DEPARTMENT OF BIOCHEMISTRY AND BIOPHYSICS

http://biochemistry.tamu.edu

Head: G. D. Reinhart

The Department of Biochemistry and Biophysics offers programs of study and research leading to the MS and PhD degrees in biochemistry. These programs are designed to provide the background for a career in independent research; in addition, graduate students gain experience in teaching, inasmuch as each is required to serve as a teaching assistant during his or her graduate work. A non-thesis option for the MS degree is available to students not intending to enter a research career.

Ongoing research activities involve plants, animals and microorganisms and span the broad fields of molecular biology, protein and nucleic acid structure, virology, enzymology, biophysical chemistry and biochemical nutrition. The department occupies a modern research building that is well equipped to conduct biochemical research. Students entering graduate work in biochemistry are required to have adequate preparation in chemistry, mathematics, physics and molecular biology. The program leading to the PhD degree is designed for extensive involvement in research. The resulting dissertation must demonstrate a superior knowledge and understanding of the subject area. In addition, the student must demonstrate a broad and commanding knowledge of general biochemistry. There is no language requirement. There is, however, an English requirement for all students, including those seeking the MS degree. The department encourages interdisciplinary research projects with other departments. Detailed information about the graduate program may be obtained from the Biochemistry Graduate Programs Office, which can be reached by mail, by email at biobiograd@tamu.edu or by telephone at 1-800-4-TAMBIO. Information can also be obtained from the website at http://biochemistry.tamu.edu.

Faculty

Ayres, Nicola M, Senior Lecturer
Biochemistry & Biophysics
PHD, University of Nebraska - Lincoln, 1987

Bryk, Mary E, Associate Professor
Biochemistry & Biophysics
PHD, Albany Medical College, 1994

Cho, Jae H, Assistant Professor
Biochemistry & Biophysics
PHD, State University of New York at Stony Brook, 2006

Cruz-Reyes, Jorge A, Professor
Biochemistry & Biophysics
PHD, London School of Hygiene & Tropical Medicine, 1992

Datta, Sumana, Associate Professor
Biochemistry & Biophysics
PHD, University of California, San Diego, 1987

Devarenne, Timothy P, Associate Professor
Biochemistry & Biophysics
PHD, University of Kentucky, 2000

Glasner, Margaret E, Associate Professor
Biochemistry & Biophysics
PHD, Massachusetts Institute of Technology, 2003

Gohil, Vishal M, Assistant Professor
Biochemistry & Biophysics
PHD, Wayne State University, 2005

He, Ping, Professor
Biochemistry & Biophysics
PHD, Kansas State University, 2003

Henderson, Michelle, Lecturer
Biochemistry & Biophysics
PHD, Texas A&M University, 2010

Herman, Jennifer K, Associate Professor
Biochemistry & Biophysics
PHD, Indiana University, 2005

Hu, James C, Professor
Biochemistry & Biophysics
PHD, University of Wisconsin - Madison, 1987

Igumenova, Tatyana I, Associate Professor
Biochemistry & Biophysics
PHD, Columbia University, 2003

Kaplan, Craig D, Associate Professor
Biochemistry & Biophysics
PHD, Harvard University, 2003

Kunkel, Gary R, Associate Professor
Biochemistry & Biophysics
PHD, University of California, Los Angeles, 1977

Li, Pingwei, Professor
Biochemistry & Biophysics
PHD, Peking University, China, 1996

Meek, Thomas D, Professor
Biochemistry & Biophysics
PHD, The Pennsylvania State University, 1981

Miles, Bryant W, Senior Lecturer
Biochemistry & Biophysics
PHD, Texas A&M University, 1998

Mullet, John E, Professor
Biochemistry & Biophysics
PHD, University of Illinois at Urbana-Champaign, 1981

Mullins, Leisha H, Senior Lecturer
Biochemistry & Biophysics
PHD, Texas A&M University, 1989

Panin, Vladislav M, Professor
Biochemistry & Biophysics
PHD, Moscow State University, 1990

Park, William D, Professor
Biochemistry & Biophysics
PHD, University of Florida, 1977
Pellois, Jean-Philippe, Professor
Biochemistry & Biophysics
PHD, University of Houston, 2002

