



The Bavarian Center for Molecular Biosystems

BioSysNet

Bavarian Research Network for Molecular Biosystems

During recent years the Bavarian State government has made a great effort to strengthen functional genome research and biotechnology in Bavaria. The high international reputation of the Bavarian research environment in these key technologies and the rapid development of the biotechnological industry have clearly shown that the funding of the state of Bavaria can be considered an impulse to this positive development. The newly founded **Bavarian Research Center for Molecular Biosystems** provides further proof for this successful concept. Aiming at the concentration of biosystems research in Bavaria, a research institute shall be founded, which will be of vital importance to the innovation capacity of all academic and economic activities in biomedicine. In view of the development in recent years, it has become

clear that genome research is focusing increasingly on the behavior of complex systems. By now, an impressive expertise in this area has emerged in Bavaria. This development became apparent through the success of the Bavarian Genome Research Network and the Bavarian Immunotherapy Network. The molecular biosystems research represents in many ways the future of biology. The **Bavarian Research Center for Molecular Biosystems** granted by the state government is led by a strategic council consisting of Professor Dr. Patrick Cramer (Gene Center of LMU), Professor Dr. Reinhard Lührmann (Max-Planck-Institute Gottingen) and Professor Dr. Horst Domdey (Bio^M AG). It includes the **Bavarian Research Network for Molecular Biosystems (BioSysNet)** under the scientific coordina-

tion of Professor Dr. Horst Domdey, a Core Center at the LMU Munich, as well as activities in technology transfer. The Core Center will coordinate the activities and is buttressed by the new **Research Building for Molecular Biosystems (BioSys^M)** (fig. 1) on the Munich campus Großhadern/Martinsried (fig. 2), which can be attributed to the expertise of the Gene Center and the excellence cluster CIPSM and will be completed by 2015.

The **Bavarian Research Center for Molecular Biosystems** will not only promote cutting-edge research in this innovative field, but also educate a new generation of interdisciplinary thinking scientists, who represent Bavaria in this interdisciplinary area on a highly competitive international level. Networks, in which outstanding research projects of different universities in the Free

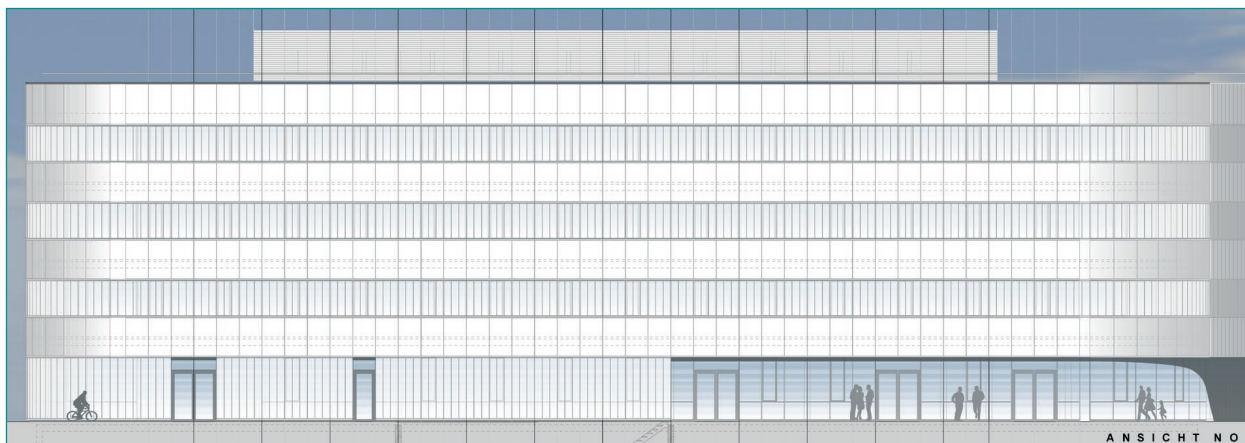


Fig. 1: This is what the new Research Building for Molecular Biosystems (BioSys^M) shall look like. The construction will start in the fall of 2012 ■



Fig. 2: The site of the planned Research Building on the campus Großhadern/Martinsried ■

State of Bavaria cooperate over an extended period of time and under a consistent scientific-administrative direction, will become more than ever a necessity for the successful implementation of new research and innovations. ■

