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Oceans as Carbon Sinks: DFG Funds New Collaborative Research Center on Marine Sugars

On May 28, 2025, the University of Greifswald and the University of Bremen received funding approval for the Transregional Collaborative Research Center (TRR) 420 "CONCENTRATE." The scientists in the consortium are investigating sugar polymers from marine algae and how they protect the climate.

Every year, marine algae convert about five times as much carbon dioxidae into polysaccharides – known as glycans – as is released worldwide through the burning of fossil fuels. These glycans are a central component of the marine carbon cycle. Although marine bacteria have a variety of enzymes that can break down glycans and release the bound carbon, surprisingly large amounts of these sugar structures are found in the world's oceans. This suggests that previously unknown factors prevent the complete degradation of glycans and thus contribute to the long-term storage of carbon.

A Look at the Atomic Level

This is where TRR 420 comes in: The aim of the research program is to decipher the molecular and microbial processes that lead to the stabilization of glycans in the ocean. Taking an interdisciplinary approach, the research team combines laboratory experiments with measurements in natural marine habitats. The focus is on the interactions between algae, bacteria, fungi, their glycans, and proteins – down to atomic resolution in the Ångström range (i.e. length scales in the range of about 0.1 to 1 nanometer, or 0.1 to 1 billionth of a meter).

"We want to understand which biotic and abiotic mechanisms influence the stability of glycans and how these processes occur temporally and spatially in the ocean," explains spokesperson Prof. Dr. Thomas Schweder, Professor of Pharmaceutical Biotechnology at the University of Greifswald. The consortium is focusing in particular on the sun-exposed surface ocean – the main site of glycan production by algae – and is investigating time scales ranging from days to years.

Research for the Climate: New Insights into Natural Carbon Storage

"In the long term, TRR 420 aims to provide a mechanistic understanding of why sugar structures from algae contribute to carbon storage," adds co-spokesperson Prof. Dr. Jan-Hendrik Hehemann, head of the Carbon Sequestration and Glycobiochemistry research group at the University of Bremen. The findings could make important contributions to the fight against climate change by opening up new perspectives on natural carbon sequestration processes.

"The establishment of TRR 420 is a major success for the University of Greifswald and underscores our international visibility in marine research," stated President Prof. Dr. Katharina Riedel. "Research into the natural processes of carbon sequestration in the oceans is both highly relevant scientifically and of great social importance in the context of climate change and due to the biotechnological and pharmaceutical properties of algae sugar compounds."

“I congratulate the two spokespersons and all participating researchers of the TRR 420 – they are conducting passionate research in an extremely promising field. The funding approval marks another major milestone in marine research for the University of Bremen and strengthens sustainability-related research topics,” commented Professor Jutta Günther, President of the University of Bremen. ”This success not only reflects our expertise in marine research, but also the added value of scientific cooperation.”

The following institutions are involved in the consortium: University of Greifswald, Universitätsmedizin Greifswald, University of Bremen, Technische Universität Berlin, Leibniz Institute for Baltic Sea Research Warnemünde, Max Planck Institute of Colloids and Interfaces Potsdam, Max Planck Institute for Marine Microbiology in Bremen.

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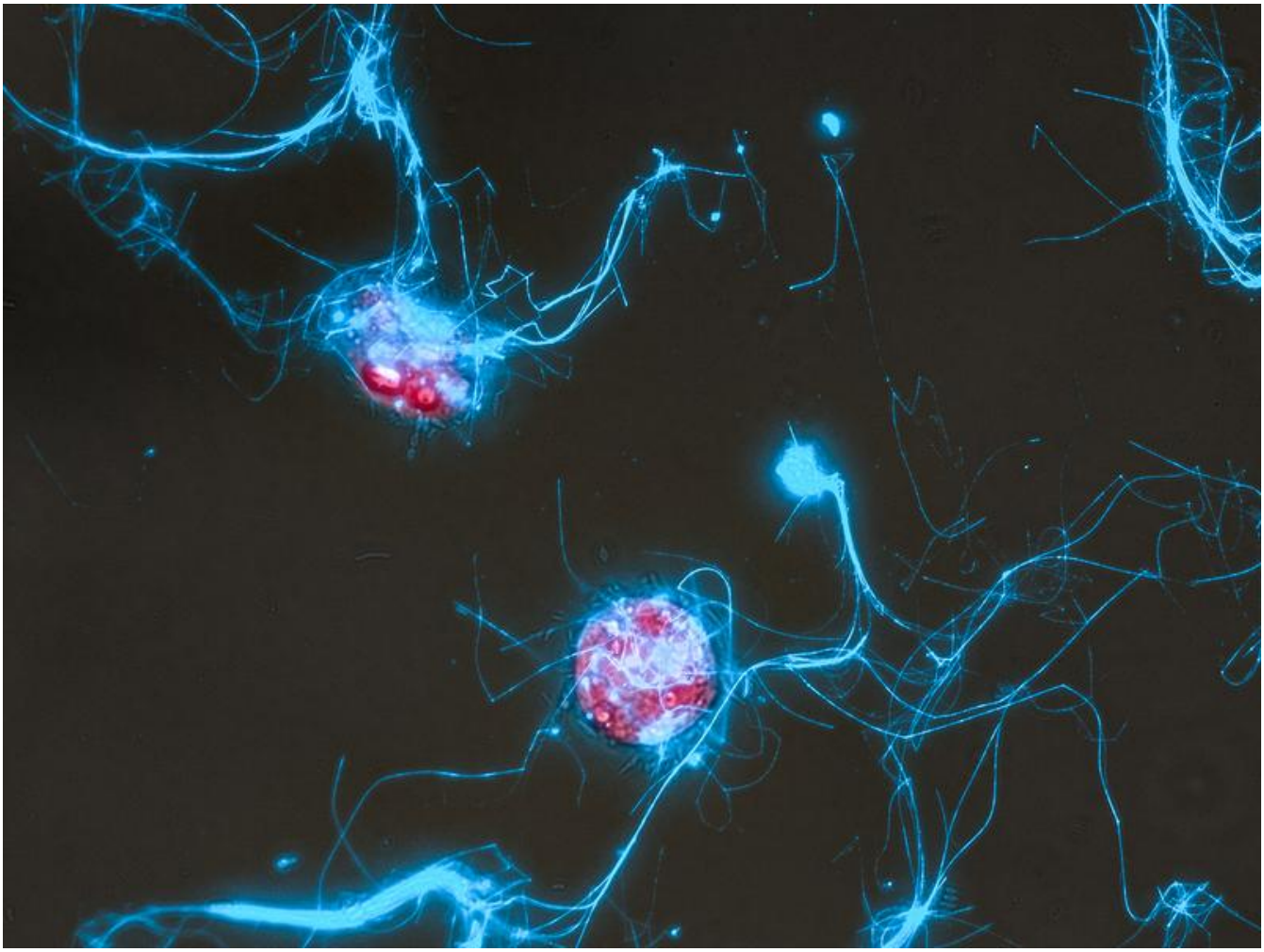

The diatom Conticribra weissflogii (red) and the sugar structures it secretes (blue).
Marlene Reich, 2024