Most popular interdisciplinary undergraduate major!

Over 140 graduates every year!

Started in 1997, it’s the most established program of its kind!

Neuroscience and Behavioral Biology Program

STUDENT HANDBOOK

2019-2020
Table of Contents

NBB Advisor Information 3
NBB Checklist of Courses 3
Overview 4
NBB Major Requirements 4
Honors Program 4
Course Descriptions, NBB Core Courses 5
Research Experiences-NBB Elective Credit 6
Course Descriptions, Electives-NBB 7
NBB Courses College Credit Only 9
Course Descriptions, Electives-Anthropology 10
Course Descriptions, Electives-Biology 12
Course Descriptions, Electives-Psychology 14
Course Descriptions, Electives-Other 16
Additional Courses 17
Faculty Research Interests* 18
Student Organizations 28
University of St. Andrews, Scotland/MPhil 29
University of Melbourne, Australia 29
Study Abroad in Paris 29
Useful Emory Resources for Students 30
Notes 31

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Phone: 404-727-1317

Leah Anderson Roesch
Director of Undergraduate Research
leah.roesch@emory.edu
Phone: 404-727-4589

Nadia G. Brown-Ware
Academic Degree Program Coordinator
nadia.brown@emory.edu
Phone: 404-727-4958

*Please call the office if you have additional questions.
Useful Emory Resources for Students

http://college.emory.edu/oue/student-support
(Student Academic Support)
EPASS
Academic Coaches
ESL Program
Information for Students with Disabilities
Academic Fellows
Writing Center
Tutor Employment

Pre-Health Advising
http://prehealth.emory.edu

Emory helpline - 404.727.4357 (HELP)

Counseling and Psychological Services
http://studenthealth.emory.edu/cs/
Or
Counseling and Psychological Services

Student Health Services (and campus medical professionals)

Office of Spiritual & Religious Life
(when a staff member is acting in the role of Clergy).

Sexual Misconduct Resources
http://sexualmisconductresources.emory.edu

Office of Accessibility
Access, Disability Services and Resources
http://accessibility.emory.edu

Advisor ___________________    Department_________________
Office ____________________    Telephone ________________
E-mail _____________________

Please bring this booklet with you when you meet with your advisor.

Each NBB major is assigned an academic advisor. It is imperative that you meet with that advisor at least once a semester to discuss courses that meet the requirements of the major. In addition, students should talk to their advisors about future career plans; e.g., graduate school, medical school, etc., as there may be additional courses they should take for entrance to graduate school. Advisors will be available during pre-registration and their office hours. However, advisors will often have more time to spend with students at times other than pre-registration. We hope that students will take advantage of these times in scheduling appointments with their advisors.

In addition to these courses, Emory College’s General Requirements must be met.

If your advisor is not a good fit for you, then be aware that you can change your advisor at any time.

NBB Checklist of Courses
Neuroscience & Behavioral Biology B.S. Program

Student____________________    Expected Graduation Date_________________
Post-Graduation Plans____________________

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<th>Course</th>
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<td>BIOL 141 w/Lab</td>
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*Math 111, 112, 112z, 116, 211, 212, 221, 275, Bio 212, CS 170 or QTM 200
*Contact NBB with any questions
Overview
The interdepartmental program in Neuroscience and Behavioral Biology offers a Bachelor of Science. Our program combines the expertise, enthusiasm and commitment of a large and diverse group of faculty from many departments including Anthropology, Biology, Chemistry, and Psychology. Using the concepts of evolution as a unifying theme, the major represents a unique interdisciplinary synthesis of the fields of Neuroscience and Behavior and provides a breadth and focus not found in traditional Biology, Psychology, Biopsychology, Neuroscience or Anthropology programs. NBB has developed strong partnerships with: the Emory University Comprehensive Neuroscience Initiative; The Emory College Center for Mind, Brain and Culture; The Center for Neuropolicy; The Emory-Tibet Science Initiative; and The Emory Graduate Program in Neuroscience. NBB has formal teaching/internship programs established with the Neurology Department and with the Department of Emergency Medicine. NBB also has established a semester study abroad exchange program with the University of St. Andrews in Scotland.

NBB Major Requirements
The major requires a minimum of twelve courses (thirty-four semester hours) in the field of Neuroscience and Behavioral Biology. Majors must take the sequence of four core courses, which include NBB 201, NBB 301, NBB 302, and NBB 401/SW or NBB 402. In addition to the core courses, a minimum of seven NBB approved electives are needed.

All majors are also required to take the following introductory foundation courses: QTM 100; Biology 141 with Lab and Biology 142 with Lab; 1 year of Chemistry with lab; and one quantitative course (Math 111, 112, 112z, 116, 211, 212, 221, 275, Bio 212, CS 170 or QTM 200). Students are encouraged to complete these courses by the end of their sophomore year.

Students with particular interests, e.g. premedical, graduate school in biological anthropology, biopsychology, neuropsychology, ethology, or neuroscience, may be advised to take additional courses in anthropology, biology, chemistry, math, physics, and psychology. The courses would be chosen by the student and advisor to fit the student’s plan.

Honors Program
Qualified seniors are encouraged to participate in the Neuroscience and Behavioral Biology Honors Program. Admission to the Honors Program depends upon criteria established by the college (minimum 3.5 GPA) and sponsorship by a Faculty research advisor. NBB honors students must complete two semesters of Honors research NBB 495A (4 hrs) & NBB 495BW (4hrs) and successfully complete at least one graduate-level course of 2 credits or more.

STUDY ABROAD OPPORTUNITIES – CONTACT NADIA BROWN-WARE (nadia.brown@emory.edu) FOR MORE INFORMATION

UNIVERSITY OF ST. ANDREWS, SCOTLAND
Brain StEm (Spring and Fall Courses)
The Emory Neuroscience and Behavioral Biology Program (NBB) and the University of St. Andrews Schools of Biology and Psychology have established a unique type of study abroad exchange program. The “Brain StEm” Program, represents the creation of a true “sister school” relationship between the extremely strong neuroscience and behavioral sciences programs at the two institutions. Emory’s NBB Program is one of the largest undergraduate programs in North America with over 500 majors and eighty-five faculty members. The neuroscience program at University of St Andrews is a joint undertaking of the Schools of Biology and Psychology which both recently received top ratings from RAE, the national audit of research quality in UK university departments. What does all this mean for the students? By implementing “The Institute of Behavioral and Neural Sciences”, rather than an a la carte approach to selecting courses, a coherent program of pre-approved courses has been put into place. Overall curriculum and appropriate courses have been evaluated and selected by the faculty of each institution and faculty advisors are in place at Emory and St. Andrews to assist the students participating in “Brain StEm”. Here at Emory this translates into a study abroad program that provides pre-approved equivalents for: NBB 301, 302 & 401, required core courses; QTM 100, the statistics & experimental design course which is a prerequisite for undergraduate research; and thirty-two University of St. Andrew courses which can serve as electives for the NBB major!

