Berkeley Bioscience Study Abroad
Fall 2017 Possible Courses

Integrative Biology

IB 77: Integrative Human Biology, 1 unit

Each week a different Integrative Biology faculty member will give a one-hour lecture on how their research field contributes to our understanding of human biology. The integration of the disciplines of evolution, ecology, paleontology, comparative physiology, and comparative anatomy in the study of how humans function in ecosystems illuminates our understanding of human biology. During each presentation, the faculty member will also inform students about IB courses they teach, research in their lab, and which Berkeley Natural History Museum they may be affiliated with. 1 hour seminar per week.

IB C82: Oceans, 3 units

This course offers multidisciplinary approach to begin answering the question ″Why are oceans important to us?″ Upon a physical, chemical, and geologic base, we introduce the alien world of sea life, the importance of the ocean to the global carbon cycle, and the principles of ecology with a focus on the important concept of energy flow through food webs. Lectures expand beyond science to include current topics as diverse as music, movies, mythology, biomechanics, policy, and trade. 3 hours of lecture, 1 hour of discussion per week.

IB C105: Natural History Museums and Biodiversity Science, 3 units

Course will include a survey of museum resources, including strategies for accession, conservation, collecting and acquiring material, administration, and policies; strategies for making collections digitally available (digitization, databasing, georeferencing, mapping); tools and approaches for examining historical specimens (genomics, isotopes, ecology, morphology, etc.); and data integration and inference. The final third of the course will involve individual projects within a given museum. 2 hours of lecture and 3 hours of lab per week.

IB C107L: Principles of Plant Morphology with Lab, 4 units

An analysis of the structural diversity of land plants with emphasis on the developmental mechanisms responsible for this variation in morphology and the significance of this diversity in relation to adaptation and evolution. 1 hour of lecture, 1 hour of discussion, 4 hours of lab per week

IB 117: Medical Ethnobotany, 2 units

Biological diversity and ethno-linguistic diversity sustain traditional botanical medicine systems of the world. Major topics covered in this course include cultural origins of medicinal plant knowledge on plant-derived pharmaceuticals and phytomedicines; field research methods in ethnobotany and ethnopharmacology; examples of how traditional botanical medicines provide safe, effective, affordable, and sustainable primary health care to tropical countries; human physiology, human diseases, and mechanisms of action of plant-derived drugs. 2 hours of lecture per week.

IB 118: Host-Pathogen Interactions: A trans-discipline outlook, 4 units

The second half of the 20th century is marked by great strides in the battle against infectious diseases. However, the forces that drive pathogen evolution continue to pose new challenges for science and medicine. In this course we will cover various aspects relating to host-pathogen interactions, focusing on animals and their bacterial pathogens. We will address the ecology of host-pathogen interactions, their

shaping by co-evolution, examine prominent molecular mechanisms taking part in this warfare and learn how ancient mechanisms are used and reused through millions of years of evolution. The course will examine how better understanding of host-pathogen interactions can suggest new strategies for fighting infectious diseases. 3 hours lecture, 1 hour discussion per week.

IB 123AL: Exercise Physiology with Lab, 5 units

Discussion of how chemical energy is captured within cells and how potential chemical energy is converted to muscular work. Energetics, direct and indirect calorimetry, pathways of carbon flow in exercise, ventilation, circulation, skeletal muscle fiber types. Laboratory component of the course is to obtain practical experience in the measurement of physiological parameters and to be able to compile, compare, contrast, and interpret physiological data. Laboratory demonstrations and exercises will explain lecture content. 3 hours of lecture, 3 hours of lab per week. Students should have previously taken basic physiology and basic chemistry.

IB 137: Human Endocrinology, 4 units

Course will address the role of hormones in physiology with a focus on humans. Regulation of hormone secretion and mechanisms of hormone action will be discussed. Physiological processes to be addressed include reproduction, metabolism, water balance, growth, fetal development. Experimental and clinical aspects will be addressed. 3 hours of lecture, 1 hour of discussion per week. Previous experience with physiology is recommended.

IB 139: Neurobiology of Stress, 4 units

This course is designed to be an interdisciplinary course. It will adopt a broad-based approach to explore the concepts of stress, health, and disease, with a particular focus on current primary literature. The course will cover multiple dimensions in the study of stress, which employ genetic, epigenetic, molecular, cellular, physiological, and cognitive approaches, especially in the context of endocrine and neuroscience research. We will analyze the individual response to stress, how genetic and environmental factors play a role in it, how it translates to physiological and mental health and well being vs. pathological conditions, and put that in a public health perspective. 3 hours of lecture, 1 hour of discussion per week. Fundamental biology is essential, and some experience with psychology is useful.

IB C144: Animal Behavior, 4 units

An introduction to comparative animal behavior and behavioral physiology in an evolutionary context, including but not limited to analysis of behavior, genetics and development, learning, aggression, reproduction, adaptiveness, and physiological substrates. 3 hours of lecture, 1 hour of discussion per week.

