

# Biology

## **BIOL S-100b. Biochemistry: Nucleic Acids and Molecular Genetics (CRN: 31301)**

*David Dressler PhD, Lecturer on Biochemistry, Oxford University*

DNA as the genetic material: basic principles of replication, recombination, repair, mutagenesis, RNA transcription, protein translation, and control of gene expression will be explored. Topics such as gene therapy, molecular medicine, cancer, and cardiovascular disease will be used to integrate the underlying molecular biochemistry. Designed as a companion course to BIOL S-100a, but may be taken independently.

## **BIOL S-100a. Biochemistry: Structure and Function of Proteins (CRN: 31300)**

*David Dressler PhD, Lecturer on Biochemistry, Oxford University*

Basic principles of the enzymatically catalysed reaction: metabolism, energy production, and the physiological processes of living cells and organisms will be discussed in terms of proteins functioning as molecular machines. Proteins as catalysts, hormonal signaling agents, receptors, architectural elements, and immune system antibodies will be explored. The roles of the four major classes of macromolecule--proteins, carbohydrates, lipids and membranes, and, briefly, nucleic acids--will be delineated in terms of their medically and physiologically relevant biological chemistry. May be taken concurrently with BIOL S-100b.

## **BIOL S-172. Biological Perspectives on HIV and AIDS (CRN: 31099)**

*Robert Lue PhD, Senior Lecturer on Molecular and Cellular Biology, Harvard University*

Conservative estimates indicate that more than 60 million men, women, and children worldwide have been infected with HIV since the start of the epidemic. It is expected that the vast majority of these people will go on to develop AIDS and become part of the most serious medical crisis in recorded history. This course will examine the molecular biology of both the virus and the immune system that it destroys. The history of the disease also will be traced and compared to current theories of HIV transmission, clinical testing, and the potential for effective therapies and vaccines. The biology of the virus will be related at each step to issues of public policy and human behavior.

## **BIOL S-21. Comparative Functional Anatomy of the Vertebrates (CRN: 31314)**

*Karel F. Liem PhD, Henry Bryant Bigelow Professor and Curator of Ichthyology, Harvard University*

A functional perspective of comparative vertebrate anatomy. Lectures concentrate on the important evolutionary transformations of selected organ systems and their functional meaning during the diversification of the major groups of vertebrates. Laboratory exercises involve dissections of representative vertebrates and some laboratory demonstrations. Even though this course provides the essential foundation for biologists in general, it is especially appropriate for entry into professional schools and programs.

## **BIOL S-169c. Introduction to Immunology (CRN: 30016)**

*Jeffrey Lyczak PhD, Research Fellow in Medicine, Harvard Medical School*

This course focuses on the molecular and cellular biology of the immune system, including the structure, function, and genetics of the major molecules needed to elicit an immune response. Emphasis is on the interactions among cell-surface structures and extracellular molecules leading to an immune response, and the manner by which antibodies and immune cells protect an individual against infection and harmful foreign materials.

## **BIOL S-1ab. Introductory Biology (CRN: 30607)**

*William Fixsen PhD, , Senior Lecturer on Molecular and Cellular Biology, Harvard University*

The principles of biology will be covered in this course, with special reference to the structural, functional, and molecular mechanisms and organization of cells; genetics; development; evolution; anatomy; and physiology. Emphasis will be on cells as

evolved systems for the capture and transformation of energy and the processing of information, the evolution of multicellularity, and the continued interplay of structure and function at the organ level. BIOL S-1ab fulfills the requirement of a year course in biology needed for admission to medical school.

### **BIOL S-74. Marine Biology (CRN: 30014)**

*Ron J. Etter PhD, Professor of Biology, University of Massachusetts, Boston*

This is a general overview of marine biology designed to introduce students to the biology, ecology, and physiology of marine organisms. Topics will include the effects of currents, tides, and waves on marine organisms; the diversity and ecology of the major groups of organisms inhabiting the seas, including plants, invertebrates, fish, and mammals; the ecology of the major oceanic biomes such as coral reefs, the deep sea, and the intertidal zone; contemporary research in marine biology; the use of underwater habitats and submersibles in underwater research; and problems of marine pollution. Students participate in weekly laboratory sessions working with live material and field trips to the Marine Science Center and the New England Aquarium.

### **BIOL S-80. Neurobiology (CRN: 30017)**

*Shawn Murphy PhD, MD, Instructor in Medicine, Harvard Medical School*

An introduction to the organization and function of the nervous system. Topics to be covered include cell biology of neurons, physiology of excitable membranes and electrical signaling, neurotransmitters and neuropeptides, sensory systems, motor systems, developmental neurobiology, simple circuits, and behavior. Discussion of the molecular basis of neurodegenerative and neuropsychological disease.

### **BIOL S-110. Principles and Techniques of Molecular Biology (CRN: 31200)**

*Alain Viel PhD, Instructor in Dermatology, Harvard Medical School*

*Robert Lue PhD, Senior Lecturer on Molecular and Cellular Biology, Harvard University*

The course will address both the fundamental principles and techniques of molecular biology. Students will gain an in-depth knowledge of nucleic acid structure, molecular genetics, and the biochemistry of transcription and protein synthesis. Other topics will include how mechanisms of gene regulation play a role in retroviral pathogenesis, embryonic development, and the generation of immune diversity. Each lecture will directly relate molecular biology to current laboratory techniques. The laboratory portion of the course will represent a complete experimental project. A combination of experiments will give students a broad exposure to several important techniques in molecular biology, together with the direct experience of an intensive research project. Experiments will include current approaches to mutation analysis, protein interaction assays, and recombinant cDNA cloning by PCR.

### **BIOL S-76. Principles of Cell Biology (CRN: 30015)**

*Robert Lue PhD, Senior Lecturer on Molecular and Cellular Biology, Harvard University*

This course is an introduction to the structure and function of cells. Emphasis will be placed on exploring modern research tools, such as microscopy, protein separation techniques, and molecular biology, that are used to understand and manipulate cell function. Emphasis will be placed on the cellular and molecular basis of selected disease states such as inherited tendencies to have high blood cholesterol levels as well as diabetes. Current strategies used to develop new treatments for cancer will be used as a window to understand the molecular basis of this disease. Lectures will include animations and time-lapse microscopy illustrating fundamental cellular processes.

### **BIOL S-77. Principles of Genetics (CRN: 30046)**

*Steven Theroux PhD, Associate Professor of Biology, Assumption College*

This course will focus on the fundamentals of transmission and molecular genetics. Topics will include chromosome structure and replication, genetic linkage and mapping, regulation of gene expression, genetic mutation, and the principles of genetic engineering. Pertinent applications to modern biological problems also will be discussed.