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The newly granted BioSysNet, in which new independent junior research groups are established at different universities in Bavaria, is such a project association, which complements perfectly the **Core Center** of the **Bavarian Center of Molecular Biosystems** in Munich. In addition to the five independent new research groups, scientists who already actively do research in this field at Bavarian universities are going to be integrated into the network, in order to ensure the further development of existing expertise. By co financing up to 20 more research groups this aspect shall be taken into account. The objective is to concentrate expertise in the area of molecular biosystems research in Bavaria and thus create ideal research conditions for outstanding research groups in the state. At the same time, BioSysNet should be an incentive to scientists abroad to come to

Bavaria in order to contribute their expertise and bring new technologies to Bavarian universities. A close cooperation with the industry shall be achieved through continuous effort in technology transfer. Practice oriented research and creative interaction with young and established companies is one of the main goals of the program. This is how results shall be effectively implemented and findings shall be integrated into the Bavarian economy.

There are various scientific questions that BioSysNet will be working on: Which are the components of a biological system? How do these components interact? How does the system react as a whole when left to itself or when disturbed? These questions have always been in the center of life sciences – but only nowadays and in the follow up of the achievements of genome research has it become possible to study components, interactions and perturbations on a molecular level with a sufficient quantitative definition. The analysis of complex biological regulatory systems is a basically interdisciplinary undertaking and requires the cooperation of biochemistry, genetics, bioinformatics, synthetic chemistry, bio imaging and biophysics as well as medicine (*fig. 3*).

The concept of the planned **BioSys^M** at the Munich high-tech campus shall focus on a central and extensive problem of biology, the **regulation of gene expression**. The research topics at **BioSysNet** will also build on this. The regulation of gene expression and thus the activity of genes is the fundamental process in the development and functioning of all organisms. The challenge of this subject lays on the one hand in studying the sub-steps of gene expression in mechanistic-structural high definition; on the other hand it lays in understanding the interaction of individual steps in a living cell, in tissue and in the organism as a whole.

These control processes include the regulation of cellular processes on all levels and can be investigated in simple biological systems such as yeast cells, as well as in complex model organisms or even in vertebrates. Whereas genomic, proteomic and metabolomic techniques are applied, the development of new experimental and theoretical methods is also required.

Overall this research aims at understanding the function and malfunction of cells and organisms or even the malfunction in diseases such as cancer and neurodegenerative symp-



Fig. 3: Computational Biology at the Gene Center, LMU. Source: Patrick Cramer ■

toms. This implies a broad range of research which permits to integrate important developments in Bavaria into this network. The funded research projects can thus emerge from different areas of biology, biochemistry, chemistry, medicine, physics and mathematics. The objectives of the program are correlated to the current level of knowledge and the methodological accessibility and are based on the existing strengths on the area of systems biology in Bavaria. Outstanding scientists account for specific topics such as stem cell research, functional genome research, structural biology and bioinformatics. They were chosen during an external evaluation by a renowned international board of reviewers out of 120 applications. The importance of this project for the Free State of Bavaria was highlighted by the personal presence of the state minister at the selection meeting, who discussed the goals of the scientific environment of this state with the cutting-edge international board of scientists. The state of Bavaria is associated worldwide with the high standards of its biotechnological research in academia and industry. This can mainly be attributed to the excellent

Bavarian universities and research institutions, as well as promising local conditions, which have reached a high international level based on the funding of the State of Bavaria. Outstanding research locations in the USA (Harvard, Seattle and Stanford) have always had programs on systems biology, which are currently culminating in a second round of institute foundations due to intense state funding programs by the NIH or NSF. In Europe this development is also apparent and can be seen in programs such as SystemX in Switzerland and the Center of Genomic Regulation in Barcelona. Further initiatives such as BioQuant (with focus on virology) in Heidelberg and the newly founded Berlin institute for medical systems biology at the Max-Delbruck-Center for molecular medicine indicate how strong and outstanding research centers are further developing into this direction. This causes strong competitive pressure on the Bavarian research institutions and biotechnological companies, both on a national and international level. Therefore, molecular biosystems research has to be expanded in all areas in Bavaria, in order to keep up with the efforts of other states and regions in

the future. The establishment of the **Bavarian Research Center for Molecular Biosystems** with the Core Center in Munich and the **Bavarian Research Network for Molecular Biosystems** represents a positive impulse in this direction. The profile of the scientific and educational environment is strengthened and thus ensures a future oriented alignment of the state of Bavaria, which is a front-runner on the area of functional genome research compared with other European countries. In order to enhance this status, the knowledge and human resources for the formation of a new generation of companies and the extension of existing companies have to be promoted. Only this way can the dynamic development of the Bavarian biotechnological industry be ensured. ■



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