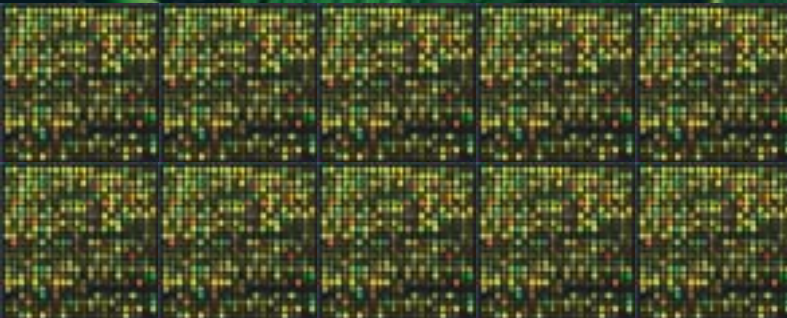
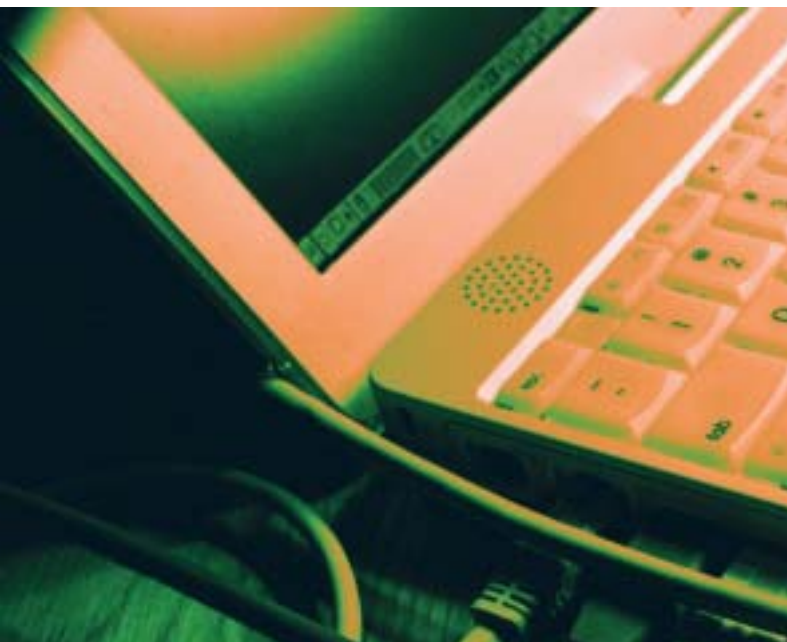


Systems Biology and Bioinformatics **Research Programme**
2003-2007



SYSBIO

Systems Biology and Bioinformatics Research Programme

Background

Publication of the preliminary nucleotide sequence of the human genome at the turn of the millennium was one of the milestones in modern biology. Yet this information package of 3 000 000 000 nucleotides marks only the beginning for modern "postgenomic" research on molecular genetics and life sciences in general. A characteristic feature of such research is the generation of increasing amounts of raw data requiring advanced informatics services and tools to process this information into biological knowledge.

Multidisciplinarity and integration are other characteristic features of postgenomic research. Genes, gene products, their regulatory networks and interactions with environment are analysed as components of higher order structures, metabolic pathways or entire cells and organisms. This type of an integrative and holistic approach has been termed systems biology. Close collaboration of biologists, biochemists, physiologists, chemists and physicists with mathematicians, computer scientists and engineers is needed for the characterisation and modelling of the complex interactions of genes, proteins and metabolic processes.

