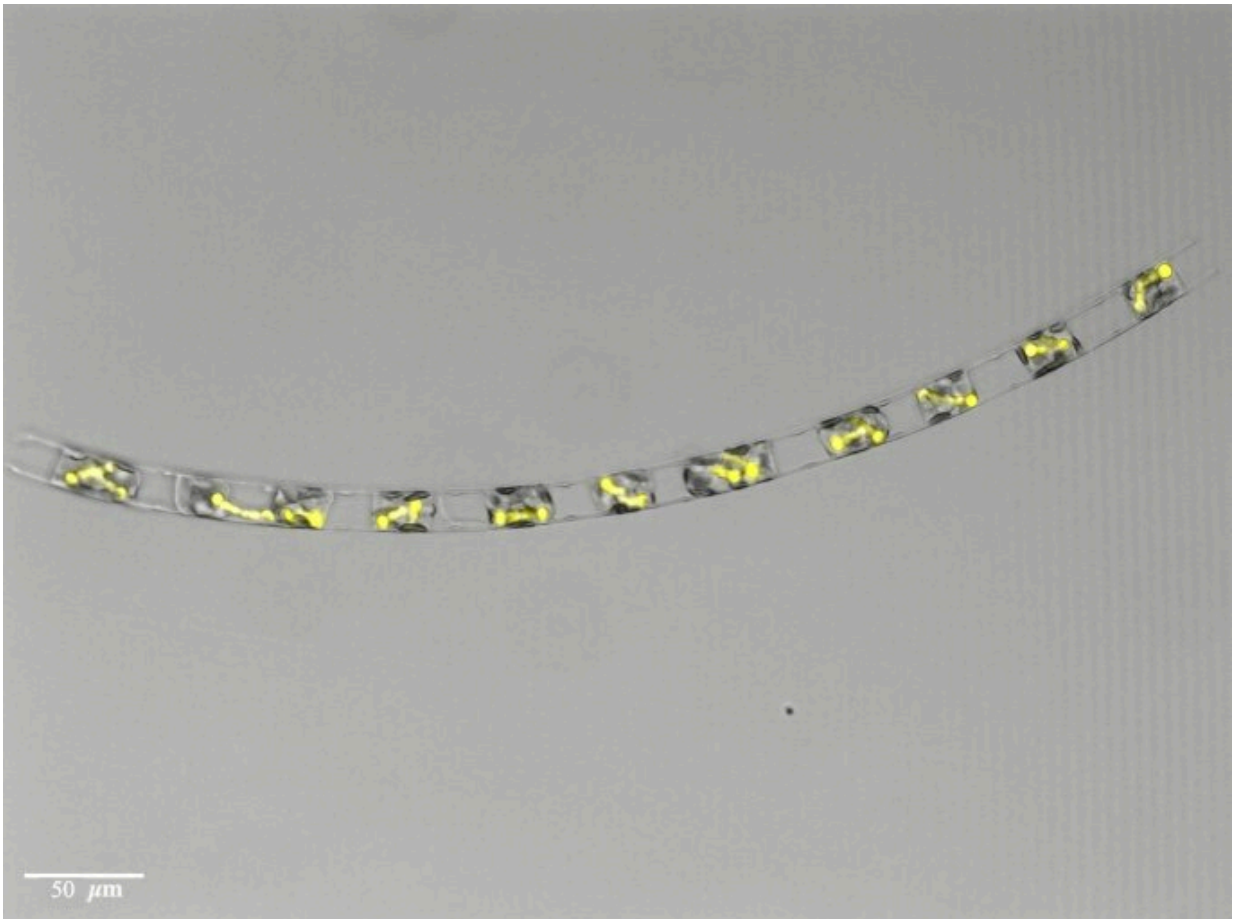


Diatom / bacteria symbiosis in the open ocean explored

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Epi-fluorescent micrograph of a chain of the *Hemiaulus*-*Richelia* symbiosis combining brightfield and green excitation to excite the autofluorescence of the *Richelia* filaments (here shown in yellow). Usually, one or two *Richelia* symbionts are observed per host diatom. Credit: Sepehr Bardi

A study published in *PNAS Nexus* explores the genetic expression of a photosynthetic symbiont that lives inside an abundant marine organism. Marine diatoms are responsible for one-fifth of global photosynthesis. Many are coastal, but diatom-diazotroph associations thrive in open ocean waters that are low in nutrients thanks to a symbiotic relationship between a diatom host and nitrogen-fixing bacteria.

Rachel Foster, Enrique Flores, and colleagues collected the diatom *Hemiaulus hauckii*, along with the cyanobacterium *Richelia eulintracellularis*, which lives inside the diatom's cells, from multiple locations in the western tropical North Atlantic.

Cyanobacteria are bacteria which can perform plant-like photosynthesis. As researchers are currently unable to grow *Richelia eulintracellularis* in the laboratory, the authors explored the function of proteins found in the endosymbiont by expressing the proteins in model organisms, including *Escherichia coli* and *Anabaena* sp.

One protein was found to split sucrose into glucose and fructose. The presence of a sucrose-specific solute binding protein, which participates in shuttling molecules across the [cell membrane](#), suggests that the sucrose is provided to the bacteria by the diatom hosts. Other solute binding proteins were found that participate in the transport of amino acids (glutamate, phenylalanine) and a polyamine (spermidine). The expression of genes that encode these proteins was verified in wild populations from the Atlantic Ocean.

According to the authors, the study paints a picture of a system in which the diatom supplies the bacteria with reduced organic carbon compounds to sustain a high rate of nitrogen fixation.

More information: Mercedes Nieves-Mori3n et al, Heterologous expression of genes from a cyanobacterial endosymbiont highlights

substrate exchanges with its diatom host, *PNAS Nexus* (2023). DOI: [10.1093/pnasnexus/pgad194](https://doi.org/10.1093/pnasnexus/pgad194)

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