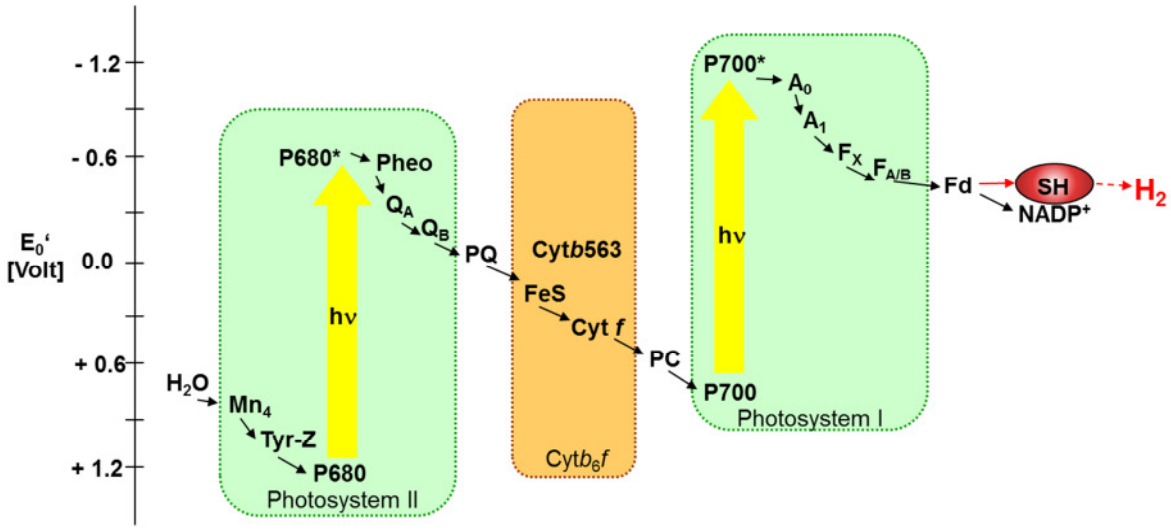
MASTER THESIS

Light-driven dihydrogen production

The research group of Oliver Lenz at the Department of Chemistry, Technische Universität Berlin offers an exciting master thesis project on light-driven dihydrogen production.
The production of biological H_2 has considerable technological impact as H_2 is regarded a zero-emission energy carrier of the future. From an ecological and economical point of view, the most preferred scenario for H_2 generation is a photobiological approach utilizing the photosynthetic power of photoautotrophic organisms. During photosynthesis, energy from sunlight is harvested and used to split water into molecular oxygen, protons, and activated electrons. Electrons and protons can be converted into molecular hydrogen, a process catalysed by the so-called hydrogenases. Unfortunately, most hydrogenases are inhibited even by traces of O_2 that is produced during photosynthesis. However certain hydrogenases catalyse H_2 conversion in the presence of O_2. Our group works on a prominent example, the soluble, NAD^+-reducing [NiFe]-hydrogenase (SH) from the "Knallgas" bacterium *Ralstonia eutropha*.



In order to exploit the extraordinary O_2 tolerance of the SH for light driven H_2 evolution, we have modified the SH by protein engineering. An additional [2Fe2S] cluster was incorporated close to the NAD(H) binding pocket and the protein surface was altered in order to accept electrons from photosystem I *via* ferredoxin (Fd). These alterations are supposed to allow efficient H_2 production production from reduced Fd.
Within the proposed master thesis project, the modified SH proteins and various ferredoxins will be purified. Appropriate insertion of the additional [2Fe2S] cluster will be studied by UV-Vis and EPR spectroscopy. Ferredoxin-driven H_2 production activities will be quantified amperometrically and by gas chromatography. The work will be performed in close cooperation with scientists at the FU Berlin (Christian Teutloff, Robert Bittl) and the Ruhr-Universität Bochum (Martin Winkler, Thomas Happe).

Interested? We invite applications from highly qualified undergraduate students with strong interest in protein biochemistry and interdisciplinary collaborations. For more information please contact Lars Lauterbach phone: 030/ 314 25572, email: lars.lauterbach@tu-berlin.de.

References:

- Lenz *et al.* 2014 In Biohydrogen, Matthias Rögner (Ed.), ISBN 978-3-11-033645-0.
- Lauterbach, Lenz 2013. *J. Am. Chem. Soc.* 135:17897
- Lauterbach *et al.* 2013 *FEBS J.* 280:3058
- Krassen *et al.* 2009 *ACS Nano*, 3: 4055