Chemical Catalysis in Biology

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Overview

Enzymes are the catalysts that direct, control and enhance the chemistry in biological systems. Those catalysts are mostly stereo- and regio-selective and specific. Their catalytic power is typically many orders of magnitude at ambient temperature and pressure. The structure and properties of protein and RNA enzymes will be studied. We will deliberate examples of enzymatic mechanisms and compare them to organic and inorganic catalytic processes. We will discuss the chemical and physical basis of their action, and how this understanding is used in the medical and chemical industries. A variety of experimental methods and theoretical approaches will be presented.

This course will familiarize the participants of the fundamentals of enzyme/proteins, will expose the participants to enzyme catalysis and build in confidence and capability amongst the participants in handling enzymatic reactions. It will be tried to make the participants capable of determining enzyme kinetics.

Course participants will learn various topics through lectures and also case studies and assignments will be shared to stimulate research motivation of participants.

Modules	**Chemical Catalysis in Biology : May 18 – 31, 2016** **18.5.2016**: Chemical and biological catalysis. The absolute rate theory Principles of catalysis Catalytic strategies i. Acid/Base; Covalent; Metal Ion, Electrostatic. ii. Proximity/Orientation, Effective Concentration. iii. Transition Stabilization, Contribution of Dynamics, Electrostatics. **19.5.2016**: Protein folding, structure and dynamics. From amino acids to three dimensional structure of proteins Methods for determination Cofactors and other non-amino-acids functionalities **20.5.2016**: Enzyme kinetics I. Introduction to kinetics (steady state and pre-steady state kinetics) Inhibition patterns:various types of inhibition. **23.5.2016**: Enzyme kinetics II. Kinetic regulations (allosteric; product inhibition, substrate inhibition, slow binding inhibitors, feedback inhibition, etc) and their application to productregulation Isotope effects **24.5.2016**: Evolution on the molecular level. Adaptation of enzymes in thermophiles and mesophile. Primitive to mature enzymes **25.5.2016:** Mechanistic examples I. Classical and recent examples of enzymes' mechanistic research **26.5.2016:** Mechanistic examples II. Classical and recent examples of enzymes' mechanistic research

	27.5.2016: Deconstruction of kinetic pathways from mechanistic studies **30.5.2016:** Chemistry of inhibition and autocatalysis **31.5.2016:** Problem solving, discussion **Number of participants for the course will be limited to fifty.**
You Should Attend If…	▪ you are a research scientist in Chemistry, Biology interested in studying the role of enzymes in the biochemical reactions, kinetics and mechanism of the enzymatic reactions. ▪ you are chemist or biologist interested to learn application of enzyme based reactions and make use for laboratory/industry reactions. ▪ you are a student or faculty from academic institution interested in learning basics of enzymes and how to use enzyme based reactions for the research purpose and industrial purpose.
Fees	**The participation fees for taking the course is as follows:** **Participants from abroad : US $200** **Industry/ Research Organizations: Rs. 5000/-** **Academic Institutions:** **BSc Students: Rs. 500/-** **MSc Students: Rs. 1000/-** **PhD Students: Rs. 1500/-** **Faculty members: Rs. 2000/-** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Prof. Dr. Amnon Kohen, Director of the Iowa Training Program in Biotechnology (T32 GM008365) since 2013, is studying enzymes for more than 15 years, with focus on the physical features involved in C-H bond activation (i.e., 80-100 kcal/mol activation barrier for uncatalyzed reaction). His studies range from physical chemistry understanding of hydrogen nuclear tunneling to organic chemistry investigation of new enzymatic systems as targets for antibiotic and chemotherapeutic drugs. In addition to basic biophysical features, he also studies molecular evolution and network of coupled dynamics and applications to drug design and biomimetic catalyst design. He has the needed background in Organic Synthesis; Physical-organic methods; Enzyme kinetics; Isotopic labeling and isotope effects; Spectroscopy and bioanalytical methods; Molecular biology and protein preparation; Rate theories; and Enzymology in general.

Prof. Dr. Palwinder Singh is the faculty of Organic Chemistry in the Department of Chemistry, Guru Nanak Dev University, Amritsar. His research interest is in the area of medicinal and bioorganic chemistry involving rational design, synthesis, characterization and evaluation of materials as enzyme models; development of anticancer, anti-inflammatory and anti-fungal agents, and studying their mode of action.

Course Co-ordinator

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REGISTRATION CUM ACCOMODATION REQUEST FORM

(To reach electronically by 5th May, 2016 and hard copy by 10th May, 2016)

INTERNATIONAL WORKSHOP on CHEMICAL CATALYSIS IN BIOLOGY

May 18-31, 2016

Department of Chemistry, Guru Nanak Dev University

Amritsar, Punjab

Name (Block Letters): …… M/F: ……

Designation/ Professional Title: ……..

Organization: ……

Address: ……

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Tel.: …….. . Mobile: ……...

E- mail: ……..

Accommodation Required (Yes/ No): ……...

The Registration fee of Rupees ……has been paid via Demand Draft No……..in favour of The Registrar, Guru Nanak Dev University, Amritsar Through online/offline banking bearing Transaction No. …….. to Punjab & Sind Bank, Guru Nanak Dev University Campus (RTGS/IFSC code: PSIB0000288) A/Ct No. 02881000007953 of Guru Nanak Dev University. Demand Draft/ Fee Receipt have been enclosed herewith.

Date: Signature