Exotic life forms: looking for life as we don't know it

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Courtesy Europlanet Media Centre
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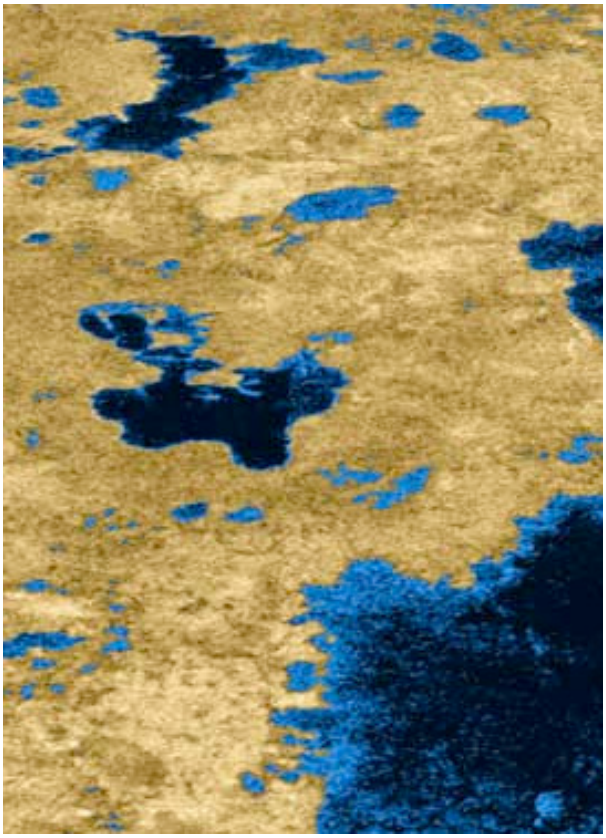
Scientists at a new research institute are working to find out how life might evolve using chemicals not found in Earth-based life forms.

They're studying how organisms might employ alternative solvents—that is, other liquids that could play the role that water does in familiar life forms.



Bodies of liquid on Titan, a moon of Saturn. (Courtesy NASA)

The University of Vienna established the research group Alternative Solvents as a Basis for Life Supporting Zones in (Exo-)Planetary Systems last May under the leadership of astronomer Maria Firneis. Research by the group was presented at the European Planetary Science Congress in Potsdam, Germany on Sept. 18.

Traditionally, planets that might sustain life are sought in "habitable zone," the regions around stars in which Earth-like planets with carbon dioxide, water vapour and nitrogen atmospheres could maintain liquid water on their surfaces.

Scientists have been seeking chemical signatures produced by extraterrestrial life with metabolisms resembling the terrestrial ones, where the building blocks of life, amino acids, are based on carbon and oxygen dissolved in water.

But “it cannot be ruled out that life forms have evolved somewhere that neither rely on water nor on a carbon- and oxygen-based metabolism,” said research group member Johannes Leitner. “It is time to make a radical change in our present ‘geocentric’ mindset.”

A life-supporting solvent must remain liquid over a large temperature range. Water is liquid between 0 and 100 degrees Celsius, but some other solvents are liquid over more than 200 degrees. Such a solvent would allow an ocean on a planet closer to the central star, researchers say.

The reverse scenario is also possible – a liquid ocean of ammonia could exist much further from a star. Furthermore, sulphuric acid can be found within the cloud layers of Venus and lakes of methane or ethane cover parts of the surface of the Saturnian moon Titan.

The research group, with international collaborators, plans to study the properties of a range of solvents other than water, including their abundance in space, thermal and biochemical characteristics as well as their ability to support the origin and evolution of life-supporting metabolisms. Although known most exoplanets, or planets outside our solar system, are composed of gas, “it is a matter of time until smaller, Earth-size exoplanets are discovered,” said Leitner.