IB 153: Ecology, 3 units

Principles of microbial, animal, and plant population ecology, illustrated with examples from marine, freshwater, and terrestrial habitats. Consideration of the roles of physical and biological processes in structuring natural communities. Observational, experimental, and theoretical approaches to population and community ecology will be discussed. Topics will include quantitative approaches relying on algebra, graph analysis, and elementary calculus. Discussion section will review recent literature in ecology. 3 hours of lecture, 1 hour of discussion per week

IB 154: Plant Ecology, 3 units
An introduction to ecology of plants, covering individuals, populations, communities, and global processes. Topics include: form and function, population ecology, life histories, community structure and dynamics, disturbance and succession, diversity and global change. 2 hours of lecture, 1 hour of discussion per week

IB C156: Principles of Conservation Biology, 4 units
A survey of the principles and practices of conservation biology. Factors that affect the creation, destruction, and distribution of biological diversity at the level of the gene, species, and ecosystem are examined. Tools and management options derived from ecology and evolutionary biology that can recover or prevent the loss of biological diversity are explored. 3 hours of lecture, 1.5 hours of discussion per week

IB 160: Evolution, 4 units
An analysis of the patterns and processes of organic evolution. History and philosophy of evolutionary thought; the different lines of evidence and fields of inquiry that bear on the understanding of evolution. The major features and processes of evolution through geologic times; the generation of new forms and new lineages; extinction; population processes of selection, adaptation, and other forces; genetics, genomics, and the molecular basis of evolution; evolutionary developmental biology; sexual selection; behavioral evolution; applications of evolutionary biology to medical, agricultural, conservational, and anthropological research. 3 hours of lecture, 1 hour discussion per week

IB 164: Human Genetics and Genomics, 4 units
This course will introduce students to basic principles of genetics, including transmissions genetics, gene regulation, pedigree analysis, genetic mapping, population genetics, and the principles of molecular evolution. The course will also introduce students to recent developments in genomics as applied to problems in human genetic diseases, human history, and the relationship between humans and their closest relatives. 3 hours of lecture, 2 hours of lab per week.

Molecular and Cell Biology

MCB 32: Introduction to Human Physiology, 3 units
A comprehensive introduction to human biology. The course will concentrate on basic mechanisms underlying human life processes, including cells and membranes; nerve and muscle function; cardiovascular, respiratory, renal, and gastrointestinal physiology; metabolism, endocrinology, and reproduction. 3hours lecture, 1 hour discussion per week.

MCB 32L: Introduction to Human Physiology Lab, 2 units
Experiments and demonstrations are designed to amplify and reinforce information presented in 32. Exercises include investigations into the structure and function of muscle, nerve, cardiovascular, renal, respiratory, endocrine, and blood systems. May be taken concurrently with MCB 32. 1 hour lecture, 3 hours lab per week.

MCB 55: Plagues and Pandemics, 3 units
Discussion of how infectious agents cause disease and impact society at large. We will examine historical and current examples of plagues and pandemics and consider the question of what we should do to ameliorate the impact of infectious disease in the future. The course is intended for non-majors and will

begin by briefly providing necessary background in microbiology and immunology. The primary focus in each subsequent week, however, will be on discussing a particular infectious disease. The course will be broad in scope covering biological, historical, ethical and social implications of each disease.

MCB C62: Drugs and the Brain, 3 units
The history, chemical nature, botanical origins, and effects on the human brain and behavior of drugs such as stimulants, depressants, psychedelics, analgesics, antidepressants, antipsychotics, steroids, and other psychoactive substances of both natural and synthetic origin. The necessary biological, chemical, and psychological background material for understanding the content of this course will be contained within the course itself.

MCB C100A: Biophysical Chemistry: Physical Principles and the Molecules of Life, 4 units
Thermodynamic and kinetic concepts applied to understanding the chemistry and structure of biomolecules (proteins, DNA, and RNA). Molecular distributions, reaction kinetics, enzyme kinetics. Bioenergetics, energy transduction, and motor proteins. Electrochemical potential, membranes, and ion channels. 3 hours lecture, 1 hour discussion per week.

MCB 102: Survey of the Principles of Biochemistry and Molecular Biology, 4 units
A comprehensive survey of the fundamentals of biological chemistry, including the properties of intermediary metabolites, the structure and function of biological macromolecules, the logic of metabolic pathways (both degradative and biosynthetic) and the molecular basis of genetics and gene expression. 3 hours lecture, 1 hour discussion per week.

MCB 104: Genetics, Genomics, and Cell Biology, 4 units
This course will introduce students to key concepts in genetic analysis, eukaryotic cell biology, and state-of-the-art approaches in genomic medicine. Lectures will highlight basic knowledge of cellular processes with the basis for human diseases, particularly cancer. Prerequisite courses will have introduced students to the concepts of cells, the central dogma of molecular biology, and gene regulation. Emphasis in this course will be on eukaryotic cell processes, including cellular organization, dynamics, and signaling. 3 hours lecture, 1 hour discussion per week.

