

BIOLOGICAL BASIS OF BEHAVIOR (AS) {BIBB}

L/R 109. (BIOL219, PSYC109) Introduction to Brain and Behavior. (C) Living World Sector. All classes. Medina and Muzzio.

Introduction to the structure and function of the vertebrate nervous system. We begin with the cellular basis of neuronal activities, then discuss the physiological bases of motor control, sensory systems, motivated behaviors, and higher mental processes. This course is intended for students interested in the neurobiology of behavior, ranging from animal behaviors to clinical disorders. Familiarity with elementary physics and chemistry may be helpful.

L/R 217. (PSYC117) Visual Neuroscience. (B) Staff. Prerequisite(s): BIBB 109, PSYC 001, COGS 001 or VLST 101.

An introduction to the scientific study of vision, with an emphasis on the biological substrate and its relation to behavior. Topics will typically include physiological optics, transduction of light, visual thresholds, anatomy and physiology of the visual pathways, retinal processing, properties of visual cortex, and color vision.

227. (PSYC127) Physiology of Motivated Behaviors. (C) May be counted as a General Requirement Course in Living World. Class of 2009 & prior only. Grill.

The regulatory physiology of motivation will be discussed in detail, including the coordination of behavioral and neural mechanisms in motivation.

231. (BIOL231, PSYC131) Animal Behavior. (C) May be counted as a General Requirement Course in Living World. Class of 2009 & prior only. Seyfarth/Cheney. Prerequisite(s): PSYC 001 or BIOL 102 or BIOL 122.

The evolution of social behavior in animals, with special emphasis on group formation, cooperation among kin, mating systems, territoriality and communication.

240. Human Chronobiology and Sleep. (M) Dinges. Prerequisite(s): PSYC 001 and one year of biology.

Topics to be covered include basic principles of chronobiology; neuroscience mechanisms of circadian rhythms and sleep; phylogeny and ontogeny of sleep; human sleep and sleep disorders; circadian dysfunction; circadian and sleep homeostatic influences in human health and safety.

L/R 249. (PSYC149) Cognitive Neuroscience. (C) Living World Sector. All classes. Thompson-Schills. Prerequisite(s): PSYC 001 or BIBB/PSYC 109.

The study of the neuronal systems that underlie human perception, memory and language; and of the pathological syndromes that result from damage to these systems.

L/L 251. (BIOL251) Molecular and Cellular Neurobiology (formerly Cellular Neurobiology). (A) Schmidt, M./Abel/Peachey. Prerequisite(s): BIOL 101 and 102, or BIOL 121; PHYS 102 or 151 strongly recommended. Lab fee \$150. (3hrs. lec., 3hrs. lab, 1.5 c.u.).

Cellular physiology of neurons and excitable cells; molecular neurobiology and development. Topics include: action potential generation; synaptic transmission; molecular and physiological studies of ion channels; second messengers; simple neural circuits; synaptic plasticity; learning and memory; and neural development.

260. (PSYC139) Neuroendocrinology. (C) Flanagan-Cato. Prerequisite(s): BIBB 109, one year of Biology, or Permission of Instructor.

This course is designed to examine the various roles played by the nervous and endocrine systems in controlling both physiological processes and behavior. First, the course will build a foundation in the concepts of neural and endocrine system function. Then, we will discuss how these mechanisms form the biological underpinnings of various behaviors and their relevant physiological correlates. We will focus on sexual and parental behaviors, stress, metabolism, neuroendocrine-immune interactions, and mental health.

269. Autonomic Physiology. (A) Heerding. Prerequisite(s): BIBB 109 or Permission of Instructor.

This lecture course is designed to introduce the student to the functioning of the autonomic nervous system (ANS), which is critically involved in the maintenance of body homeostasis through regulation of behavior and physiology. The course will begin with a review of the basic anatomy and physiology of the ANS including the sympathetic, parasympathetic and enteric divisions. The mechanisms by which the ANS regulates peripheral tissues will be discussed, including reflex and regulatory functions, as will the effect of drugs which modulate ANS activity. The role of the ANS in regulating behavior will be addressed in the context of thirst, salt appetite and food intake. Finally, the course will cover the result of over-activation of the sympathetic nervous system as manifested in chronic stress.

