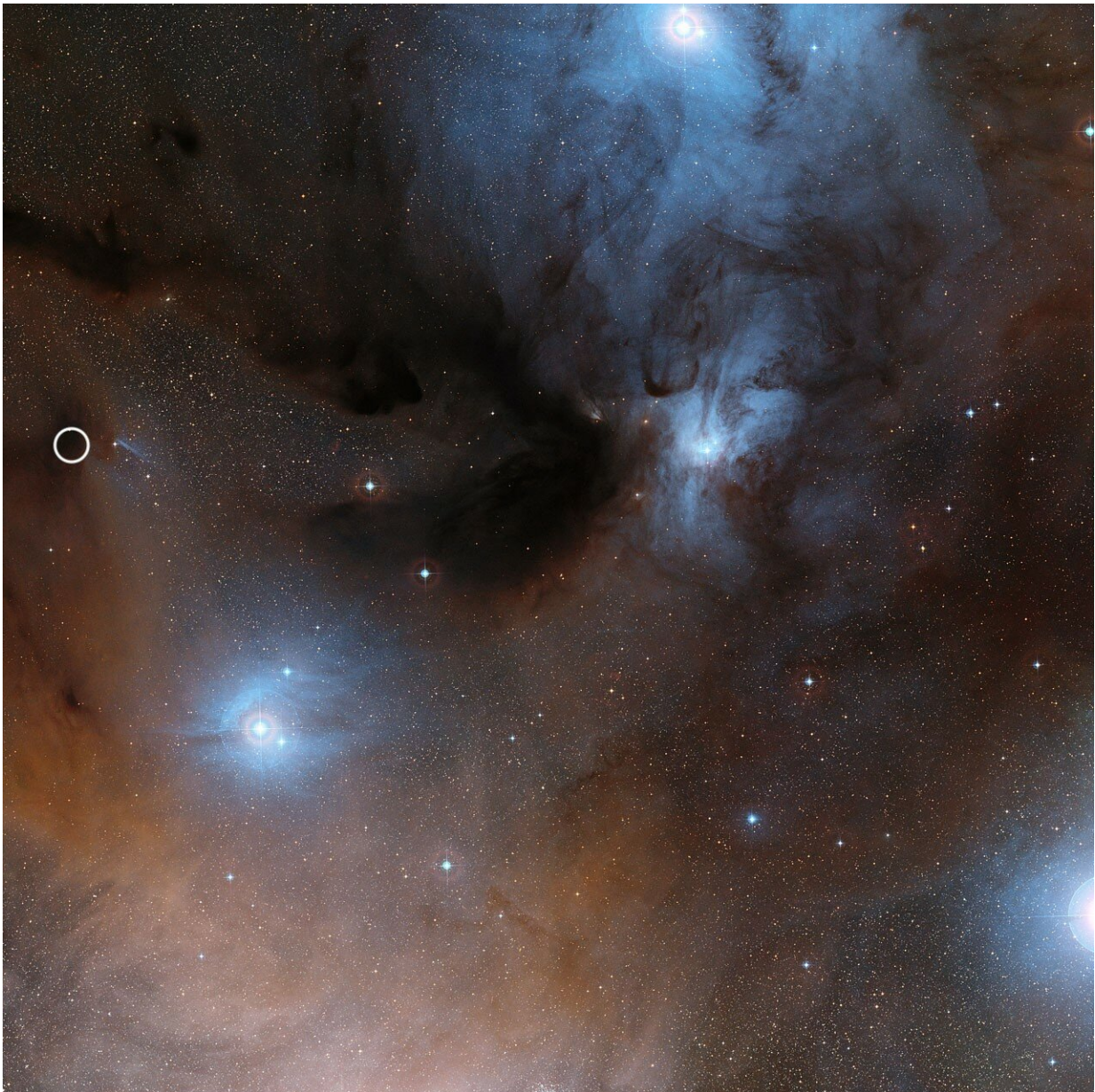


Astronomers find star material could be building block of life

January 23 2019



The Rho Ophiuchi star formation region with IRAS16293-2422 B circled.
Credit: ESO/Digitized Sky Survey 2. Acknowledgement: Davide De Martin

An organic molecule detected in the material from which a star forms could shed light on how life emerged on Earth, according to new research led by Queen Mary University of London.

The researchers report the first ever detection of glycolonitrile (HOCH₂CN), a pre-biotic molecule which existed before the emergence of life, in a solar-type protostar known as IRAS16293-2422 B.

This warm and dense region contains [young stars](#) at the earliest stage of their evolution surrounded by a cocoon of dust and gas—similar conditions to those when our Solar System formed.

Detecting pre-biotic [molecules](#) in solar-type protostars enhances our understanding of how the solar system formed as it indicates that planets created around the star could begin their existence with a supply of the [chemical](#) ingredients needed to make some form of life.

This finding, published in the journal *Monthly Notices of the Royal Astronomical Society: Letters*, is a significant step forward for pre-biotic astrochemistry since glycolonitrile is recognised as a key precursor towards the formation of adenine, one of the nucleobases that form both DNA and RNA in living organisms.

