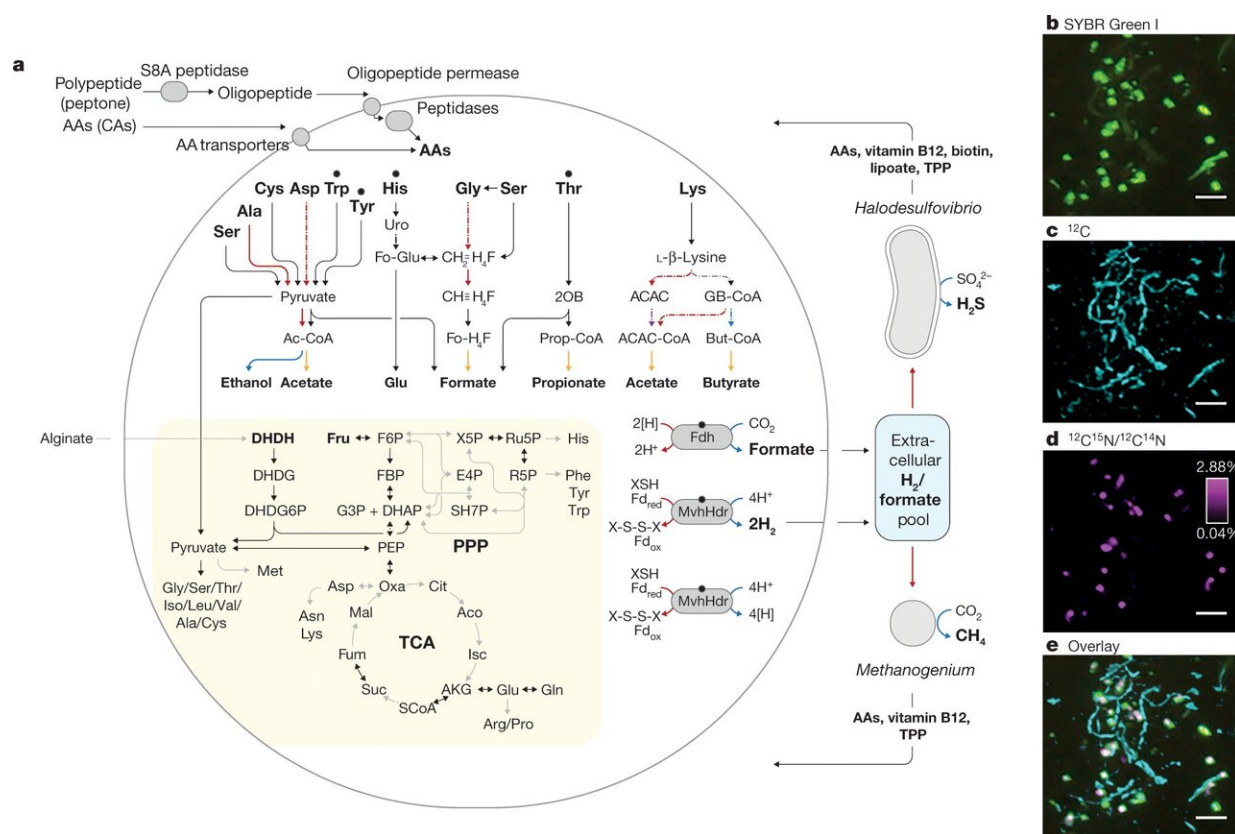


Incubated *Prometheoarchaeum syntrophicum* samples may provide clues about origin of eukaryotic cells

January 16 2020, by Bob Yirka



Syntrophic amino acid utilization of MK-D1. Credit: *Nature* (2020). DOI: 10.1038/s41586-019-1916-6

A team of researchers affiliated with a large number of institutions in

Japan has found a possible link between primitive archaea and the development of eukaryotes. In their paper published in the journal *Nature*, the group describes culturing *Prometheoarchaeum syntrophicum* samples and what they learned by studying them.

One of the great mysteries of science is how primitive bacteria-like organisms evolved into much more sophisticated organisms called eukaryotes. Scientists believe life appeared on Earth approximately 4 billion years ago. They also believe that the first forms of life were bacteria-like organisms similar to modern archaea—a group of organisms with a very simple type of cell structure—they do not have a nucleus, for example.

The next evolutionary stage remains a mystery, though researchers believe it occurred approximately 2 billion years ago. How did a member of archaea evolve to become a [eukaryote](#)? Eukaryotes are organisms with complex cell structures, like plants and animals. One theory that has become popular suggests that a certain kind of archaea was swallowed by another, and that the one that was ingested evolved into a group of organelles. In this new effort, the team in Japan has developed a theory based on a kind of archaea they cultured in their laboratory.

The work involved retrieving mud samples containing archaea, known collectively as Asgard archaea, from the [ocean floor](#) near Japan, and culturing the archaea lines that developed in special methane-infused chambers—the researchers had to wait for three years before they could separate them into individual groups due to their slow growth.

After several more years, they began to focus on one particular strain they called *Candidatus Prometheoarchaeum syntrophicum*. Its features suggested it bore a close resemblance to the ancient [archaea](#) that had evolved into eukaryotic cells. The researchers continued studying the microbes for several more years—they found that the organisms grew to

approximately 550 nm in diameter and degraded amino acids through syntrophy. They also discovered that they had long, branching protrusions. After careful observation of the [organisms](#), the researchers developed a theory: They suggest that a bacterium became entangled in the branching protrusions and evolved into an organelle and that led to the development of eukaryotes.

More information: Hiroyuki Imachi et al. Isolation of an archaeon at the prokaryote–eukaryote interface, *Nature* (2020). [DOI: 10.1038/s41586-019-1916-6](#)

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