MPHIL IN NBB (Masters of Philosophy in Neuroscience- 1 year)
Building upon the successful Brain StEm program, Emory and St. Andrews are offering a 4+1 BS (Emory) MPhil (St. Andrews) research-based NBB degree combination. To qualify, Emory NBB majors must have a 3.5 GPA and have an invitation from one of the St. Andrews participating professors, or graduate from Emory with honors in NBB. The first year of the normally two-year MPhil program will be waived, allowing qualifying NBB BS graduates to complete their Master’s degree in one year. Contact the NBB office for further information.

Emory Melbourne University Science Experience (E.M.U.S.E)
A new program that has been designed specifically for Emory Biology, Chemistry, and NBB students in their junior and senior year who are interested in spending a semester abroad in Melbourne, Australia. As a student in the program, you will undertake a research-focused study abroad experience while also taking biology, neuroscience, or chemistry courses offered Fall and Spring semesters: Semester 1 runs from early February to mid-June; Semester 2 runs from early July to Mid-November. This program is run in conjunction with the Department of Anatomy and Cell Biology and the Department of Chemistry at the University of Melbourne. For more information please contact the NBB office.

NBB Study Abroad in Paris (Summer)
Neuroscience and Behavioral Biology program is offering a unique opportunity to study in Paris for a 5-week program that will connect the rich history of French neurology with contemporary neuroscience research. Students will couple in-class discussions with a variety of extracurricular outings to locations that illustrate France’s role in early Neurology (e.g. Hôpital de la Salpêtrière) and its current research interests (e.g. Institut Curie or La Cité des Sciences). Please note: NO FRENCH LANGUAGE PROFICIENCY IS REQUIRED.
STUDENT ORGANIZATIONS

Nu Rho Psi

The current members of Nu Rho Psi shared that recognition as an honor society at commencement was important. Now that our local chapter is officially part of the national chapter, our members can wear honor cords at commencement. The purpose is to encourage professional interest and excellence in scholarship; award recognition to students who achieved such excellence in scholarship; advance discipline of neuroscience; encourage intellectual and social interaction between students and faculty; promote career development in neuroscience and related fields; increase public awareness of neuroscience and its benefits for the individual and society; and encourage service to the community.

ENA

Emory Neuroscience Association is an undergraduate organization dedicated to promoting the Neuroscience & Behavioral Biology major and fostering interest in neuroscience. The organization achieves these goals by hosting regular events that provide students with opportunities to meet NBB faculty and understand ongoing neuroscience research. Furthermore, the organization provides peer support and mentorship to facilitate undergraduate students’ academic and career aspirations. Interested students should contact any of the current officers for more information regarding membership and upcoming events. Membership is open to undergraduate students of any academic background.

For more information contact Alan Weinstein (alan.weinstein@emory.edu) or visit the NBB website (www.nbb.emory.edu)

Cité des Sciences). Please note: NO FRENCH LANGUAGE PROFICIENCY IS REQUIRED.

Course Descriptions, NBB Core Courses

NBB 201. Foundations of Behavior (Same as ANT 200)
Fall. Prerequisite: Biology 141. This course presents an overview of behavioral biology and evolution. The biological bases of behavior are examined in light of evolutionary processes and ecological pressures, emphasizing human and primate examples. (General Education Requirements: Area II B2 - Natural Sciences/Non-Lab)

NBB 301. Introduction to Neurobiology (Same as BIOL 360)
Fall and Spring. Prerequisites: Biology 141, 1 year of Chemistry with lab. An introduction to cellular and integrative neurobiology. Topics include the electrochemical and biophysical mechanisms for neuronal signaling and synaptic transmission and the neural bases of behavior and perception.

NBB 302. Behavioral Neuroscience (Same as PSYCH 353)
Fall and Spring. The goal of this course is to present an integrated coverage of work at the intersection of animal behavior, evolution, and cellular/systems neuroscience. The course surveys the major areas of behavioral neuroscience. NBB 301 is a prerequisite/co-requisite.

NBB 401W. Perspectives in Neurobiology and Behavior
Fall. Prerequisite: NBB 201, NBB 301, and NBB 302 or by permission of instructor. A writing-intensive Senior Seminar utilizing the primary literature to examine current issues, trends, and controversies in the field of Neuroscience and Behavioral Biology. Fulfills a General Education Writing Requirement (Post-Freshman Writing and Advanced Seminar)

NBB 402W, Global Neuro and Behavior
Summer. Prerequisite: NBB 201, NBB 301, and NBB 302 or by permission of instructor. An intensive Senior Seminar utilizing the primary literature to examine current issues, trends, and controversies in the field of Neuroscience and Behavioral Biology. Fulfills NBB 401W requirement and a General Education Writing Requirement
Research Experience Courses – for NBB Elective Credit

NBB 495A. Honors Research
Fall, Spring. Only open to senior NBB majors enrolled in the NBB/College Honors Program. For every credit hour attempted, students spend a minimum of three hours working on the research project under the direction of their faculty research mentor. They also attend scheduled meetings to present progress reports of their ongoing research, discuss how to write proposals and papers, and give oral presentations. Pre-Reqs: Permission of instructor and QTM 100. Cannot be taken concurrently with NBB 495B(W) or NBB 499R. May not receive credit for NBB 495A if also taking NBB 497W or NBB 498R under the direction of the same faculty mentor during the same semester. Eight hours of NBB 495A, 495B(W), or 499R are accepted as a total of two electives toward the NBB major.

