

UNIVERSITY OF OULU  
Department of Biochemistry

Plan of action for the implementation and development of the teaching duty for 2007-2009

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The focus areas for profiling the teaching of the department are two-fold, “Protein Science and Biotechnology” and “Molecular and Cellular Biology”. These two areas currently form the MSc degree programmes that will be offered from the academic year 2008-2009 under the phase-in of the Bologna process.

Of these the primary focus will be in the broad area of Protein Science (including Biotechnology which in essence is applied Protein Science). The study of protein structure and function has always been an essential part of biochemistry. It is the primary basis of the biotechnology industry and of fundamental importance to the pharmaceutical industry. Often biochemical processes can occur via multiple parallel pathways, significantly complicating the interpretation of *in vivo* data, while *in vitro* analysis can often lead to non-physiologically relevant functions being assigned. It is only the integration of the structural, biophysical and biochemical analysis of proteins *in vitro*, *in vivo* and *in silico* that can produce an understanding of the molecular mechanisms by which proteins function within the complex and highly interactive systems formed by cells and whole organisms. Hence while protein scientists in both academia and in industries will need to be highly trained within a single specialization they will also need to have a well based understanding of theoretical and practical aspects of all facets of protein function and structure in the post-genomic era. Without sufficient critical mass in this research field and without sufficient numbers of highly-trained and well motivated specialists, Finland will be very poorly placed to take advantage of the new areas of economic growth in biomedical and biotechnological industries that will be fuelled by advances in molecular biosciences and in particular in protein science in the post-genomic era.

This area of focus covers one of the three focus areas of research defined by the University of Oulu.

The Department of Biochemistry is well resourced and equipped with a specific strength in the area of protein structure and function. This focus has been purposefully built up by the active policy of the systematic recruitment of experts from Finland and abroad, with the aim of generating a coherent and complementary set of groups that between them cover all facets of the fields of protein structure and function.

The need for researchers and experts trained in Functional and Structural Enzymology is profound. Currently Life Sciences, in particular biotechnology / molecular biology, is the second fastest growth area for science jobs worldwide (behind information technology). In the post genomic era a deep understanding of protein structure and function will be

fundamental in understanding the molecular mechanisms of life, in rational drug design and cell engineering, in the development of new diagnostics and the identification and treatment of inborn errors. It is the primary basis of the biotechnology industry and of fundamental importance to the pharmaceutical industry. Without sufficient critical mass in this research field and without sufficient numbers of highly-trained and well motivated specialists, Finland will be very poorly placed to take advantage of the new areas of economic growth in biomedical and biotechnological industries that will be fuelled by advances in molecular biosciences and in particular in protein science. In particular there is an urgent need for protein scientists who are able to integrate the structural, biophysical and biochemical analysis of proteins *in vitro*, *in vivo* and *in silico*.

The current need for experts in this field is exemplified by the facts that according to university statistics our graduates have the lowest unemployment rate in the faculty and that we are not aware of a single ex-PhD student who is currently unemployed.

The department has four goals for the development of teaching in its focus areas:

- 1) The introduction of a MSc degree in Protein Science and Biotechnology from the academic year 2008-2009. This will form an integrated package of specialization which flows smoothly on from the existing BSc in biochemistry. The modules that make up this degree are planned in outline and discussions are ongoing between the members of staff who will be responsible for these modules, the OKTR group and the head of teaching (who is coordinating the implementation of the Bologna process) to finalize the fine details of content to ensure an overall flow and coherency between the modules.
- 2) The introduction of an international M.Sc. degree in Protein Science and Biotechnology. The number of students that can be taken in at the BSc level is severely limited by the available laboratory space. In order both to increase the number of MSc students produced by the department, to raise the profile of the University of Oulu and to further internationalize the Faculty of Science (the Department of Biochemistry already has 15 nationalities among the staff), a new international 2 year MSc has been proposed. Details for this degree can be found in the attached file which has been submitted to either Faculty or the University of at least three previous occasions. While there will be an initial outlay by the University to support the establishment of the degree, it will become self-supporting and more than double repay the initial outlay in terms of direct income to the University within 5 years.
- 3) The increase in the number of PhD students who complete each year within the department to 7-8 per year.
- 4) The introduction of a new Professorship in Cell Biology. Both cellular and molecular biology are essential auxiliary subjects for Protein Science and Biotechnology. Currently the department has some active research staff in the area of cell biology, but it lacks critical mass both to provide the required level of teaching and in research in this area.

The main development projects for which support from the University is wanted are areas 2 and 4 outlined above. Specifically:

- a) Financial support to establish the new international MSc degree in Protein Science and Biotechnology. As outlined in the attached file this support comes to 426000 euro over a 5 year period, by the end of which the income generated for the University will be 640000 euro and the degree will be fully self funding. Since the funds requested are, in part, to support new assistant positions within the department (which are always filled by PhD students), this will in addition help the department to attain and sustain goal 3 listed above.