

# Master thesis in Geobiology

Microbiology, Geobiology, Marine Biology

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**Project title:** Who is out there and how many? – Visualizing marine microorganisms

(2-3 Master theses are possible within this subject)

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## About the project:

Identifying environmental microbes with microscopic techniques is an impossible task: they all seem to look the same, and their shape does not tell anything about their phylogeny or physiology. Culture-independent methods like DNA and RNA sequencing are better options; however, these methods tell little about shape, numbers and fine-scale spatial distribution of certain microbes in an environmental sample. Fluorescence *in situ* hybridization (FISH) combines the culture-independent and the microscopic approach and enables therefore *in situ* identification, visualization and quantification of target microbes.

Researchers at CGB use deep-sequencing methodologies and different – omics technologies (metatranscriptomics, metagenomics and metaproteomics) to explore the microbial community structure and function at hydrothermal vents along the Arctic Mid-Ocean ridge, at methane seeps at Nyegga, or above CO<sub>2</sub> storage sites in the North Sea. The research focuses on several key microbial groups like sulfide oxidisers, sulfate reducers and methane oxidisers.

But how abundant are these key microbes in these environments, what do they look like, and where exactly do we find them? These questions can be answered using fluorescence *in situ* hybridization with specific probes applied directly on the environmental sample. In combination with the molecular techniques, we have a powerful tool to obtain a holistic view of microbial community structures also in remote and extreme environments.

Several master thesis projects are possible which can be embedded in several ongoing research projects at the Centre for Geobiology. The candidate can focus only on the FISH method or combine this method with other molecular techniques, depending on the candidates' aims and experiences.

**Field work:** Sufficient samples from our previous cruises are available so lab work can start immediately. Participation in our upcoming cruises (mostly in summer) for sampling is also possible.

## Lab work:

- Fluorescence microscopy
- Fluorescence *in situ* hybridization (FISH)
- Microscopic photography
- Electronic image processing
- Different molecular methods, depending on thesis outline

**Thesis type:** Master thesis, 60 credit points

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