270. (PSYC125) Drugs, Brain and Mind. (B) Peoples. Prerequisite(s): BIBB 209, Intro Biology and Intro Psychology.

The course will begin with a review of basic concepts in pharmacology including: routes of drug administration, drug metabolism, the dose response curve, tolerance and sensitization. Following a brief overview of cellular foundations of neuropharmacology (cell biology, synaptic and receptor function), the course will focus on various classes of drugs used to treat neuropsychiatric disorders including, among others, depression, schizophrenia and anxiety. We will additionally consider mechanisms mediating the mind-altering, addictive and neurotoxic effects of abused drugs.

310. Laboratory in the Structure of the Nervous System. (A) Miselis. Prerequisite(s): BIBB 109 or permission of instructor. Lab Fee: \$100.

A laboratory course designed to familiarize the student with the fundamental gross and histological organization of the brain. The mammalian brain will be dissected and its microscopic anatomy examined using standard slide sets. Comparative brain material will be introduced, where appropriate, to demonstrate basic structural-functional correlations.

340. Human Chronobiology and Sleep. (B) Dinges. Prerequisite(s): BIBB 109 or Permission of Instructor.

Topics to be covered include basic principles of chronobiology; neuroscience mechanisms of circadian rhythms and sleep; phylogeny and ontogeny of sleep; human sleep and sleep disorders; circadian dysfunction; circadian and sleep homeostatic influences in human health and safety.

350. Developmental Neurobiology. (C) Staff. Prerequisite(s): BIOL 102 or 122 and BIBB 109, or Permission of Instructor.

This course will focus on cellular and molecular mechanisms of the organogenesis of the central nervous system. A goal of the course will be to understand the form, function and pathology of the adult nervous system in terms of antecedent developmental processes.

399. Independent Research. (C) Standing Faculty. Prerequisite(s): BIBB 109 and permission of the Director.

Individual research of an experimental nature with a member of the standing faculty leading to a written paper. The grade is based primarily on a serious term paper describing original research carried out by the student. Students must submit a proposal prior to registering. During the semester, students must attend two seminars led by the BBB Director or Associate Director to discuss planning an independent research project, ethical concerns in research and writing a scientific paper. Attendance at the meetings is mandatory. Students wishing to do research in hospitals with investigators who are not standing faculty at Penn should inquire about College 99 at the College Advising Office. Students doing more than one credit of independent study will be required to present a poster at the annual BBB Symposium.

SM 410. Behavioral Medicine: Experimental & Animal Models. (C) Ulm. Prerequisite(s): BIBB 109. Previously BIBB 390.

Fundamentals of Behavioral Medicine concerns itself with the description of ideology, disease and treatment from the perspective of a functional analyses. It is the intent of this course to extend the traditional structural analysis that traditional medicine provides.

SM 421. Functional Imaging of the Human Brain. (B) Newberg. Prerequisite(s): BIBB 109.

The ability to utilize different imaging techniques in disciplines such as psychology, psychiatry, neurology, and cognitive neurosciences is a growing field and presents many interesting problems and possibilities. This course is an upper level seminar course for individuals pursuing one of the above mentioned fields and/or premedical course work. The course would provide a detailed overview of functional brain imaging and its potential uses. Issues regarding advantages and disadvantages of different modalities, study design image analysis and interpretation, and how each of these relates to various neurological and psychological phenomena will be discussed. The classes will cover the following specific topics in this general time frame: Introduction to functional brain function, basics of nuclear medicine imaging (including instrumentation, image acquisition, and radiopharmaceuticals for positron emission tomography and single photon emission computed tomography), imaging of neurological disorders, imaging of psychological disorders, introduction to activation studies, image analysis and statistical problems, study design, literature review, journal article presentation, tour of Penn imaging facilities, interpretation of imaging studies, implications for clinical and research, and implications for understand the human mind and consciousness.

SM 441. (PSYC441) Genetics, Evolution, and Behavior. (C) Norman.