Peterson, David O, Professor
Biochemistry & Biophysics
PHD, Harvard University, 1977

Pishko, Elizabeth J, Lecturer
Biochemistry & Biophysics
PHD, The University of Texas at Austin, 1993

Polymenis, Michael S, Professor
Biochemistry & Biophysics
PHD, Tufts University, 1994

Reinhart, Gregory D, Professor
Biochemistry & Biophysics
PHD, University of Wisconsin - Madison, 1979

Reynolds, Mollie M, Lecturer
Biochemistry & Biophysics
PHD, Texas A&M University, 2010

Rye, Chavela M, Lecturer
Biochemistry & Biophysics
PHD, Massachusetts Institute of Technology, 2014

Rye, Hays S, Associate Professor
Biochemistry & Biophysics
PHD, University of California, Berkeley, 1995

Sacchettini, James C, Professor
Biochemistry & Biophysics
PHD, Washington University in St. Louis, 1987

Shippen, Dorothy E, Professor
Biochemistry & Biophysics
PHD, The University of Alabama at Birmingham, 1987

Straight, Paul D, Associate Professor
Biochemistry & Biophysics
PHD, University of Colorado, 2000

Young, Ryland F, Professor
Biochemistry & Biophysics
PHD, The University of Texas at Dallas, 1975

Zeng, Lanying, Assistant Professor
Biochemistry & Biophysics
PHD, University of Illinois at Urbana-Champaign, 2007

Zhang, Junjie, Assistant Professor
Biochemistry & Biophysics
PHD, Baylor College of Medicine, 2009

Zhang, Xiuren, Associate Professor
Biochemistry & Biophysics
PHD, Cornell University, 2003

Masters

- Master of Science in Biochemistry (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/biochemistry-biophysics/biochemistry-ms)

Doctoral

- Doctor of Philosophy in Biochemistry (http://catalog.tamu.edu/graduate/colleges-schools-interdisciplinary/agriculture-life-sciences/biochemistry-biophysics/phd)

Courses

BICH 601 Fundamentals of Biochemistry I
Credits 3.3 Lecture Hours.
Basic biochemical concepts pertaining to the structure of the major biomolecules (proteins, carbohydrates, lipids and nucleic acids); the relationship of structure to function of these molecules; structure and action of enzymes; principles of bioenergetics.
Prerequisite: One year of organic chemistry.

BICH 602 Fundamentals of Biochemistry II
Credits 3.3 Lecture Hours.
Major metabolic pathways for carbohydrates, lipids, amino acids, proteins and nucleic acids, emphasizing oxidative processes and the biosynthesis of RNA, DNA and protein; regulation of cellular metabolism.
Prerequisite: BICH 601.

BICH 603 General Biochemistry I
Credits 3.3 Lecture Hours.
The biochemical properties of macromolecules found in living matter; proteins, enzymes and nucleic acids.
Prerequisites: BICH 410 or BICH 601; CHEM 228 and CHEM 323.

BICH 605 Methods of Biochemical Analysis
Credits 3.3 Lecture Hours.
Experimental techniques important in biochemistry including methodologies for data analysis.
Prerequisite: Graduate classification in biochemistry or approval of instructor.

BICH 608 Critical Analysis of the Biochemical Literature
Credits 2.2 Lecture Hours.
Reading and presentation of original articles in biochemistry and related fields to enhance understanding of experimental logic and scientific communication.
Prerequisite: Graduate classification in biochemistry or approval of instructor.

BICH 609 Preparation of a Biochemical Research Proposal
Credits 2.2 Lecture Hours.
Development and presentation of hypotheses, specific aims, significance and experimental approaches for a biochemical research proposal.
Prerequisite: Graduate classification in biochemistry.

BICH 624 Enzymes, Proteins and Nucleic Acids
Credits 3.3 Lecture Hours.
Chemical and physical properties of enzymes, proteins and nucleic acids; thermodynamics, kinetics and mechanisms of enzyme-catalyzed reactions and protein-nucleic acid interactions.
Prerequisites: BICH 603; CHEM 324.
BICH 625/MCMD 625 Nucleic Acid--Protein Interactions
Credit 1. 1 Lecture Hour.
Mechanisms of nucleic acid-protein interactions involved in fundamental biochemical processes such as DNA replication and rearrangement, transposition, transcription, RNA splicing and translation; original research articles presented focusing on experimental approaches, interpretation of results and overall significance. Course may be taken 8 times for credit.
Prerequisites: BICH 431/GENE 431 or GENE 431/BICH 431 or equivalent; approval of instructor.
Cross Listing: MCMD 625/BICH 625.

