

# NEUROBIOLOGY, PHYSIOLOGY, & BEHAVIOR, BACHELOR OF SCIENCE

College of Biological Sciences

## The Neurobiology, Physiology, & Behavior Major Program

Neurobiology, Physiology, & Behavior (NPB) is a major that emphasizes the understanding of vital functions common to all animals. All animals perform certain basic functions—they grow, reproduce, move, respond to stimuli, and maintain homeostasis. The physiological mechanisms upon which these functions depend are precisely regulated and highly integrated. Actions of the nervous and endocrine systems determine behavior and the interaction between organisms and their physical and social environments. Students in this major study functional mechanisms; the control, regulation, and integration of these mechanisms; and the behavior that relates to those mechanisms. They do so at the level of the cell, the organ system, and the organism.

### The Program

In the freshman and sophomore years, students majoring in Neurobiology, Physiology, & Behavior build a broad scientific background, taking courses in chemistry, biology, physics, and mathematics. As juniors or seniors, students can enroll in a variety of Neurobiology, Physiology, & Behavior courses and related upper division courses. The NPB major contains three tracks: the Neurobiology track, the Physiology track, and the Organism-Environmental Interactions track. If you wish to propose an alternative to these tracks for yourself, please meet with your Biology Academic Success Center (BASC) advisor who can approve such individualized plans. Students can also participate in a number of advanced laboratory courses or may design an individual, independent project guided by a member of the faculty.

### Career Alternatives

Completion of the Neurobiology, Physiology, & Behavior major provides the foundation for advanced study leading to careers in high school teaching, college level teaching or research. It also serves as the basis for further training in the health professions, including but not limited to human and veterinary medicine, medical technology, physical therapy, pharmacy, nursing, dentistry, and optometry. The major is also appropriate for those intending to seek careers in biotechnology or other biologically related industries.

### Graduate Study

Information on graduate study in neuroscience, physiology or behavior may be obtained by writing the Graduate Advisor, College of Biological Sciences, Graduate Academic Programs. See also the graduate course offerings listed under Animal Behavior (Graduate Group), Molecular, Cellular, & Integrative Physiology (Graduate Group), and Neuroscience. See also Graduate Studies (<http://gradstudies.ucdavis.edu/>).

### Faculty Advisors

William DeBello, Ph.D., Lee Miller, Ph.D.

### Advising

Biology Academic Success Center (BASC) (<https://basc.biology.ucdavis.edu/>) in 1023 Katherine Esau Science Hall (formerly Sciences Laboratory Building); 530-752-0410.

Code	Title	Units
<b>Preparatory Subject Matter</b>		
<i>Biological Science</i>		15
BIS 002A & BIS 002B & BIS 002C	Introduction to Biology: Essentials of Life on Earth and Introduction to Biology: Principles of Ecology & Evolution and Introduction to Biology: Biodiversity & the Tree of Life	
<i>Chemistry</i>		
Choose the 002 series or 004 series: <sup>1</sup>		15
CHE 002A & CHE 002B & CHE 002C	General Chemistry and General Chemistry and General Chemistry	
<b>OR</b>		
CHE 004A & CHE 004B & CHE 004C	General Chemistry for the Physical Sciences & Engineering and General Chemistry for the Physical Sciences & Engineering and General Chemistry for the Physical Sciences & Engineering	
Choose the 008 series or 118 series or 128 series & 129 A-B: <sup>2</sup>		6-13
CHE 008A & CHE 008B	Organic Chemistry: Brief Course and Organic Chemistry: Brief Course	
<b>OR</b>		
CHE 118A & CHE 118B & CHE 118C	Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences and Organic Chemistry for Health & Life Sciences	
<b>OR</b>		
CHE 128A & CHE 128B & CHE 128C	Organic Chemistry and Organic Chemistry and Organic Chemistry	
CHE 129A & CHE 129B	Organic Chemistry Laboratory and Organic Chemistry Laboratory	
<i>Mathematics</i>		
Choose the 017 series or 021 series: <sup>3</sup>		8-12
MAT 017A & MAT 017B & MAT 017C	Calculus for Biology & Medicine and Calculus for Biology & Medicine and Calculus for Biology & Medicine	
<b>OR</b>		
MAT 021A & MAT 021B & MAT 021C	Calculus and Calculus and Calculus (Recommended)	
<i>Physics</i>		
Choose the 007 series or 009 series:		12-15
PHY 007A & PHY 007B & PHY 007C	General Physics and General Physics and General Physics	
<b>OR</b>		

