

## UniCat Colloquium

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Lecturer: **Prof. Rudolf K. Thauer**, Max Planck Institute for Terrestrial Mikrobiologie, Marburg, Germany

Title: **The structure of the nickel enzyme that catalyzes the anaerobic oxidation of methane**

Abstract: The anaerobic oxidation of methane (AOM) with sulfate is currently a hot topic in microbiology (1). The enzyme catalyzing the methane activation step has tentatively been identified as a homolog of methyl-coenzyme M reductase (MCR) that in methanogenic archaea catalyzes the methane forming step. And indeed purified MCR from methanogens has recently been shown to catalyze the conversion of methane into methyl-coenzyme M with apparent  $V_{\max}$  and  $K_M$  values consistent with the observed *in vivo* kinetics of AOM with sulfate (2, 3). However, whether the MCR homolog uses the same coenzymes as the enzyme from methanogens remained unknown. We report here on the crystal structure at 2.3 Å resolution of one of the MCR homologs purified from Black Sea microbial mats catalyzing AOM with sulfate (4). The crystallized enzyme was identified by its primary structure and by its modified F<sub>430</sub> prosthetic group as belonging to the ANME-1 group of methanotrophic archaea involved in AOM with sulfate. The secondary, ternary and quaternary structures of the crystallized enzyme are almost identical to those of MCR from methanogenic archaea. The enzyme contains bound coenzyme M and coenzyme B.

(1) Knittel, A. and Boetius, A. (2009). Anaerobic oxidation of methane: Progress with an unknown process. *Annual Reviews of Microbiology* **63**:311–34.

(2) Scheller, S., Goenrich, M., Boecher, B., Thauer, R. K. & Jaun, J. (2010). The key nickel enzyme of methanogenesis catalyses anaerobic oxidation of methane. *Nature* **465**:606-608.

(3) Thauer, R. K. (2010). Functionalization of methane in anaerobic microorganisms. *Angewandte Chemie Int. Ed. Engl.* **49**:6712-6713.

(4) Shima, S., Krueger, M., Weinert, T., Demmer, U., Kahnt, J., Thauer, R. K. & Ermler, U. (2011). Crystal structure of a methyl-coenzyme M reductase purified from Black Sea mats catalyzing the anaerobic oxidation of methane with sulfate. *in revision*.

Date: **Wednesday, November 30, 2011**

Time: **5:15 pm - around 6:45 pm**

Location: **TU Berlin, Institute of Chemistry,  
Straße des 17. Juni 115, 10623 Berlin  
Building C, Lecture Hall C 243**

Organiser: **Prof. Holger Dobbek (HUB)**

Coffee and tea will be served thirty minutes prior to the lecture start.  
**Guests are cordially invited to attend!**

Prof. Dr. Matthias Driess, Chair of the Cluster of Excellence UniCat