IRAS16293-2422 B is a well-studied protostar in the constellation of Ophiuchus, in a region of star formation known as rho Ophiuchi, about 450 light-years from Earth.



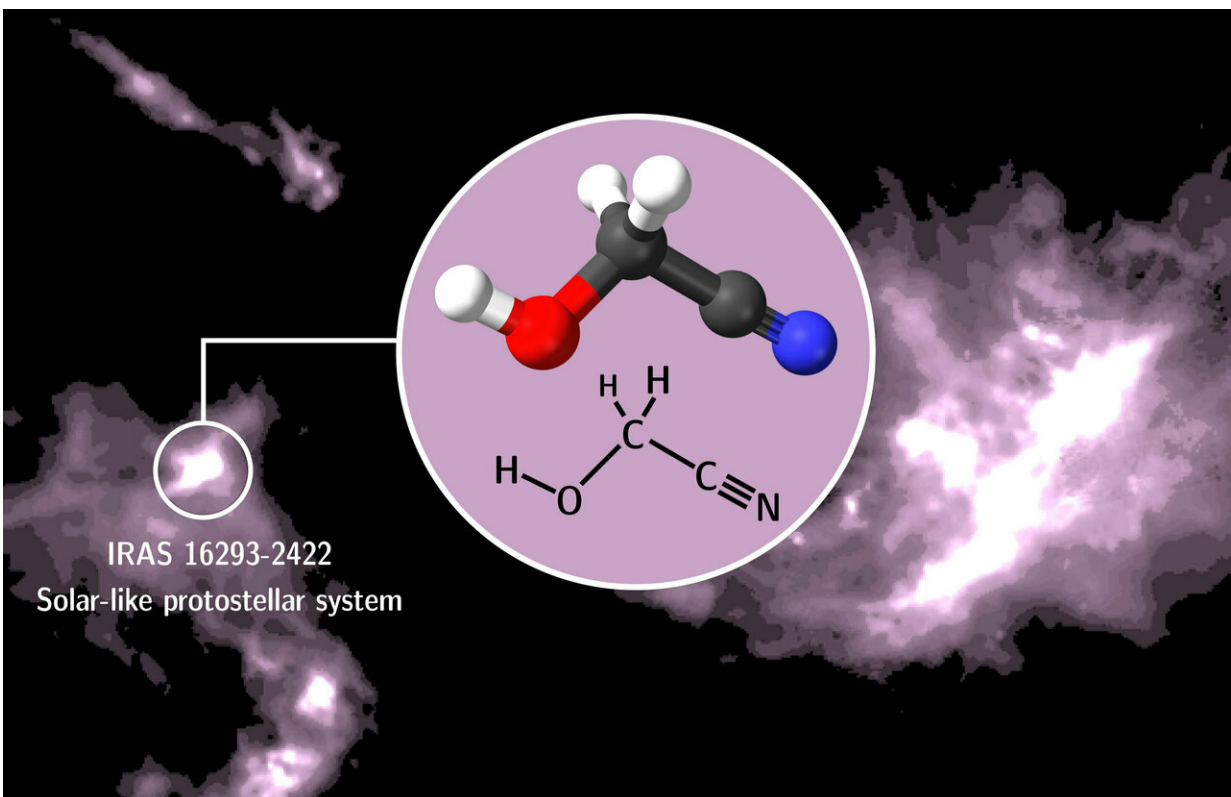
The Rho Ophiuchi star formation region. Credit: ESO/Digitized Sky Survey 2.
Acknowledgement: Davide De Martin

The research was also carried out with the Centro de Astrobiología in Spain, INAF-Osservatorio Astrofisico di Arcetri in Italy, the European Southern Observatory, and the Harvard-Smithsonian Center for

Astrophysics in the USA.

Lead author Shaoshan Zeng, from Queen Mary University of London, said: "We have shown that this important pre-biotic molecule can be formed in the material from which [stars](#) and planets emerge, taking us a step closer to identifying the processes that may have led to the origin of life on Earth."

The researchers used data from the Atacama Large Millimeter/submillimetre Array (ALMA) telescope in Chile to uncover evidence for the presence of glycolonitrile in the material from which the star is forming—known as the interstellar medium.



Glycolonitrile Credit: Víctor M. Rivilla & Ben Mills & Herschel-SPIRE 500 microns

With the ALMA data, they were able to identify the chemical signatures of glycolonitrile and determine the conditions in which the molecule was found. They also followed this up by using chemical modelling to reproduce the observed data which allowed them to investigate the chemical processes that could help to understand the origin of this molecule.

This follows the earlier detection of methyl isocyanate in the same object by researchers from Queen Mary. Methyl isocyanate is what is known as an isomer of glycolonitrile—it is made up of the same atoms but in a slightly different arrangement, meaning it has different chemical properties.

More information: S Zeng et al, First detection of the pre-biotic molecule glycolonitrile (HOCH₂CN) in the interstellar medium, *Monthly Notices of the Royal Astronomical Society: Letters* (2019). [DOI: 10.1093/mnrasl/slz002](https://doi.org/10.1093/mnrasl/slz002)

Provided by Queen Mary, University of London

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