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Lecturer: **Prof. Lo Gorton**, Department of Biochemistry and Structural Biology, Lund University, Sweden

Title: **Electrochemical Communication Between Viable Bacterial Cells And Electrodes**

Abstract: During the last few years we have proven that viable bacterial cells can be electrochemically "wired" to electrodes with flexible $Os^{2+/3+}$ functionalised polymers. Our initial studies [1] were made with simple Gram-negative *Gluconobacter oxydans*, where we addressed redox enzymes from the cytoplasmic membrane yielding response for glucose, fructose, ethanol and glycerol. In further studies focus was on the structurally more complex Gram-negative *Pseudomonas putida* and *Pseudomonas fluorescens* [2,3], where response currents could be obtained both for substrates being metabolized in the cytoplasmic membrane (glucose) as well as in the cytosol of the cell (phenol). We have also showed that introduction of a cytochrome to the cytoplasmic membrane of *E. coli* greatly facilitated the communication between these Gram-negative bacterial cells and the Os polymers [4]. Additionally [5], Gram-positive *B. subtilis*, with a substantially thicker peptidoglycan cell wall, was shown to be "wired" by the Os polymers. In *B. subtilis* the polyelectrolytic properties of the peptidoglycan and teichoic acids provide a continuum of anionic charge between the cytoplasmic membrane and the environment. Using a *B. subtilis* strain which overproduces succinate:quinone oxidoreductase (respiratory complex II), we were able to improve the current response several fold using succinate as substrate. This is also in line with the recent hypothesis raised by Ehrlich [6] on that electron conducting structures are present in the periplasm of Gram-positive bacteria (peptidoglycan, teichoic acids), which must be responsible for conveying electrons from the cytoplasmic membrane to the outer surface of the cell wall. Currently we are focussing on "wiring" the Gram-negative *Rhodobacter capsulatus* both when cells are grown heterotrophically and photosynthetically and results will be shown that find the basis for photosynthetic microbial fuel cells.

[1] Vostiar, I.; Ferapontova, E. E.; Gorton, L. *Electrochem. Commun.*, 6 (2004) 621-626.
[2] Timur, S.; Haghighi, B.; Tkac, J.; Pazarlioglu, N.; Telefoncu, A.; Gorton, L. *Bioelectrochemistry*, 71 (2007) 38-45.
[3] Timur, S.; Anik, U.; Odaci, D.; Gorton, L. *Electrochem. Commun.*, 9 (2007) 1810-1815.
[4] Alferov, S.; Coman, V.; Gustavsson, T.; Reshetilov, A.; von Wachenfeldt, C.; Hägerhäll, C.; Gorton, L. *Electrochim. Acta*, 54 (2009) 4979-4984.
[5] Coman, V.; Gustavsson, T.; Finkelsteinas, A.; von Wachenfeldt, C.; Hägerhäll, C.; Gorton, L. *J. Am. Chem. Soc.,* 131 (2009) 16171-16176.
[6] Ehrlich, H. L. *Geobiology*, 6 (2008) 220-224.

Please find more information about Prof. Lo Gorton on his webpage:
http://www.cmps.lu.se/biostruct/people/lo_gorton/

Date: **Wednesday, March 21st, 2012**

Time: **5:15 pm**

Location: **TU Berlin, Institute of Chemistry**
Straße des 17. Juni 115, 10623 Berlin
Building C, Lecture Hall C 264

Organizer: **Prof. Ulla Wollenberger (UP)**

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