Objectives

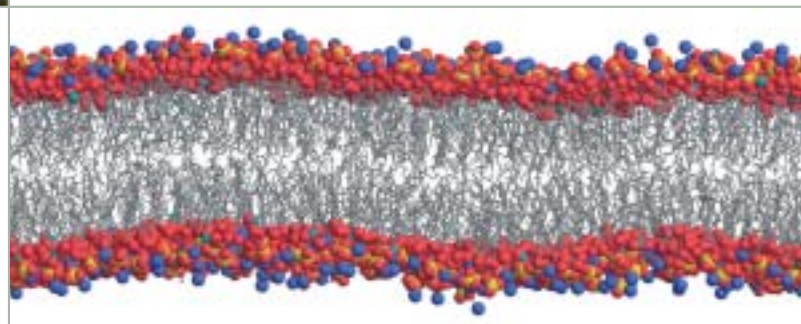
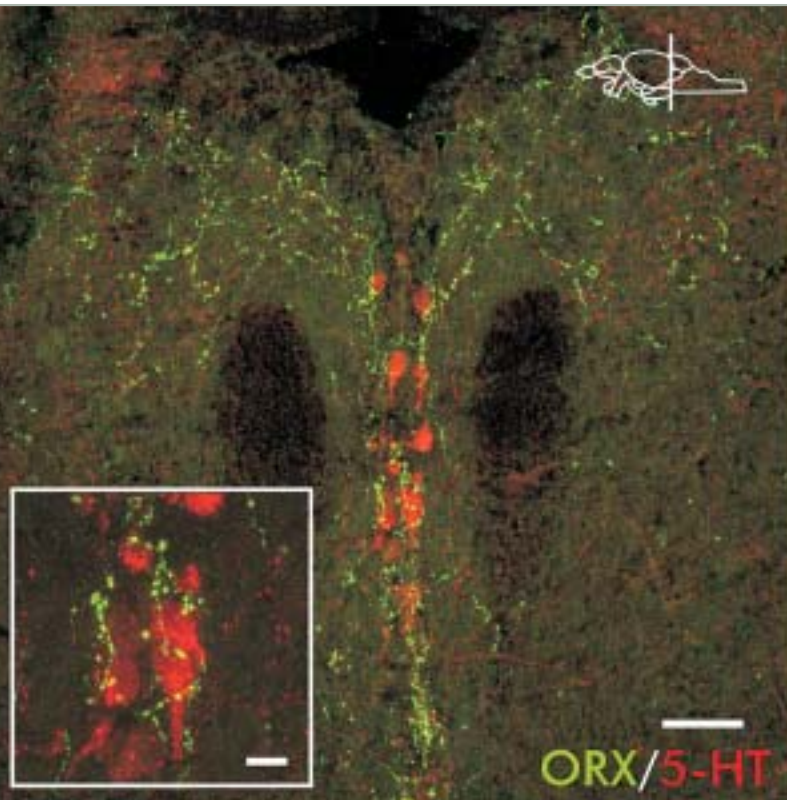
The main objective of the SYSBIO Research Programme is to promote an integrative and holistic approach in research on complex biological processes at the systems level. Multidisciplinarity, interdisciplinarity and transdisciplinarity are essential characteristics of the Programme, with bioinformatics having a central integrating role in the projects.



In order to understand the complex biological systems, knowledge of the molecular characteristics of individual components or phenomena is not enough. A holistic view and an integrative approach is needed to study the complex interactions between components and networks. Novel high-throughput technologies produce increasing amounts of raw data. Collecting, storing, handling, sharing and analysis of large amounts of data require tools and know-how of bioinformatics, mathematical and statistical modelling as well as the development of visualization methods.

Applications involve important political and economic interests and challenges. In addition, storage and use of genetic information and manipulation of genomes may pose ethical questions and challenges. Therefore ethical, social and cultural dimensions of bioinformatics and systems biology are essential part of the SYSBIO research programme.

In long term the studies on the interaction of genes, environmental factors and life style in the pathogenesis of several common diseases is likely to change in our conceptual thinking of disease, health, health policy. Research will form foundations for novel diagnostics and development of preventive and personalised medical treatments.



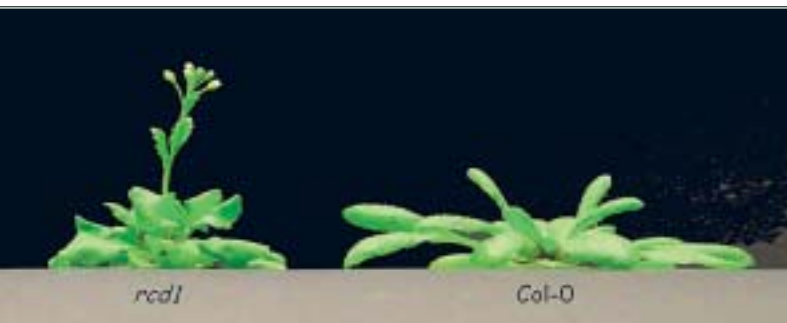


SYSBIO Research Programme

is composed of 21 research projects that involve altogether 54 research groups.