NBB 495B (W). Honors Research
Fall, Spring. Open only to senior NBB majors enrolled in the NBB/College Honor Program. For every credit hour attempted, students spend a minimum of three hours working on the research project under the direction of their faculty research mentor. Students also attend scheduled meetings to present progress reports, discuss how to write proposals, papers, and give oral presentations. Successful completion of the written thesis is a fundamental component of the course. Pre-Reqs: Permission of instructor; QTM 100; NBB 495A Cannot be taken concurrently with 499R. May not receive credit for NBB 495B(W) if also taking NBB 497W or NBB 498R under the direction of the same faculty mentor during the same semester. Eight hours of NBB 495A, 495B(W), or 499R are accepted as a total of two electives toward the NBB major.

NBB 499R. Undergraduate Research,
Fall, Spring. Credit is variable up to four hours, but 3-4 hours is strongly recommended. For every credit hour attempted, students spend a minimum of three hours working on the research project under the direction of their faculty research mentor. Students also attend meetings to present progress reports of their ongoing research, discuss how to write proposals, papers, and give oral presentations. Eight hours of NBB 495A, 495B(W), or 499R are accepted as a total of two electives toward the NBB major. Pre-Reqs: Permission of instructor. For enrollment in a second semester, QTM 100 is required. Cannot be taken concurrently with NBB 495A or 495B(W). May not receive credit for NBB 497W or NBB 498R under the direction of the same faculty mentor during the same semester.

* For updated information, confirm with faculty.
Sam Sober (Biological Sciences)
samuel.s.sober@emory.edu, Assistant Professor
Relationship between neural activity, muscular activation, and task performance by investigating singing behavior in finches.

Amanda Starnes (Biological Sciences)
amanda.starnes@emory.edu, Senior Lecturer
Veterinary medicine

Donald G. Stein (Emergency Medicine)
donald.stein@emory.edu, Professor
Develop a safe and effective treatment for traumatic brain injury (TBI) and stroke.

Dietrich Stout (Anthropology)
dwstout@emory.edu, Assistant Professor
Specializes in the evolution of brain and cognition, Paleolithic archaeology, lithic technology, experimental archaeology, and cognitive neuroscience.

Aaron Stutz (Oxford-Anthropology)
astutz@emory.edu, Associate Professor
Rejuvenating substantial intellectual connections between now-fragmented cultural/humanistic and evolutionary/scientific approaches to understanding our diversity and our shared biocultural inheritance.

Irwin Waldman (Psychology)
psiyw@emory.edu, Professor
Developmental psychopathology research and methods.

Elaine Walker (Psychology)
elaine.walker@emory.edu, Professor
The precursors and neurodevelopmental aspects of psychopathology, especially schizophrenia.

Kim Wallen (Psychology)
kim@emory.edu, Professor
Role of hormones in primate sexual behavior and gender development; the interaction between social context and hormonal factors on development and expression.

David Weinshenker (Human Genetics)
dweinshenker@genetics.emory.edu, Director, Neuroscience Graduate Program
Focus on the catecholamine neurotransmitters norepinephrine and dopamine using a combination of genetics, behavior, pharmacology, neurochemistry, optogenetics, and chemogenetics in rodents to better understand the neurobiology underlying normal brain function.

Jay Weiss (Psychiatry & Behavioral Science)
jweiss01@emory.edu, Professor
Neuroimmunology; interaction of immune system with brain and behavior.

Whitney Wharton (Neurology)
wharton@emory.edu, Assistant Professor
Cognitive neuroscientist specializing in Alzheimer’s disease.

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Course Descriptions, Electives: NBB

**NBB 221. Research Methods in Neuroscience (Not currently offered)**
The focus will be to educate students in the scientific method: generating testable hypotheses, sampling randomization and control techniques. Students will learn the basic statistical vocabulary necessary to read and interpret scientific articles in the field.

**NBB 270. Special Topics in NBB**
Variable course that changes depending on the semester. Check most recent course atlas for current Special Topics.

**NBB 299. Explore NBB Research**
Spring, 3-credit NBB elective. This class is designed for first- and second-year students who are looking for a broad understanding of the breadth of what NBB actually is. This class would be excellent preparation for students who have recently joined a research lab/team or who are considering joining a research lab/team. We will explore practical questions about research with discussions, cases and guest speakers. Grading will be based on class participation, short investigative papers, and your professional portfolio.

**NBB 300. The Musical Brain (Same as Music 309)**
This course examines the subjective experience and neural substrates of music perception and performance. Each week the class participates in a dialog between musicians and neuroscientists that examines both the experiential and mechanistic approach to music by asking questions such as “What makes something musical and how are the complex sounds of music processed by the brain?” The relationships of music to language, emotion and memory will be examined in detail. Theories of motor learning will be discussed and applied to musical performance. The course explores the development of the musical mind from infancy to adulthood and asks the question, “How are the brains of composers, conductors, and performers different?” Evidence of the efficacy of music therapy and the impact of music on mental health are evaluated. Finally, the evolution of musicality in animals and humans is examined.

**Prerequisites:** None

**NBB 317. Human Social Neuroscience (Same as Anthropology 317)**
Neurobiological substrates supporting human social cognition and behavior. Review and synthesis of relevant research in neuropsychology, psychiatry, neuroimaging, and experimental animal research.

**NBB 319. Anthropology of Fatherhood (Same as ANT 319)**
This course will explore fatherhood from an anthropological perspective. It will describe an attempt to explain variation in male parental care across species, across cultures and across individuals within a culture. Emphasis will be placed on hormonal and neurobiological foundations of paternal care, evolutionary theory, ethnography and developmental psychology.

**NBB 321: Behavioral Neuroendocrinology of Sex (Same as PSYC 321)**
This course examines the role hormones, particularly steroid hormones, play in the development and activation of reproductive behaviors in animals and humans. In addition, the role of hormones in the development of sex differences in the brain and behavior will be explored.

**NBB 361 (WR). Neurophysiology Laboratory**
Prerequisite: NBB 301 (BIOL 360)
This lab uses intracellular and extracellular techniques to examine sensory and motor circuits, synaptic plasticity, and ionic bases of potentials from invertebrates. Part of the semester is devoted to student-designed projects. Special attention is given to scientific writing and presentation of data. Taught every spring; 2 hours lecture and 3 hours lab. 4 credits.
NBB 370. Variable topics, of special interest, in the field of Neuroscience and Behavioral Biology.

