



KTH School of Biotechnology Department of Biochemistry

Head of Department: Prof. Karl Hult

Royal Institute of Technology
AlbaNova University Center
SE-106 91 Stockholm
Sweden
www.biotech.kth.se

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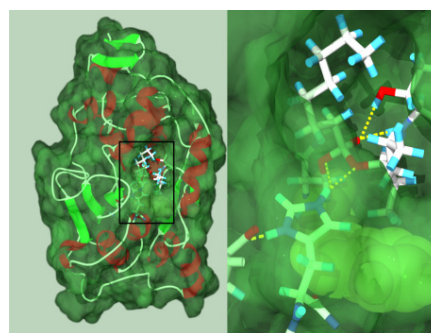
The research at the department of Biochemistry is focused on enzyme catalysis, applied enzymology and ecological plant biochemistry. There are two main activities within enzyme catalysis, one towards synthesis or biocatalysis and one towards analytical biochemistry. Our joint goal is to advance the understanding and use of enzyme catalysis based on a broad interdisciplinary competence in enzymology, molecular biology, organic chemistry, and molecular modeling, to identify, investigate, modify and produce enzymes and proteins of synthetic and analytical interest and to use enzymes and proteins for development of fast, sensitive and robust analytical methods with technical, biological and medical applications. The goal is also to develop and apply new environmentally friendly technologies at the interface between chemistry, biology and ecology.

The Biocatalysis Group

The Biocatalysis Group is internationally well recognized in the field of combining molecular modeling, enzymology, molecular biology and organic chemistry to understand and develop enzymes at a molecular level. We have shown that it is possible to rationally design properties of enzymes based on a detailed understanding of substrate enzyme interactions. Break-through results comprise expanded substrate specificity, induced reversal of enantioselectivity by a factor of 10⁷. In addition we have introduced substrate assisted catalysis and even changed the reaction specificity of a lipase. In the latter case we redesigned a lipase from cleaving C-O bonds to forming C-C, C-S and C-N bonds in aldol and Michael addition reactions. We believe that tailor-made enzymes will be invaluable to new chemical processes ranging from small scale production to production of bulk chemicals. Areas we are especially interested in are; advanced chiral synthons, nanotechnology and advanced polymers.

Ecological plant biochemistry Group

Activation of defense functions in plants is studied, and how this knowledge can be used for applied plant defense against microorganisms, insects, or abiotic stress. The aim is to substitute chemicals with a negative environmental impact with new sustainable strategies and to increase the productivity within Swedish forestry and agriculture. A special topic is plant stress signaling. We have since long time established a plant cell culture technology, which is used in our laboratory. We cooperate with e.g. botanists, ecologists, plant breeders and organic chemists. Examples of present research are induced metal tolerance in trees and plant protection against insect attack.



One protein scaffold for many applications

Candida antarctica lipase B has been redesigned to produce a variety of new products and to catalyse new chemical reactions.

Applied enzymology Group

The research involves method developments in the area of biotechnology with technical, biological and medical applications. The research focuses on identification, investigation, modification and production of enzymes of analytical interest. The identified enzymes are used for the development of fast, sensitive and robust analytical methods that are well suited for automation. The main part of the method development work is performed inside the unit, whereas most of the application work is pursued in collaboration with Swedish or foreign researchers. Examples of recent developments in the unit are a new DNA sequencing method called pyrosequencing and an automated instrument, utilizing the pyrosequencing chemistry, for very high-throughput DNA sequencing. The achievements of the unit were recently acknowledged in an article in New York Times (August 1, 2005). The research performed in the unit formed the basis for the development of a new kind of machine for decoding DNA. The machine may help bring costs so low that it would be feasible to decode an individual's DNA for medical reasons; a revolution in the field of medicine. Nyrén P. (1998/2001) Method for sequencing DNA Patent WO 9828440/US 6258568.

Research Groups



Prof. Karl Hult (kalle@biotech.kth.se)
Biocatalysis
4 PhD students



Prof. Pål Nyrén (nyren@kth.se)
Applied enzymology
1 scientist, 2 PhD students



Assoc. Prof. Per Berglund (per.berglund@biotech.kth.se)
Biocatalysis
1 Posdoc, 2 PhD students

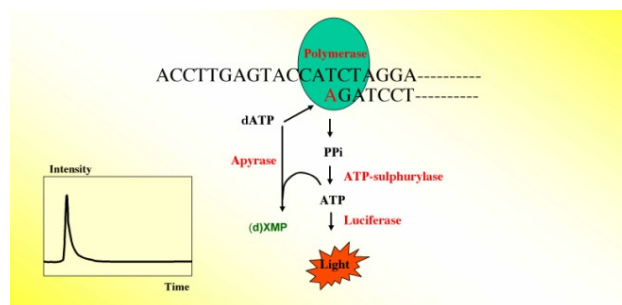


Dr. Mats Martinelle (matsm@biotech.kth.se)
Biocatalysis
3 PhD students



Assoc. Prof. Torkel Berglund (torkel@biotech.kth.se)
Plant Biochemistry
1 scientist

Pyrosequencing reaction



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