PHY 009A & PHY 009B & PHY 009C	Classical Physics and Classical Physics and Classical Physics	
Students may be able to complete their Physics requirement by blending the PHY 007 & PHY 009 series. For more details about how to do so and course placement, students will need to follow up with the PHY department. Students will also need to follow up with a BASC advisor to discuss their plans. <sup>4</sup>		
Preparatory Subject Matter Subtotal		56-70
<b>Depth Subject Matter</b>		
<i>Biological Science</i>		
BIS 101	Genes & Gene Expression	4
BIS 105	Biomolecules & Metabolism	3-6
or BIS 102 & BIS 103	Structure & Function of Biomolecules and Bioenergetics & Metabolism	
<i>Neurobiology, Physiology, &amp; Behavior</i>		
NPB 110A	Foundations 1: From Molecules to Individuals	5
NPB 110B	Foundations 2: Neurobiology	5
NPB 110C	Foundations 3: Physiology	5
<i>Statistics</i>		
STA 100	Applied Statistics for Biological Sciences	4
<b>Laboratory Requirements</b>		
Choose 3 units of laboratory work from the track-specific list:		3
<i>Neurobiology Track</i>		
NPB 100L	Neurobiology Laboratory	
<i>Physiology Track</i>		
NPB 101L	Systemic Physiology Laboratory	
<i>Organism-Environmental Interactions Track</i>		
NPB 101L	Systemic Physiology Laboratory	
<i>Integrative Principles Track</i>		
NPB 100L	Neurobiology Laboratory	
or NPB 101L	Systemic Physiology Laboratory	
<b>Depth Electives</b>		
All students must do a minimum of four depth electives: three Track-Specific Depth Electives, and one Additional Depth Elective. At least two of these electives must be upper division NPB or EXB courses. <sup>5</sup>		
<i>Track-Specific Depth Electives</i>		
Choose three Track-Specific Depth Electives from one of the following:		9-13
Neurobiology Track (p. 3)		
Physiology Track (p. 3)		
Organism-Environmental Interactions Track (p. 3)		
Integrative Principles Track (p. 4)		
<i>Additional Depth Elective</i>		
Choose one Additional Depth Elective in addition to completing three Track-Specific Depth Electives. The course cannot have been used in satisfaction of any other major requirement.		3-5
ANT 151	Primate Evolution	
ENT 104	Behavioral Ecology of Insects	
ENT 153	Medical Entomology	
EVE 100	Introduction to Evolution	
EXB 101	Exercise Physiology	