NBB 404 (WR). Routes of Modern Neuroscience Seminar
Using a combination of literature, film, and laboratory demonstrations, this course will trace contemporary issues in neuroscience from their origins in the 18th and 19th centuries to new frontiers. Among the topics treated will be localization vs. holism, visionaries and their models, conflicts and controversies between scientists and their students, and philosophical concepts vs. instrument-based inquiry. Some examples of the readings are papers by Santiago Ramon y Cajal, Hermann von Helmholtz, Sir Charles Sherrington, and Sigmund Freud; the novels Frankenstein and Neuromancer; and the film Pi.

NBB 414. Brain and Cognitive Development (Same as PSYC 414)
The course examines developmental changes in brain function and organization linked to different aspects of sensory, language, and non-language cognitive processes during the first three years of life.

NBB 424. Medical Neuropathology
The primary focus of this course will be to provide an overview of the organic foundations of selected neurological disorders. The first part of the course will be an introduction to the functional neuroanatomy of the “normal” brain. The second part of the course will introduce some clinical aspects related to damage/degeneration in these areas; such as stroke, ischemia, Parkinson’s, Alzheimer’s, Epilepsy, amnesias/dementias paying attention to traditional neuropsychological assessment/tests that differentiate among them.

NBB 425. Brain Imaging (Same as PSYC 425)
This course will focus on the application of imaging technology to the study of brain function and anatomy. We will cover the history of the development of brain imaging methods, the technical basis for various imaging methods, and learn to apply imaging methods in the realms of both basic and clinical science.

NBB 426. Neuropharmacology & Placebo (Same as PSYC426)
Prerequisites: Biology 141 and 142, Chemistry 141 and 142. Taken after introductory biology and chemistry courses. The focus will be drug development, namely the process by which a condition to be treated is identified and then medications are developed, tested, and finally distributed to patients.

NBB 460. Building Brains (Same as BIOL 460)
Prerequisites: Bio 141/142. Explore the current understanding of the mechanisms that regulate development of the nervous system. Topics covered include neurogenesis, axon guidance, programmed cell death, and synapse formation.

NBB 470/471. Special Topics in NBB
Variable topics of special interest in the field of Neuroscience & Behavioral Biology. Check most recent Course Atlas for current NBB 470 courses. 471 is available during the summer Paris Program/Study Abroad.

NBB 481. Neuroeconomics (Same as ECON 481)
Prerequisites: Economics 201 and 212, or NBB 301 and 302, or consent of instructor. This course is designed to provide students with an introduction to the field of neuroeconomics. Upon completion of the course, students will have a basic understanding of the tools used to study the neurobiology of decision making.

NBB 490. Clinical Neurology Study
Much more than a shadowing program, NBB 490 offers genuine clinical neurology experience, classroom guidance on presentations, and a vigorous look at current issues and practices in medicine. Students will have an opportunity to correlate experience with actual patients with the science behind the diagnosis.

Mark Rijjord (Philosophy)
mrisjord@emory.edu
Professor
The relationship between scientific judgment and moral or political evaluation in the philosophy of science.

Hillary R. Rodman (Psychology)
hrrodmann@emory.edu, Associate Professor
The organization, development, and plasticity of visual cortex, particularly “extra-striate” areas.

Leah Anderson Roesch (Neuroscience and Behavioral Biology)
leah.roesch@emory.edu, Lecturer
Molecular basis of neurodegenerative disease and science education.

Karen S. Rommelfanger (Neuroethics)
krommel@emory.edu, Assistant Professor
Current research explores the nature and utility of placebo using Psychogenic Movement Disorders as a therapeutic model.

Deboleena Roy (Neuroscience and Behavioral Biology, Women’s Studies)
droy2@emory.edu, Associate Professor
Primary research emphasis on bridging theoretical critiques of science and technology with transformations in the processes of scientific knowledge production with feminist attempts to return to matters of the biological body.

Mar Sanchez (Psychiatry)
sanchez@rmy.emory.edu, Associate Professor
Effects of early adverse experiences on development of nonhuman primates, focusing on emotion regulation, stress reactivity and relaxed neurobiological substrates.

Krish Sathian (Neurorehabilitation Center)
krish.sathian@emory.edu, Professor
Tactile perception, its neural basis and its alteration in neurological disorders.

Iain Shepherd (Biology)
ishephe@emory.edu, Associate Professor
Molecular and genetic mechanisms that are involved in the development of a functional nervous system. Development of the vertebrate enteric nervous (ENS).

Bradd Shore (Anthropology)
antbs@emory.edu, Professor
Symbolic and psychological anthropologist of Oceania, Polynesian and U.S. rituals.

Yoland Smith (Yerkes)
ysmith01@emory.edu, Professor
Elucidate various aspects of the synaptic circuitry of the primate basal ganglia.
and visual and auditory perception.

Kate O’Toole (Biology)
kate.k.otoole@emory.edu, Lecturer
My own research training has focused on understanding the role of transmembrane proteins in cellular functions.

Chikako Ozawa-de Silva (Anthropology)
cozawad@emory.edu, Associate Professor
Medical anthropology, anthropology of body and mind, discourse of selfhood, therapies and healing practices, suicide, psychiatric disorders and meditation, religious practices.

Nelson M. Oyesiku (SOM: Neurosurgery)
noyesik@emory.edu, Professor
Premier tertiary neurosurgical care for patients with pituitary tumors.

Rohan Palmer(Psychology)
rohan.palmer@emory.edu, Assistant Professor
As principal investigator of NIAA sponsored K01, I am currently engaged in whole genome of alcohol use disorder and comorbid substance use problems.

Lisa Parr (Yerkes)
parr@emory.edu, Assistant Research Professor
Clarify the similarities and the differences in the way in which chimpanzees view the social and emotional signals that help them to mediate their social environment.

Todd Preuss (Pathology Yerkes)
tpreuss@rmyn.emory.edu, Associate Research Professor
Fundamental research on the human brain; identify the evolutionary specializations of the human brain, which we do by comparing humans to chimpanzees and to other nonhuman primates.

Astrid Prinz (Biology)
astrod.prinz@emory.edu, Associate Professor
Computational and experimental methods to study pattern generation and homeostatic regulation in small neural networks.

James Rilling (Anthropology)
jrillin@emory.edu, Professor
Neural bases of human behavior, evolution of social behavior, comparative primate neurobiology, human brain evolution.

