Max-Planck-Institut für biophysikalische Chemie Göttingen

Press Release

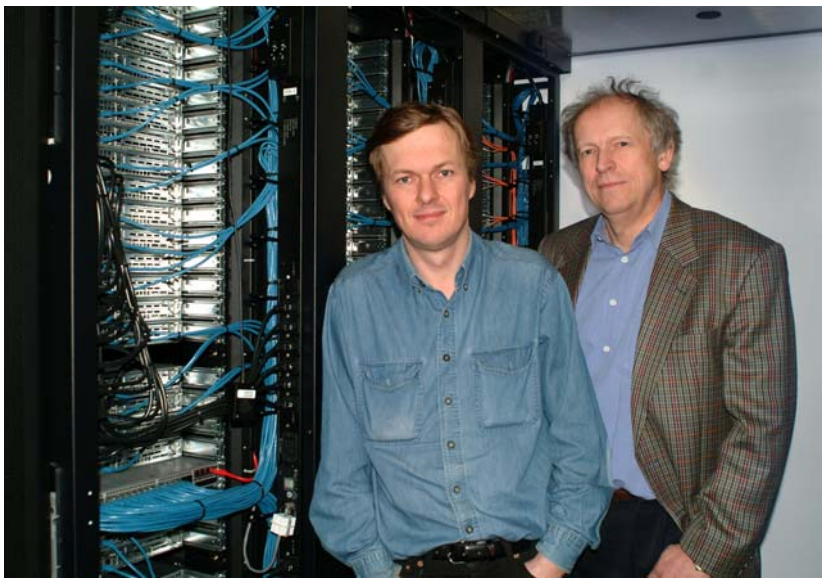
March 16, 2006

Small, smaller, smallest: EU supports research towards the construction of nanomotors

Within an initiative aimed at supporting visionary research projects, the European Union has set aside research funds for the development of biological nanomotors. An international consortium of scientists, co-ordinated by Prof. Helmut Grubmüller at the Max Planck Institute for Biophysical Chemistry in Göttingen, envisages many applications for the results of this research, primarily in the field of biological medicine. The foundations for this will be laid by the creation of a "construction kit" of tailored nanomotor components.

Nanotechnology is one of the most important technologies of the future. This field embraces research, handling, and production of objects and structures in the size range below 100 nanometres (a nanometre is a millionth of a millimetre), the boundary where living and non-living Nature meet. It thus includes the development of biological "working parts", as a prerequisite for their technological application. A promising interdisciplinary approach combines research methods of biology, physics, chemistry, computing, system theory and engineering into a "synthetic biology".

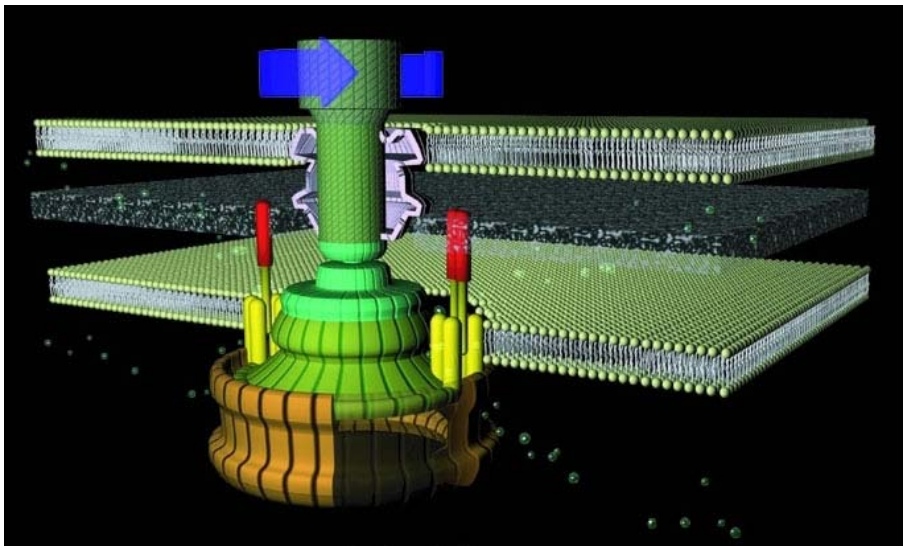
The EU has also recognised this, and has started up the NEST (*New and Emerging Science and Technology*) programme – an initiative aimed at supporting unconventional and visionary research in this field. An international consortium, co-ordinated by Prof. Helmut Grubmüller, has now been awarded funding for a research plan to pioneer the tailored development and production of artificial systems according to the blueprints of biological



Prof. Helmut Grubmüller (left) and EU co-ordinator Dr. Joachim Bormann in the department's computer centre, where 980 PC processors are linked up in a Linux cluster. *(Photograph: Irene Böttcher / MPIbpc)*

functional units. Their ambitious project NANOMOT aims at developing nanomotors, and at joining up them and their components in a system resembling a construction kit.

The idea of a nanomotor of this kind is based upon biological machines such as the “tail” (flagellum) of many bacteria, which is driven by a *flagellar motor* and thus propels the bacterium forwards. A *motor complex,* running on ion flux, produces the rotational movement of the flagellum, which is fixed to an “axle”. Another example is the “packaging” of DNA (the substance in which genetic information is stored) into viral coats by a biological nanomotor with a rotating axis.



Structure of a bacterial flagellar motor. The stator is anchored to the cell membrane and encloses the rotor (diameter 50 nm), which turns at a rate of up to 1700 revolutions per second.
(Courtesy R. Berry, Oxford University)

Nano-components of this kind are expected to be applied in the production of DNA, protein and antibody chips as miniaturised platforms for use in molecular-biological and molecular-medical tests and in targeted medicines with fewer side effects.

The NANOMOT consortium comprises the co-ordinating Max Planck Institute in Göttingen, the Universities of Osnabrück, Dresden, Oxford, Basel, the ETH Zürich, and the CSIC in Madrid. The financial support from the EU will total ~2.3 million Euros for a period of three years. The project has been formally initiated at a ceremony in Göttingen on February 10th. and 11th. 2006.

NANOMOT is the third NEST project at the Max Planck Institute for Biophysical Chemistry. Research funds from Brussels have already been granted for the construction of a high-resolution “nanoscope” (SPOTLITE; Prof. Stefan Hell) and for time-resolved X-ray structure determination of small bio-organic crystals (TOTALCRYST; Dr. Simone Techert).

For further information, contact Dr. Joachim Bormann, Max Planck Institute for Biophysical Chemistry, EU Liaison Office, Am Fassberg 11, 37077 Göttingen, Phone: +49 (0) 551 201 -1076, Fax: -1175, E-mail: j.bormann@gwdg.de

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Edited by:
Max Planck Institute for Biophysical Chemistry
PR Office, Christoph Nothdurft
37070 Göttingen

Phone: +49 (0) 551 201 - 1641
Fax: +49 (0) 551 201 - 1151
E-mail: pr@mpibpc.mpg.de