EXB 102	Introduction to Motor Learning & the Psychology of Sport & Exercise	
EXB 106/CHA 101	Human Gross Anatomy	
EXB 106L/ CHA 101L	Human Gross Anatomy Laboratory	
EXB 110	Exercise Metabolism	
EXB 112	Clinical Exercise Physiology	
EXB 117	Exercise & Aging in Health & Disease	
EXB 124	Physiology of Maximal Human Performance	
EXB 125	Neuromuscular & Behavioral Aspects of Motor Control	
MIC 102	Introductory Microbiology	
NPB 100L	Neurobiology Laboratory	
NPB 101L	Systemic Physiology Laboratory	
NPB 102	Animal Behavior	
NPB 106	Experiments in Neurobiology, Physiology, & Behavior: Design & Execution	
NPB 107	Cell Signaling in Health & Disease	
NPB 109	Kinesiology: Analysis & Control of Human Movement	
NPB 113	Cardiovascular, Respiratory, & Renal Physiology	
NPB 114	Gastrointestinal Physiology	
NPB 116	Stress Physiology in Health & Disease	
NPB 117	Avian Physiology	
NPB 118	Comparative Biomechanics	
NPB 121	Physiology of Reproduction	
NPB 123/APC 100	Comparative Vertebrate Organology	
NPB/PSC 124	Comparative Neuroanatomy	
NPB 128	Comparative Physiology: Endocrinology	
NPB 130	Physiology of the Endocrine Glands	
NPB 132	Nature vs. Nurture: Physiological Interactions Among Genes, Nutrients & Health	
NPB 133	Genes & the Brain	
NPB 134	General Immunology for Physiologists	
NPB 139	Frontiers in Physiology	
NPB 140	Principles of Environmental Physiology	
NPB 141	(Discontinued)	
NPB 141P	(Discontinued)	
NPB 150/PSC 122	Advanced Animal Behavior	
NPB 152/PSC 123	Hormones & Behavior	
NPB/HPH 157	Advanced Physiology of Animal/Human Disease	
NPB 159	Frontiers in Behavior	
NPB 161	Developmental Neurobiology	
NPB 162	Neural Mechanisms of Behavior	
NPB 163	Systems Neuroscience	
NPB 164	Mammalian Vision	
NPB 165	Neurobiology of Speech Perception	
NPB 168	Neurobiology of Addictive Drugs	
NPB 169	Frontiers in Neurobiology	
NPB 171	Physiology of Neuroimmune Interactions	

NPB 172	Map Formation in the Brain	
NPB 173	Neurobiology of Brain Disorders	
Depth Subject Matter Subtotal		41-50
<b>Total Units</b>		<b>97-120</b>

<sup>1</sup> With BASC advisor approval, these combinations also satisfy the Chemistry requirement: CHE 004A-CHE 002A (3 units w/no lab)-CHE 002B-CHE 002C; CHE 004A, CHE 004B-CHE 002C.

<sup>2</sup> With BASC advisor approval, these combinations also satisfy the Organic Chemistry requirement: CHE 118A-CHE 008B; CHE 128A-CHE 128B-CHE 008B; CHE 128A-CHE 118B-CHE 118C; CHE 128A-CHE 128B-CHE 129A-CHE 118C; CHE 118A-CHE 128B-CHE 128C-CHE 129A-CHE 129B; CHE 118A-CHE 118B-CHE 128C-CHE 129B.

<sup>3</sup> With BASC advisor approval, this combination also satisfies the Mathematics requirement: MAT 021A-MAT 017B-MAT 017C; MAT 017A-MAT 021B.

<sup>4</sup> With BASC advisor approval, these combinations also satisfy the Physics requirement: PHY 007A-PHY 009A-PHY 049\*-PHY 007C; PHY 009A-PHY 009B-PHY 049\*-PHY 007C. \*PHY 049 will require approval from the Physics Department to enroll.

<sup>5</sup> 4 units of NPB 199 or NPB 194HB may be substituted for a single Track-Specific Depth Elective. Substitution must be pre-approved by Neurobiology, Physiology, & Behavior faculty advisor. Only one of the following courses can be used as a major depth elective: 4 units of NPB 199; NPB 194HB; NPB 106.

## Neurobiology Track Depth Electives

Code	Title	Units
NPB 101L	Systemic Physiology Laboratory	3
NPB 106	Experiments in Neurobiology, Physiology, & Behavior: Design & Execution	3
NPB 107	Cell Signaling in Health & Disease	3
NPB/PSC 124	Comparative Neuroanatomy	3
NPB 136	Neural Networks & Machine Learning in Biology	4
NPB 162	Neural Mechanisms of Behavior	3
NPB 163	Systems Neuroscience	4
NPB 164	Mammalian Vision	4
NPB 165	Neurobiology of Speech Perception	3
NPB 168	Neurobiology of Addictive Drugs	4
NPB 169	Frontiers in Neurobiology	3
NPB 171	Physiology of Neuroimmune Interactions	4
NPB 172	Map Formation in the Brain	3
NPB 173	Neurobiology of Brain Disorders	3
PSC 130	Human Learning & Memory	4
PSC 135	Cognitive Neuroscience: The Biological Foundations of the Mind	4
PSC 137	Neurobiology of Learning & Memory	4