Mark Risjord (Philosophy)
mrisjor@emory.edu, Professor
The relationship between scientific judgment and moral or political evaluation in the philosophy of science.

During their time in the clinics, students will act as a "patient assistant," helping patients who may have partial paralysis or loss of sensation. They will learn the basics of the Health Insurance Portability and Accountability Act (HIPAA) and will record patients’ history and neurological findings in compliance with HIPAA while observing real-life patient examinations. Each student will be assigned a Clinical Neurology faculty mentor and will be required to attend a minimum of one half-day clinic per week.

Prerequisites: NBB 301 and Instructor Permission

NBB Courses College Credit Only

NBB 120. From Botox to Behavior
For non-science majors. No NBB credit. This course satisfies the General Education requirement for SNT+Lab course. Using active-learning methods and real-world examples, this course is designed to provide a fuller understanding of how the brain works and how neuronal activity underlies complex human behaviors. We will explore topics like: drug overdoses, Botox injections, sensory systems, emotions and memories.

NBB 190. Freshman Seminars
Variable topics of special interest in the field of Neuroscience and Behavioral Biology. Any of these NBB 190 Courses will satisfy the General Education Freshman Seminar requirement.

NBB 301L / BIOL 360L
This course will explore topics in cellular and small network neuroscience by performing virtual electrophysiology experiments on the computer. The content of the course matches material covered in Biology 360/NBB 301 and will help students understand neurons and neuronal networks in greater depth. This course should be taken concurrently with, or after Biology 360/NBB 301.

NBB 399R. Intro to Mentored Research
Fall, Spring. Permission only. Credit is variable up to four hours maximum. Appropriate for students during their first semester(s) of research work, prior to NBB499. For every credit hour attempted, registrants spend a minimum of three hours working on the research project under the direction of their faculty research mentor to learn new techniques and prepare for independent projects. Grading is based on completion of the criteria that the student and mentor set at the beginning of each semester.

Variable topics of special interest in the field of Neuroscience and Behavioral Biology. Any of these NBB 190 Courses College Credit Only

NBB 482R. From Botox to Behavior
Fall, Spring; 1 hour credit; Students attend cutting edge Neuroscience talks by researchers. Students will attend seminars and take notes during them. NBB 301 is a prerequisite. (Note: Frontiers in Neuroscience does not fulfill the elective requirement for NBB majors, is only S/U graded, and is a 1-credit course.)

NBB 483R. Intro to Mentored Research
Fall, Spring. Permission only. Credit is variable up to four hours maximum. Appropriate for students during their first semester(s) of research work, prior to NBB499. For every credit hour attempted, registrants spend a minimum of three hours working on the research project under the direction of their faculty research mentor to learn new techniques and prepare for independent projects. Grading is based on completion of the criteria that the student and mentor set at the beginning of each semester.

NBB 489R. Intro to Mentored Research
Fall, Spring. Permission only. Credit is variable up to four hours maximum. Appropriate for students during their first semester(s) of research work, prior to NBB499. For every credit hour attempted, registrants spend a minimum of three hours working on the research project under the direction of their faculty research mentor to learn new techniques and prepare for independent projects. Grading is based on completion of the criteria that the student and mentor set at the beginning of each semester.

NBB 497W. Supervised Writing
Fall, Spring, Summer. “4” hour credit. Independent, faculty-mentored research and writing, with major writing assignment(s) accounting for at least 60% of the grade. For every credit hour attempted, registrants spend at least three hours working under the direction of their faculty research mentor. Is not an elective towards the major.

Pre-Reqs: Permission of instructor. May not receive credit for NBB 495A, 495B(W), 498R, 499R under the direction of the same faculty mentor during the same semester.

NBB 499R. Supervised Reading
Fall, Spring, Summer. 1-4 hours credit. Independent, faculty-mentored research; designed as a prelude to conducting laboratory research under the same mentor. For every credit hour attempted, registrants spend at least three hours working under the direction of their faculty research mentor.

Pre-Reqs: permission of instructor; cannot be taken concurrently with NBB 497WR, 495A, or 499R. NBB 498R does not count as an NBB elective.
**Course Descriptions, Electives: Anthropology**

**ANT 210. Human Biology: A Life Cycle Approach**  
Human biology from conception to senescence, in an evolutionary and cross-cultural context, emphasizing neural and neuroendocrine processes underlying behavior and reproduction. Conception, fetal development, birth, infant growth, puberty, pregnancy, adult sexuality, and aging.

**ANT 302. Primate Behavior and Ecology**  
This course surveys the social behavior, behavioral ecology, and adaptations of nonhuman primate species, the extant prosimians, monkeys, and apes.

**ANT 303. The Human Brain**  
Prerequisite: Anthropology 201 or Anthropology 210 or Biology 142. This course introduces principles and findings relevant to the understanding of behavior, especially social behavior. The phylogenetic range of the course will be as wide as is appropriate to elucidate a given principle, but the focus will be on the human species. The approach will be to bring evolutionary, physiological, and developmental principles to bear on a given question about behavior.

**ANT 304. Primate Matting Strategies**  
Prerequisite: Anthropology 302. Comparative study of primate mating strategies and sexual behavior.

**ANT 305. Human Evolution**  
Integrates data and theory from genetics, geology, and paleoanthropological evidence. Opposing theories regarding the interpretation of data will be the focus of evaluation.

**ANT 310. Communication in Primates**  
This course examines human as well as non-human primate communication systems from an evolutionary perspective. Topics covered include signal structure and function, information content of signals, honesty, deceit, and the evolution of language in humans.

**ANT 311. Nutritional Anthropology**  
Introduction to the evolution, diversity, and social significance of human diet and nutrition.

**ANT 316. Evolution of Human Brain and Mind**  
Evolutionary modifications of the human brain as evidenced by the fossil and archeological record; by comparisons between human and non-human brains with respect to anatomy, function, and development; and by comparisons between human and non-human cognition. Special emphasis will be placed on the evolved neural bases of human language, cooperation, morality, social cognition, and pair bonding.

**ANT 317. Human Social Neuroscience**  
Neurobiological substrates supporting human social cognition and behavior. Review and synthesis of relevant research in neuropsychology, psychiatry, neuroimaging, and experimental animal research (NBB 317).

