Biohydrogen production with the sun:
Learning from natural systems to harvest "clean" energy

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We report on a model system which should combine the water-splitting photosynthesis system of plants and the most efficient hydrogen producing enzyme, the hydrogenase, of bacteria. If successful, this system produces hydrogen gas with electrons from water and energy from sunlight. In order to characterize and optimize all components individually, we isolate them from their natural systems and immobilize them on electrode surfaces. After stabilizing the involved enzymes by natural and artificial compounds we can measure light-induced currents and voltage-induced hydrogen production. We present the current status of this international project and its future potential for hydrogen production: The know how gained by this model system can be used either for the construction of efficient, completely artificial systems or for the engineering of natural, self-replicating systems. As both cases represent a cyclic process, in which water is split by sunlight and regenerated by the reaction of hydrogen and oxygen in a fuel cell, this is an environmentally most acceptable way of energy production and consumption without pollution.

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Curriculum Vitae Prof. Dr. Matthias Rögner (*06.11.1952)

1972-78	Study of Biology (Dipl.) and Japanology at the University of Tübingen, Germany
1978	Diploma in biology at the University of Tübingen; Diploma work at the Max-Volmer-Institute of Biophysical and Physical Chemistry, Technical University of Berlin (TU Berlin), (with Prof. Dr. H.T. Witt)
1979	6 months visiting scientist in Japan at the Dept. of Biochemistry, Jichi Medical School, Minamikawachi-Machi, Tochigi-ken (Prof.Dr. Y. Kagawa) (grant from the German Academic Exchange Service, DAAD, Bonn)
1984	Dr.rer.nat., Max-Volmer-Institute, TU Berlin (Prof.Dr. H.T. Witt)
1984-87	Postdoc in a research project of the SFB 312 at the Max-Volmer-Institute, TU Berlin
1988-90	Visiting Scientist at the Dept. of Microbiology, Experimental Station, E.I. du Pont de Nemours & Co., Wilmington, DE, USA (with Dr. B.A. Diner)
1990-96	Assistant at the Institute of Botany, University of Münster, Germany (with Prof.Dr. E. Weis)
1992	Habilitation (qualification for professorship) in Plant Biochemistry & Physiology, University of Münster
1992-95	Hochschuldozent (Associate Professor) at the Institute of Botany, University of Münster
since 1996	Chair of Plant Biochemistry, Faculty of Biology, Ruhr-University Bochum (former chair of Prof. Trebst)
2001-2004	Speaker of the International NEDO-Project "Molecular device for hydrogen production"
since 2002	Speaker of the European Graduate College 795 (between Ruhr-University Bochum and Rijks-Universiteit Groningen, The Netherlands) "Regulatory circuits in cellular systems: Fundamentals and biotechnological applications"

Awards

1991	Bennigsen-Foerder-Prize from the Ministry for Science and Research of Northrhine Westfalia (NRW)
2000	Senior-Research Prize of the Japan Society for the Promotion of Science (JSPS) for a 6-months research stay in Japan (used for a sabbatical in 2000 and a research stay in 2002 in the lab. of Prof.Dr. M. Yoshida, Tokyo Institute of Technology)

Curriculum Vitae Masato Miyake (15 August, 1965)

EDUCATION:
- Tokyo University of Agriculture and Technology, Faculty of Agriculture, 1985-1989
- Tokyo University of Agriculture and Technology, Graduate School of Technology, 1989-1990
- Research work in marine biotechnology under Professor Tadashi Matsunaga.
- Thesis: Cloning and expression of bonito growth hormone in a marine Rhodobacter sp. NKPB0021.
  Awarded Ph.D (Applied Biology) 1998
- Doctoral thesis: Studies on the improvement of poly-beta- hydroxybutyrate accumulation by cyanobacteria.

SPECIALTY: Bioengineering, Biochemistry, Genetic engineering, Cell Informatics, Bacteriology, Cell Biology

APPOINTMENTS:
- Researcher (permanent position), National Institute of Fermentation Research, 1990-1994
- Researcher, National Institute of Bioscience and Human Technology, 1994-1998
- Senior Researcher, National Institute of Bioscience and Human Technology, 1998-2001
- Lecturer, University of Tokyo (Life Science), 1996-2000
- Visiting Researcher, Res. Center for Advanced Science and Technology, University of Tokyo, 1998-1999
- Visiting Researcher, The Scripps Research Institute (USA), 1999-2001
- Team Leader, Gene Technology Team, Tissue Engineering Research Center(TERC), National Institute of Advanced Industrial Science and Technology (AIST), 2001-present
- Associate Professor, Osaka University Medical School, 2001-present
- Senior Visiting Researcher, Foundation for Biomedical Research and Innovation, 2002-present
- Visiting Professor, Université Louis Pasteur (France), 2003-present

PRESENT RESEARCH SUBJECT: Development of analytical methods for intracellular network structures

RESEARCH GRANTS: (2004fy)
- AIST Strategic Project for Special Top Priority Fields
- Millenium Project (by Minister for the Cabinet Office) -
- University Start-Ups Creation Support System (by MEXT):
- Major Areas Funded Research by NEDO
  (Collaborative research with Foundation for Biomedical Research and Innovation):

AWARDS:
1) 58th award of great invention (STA, Japan, 1998)
2) 1999 HFSP Long-Term Fellowship