## Physiology Track Depth Electives

Code	Title	Units
ANS 123	Animal Growth & Development	4
EXB 106	Human Gross Anatomy	4

EXB 106L	Human Gross Anatomy Laboratory	3
EXB 101	Exercise Physiology	4
EXB 110	Exercise Metabolism	3
EXB 112	Clinical Exercise Physiology	4
EXB 117	Exercise & Aging in Health & Disease	3
EXB 124	Physiology of Maximal Human Performance	4
EXB 125	Neuromuscular & Behavioral Aspects of Motor Control	3
MMI 188A or MMI 188B	Human Immunology	3-4
PMI 126	Fundamentals of Immunology	3
MCB 150	Developmental Biology	4
NPB 106	Experiments in Neurobiology, Physiology, & Behavior: Design & Execution	3
NPB 107	Cell Signaling in Health & Disease	3
NPB 109	Kinesiology: Analysis & Control of Human Movement	4
NPB 113	Cardiovascular, Respiratory, & Renal Physiology	4
NPB 114	Gastrointestinal Physiology	3
NPB 116	Stress Physiology in Health & Disease	3
NPB 118	Comparative Biomechanics	3
NPB 121	Physiology of Reproduction	4
NPB 123	Comparative Vertebrate Organology	4
NPB 128	Comparative Physiology: Endocrinology	3
NPB 130	Physiology of the Endocrine Glands	4
NPB 132	Nature vs. Nurture: Physiological Interactions Among Genes, Nutrients & Health	3
NPB 134	General Immunology for Physiologists	3
NPB 139	Frontiers in Physiology	3
NPB 140	Principles of Environmental Physiology	3
NPB 141	(Discontinued)	3
NPB 141P	(Discontinued)	5
NPB 152/PSC 123	Hormones & Behavior	3
NPB/HPH 157	Advanced Physiology of Animal/Human Disease	3
NPB 168	Neurobiology of Addictive Drugs	4

## Organism-Environmental Interactions Track Depth Electives

Code	Title	Units
ANS 104	Principles & Applications of Domestic Animal Behavior	4
ANS 123	Animal Growth & Development	4
EVE 105	Phylogenetic Analysis of Vertebrate Structure	4
EVE 107	Animal Communication	4
EVE 147	Biogeography	4
NPB 100L	Neurobiology Laboratory	3
NPB 102	Animal Behavior	3

NPB 106	Experiments in Neurobiology, Physiology, & Behavior: Design & Execution	3
NPB 113	Cardiovascular, Respiratory, & Renal Physiology	4
NPB 117	Avian Physiology	3
NPB 118	Comparative Biomechanics	3
NPB 123	Comparative Vertebrate Organology	4
NPB 128	Comparative Physiology: Endocrinology	3
NPB 132	Nature vs. Nurture: Physiological Interactions Among Genes, Nutrients & Health	3
NPB 140	Principles of Environmental Physiology	3
NPB 141	(Discontinued)	3
NPB 141P	(Discontinued)	5
NPB 150/PSC 122	Advanced Animal Behavior	4
NPB 152/PSC 123	Hormones & Behavior	3
NPB 159	Frontiers in Behavior	3
NPB 162	Neural Mechanisms of Behavior	3
PMI 126	Fundamentals of Immunology	3
WFC 130	Physiological Ecology of Wildlife	4
WFC 141	Behavioral Ecology	4

## Integrative Principles Track Depth Electives

Needs to be approved by a BASC advisor. Any three courses from any of the three NPB tracks.