**ANT 319. Anthropology of Fatherhood (Same as NBB 319)**  
This course will explore fatherhood from an anthropological perspective. It will describe an attempt to explain variation in male parental care across species, across cultures, and across individuals within a culture. Emphasis will be placed on hormonal and neurobiological foundations of paternal care, evolutionary theory, ethnography, and developmental psychology.

Ichnology, the study of plant and animal traces, such as tracks, trails, burrows, nests, and feces. Tracks and tracking of modern terrestrial vertebrates.

**Jennifer Mascaro** (SOM: Wesley Woods)  
jmascar@emory.edu, Asst. Professor  

**Robert N. McCauley** (Philosophy)  
philmm@emory.edu, Professor  
Models of cross-scientific relations and the interfaces of cognitive psychology, connectionism, and neuroscience; psychological (especially cognitive) foundations of cultural systems that seem to conform to rules; naturalistic accounts of consciousness.

**Vasili Michopoulos** (Psychiatry)  
vmichop@emory.edu, Assistant Professor  
Psychosocial stress exposure (including trauma) across the lifespan adversely affects behavior and physiology using a translational neuroscience approach across non-human primates and humans in a sex-specific manner.

**E. Christopher Muly** (SOM: Psychiatry/Yerkes)  
ecmuly@rmy.emory.edu, Assistant Professor/ Affiliate Scientist  
Neuroanatomy of dopaminergic systems in primates.

**Daryl Neill** (Psychology)  
dneill@emory.edu, Professor  
Mammalian brain systems which are the neural substrates of the psychological/behavioral processes of mood, motivation, reward, and reinforcement.

**Ilya Nemenman** (Physics)  
ilya.nemenman@emory.edu, Associate Professor  
Theoretical physics and machine learning methods to develop coarse-grained models of information processing in systems biology.

**Seth Davin Norrholm** (Psychiatry)  
snorrho@emory.edu, assistant professor  
"Bench-to-bedside" clinical research methods to inform therapeutic interventions for posttraumatic stress disorder (PTSD) and the disorders with which it is co-morbid.

**Lynne Nygaard** (Psychology)  
llygaard@emory.edu, Professor  
Research interests include the perception of speech and other auditory events.

**Laura Otis** (English)  
lotis@emory.edu, Professor  
Dr. Otis compares the ways that neuroscientists and literary writers conceive of memory, identity,
Melvin Konner (Anthropology)  
Antmk@emory.edu, Professor  
Human nature and child development in evolutionary and cross-cultural perspective.

Michelle Lampl (Anthropology)  
Mlampl@emory.edu, Associate Professor  
Biological mechanisms underlying normal human growth and development, maternal child health, nutrition.

Paul Lennard, Director (Neuroscience and Behavioral Biology)  
Prlenna@emory.edu, Associate Professor  
Pathogenesis of primary myopathies, progression of degenerative neuromuscular diseases.

Allan Levey (SOM: Neurology)  
Allan.levey@emory.edu, Professor  
Investigating Alzheimer's and Parkinson's diseases.

Richard Levinson (School of Public Health)  
Rlevins@sph.emory.edu, Professor  
Social determinants of health risk behavior; prevention of HIV/AIDS; and access to and utilization of health services.

Scott Lilienfeld (Psychology)  
Slilien@emory.edu, Professor  
Biological factors in the etiology of personality disorders, behavior-genetic approaches to psychopathology, and pseudoscientific practices in psychology, neuroscience, and medicine.

Robert Liu (Biology)  
Robert.liu@emory.edu, Associate Professor  
Computational neuroethology-exploring the elegant hypothesis in neuroscience that the statistics and regularities of the sensory world are closely reflected in the coding strategies used by neurons.

David Lynn (Chemistry)  
David.lynn@emory.edu, Professor/Chair  
Research focuses on the processes of molecular self-assembly and how chemical information can be stored and translated in molecular entities.

Donna Maney (Psychology)  
Dmaney@emory.edu, Professor  
Neural circuitry underlying communication behavior. How animals perceive, process, and respond appropriately to social signals.

Joe Manns (Psychology)  
Jmanns@emory.edu, Associate Professor  
Focuses on electrophysiological recordings in rats performing memory tasks and has addressed how activity in the hippocampus allows us to encode and retrieve specific information about individual items.

Pat Marsteller (Biology)  
Pmars@emory.edu, Director/ECCSE  
Science teaching and pedagogy in K-12, undergraduate and graduate programs.

Anthony (Tony) Martin (Environmental Studies)  
Geoam@emory.edu, Professor of Practice

ANT 321. Anthropology of Human Reproduction  
This course examines biological, cultural and behavioral determinants of human reproduction.

ANT 323. Sex Differences: Biological Bases  
Examination of the biological bases of sex differences and their development.

ANT 333. Disease & Human Behavior  
Biological and cultural adaptations to disease, the role of specific diseases in evolution, social epidemiological patterns related to culture, contemporary issues in disease control, and economic development. Considers a variety of diseases including malaria, tuberculosis, AIDS, diabetes, and depression.

ANT 334. Evolutionary medicine  
Survey of the application of Darwinian evolutionary principles to human vulnerability to a variety of disease (e.g. cancer, depression, atherosclerosis). The evolution of defenses against disease is reviewed.

ANT 338/338W. Global Health: Biosocial Model  
This course surveys the global landscape of challenges to physical and mental health that confront us today, and traces the emergence of biosocial approaches to both explaining and tackling these challenges.

ANT 339. Defining Health: Biocultural Perspective  
Evolutionary perspectives provide a background for understanding the limitation imposed by biomedical frameworks and our understanding of human biological variability. Flexibility in gene expression and human phenotypes reflect the importance of bicultural influences on health.

ANT 385. Various Topics *Requires NBB approval.  
Rotating topics in Anthropology. Please refer to the most recent atlas for the most recent course offerings from Anthropology.

ANT 450W: The Evolution of Childhood.  
This course will cover the evolutionary and anatomical foundations of psychological, especially social and emotional, development, as well as comparative socialization and cross-cultural varieties of enculturation.
**Course Descriptions, Electives: Biology**

**BIOL 241/341-SAF. Evolutionary Biology**
A study of the factors that cause genetic change and of the evolutionary consequences of such changes. Topics include population genetics, adaptation and natural selection, evolution of genes, proteins and genomes, sexual selection, kin selection, speciation, and diversification of taxa. Emphasis on molecular, genetic, ecological, and evolutionary factors related to variation and adaptation to environment, and constraints on adaptation of human physiology. *Prerequisites*: Biology 141 and 142. Also taught as a summer study abroad program in conjunction with Biology 349-SAF (Ecology of Invasions).

