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News & Comments

Using Ancient Microbes to Discover Extraterrestrial Life

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Using light-capturing proteins found in living microorganisms, researchers have recreated the life of some of Earth's earliest species. With the help of these initiatives, everyone may be able to detect life on distant worlds whose atmospheres resemble those of pre-oxygen planets.

In the early days of life, bacteria and single-celled organisms such as archaea lived on an oceanic planet without an ozone layer to protect them from the sun's rays. Rhodopsin is a protein that converts sunlight into energy, which is used to power cellular processes by these microbes. Seeing colors and distinguishing between light and dark is made possible by rhodopsins, which are related to rods and cones in the eye. As well as present in modern organisms and environments, such as saltern ponds, they are also widely distributed among modern organisms and environments. By analyzing rhodopsin protein sequences from around the world and tracking their evolution, the research team used machine learning. By creating a type of family tree, they were able to reconstruct the rhodopsins that existed 2.5 to 4 billion years ago, as well as the conditions under which they probably lived.

By using proteins and rhodopsins, ancient microbes derived ample energy from the sun without the complex biomolecules required for photosynthesis. As a result of these efforts, they may be able to identify signs of life on other planets whose atmospheres are more similar to those of our pre-oxygen planet.

They found differences in the amount of light absorbed by ancient and modern rhodopsins. Genetic reconstructions indicate that ancient rhodopsins absorbed blue and green light, while modern rhodopsins absorb blue, green, yellow, and orange light. A clue to the difference between ancient and modern Earth's environments can be found here. The researchers say that because the "... functional diversification and spectral tuning of this taxonomically diverse protein family..." are coupled, rhodopsins are an excellent laboratory testbed for identifying remotely detectable biosignatures on exoplanets.

KEYWORDS

atmosphere, life, solar system, early Earth, phototrophy, rhodopsin, radiative transfer, origins of life, biosignature, habitability, exobiology, rhodopsin, planet earth,