BICH 628/CSCE 628 Computational Biology
Credits 3. 3 Lecture Hours.
Introduction to computational biology; formulations of biology problems as computational problems; computational approaches to solve problems in genomics and proteomics.
Prerequisite: Graduate classification or approval of instructor.
Cross Listing: CSCE 628/BICH 628.

BICH 631/GENE 631 Biochemical Genetics
Credits 3. 3 Lecture Hours.
Genetic control of cellular metabolism; mechanism of gene action; gene-enzyme relationships; regulation of gene expression; structure and organization of genomes; biochemical manipulation and characterization of genetic molecules.
Prerequisites: BICH 431/GENE 431 or GENE 431/BICH 431; BICH 603.
Cross Listing: GENE 631/BICH 631.

BICH 650/BIOL 650 Genomics
Credits 3. 3 Lecture Hours.
Modern genomics as a tool for understanding biological systems, gene structure, and organization as well as the history of sequencing technologies; focus on transcriptional, translational and functional genomics.
Prerequisite: Graduate classification or approval of instructor.
Cross Listing: BIOL 650/BICH 650.

BICH 654 Structural Biochemistry
Credits 3. 3 Lecture Hours.
Basic physics of X-ray diffraction, crystal structure methods, introduction to structural data bases, molecular geometry and molecular modeling.
Prerequisite: Approval of instructor.

BICH 655 Crystallography Methods
Credits 3. 2 Lecture Hours. 3 Lab Hours.
The practice of x-ray diffraction in the study of biomolecules; solving protein crystal structures.
Prerequisite: Graduate classification.

BICH 656 RNA Biology
Credits 3. 3 Lecture Hours.
Emphasis on newly discovered RNA-mediated processes and regulation; range of topics in modern RNA biology include RNA silencing; RNA-guided epigenetic regulation, CRISPR/Cas immunity and genome editing, telomerase biogenesis, riboswitches, exosome and editosome; application of RNA biology in medicine and biotechnology.
Prerequisites: BICH 301 and BICH 302.

BICH 657 Introduction to Structural Biology
Credit 1. 1 Lecture Hour.
Protein expression, purification, characterization, crystallization and structural determination by X-ray crystallography; includes an eight hour workshop on crystallography.
Prerequisite: Graduate classification.

BICH 661 Advanced Genome Annotation with Ontologies
Credit 1. 2 Lab Hours.
Advanced topics in functional annotation using ontologies; usage issues and quality control for ontologies and annotations; mentoring annotation activities from BICH 460 and evaluation of annotations. May be taken three times for credit.
Prerequisite: Graduate classification or approval of instructor.

BICH 662 Eukaryotic Transcription
Credit 1. 1 Lecture Hour.
Intensive short course in molecular mechanisms of eukaryotic transcription, and its regulation.
Prerequisite: BICH 631/GENE 631 or GENE 631/BICH 631 or approval of instructor.

BICH 664 Fluorescence Spectroscopy
Credit 1. 1 Lecture Hour.
Theory underlying fluorescence spectroscopy as well as practical considerations that must be understood when utilizing fluorescence as an analytical tool; the use of both steady-state and time-resolved fluorescence measurements to evaluate fluorescence quantum yield, quenching, anisotropy, and energy transfer.
Prerequisite: Graduate classification.

BICH 665 Biochemical Kinetics
Credit 1. 1 Lecture Hour.
Theoretical principles and practical approaches to analysis of chemical kinetics with specific examples of applications to biochemistry and biochemical investigations.
Prerequisite: Graduate classification.

BICH 667 Molecular Probes
Credit 1. 1 Lecture Hour.
Function of biomolecules in the context of living cells (in cellulo as opposed to in vitro); chemical tools and analytical techniques; application in the investigation of cellular processes; identification of biological problems and design.
Prerequisite: Graduate classification.