**BIOL 320. Animal Behavior (Same as Psychology 320)**
Provides an overview of major research areas in the field of animal behavior. The behavior of animals will be analyzed from an evolutionary and comparative perspective. Some topics include orient and migration, genetic and environmental influences on behavior, population regulation, courtship and mating strategies, and parental behavior. *Prerequisites*: Biology 141 and 142

**BIOL 325. Primate Social Psychology (Same as PSYC 325)**
Covers recent progress in the field of primate social behavior. Topics range from aggression and dominance to affiliation, sex, and peaceful coexistence. *Prerequisites*: Biology 141 and 142, Psychology 320 is recommended.

**BIOL 336. Human Physiology**
A study of human physiology emphasizing integrated body functions. Topics include respiration, circulation, contractility, osmoregulation, endocrinology, and neurophysiology. *Prerequisites*: Biology 141 and 142 or permission of instructor.

**BIOL 340R-DX. Independent Research and Discovery in Biology**
The course is an integrated class with laboratory where research topics will vary each semester. *Prerequisite/Co-requisite*: Biology 142 or Biology 242 and permission of the instructor. All prerequisite classes and laboratories must be completed with a grade of B or higher. (Oxford only)

**BIOL 348. Mechanisms of Animal Behavior**
A survey of current topics in neural development and neural basis of behavior. Emphasis is on research work that uses a combination of physiological, genetic, cellular, and molecular techniques to understand neural systems and their evolution and development. *Prerequisites*: Biology 141 and 142, Biology 336 or 360, Chemistry 141 and 142, or permission of instructor.

**BIOL 385 Special Topics in Biology** Requires NBB approval.
A lecture series or special course for advanced students on topics of special biological concern. *Prerequisites*: Biology 141 and 142. See course atlas.

**BIOL 402/402W. Neuroscience Live**
This seminar covers current topics of neuroscience research. Students will learn how to read and critique research papers and how to write and prepare a research grant proposal; and will also interact in a ‘live’ format with authors of the research papers. *Prerequisites*: Biology 141 and 142; Pre- or Co-requisite: NBB 301 or Biology 360 (Fulfills Writing Requirement).

**BIOL 434. Physical Biology (Same as PHYS 434)**
This course explores the physical and statistical constraints on strategies used by biological systems, from bacteria to large organisms and to entire populations, to sense external environmental signals, process them, and shape a response.

**Neuroscience and Behavioral Biology**

**Benjamin Hampstead** (Rehabilitation Medicine)
bhampst@emory.edu, Associate Professor
Examining the efficacy of cognitive rehabilitation in patients with various neurological injuries and diseases as measured both behaviorally and through functional magnetic resonance imaging.

**Robert Hampton** (Psychology)
robert.hampton@emory.edu, Assistant Professor
Comparative cognition. Memory monitoring and metacognition in nonhuman primates. Neurobiology of learning, memory, and cognition.

**Shawn Hochman** (Psychology)
shawn.hochman@emory.edu, Associate Professor
Neuromodulatory motoneurons transmitters (serotonin, dopamine, and nor-adrenaline) modify sensorimotor integration in the mammalian CNS. Uses predominantly electrophysiological approaches to study the role of these transmitters and their dysfunction after spinal cord injury.

**Linton Hopkins** (Neurology)
lhopkin@emory.edu, Professor Emeritus (retired)
Emery Dreyfuss muscular dystrophy; myasthenia gravis; demyelinating neuropathy; ALS

**Leonard Howel** (Division of Neuroscience-Yerkes)
leonard@rmy.emory.edu, Professor
Neuropharmacology of abused stimulants and basic neurobiological studies of drug mechanisms as well as medications development to treat stimulant abuse.

**Gillian Hue** (Neuroscience and Behavioral Biology)
ghue@emory.edu, Lecturer
Circadian rhythms and spinal dopamine; sleep. Research Ethics; development of curricula promoting science and ethical engagement.

**Dieter Jaeger**, (Biology)
djaeger@emory.edu, Professor
Prolonged depolarizations in Purkinje cells following brief inputs to the granule cell layer. The function of synaptic input in the basal ganglia.

**Adrian Jaeggi** (Anthropology)
Adrianjaeggi@emory.edu, Assistant Professor
Primatologist. Employs synthesizing approaches such as phylogenetic comparative methods and meta-analyses.

**Tanja Jovanovic** (SOM: Psychiatry)
tjovanovic@emory.edu, Assistant Professor
Interactions of traumatic experiences, neurophysiology, neuroendocrinology, and genetics in mental disorders in adults and children in high-risk populations.

**Andrew Kazama** (Yerkes/Psychology)
akazama@emory.edu, Lecturer
The neurobiological basis of safety signal processing, which is implicated in several anxiety-related neuropsychiatric disorders

**Jaffar Khan** (SOM:Neurology )
jkhan@emory.edu, Associate Professor
Engaged in research in medical education, focusing on creative and effective methods for training students, residents, and fellows.
Eugene Emory (Psychology)
emory@emory.edu, Professor
Prenatal brain, behavior, and cognition; perinatal stress and HPA activation; maternal
Psychopathology (schizophrenia and depression) and fetal development; fetal brain imaging and
neuro-cognitive development.

Arthur W. English (Cell Biology)
art@cellbio.emory.edu, Professor
Investigating the roles played by the neurotrophins BDNF and NT-4/5 in that enhancement, as well as
the reformation of synapses at both neuromuscular junctions and spinal motoneurons.

Victor Faundez (Cell Biology)
vfaunde@emory.edu, professor
Microdeletion syndromes, genetic defects of human metal transporters and BLOC-1-dependent
trafficking to the synapse.

Jennifer Felger (Psychiatry)
jfelger@emory.edu, Assistant Professor
Studies the effect of inflammatory cytokines on neurotransmitters and neural circuits as they relate
to behavioral changes.

Nicholas Fotion (Philosophy)
philnf@emory.edu, Professor
Moral philosophy (metaethics, medical ethics, military ethics), and philosophy of language (speech-act
theory, pragmatics).