MCB 110: Molecular Biology: Macromolecular Synthesis and Cellular Function, 4 units
Molecular biology of prokaryotic and eukaryotic cells and their viruses. Mechanisms of DNA replication, transcription, translation. Structure of genes and chromosomes. Regulation of gene expression. Biochemical processes and principles in membrane structure and function, intracellular trafficking and subcellular compartmentation, cytoskeletal architecture, nucleocytoplasmic transport, signal transduction mechanisms, and cell cycle control.

MCB C110L: General Biochemistry and Molecular Biology Lab, 4 units
Experimental techniques of biochemistry and molecular biology, designed to accompany the lectures in Molecular and Cell Biology 100B and 110. Should be taken concurrently with MCB 110. 2 hours lecture and 6 hours lab per week.

MCB C112: General Microbiology, 4 units
This course will explore the molecular bases for physiological and biochemical diversity among members of the two major domains, Bacteria and Archaea. The ecological significance and evolutionary origins of this diversity will be discussed. Molecular, genetic, and structure-function analyses of microbial cell cycles, adaptive responses, metabolic capability, and macromolecular syntheses will be emphasized.

MCB C116: Microbial Diversity, 3 units
This course for upper-division and graduate students will broadly survey myriad types of microbial organisms, both procaryote and eucaryote, using a phylogenetic framework to organize the concept of ″biodiversity.″ Emphasis will be on the evolutionary development of the many biochemical themes, how they mold our biosphere, and the organisms that affect the global biochemistry. Molecular mechanisms that occur in different lineages will be compared and contrasted to illustrate fundamental biological strategies.

MCB 132: Biology of Human Cancer, 4 units
The course is designed for students interested in learning about the molecular and cell biology of cancer and how this knowledge is being applied to the prevention, diagnosis and therapy of cancer. Topics covered include tumor pathology and epidemiology; tumor viruses and oncogenes; intracellular signaling; tumor suppressors; multi-step carcinogenesis and tumor progression; genetic instability in cancer; tumor-host interactions; invasion and metastasis; tumor immunology; cancer therapy.

MCB 133L: Physiology and Cell Biology Lab, 4 units
Experimental analyses of central problems in cell biology and physiology using modern techniques, including DNA cloning and protein biochemistry, fluorescence microscopy of the cytoskeleton and organelles, DNA transfection and cell cycle analysis of cultured mammalian cells, RNA interference and drug treatments to analyze ion channel function in cell contractility and intracellular signaling, and somatosensation. Prerequisite: MCB 104 (may be taken concurrently.)

MCB 135: Molecular Endocrinology, 3 units
Molecular mechanisms by which hormones elicit specific responses and regulate gene expression; hormone-receptor interaction; synthesis, transport and targeting of hormones, growth factors and receptors. 3 hours lecture, 1 hour discussion per week.

MCB 136: Physiology, 4 units
Principles of mammalian (primarily human) physiology emphasizing physical, chemical, molecular and cellular bases of functional biology. The following topics will be covered: cellular and membrane ion and nonelectrolyte transport; cell and endocrine regulation; autonomic nervous system regulation; skeletal, smooth and cardiac muscle; cardiovascular physiology; respiration; renal physiology; gastrointestinal physiology. Discussion section led by Graduate Student Instructor will review material covered in lecture.

MCB 140: General Genetics, 4 units
In-depth introduction to genetics, including mechanisms of inheritance; gene transmission and recombination; transposable DNA elements; gene structure, function, and regulation; and developmental genetics. Some exams may be given in the evening. 3 hours lecture, 1 hour lab per week.

MCB 160: Cellular and Molecular Neurobiology, 4 units
Comprehensive introductory survey of cellular and molecular neuroscience, including cellular neurophysiology, ion channel function, synaptic function and plasticity, sensory transduction, and brain development. Includes introduction to molecular basis of neurological disease. Analysis from the level of molecules to cells to simple circuits. 3 hours lecture, 1 hour lab per week

MCB 163L: Mammalian Neuroanatomy Lab, 4 units
Development, structure (gross and microscopic), and functional relationships of the mammalian nervous system. Prerequisite: MCB 160, can be taken concurrently. 1 hour lecture, 6 hours lab per week.

MCB 166: Biophysical Neurobiology, 3 units
Electrochemistry and ion transport phenomena, equivalent circuits, excitability, action potentials, voltage clamp and the Hodgkin-Huxley model. Biophysical properties of ion channels. Statistical and electrophysiological models of synaptic transmission, Quantitative models for dendritic structure and neuronal morphogenesis. Sensory transduction, cellular networks as computational devices, information processing and transfer. Prerequisites: Physics, Chemistry, Molecular biology