BICH 671/MCMD 671 Macromolecular Folding and Design
Credit 1. 1 Lecture Hour.
Oral presentations and discussions in the general area of biomolecular structure, folding, function and design. May be taken 12 times.
Prerequisite: Approval of instructor.
Cross Listing: MCMD 671/BICH 671.

BICH 672/MCMD 672 Biological Membranes
Credit 1. 1 Lecture Hour.
Seminar-based course examining recent discoveries in the structure, function and assembly of biological membranes; oral presentation by students on current literature in molecular biology and biochemistry.
Prerequisite: Approval of instructor.
Cross Listing: MCMD 672/BICH 672.

BICH 673/GENE 673 Gene Expression
Credit 1. 1 Lecture Hour.
Oral presentations and discussions related to the biochemistry and molecular biology of gene expression in animal, plant and microbial systems. May be repeated for credit up to 12 times.
Prerequisite: Graduate classification in biochemistry or genetics or approval of instructor.
Cross Listing: GENE 673/BICH 673.
BICH 674/MCMD 674 Protein Folding and Stability  
**Credit 1. 1 Lecture Hour.**  
Selected topics from recent literature in the general areas of protein folding, structure, and stability.  
**Prerequisite:** Approval of instructor.  
**Cross Listing:** MCMD 674/BICH 674.

BICH 675 Plant Biochemistry and Genomics  
**Credit 1. 1 Lecture Hour.**  
Overview of current literature dealing with plant biochemistry/genomics; biochemistry topics will include the function of protein-protein interactions related to plant specific processes such as plant-pathogen interactions; genomics topics will focus on current analysis of plant genomes and how the derived information is being utilized to elucidate biochemical pathways.  
**Prerequisite:** Graduate classification.

BICH 676 Bacteriophage Biology  
**Credit 1. 1 Lecture Hour.**  
Oral presentation and discussion in the general area of the viruses of microbes and bacteria; literature review with a broad scope, from basic molecular biology of phages to practical applications of microbial virus technology. May be taken 12 times for credit.  
**Prerequisite:** Approval of instructor.

BICH 677 Chemical Genetics and Drug Discovery  
**Credit 1. 1 Lecture Hour.**  
Review, discuss and present scientific literature studies based on the usage of small molecules to alter protein function. May be repeated for credit.  
**Prerequisite:** Graduate classification.

BICH 678 Metal Ions  
**Credit 1. 1 Lecture Hour.**  
Understanding the roles of metals in biological systems and the methods used in biochemical and cell biological processes; reading primary research literature critically, critiquing research designs in terms of innovation, significance and logic, and uncovering both strengths and weaknesses of the discussed articles.  
**Prerequisites:** CHEM 628 or approval of instructor.

BICH 681 Seminar  
**Credit 1. 1 Lecture Hour.**  
Original articles in biochemistry and related fields designed to broaden understanding of problems in the field and to stimulate research.

BICH 685 Directed Studies  
**Credits 1 to 12. 1 to 12 Other Hours.**  
Biochemical laboratory procedures; preparations and instrumentation; problems assigned according to experience, interests and needs of individual student.  
**Prerequisite:** Approval of instructor.

BICH 689 Special Topics in...  
**Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 4 Lab Hours.**  
Selected topics in an identified area of biochemistry. May be repeated for credit.  
**Prerequisite:** Approval of instructor.

BICH 690 Theory of Biochemical Research  
**Credits 2. 2 Lecture Hours.**  
State-of-the-art examination of modern trends in various subfields of modern biochemistry concentrating on the design of experiments, evaluation of research results and discussion of the current literature. May be repeated for credit.

BICH 691 Research  
**Credits 1 to 23. 1 to 23 Other Hours.**  
Research for thesis or dissertation. Laboratory facilities available for original investigations in various phases of biochemistry.  
**Prerequisite:** Approval of major advisor.

BICH 697 Methods in Teaching Biochemistry Laboratory  
**Credit 1. 1 Lecture Hour.**  
Theory and practical aspects of teaching Biochemistry labs, with emphasis on content, grading, instructional methods and practical aspects of biochemistry labs. May be repeated for credit.  
**Prerequisite:** Graduate classification in biochemistry.