The total budget of SYSBIO is 10.7 million euro

- Academy of Finland: 9 million euro
- National Technology Agency Tekes: 1.7 million euro



Aims

- New knowledge through high-quality, multidisciplinary collaborative research
- Efficient and synergistic use of existing resources and infrastructures
- Development of research environments, methodologies and co-operation of researchers
- Researcher training and mobility
- National and international networking
- Attention to application and commercialisation of research results and intellectual property rights
- Ethical and social aspects

Funded projects

Ab initio protein structure prediction | **Holm Liisa**

Bayesian latent class modelling for functional genomics | **Arjas Elja**

Combining multiple data sources in functional genomics for improving genome-wide inferences | **Kaski Samuel, Castrén Eero, Hollmén Jaakko, Knuutila Sakari**

Computational processes in living cells | **Petre Ion**

Computer-aided methods as tools to find new bioactive compounds | **Poso Antti**

Deciphering the circuitry leading cancer cells to premature senescence | **Mäkelä Tomi, Klefström Juha, Ojala Päivi, Vidal Marc, Västrik Imre**

Development of data management and analysis environment for microarray data | **Korpelainen Eija**

Ethical and social aspects of bioinformatics | **Häyry Matti**

Experimental and computational analysis of physiological regulation at transcriptome, proteome and metabolome level | **Penttilä Merja, Holm Liisa, Ketola Raimo, Rousu Juho**

Genetic control of neurodegeneration in zebrafish | **Panula Pertti, Lehesjoki Anna-Elina, Vesterinen Jaana**

Global approaches to study actin filament regulation in the muscle sarcomere | **Yläne Jari, Carpén Olli, Lappalainen Pekka**

Hox-gene circuits in cancer | **Kallioniemi Olli-Pekka, Astola Jaakko, Monni Outi**

Linking developmental, computational and evolutionary biology of mammalian teeth | **Jernvall Jukka, Fortelius Mikael, Thesleff Irma**

Molecular recognition: automated reconstruction and analyses of large molecular complexes | **Johnson Mark, Nyrönen Tommi, Salminen Tiina, Cheng Holland**

New computational techniques for analysing the structural and functional landscape of the mammalian genomes | **Mannila Heikki, Jalanko Anu, Kere Juha, Palotie Aarno, Peltonen-Palotie Leena**

Probabilistic methods for microarray data analysis | **Heikkonen Jukka, Tirri Henry, Mäkelä Tomi**

Signaling pathways and gene regulatory networks leading to generation of a lymphocyte phenotype pathogenic in asthma and allergy | **Lahesmaa Riitta, Aittokallio Tero, Koski Timo, Oresic Matej**

Simulation of modern gene activity measurements: from microarrays to microscopy | **Yli-Harja Olli**

Systems level architecture of GDNF-mediated neurotrophic action | **Saarma Mart**

The function of the plant RCD1-ROL gene family: a systems biology approach | **Kangasjärvi Jaakko, Keinänen Markku**

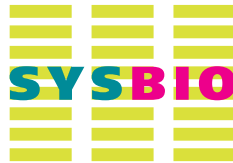
Understanding glucuronidation: A systems biology approach | **Goldman Adrian, Finel Moshe, Vihinen Mauno**

Systems Biology and Bioinformatics Research Programme

Further information

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Academy of Finland

The Academy of Finland is an expert organisation on research funding, dedicated to promoting high-quality scientific research by means of research funding, science policy expertise and work to strengthen the position of science and research. The Academy's operation covers all scientific disciplines.

Research programmes are an important funding instrument and a platform for international cooperation. A total of 22 research programmes of the Academy of Finland are ongoing or started in 2004.

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ACADEMY OF FINLAND

Tekes

Tekes, the National technology Agency of Finland, is the main financing organisation for applied and industrial R&D in Finland. Tekes' primary objective is to promote the competitiveness of Finnish industry and the service sector by technological means.

www.tekes.fi



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