

STEP

A Strategy for the EuroPhysiome

STEP is a Coordination Action that is seeking to coordinate European activity relating to the physiome – a description of human physiology that will span multiple levels from the whole body down through the organs to the cells and beneath in an integrated manner.

Objectives of the project

The physiome is the integrated description of the physiology of a species. Integration has become more important because of recent results produced from the genome, molecular biology and evolutionary biology; recent advances in computer technology are now making it feasible.

European research is currently developing the concept of **Virtual Physiological Human (VPH)** to develop models that will provide an improved description of the human physiome. The VPH relates closely to the Physiome Project (more accurately described as the Physiome Initiative), which is organised under the auspices of the International Union of Physiological Sciences (IUPS).

The VPH activities will run alongside the Physiome Project but will focus on areas in which strong European work currently exists to ensure that it continues to maintain its leading position. The VPH places a heavy emphasis on research that will have a strong impact on the clinical and industrial areas.

STEP will produce a roadmap defining the best way forward for European research in this area. It will:

- engage all interested parties in the discussion in an inclusive manner
- invite recognised experts from around the world to provide informed opinion
- organise two conferences to focus the debate.

Project Description

STEP has brought together all European projects currently engaged in physiome-related work. **STEP** seeks to move to a situation in which the issues are considered more holistically.

To reduce the complexity of the problem, **STEP** will organise a two-stage process:

- initially, the overall picture will be broken down into Strands related to tissue types, e.g. hard tissue, soft tissue, fluids
- once the Strands have identified how progress can best be made in their own areas, they will discuss, together, how to achieve their goals in a unified and coherent manner, avoiding redundancy and overlap as much as possible.

The first conference will enable the Strands to focus on their own specific problems and define consensual positions.

This will be followed by an intense Internet-based debate in which the Strands complete their deliberations and define positions for circulation to the other Strands.

The second conference will bring these documents together and start to define the final roadmap which will address, as a minimum, the following issues: common objectives and research challenges; the resources required; ethical, gender and legal issues; impact analysis; dissemination models; community building initiatives; exploitation models and long term sustainability.

Scenario : Cardiome, University of Oxford

This pioneering project has grown out of work established in the 1960s and is probably the most advanced of the Physiome organ-level models. It is seeking to develop electro-mechanically representative models of cardiac structure and function of a variety of species, including human.

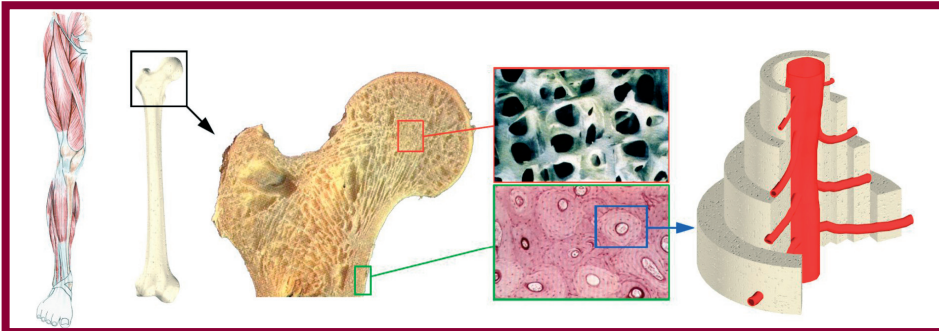
All of these studies emphasise how complex the heart is. Heart disease is influenced by many factors, not least the genes of the individual, so development of treatments must take account not only of the heart as an organ but also of factors at a subcellular level. This is why physiome-based approaches are likely to lead to provide many breakthroughs when the models developed reach maturity.

Expected Results & Impacts

Given the diversity of areas on which biomechanics and biophysics impact – health, ergonomics, safety, sport – the effects on the quality of life of the individual citizen are expected to be wide ranging.

Further, given the current costs, both social and economic, of the problems that exist in these areas, the anticipated benefits in terms of personal comfort and reduction in pain, and in terms of the associated social spending are likely to be huge.

The European biomedical industry, mostly formed by SMEs, is struggling under the fierce competition of the multinational, normally US-based, companies that have gained dominance in many markets.



For application domains, the challenges include:

- enhancing our ability to study the human body, its functioning, its inter-subject variations, and to develop and validate complex models that can accurately predict a variety of physiological and pathological conditions
- allowing the European Physiome communities to create the world's largest and most sophisticated collection of information on the human body.

Physiological knowledge is so intimately linked to clinical practice that the direct impact on clinical practice will probably be substantial:

- multiscale modelling should open new scenarios in preventive medicine, or environmental medicine, in general health studies, and in the design of drugs and medical devices
- new developments in diagnosis, treatment, monitoring and rehabilitation, which may provide improved insights to assist with patient care
- support for evidence-based medicine.

For the scientific community, the roadmap will address:

- the development of numerical simulation, interactive visualisation, and instruments for community building and collaborative working
- the evolution of core technologies to a usability level that will make them accessible by nontechnical users, such as biomedical researchers and clinical professionals.
- the deployment of infrastructures that provide the necessary levels of security and trust.

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- University of Oxford (UK)
- University of Nottingham (UK)
- CNRS-LaMI (FR)
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Timetable: from 01/06 – to 03/07

Total cost: € 1,240,770

EC funding: € 1,185,360

Instrument: CA

Project Identifier:
IST-2004-027642

Keywords:

physiology, medical technology,
physiome, in silico human,
multiscale modelling,
bioinformatics