The first half of the course treats Behavioral Genetics (e.g., genetic and environmental components of IQ, personality, and psychopathology, gene-environment interaction), and the second half deals with Evolutionary Psychology (e.g., evolution of altruistic, cooperative, and competitive behavior). There are no prerequisites, but previous courses in

Psychology, Biological Basis of Behavior, Anthropology, Biology, or Statistics would be helpful preparation. For additional information see <http://www.psych.upenn.edu/~normal/441Overview.htm>

SM 451. (PSYC407) Behavioral Genetics. (K) Price. Prerequisite(s): Basic statistics or permission of instructor.

This course covers basic principles of human and animal behavioral genetics, including normal variation and extreme phenotypes represented by behavioral, psychiatric and neurologic disorders. The course will focus on methods necessary to critically evaluate research findings on normal and abnormal human behavior. Animal models will also be reviewed. The first third of the class is in lecture format and reviews basic genetic methodologies as they apply to behavior. The remainder of the class is in seminar format and covers recently published work related to behavioral genetics.

SM 475. Neurodegenerative Diseases. (M) Lexow.

This course will familiarize students with advances in our understanding of the clinical features and pathogenesis of a wide range of neurodegenerative diseases, including Alzheimer's disease and other dementias, prion diseases, Parkinson's disease and atypical parkinsonisms, neurodegenerative ataxias, motor neuron diseases, degenerative diseases with chorea, iron and copper disorders, and mitochondrial diseases. Students will analyze original research reports on a range of proposed pathological cellular processes that may represent steps in cell death pathways leading to neuron loss seen in these diseases. Significant emphasis will be placed on the fast-expanding field exploring genetic contributions to neurodegenerative disease, as identification of genetic mutations pathogenic for familial neurodegenerative diseases has been a major driving force in neurodegenerative research and pointed researchers towards essential molecular process that may underlie these disorders. Strategies for therapeutic intervention in the management, prevention, and cure of neurodegenerative disease will be addressed.

SM 481. Behavioral Pharmacology. (B) Heerding. Prerequisite(s): BIBB 109 or Permission of Instructor.

This seminar course reviews the behavioral effects of drugs in animals, the general biological and psychological principles of drug action, and the relationship between drugs that affect brain monoamine and opiate systems and their behavioral effects. Introductory lectures on general topics will be followed by advanced discussion of specific topics in a journal club format through student presentations.

SM 482. Clinical Psychopharmacology. (M) Prerequisite(s): BIBB 109 or 269 or 380, or permission of instructor.

This course examines the history, rationale and putative mechanism of action of drugs used in the treatment of psychiatric disorders. Emphasis is placed on neurobiological processes underlying psychopathology and pharmacological intervention. Drugs currently in use as well as new drugs in development will be covered. Strategies, techniques, issues and challenges of clinical psychopharmacological research will be addressed and new approaches to drug discovery, including the use of pharmacogenomics and proteomics to understand variability in drug response and identify new molecular drug targets, will be covered in depth. Specific drug classes to be considered include antidepressants, anxiolytics, typical and atypical antipsychotics, narcotic analgesics, sedative hypnotics, and antiepileptic medications. A contrasting theme throughout the course will be the use of drugs as probes to identify neural substrates of behavior.

492. Experimental Methods in Synaptic Physiology. (C) Kaplan. Prerequisite(s): BIBB 109 and BIBB 251. Lab fee \$100.

In this lab course, a small number of students (12-20) meet once per week to discuss topics in synaptic physiology and to become proficient at sharp electrode techniques for intracellular recording, using isolated ganglia from the snail *Heliosoma*. The first part of each class will consist of discussion of weekly reading from the primary literature, with the remainder of the class devoted to hands-on experiments. After learning to record from and characterize single neurons, students will study synaptic transmission by stimulating incoming nerve trunks or by recording from pairs of interconnected neurons. As a midterm assignment, students will prepare and present a short research proposal using this model system, to be evaluated by the class. For the last half of the course, the class will work together on one or two of these proposals, meeting at the end of each class to pool our data, analyze the results and discuss their significance.

499. Senior Honors Thesis. (C) Standing Faculty. Prerequisite(s): BIBB 399, permission of BIBB Director and a GPA of 3.3 or better. Corequisite(s): BIBB 400.

Continuation of BIBB 399 research. Students will be required to present their oral defense and a poster at the annual BBB Symposium.