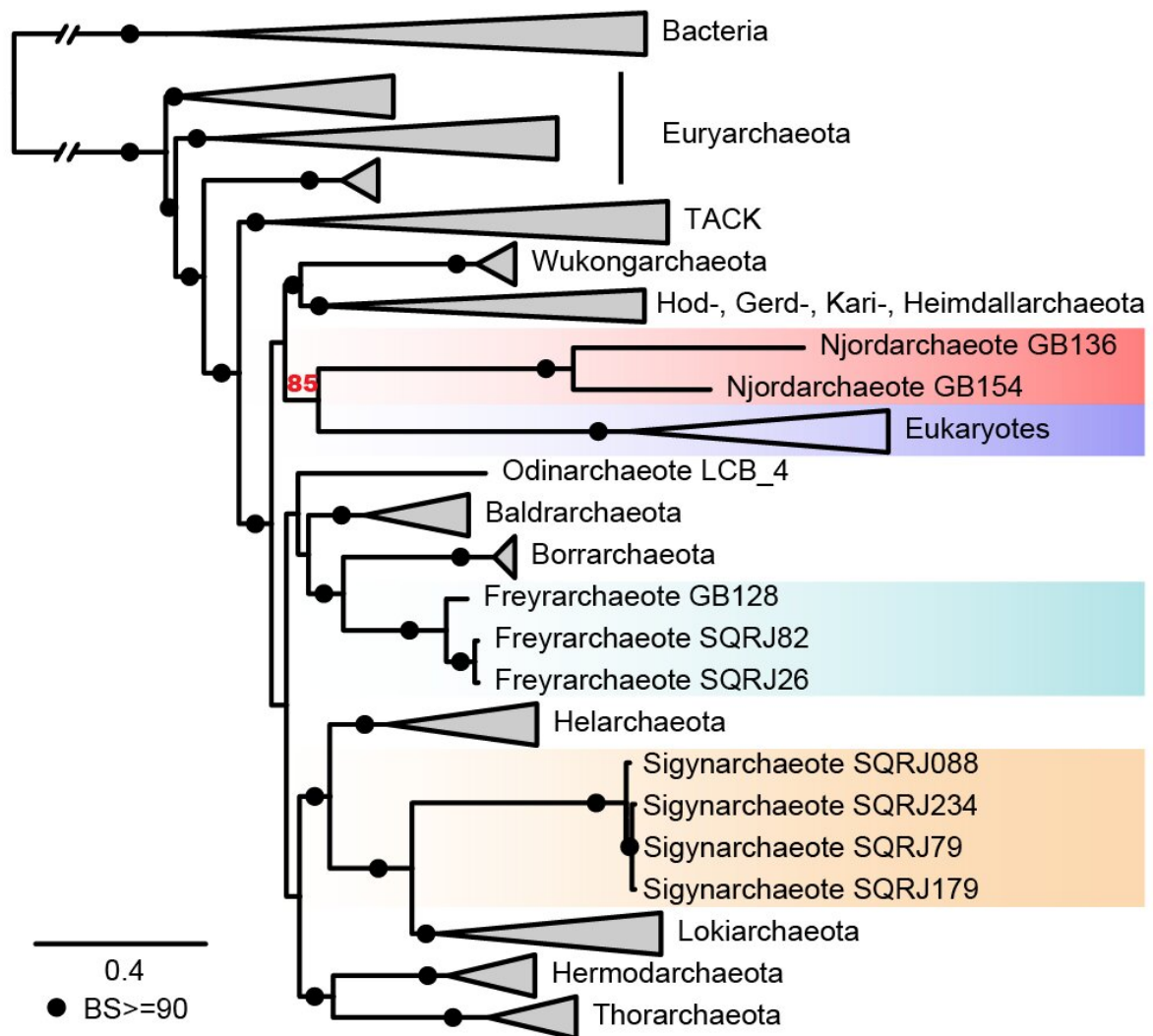


Njordarchaeota, a new candidate for a sister group to eukaryotes

October 20 2021



The phylogenetic relationship between the Asgard archaea and eukaryotes.
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The emergence of eukaryotic cells is considered as a critical biological evolutionary event on Earth. The origin of eukaryotes and eukaryosis are frontier issues in both life and Earth sciences. Currently, it is widely accepted that the origin of eukaryotes was initiated with a symbiotic process, in which one endosymbiotic host cell became the cell nucleus and one endosymbiotic alphaproteobacterium evolved into a mitochondrion.

Two divergent opinions about the host: one is 'Eocyte hypothesis', whereby the host originated from within the domain Archaea (two-domains tree); the other is 'Woese hypothesis', in which eukaryotes did not evolve from a particular archaeal branch, but independently evolved as one domain of life. In recent years, the discovery of Asgard [archaea](#), a new superphylum, has given more supports on the two-domains tree of life, including comprehensive phylogenetic analyses and the discovery that Asgard archaea possess a large number of eukaryotic signature proteins (ESP).

Recently, the exact lineage of the ancestor of eukaryotes from the Asgard archaea is of great interesting for evolutionary scientists. Initially, some European scholars supposed that Ca. Lokiarchaeota was the closest branch to eukaryotes (Spang et al. Nature 2015); subsequently, Ca. Heimdallarchaeota was identified as the closest archaeal relatives to eukaryotes (Zaremba-Niedzwiedzka et al. Nature 2017). Recently, a team led by Prof. Li Meng from Shenzhen University and Prof. Eugene V. Koonin of the National Institutes of Health discovered that eukaryotes probably originated from the common ancestor branch of Wukong-Heimdall archaea (Liu et al. Nature 2021).

In order to get more insights into the origin of eukaryotes, the authors collected sediment samples from [different environments](#) as well as using

the public metagenomic database to obtain more members of Asgard archaea. The analysis revealed that, in addition to the previously described clades, there are three additional monophyletic branching clades, named Sigyn-, Freyr- and Njordarchaeota after the Asgard gods in the Norse mythology (Sigyn, the god of victory; Freyr, the god of peace; Njord, the god of seas).

Then, the authors carefully selected representative species and conserved marker genes to construct phylogenetic trees and used different models to eliminate the interference of model selection. The results indicate that Njordarchaea is likely to be the closest potential relatives to eukaryotes. Meanwhile, a new syntrophic model is proposed based on the metabolic characteristics of Njordarchaea, in which the archaeal progenitor may likely utilize [amino acids](#) and other small organic compounds to generate hydrogen or acetate in syntrophy with bacterial partners. This long-term stable syntrophic relationship may facilitate integration of symbiogenetic consortium, and eventually evolved to the eukaryotes ancestor.

More information: Ruize Xie et al, Expanding Asgard members in the domain of Archaea sheds new light on the origin of eukaryotes, *Science China Life Sciences* (2021). [DOI: 10.1007/s11427-021-1969-6](https://doi.org/10.1007/s11427-021-1969-6)

Provided by Science China Press

Citation: Njordarchaeota, a new candidate for a sister group to eukaryotes (2021, October 20) retrieved 27 June 2024 from <https://phys.org/news/2021-10-njordarchaeota-candidate-sister-group-eukaryotes.html>

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