



COST Action 282 Workshop
Knowledge Exploration in Life Science Informatics
Nice, France, 9-11 January 2004



Motivation

Modern life sciences investigate phenomena and systems at the level of molecules, cells, tissues, organisms and populations. Typical areas of interest include natural evolution, development, disease, behavior, cognition, and consciousness. This quest has generated an overwhelming and fast-growing amount of data, information, and knowledge reflecting living systems at different levels of organization. Future progress of the life sciences will depend on effective and efficient sharing and exploitation of these resources by computational means. Fig. 1 depicts some of the key IT infrastructure that is needed for advancing life science research and development.

Life Sciences biophysics, biochemistry, biology, medicine, neuroscience ...	Life Science Informatics
Executable Models / Computational Theories knowledge-based systems, simulation systems	
Information Bases / Derived-Data Databases consolidated, pooled, integrated, enriched data	
Experimental/Clinical Data / Databases created/collected for purpose of specific study	
Computational, Data, Information, and Knowledge Grids facilitate sharing of computational resources	

Fig. 1. *IT infrastructure facilitating life science research and development*

While the precise scientific questions and goals differ in the various life science disciplines, there is a considerable overlap in terms of the required key IT methodologies and infrastructures. Critical technologies include databases, information bases, executable models, and emerging Grid computing infrastructures and systems (see Fig.1.). Important information technologies related to those systems include knowledge management and discovery, data mining, machine learning, intelligent systems, artificial and computational intelligence, human-computer interaction, computational creativity, and knowledge engineering.

Databases, information bases, and executable models represent information systems whose information content is directly related to the studied life phenomena and processes. These information systems differ in terms of their use and capability (e.g. information retrieval, data exploration, decision support, predictive) and in terms of the generality (i.e. scope of applicability) and level of abstraction (degree of detail) of the information captured.

Grid technology, on the other hand, is more generic – it is an enabling technology, which facilitates the sharing of IT systems and resources (i.e. data, information, and knowledge systems) across geographically widely dispersed sites.

Within COST Action 282, life science informatics constitutes a formidable platform for applying existing and developing new IT and knowledge technologies.

Objectives

The COST Action 282 Workshop, which will bring together all three Working Groups of the Action, has three primary objectives:

1. To provide an overview, to identify, and to discuss key research and development issues from a representative set of life science domains, including biology, neuroscience, and medicine (Day 1-2)
2. To evaluate and discuss the presented issues in the context of a COST Action 282 Symposium planned for Autumn 2004 (end of Day 2)
3. To prepare the Call for Papers and other organizational matters for the envisaged Symposium (Day 3)
4. To focus and converge the activities of Action 282 and its Working Groups around a topic central to the Action's main research objectives

Expected Outcomes

In line with the objectives of the Workshop, the expected outcomes are as follows:

- A common understanding among the Working Groups on the key issues faced by modern life science research and how their achievement is related to current and evolving information and knowledge technologies, including those represented by the Action's members
- A view on how the issues may be tackled by merging and adapting existing information and knowledge technologies and a vision on what kind of new IT developments may result from the presented life science issues and the underlying information requirements
- The formulation of a Call for Papers for the envisaged Symposium in Autumn 2004
- To discuss and plan potential follow-up short term mission to some of the experts' institutes with the objective to explore some of the discussed issue in more detail. Such missions would further increase the momentum and focus of the Action, in particular with regards to the planned Symposium and in terms of the Action's overall objectives.

Format

The format of this Workshop rests on the areas covered by the 4-5 invited speakers. Ideally, they should cover a wide range of critical life science and life science informatics areas. The initial areas envisaged include medicine and medical informatics (including medical and molecular imaging), biology and bioinformatics, proteomics, and neuroscience and neuroinformatics. The invited speakers are asked

- To give a presentation outlining the key challenges in their field and how their solutions may relate to and involve techniques and methods from life science informatics. From this requirement it is obvious that the experts must be able to convey their field and the issues to an audience that has not special expertise in their area.
- To facilitate a lively and constructive discussion, the experts should provide an outline of their presentation and pointers relevant resources, so as to allow the Action and Workshop participants members to prepare some slides as response and input to the discussion round.

Invited Speakers

We are envisaging four to five invited speakers from a diverse set of life science or life science informatics domains. So far the following speakers have confirmed their participation:

- **Professor Chris Shaw**, Professor of Biotechnology, University of Ulster, Northern Ireland (biotechnology, peptides, proteomics): <http://www.science.ulst.ac.uk/pbrg/main.html>
- **Professor Sturla Eik-Nes**. Subject: Biomedical imaging. Trondheim University Hospital, <http://www.stolav.no/stolav/Virksomhet/behandling/Kvinneklinnen/enheter/fode/enheter/fostermedisin+nsfm/ansatte/sturla.htm>
- **Professor John Weinstein**. Subject: Genomics and bioinformatics. National Cancer Institute, <http://discover.nci.nih.gov/>
- **Professor Astrid Lægreid**. Subject: Functional Genomics. Norwegian University of Science and Technology (NTNU)
- **Professor Rui Meireles de Brito**, Protein Folding and Stability Group, Chemical Department, University of Coimbra, Portugal. Subject: Protein molecular dynamics and unfolding. <http://www.biolchem.qui.uc.pt/eng/area3.html>