



# Scientific Goals of the EuroSCOPE Programme

Functional genomics gave rise to *proteomics*, defined as the identification and characterisation of proteins, their expression and their interactions. A better understanding of the function of a protein requires a detailed analysis of its structure. Such studies (e.g. carried out on crystallized protein) require substantial amounts of high quality protein. The difficulties of producing sufficient amounts of protein for structure-function analysis as well as for x-ray analysis (crystallization) constituted thus far a major bottleneck for *proteomics*. Although this was and is well recognized by the scientific community, funding for a programme addressing this topic systematically has not been available since the beginning of the post-genomic phase that started *proteomics*.

Complex proteins such as multi-domain eukaryotic proteins, integral membrane proteins and multi-enzyme complexes are difficult to produce in commonly used strains of bacteria. This is the reason why these complex systems are highly underrepresented in protein structure databases. EuroSCOPE addresses these issues in projects directed towards a systematic genome-wide analysis of functional, structural and regulatory processes involved in the expression of complex proteins. Factors such as environmental conditions will be studied in different hosts with respect to secretion, folding and solubility of complex proteins. Existing strategies of expressing complex proteins will be refined and compared to new strategies for the production of multi-domain proteins and integral membrane proteins to address a wide range of requirements by the scientific community. Furthermore, EuroSCOPE endeavours to develop technologies that improve the production of viral complexes for the structural analysis of viral intermediary complexes.

It is envisioned that the EuroSCOPE programme will make a significant contribution to *proteomics* by accelerating research on protein production and by fostering innovative and interdisciplinary collaborations through networking and dissemination in Europe.

# List of funded Collaborative Research Projects (CRPs)

## **Development and Exploitation of *Bacillus Subtilis* as a Host for the Production of Protein Complexes and Membrane Proteins**

This project aims at developing new strategies for the production of multi-domain proteins and integral membrane proteins in *Bacillus subtilis*. A major challenge to be addressed by the project is the identification and modulation of quality control systems of *B. subtilis* that limit the production of high quality protein complexes and membrane proteins, and to enhance those systems that facilitate assembly of these proteins.

### **Project Leader:**

#### **Jan Maarten van Dijk**

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#### **Imrich Barak**

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#### **Michael Hecker**

Institute for Microbiology, Greifswald, Germany

#### **Vesa Kontinen**

National Public Health Institute, Helsinki, Finland

## **Folding, Production and Assembly of Viral Complexes for High Resolution Structure Analysis**

This project endeavours to first develop protein expression, folding, and assembly systems that will then be used to produce viral complexes and to perform high resolution structural analyses of viral intermediary complexes. The development of technologies and the acquired knowledge will improve expression of pathogenic virus proteins for vaccine and anti-viral drug development.

### **Project Leader:**

#### **Roman Tuma**

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#### **Ineke Braakman**

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#### **Sarah Butcher**

University of Helsinki, Helsinki, Finland

#### **Anna Mitraki**

Institut de Biologie Structurale, Grenoble, France

#### **Iva Pichova**

Academy of Sciences, Prague, Czech Republic

#### **Saskia van der Vies**

Vrije Universiteit, Amsterdam, Netherlands

#### **Mark van Raaij**

Facultad de Farmacia, Santiago de Compostela, Spain

## **Genome-Wide Comparison of Physiological Bottlenecks in Multi-Subunit Protein Production in Prokaryotic and Eukaryotic Microbial Hosts**

The general concept of this project is a comparative (various host species with differing expression levels) genome-wide analysis of functional, structural and regulatory processes involved in the expression of complex proteins. In addition, efficiency of secretion, folding and solubility of complex proteins will be compared in different host systems at different critical environmental conditions and analyzed at the *transcriptomic* and *proteomic* level with the aim to identify main bottlenecks or major pacemakers of efficient protein production.

### **Project Leader:**

#### **Diethard Mattanovich**

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#### **Christine Lang**

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The aim of the ESF European Collaborative Research (EUROCORES) Scheme is to enable researchers in different European countries to develop collaboration and scientific synergy in areas where European scale and scope are required for leading-edge science in a global context and in this way create the critical mass necessary for scientific excellence. The scheme provides a flexible framework which allows national basic research funding organisations to join forces to support top class European research in and across all scientific areas.

The European Science Foundation currently provides programme coordination and support for the networking of funded scientists through the European Commission Contract no. ERAS-CT-2003-980409. Research funding is provided by participating national organisations.

**[www.esf.org/eurocores](http://www.esf.org/eurocores)**

## **THE FOLLOWING NATIONAL FUNDING ORGANISATIONS SUPPORT THE EuroSCOPE PROGRAMME:**

**Fonds zur Förderung der wissenschaftlichen  
Forschung (FWF)**

*Austrian Science Fund, Austria*

**Grantová agentura České republiky (GAČR)**

*Czech Science Foundation, Czech Republic*

**Suomen Akatemia/Finlands Akademi**

*Research Council for Health and Research  
Council for Biosciences and Environment  
at the Academy of Finland, Finland*

**Nederlandse Organisatie voor  
Wetenschappelijk Onderzoek (NWO)**

*Netherlands Organisation for Scientific  
Research, The Netherlands*

**Slovak Academy of Sciences**

*Slovak Republic*

**Ministerio de Educación y Ciencia (MEC)**

*Ministry of Education and Science, Spain*



## EuroSCOPE

Science of Protein Production for Functional and Structural Analysis

*Bacillus subtilis*.

Courtesy of Professor van Dijk.

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