Kristen Frenzel, Associate Director (Neuroscience and Behavioral Biology)
kfrenze@emory.edu, Senior Lecturer
Mechanisms by which proteins function; renin-angiotensin system, which is a central regulator of
blood pressure and electrolyte homeostasis; the role of the testis ACE isoform in fertility; neuregulins.

Harold Gouzoules (Psychology)
psyhg@emory.edu, Professor
Nonhuman primate vocal communication and its biological and evolutionary relationships to cognition
and social behavior.

Sarah Gouzoules (International Studies Program)
sgouzou@emory.edu, Associate Dean
Communication systems of nonhuman primates, especially macaque monkeys, and the evolution of
social behavior and language.

Claire-Anne Gutekunst (Neurosurgery)
cguteku@emory.edu, Assistant Professor
Neuropathology and neurobiology of Huntington’s Disease, molecular neuropathology of
neurodegenerative disorders, the role of Hap1 and molecular composition and function of Stigmoid
Bodies, neurogenerative therapies for Parkinson’s Disease, and neuromodulation therapies for
epilepsy.

Stephan Hamann (Psychology)
shamann@emory.edu, Associate Professor.
Explicit and implicit memory in normal and neuropsychological populations (patients with focal
hippocampal or amygdala lesions, the elderly, and patients with Alzheimer’s disease).

BIOL 440/440S. Animal Communication (Same as PSYC 440S)
Functions, evolution, ecology, and significance of animal communication systems in a wide
taxonomic range from insects to primates. Prerequisites: Biology 141 and 142 (Fulfills Writing
Requirement.)

BIOL 450. Computation Neuroscience
Exploration of single neurons and biological neural networks with computer simulations. Each class
consists of an introductory lecture followed by computer tutorials using GENESIS software under
UNIX. Specific topics include passive cable theory, compartmental modeling, voltage gated and
synaptic conductances, motor pattern generation, and cortical networks. Prerequisites: Biology 141
and 142

BIOL 460S. Building Brains (Same as NBB 460S)
Course will explore the current understanding of the mechanisms that regulate development of the
nervous system. Topics covered include neurogenesis, axon guidance, programmed cell death, and
synapse formation. Prerequisites: Biology 141 and 142.

BIOL 475. Biology of the Eye
A course designed for juniors, seniors, and graduate students who are interested in a basic
understanding of the eye. This course will review basic principles and state-of-the-art information
on ocular anatomy, embryology, biochemistry, physiology, genetics, immunology, microbiology,
pharmacology, and pathology. Prerequisites: Biology 141 and 142

Prerequisites: Biology 141 and 142
Course Descriptions, Electives: Psychology

PSYC 103. Brain & Behavior
This is a course about the biology of behavior. Special attention is given to sex, eating, drinking, sleeping and waking. Other topics include: the influence of drugs on behavior, recovery of function after brain damage, and the neural and chemical substrates of pleasure and behavioral activation.

PSYC 209. Perception and Action
Perception of the world through the senses, gathering information about one’s surroundings by seeing, hearing, smelling, tasting, touching, and acting.

PSYC 215. Cognition
Theories and research addressing the nature of higher mental processes, including such areas of cognition as categorization, attention, memory, knowledge representation, imagery, Psycholinguistics, and problem solving.

PSYC 222_OX. Clinical Neuroscience (same as NBB 223_OX)
An introduction to the neurobiology of mental disorders such as depression and schizophrenia. (Oxford Only)

PSYC 302. Evolution of Acquired Behavior
Research and theory concerning the way information about the world is acquired and remembered.

PSYC 303. Human Learning and Memory
The evolutionary basis of learning to adapt to the environment. Detailed analysis of the mechanisms of learning and their evolutionary function.

PSYC 309. Brain and Language (Same as LING 309)
This course examines the relationship between brain mechanisms and language behavior. Topics include aphasia and language disorders, aphasia in the deaf, critical periods in children, and gender differences in brain organization.

PSYC 313. Neuropsychology and Developmental Disabilities
The effects of conditions such as blindness, deafness, cerebral palsy, and epilepsy on information processing behavior and psychological development in children. Complex disorders such as learning disabilities, childhood psychoses, and mental retardation are examined in the light of what has been learned about the simpler disorders.

PSYC 320. Animal Behavior (Same as BIOL 320)
Provides an overview of major research areas in the field of animal behavior. The behavior of animals will be analyzed from an evolutionary and comparative perspective. Some topics included are orientation and migration, genetic and environmental influences on behavior, population regulation, courtship and mating strategies, and parental behavior.

PSYC 321: Behavioral Neuroendocrinology of Sex (Same as NBB 321)
This course examines the role hormones, particularly steroid hormones, play in the development and activation of reproductive behaviors in animals and humans. In addition, the role of hormones in the development of sex differences in the brain and behavior will be explored.

PSYC 322. Biological Basis of Learning and Memory
Biological factors influencing memory with the attention to the findings from both animal and human research.

Kenneth Carter (Oxford-Psychology)
kenneth.carter@emory.edu, Professor
Researching systematic reviews of psychiatric medications.

William Michael Caudle (School of Public Health)
william.m.caudle@emory.edu, Assistant Professor/Principle Investigator
Contribution to environmental contaminants makes on development of neurobehavioral and neurodegenerative diseases, either independently or through their interaction with underlying genetic predispositions.

Anthony Chan (Yerkes: Human Genetics)
awchan@emory.edu, Associate Professor
Focus on development of a nonhuman primate model (NHP) of Huntington’s disease (HD) that is not only physiologically comparable to humans but also carries a mutant huntingtin (HTT) gene that leads to HD as well as developing an Alzheimer’s disease (AD) monkey model.

Nancy Collop (Pulmonology)
nancy.collop@emory.edu, Professor
Research interests include diagnostic testing for sleep-disordered breathing and standards for polysomnography.

Michael Crutcher (Neuroscience and Behavioral Biology)
michael.crutcher@emory.edu, Senior Lecturer
Demonstrating that a novel test of recognition memory can be used to diagnose Alzheimer’s disease at the earliest possible stage.

Joseph Cubells (Human Genetics)
jcubells@genetics.emory.edu, Associate Professor
Expanding work into biochemical, physiological and psychological traits associated with psychiatric illness.

Frans de Waal (Psychology)
dewaal@rmy.emory.edu, Professor
Social behavior and social cognition emphasizing mechanisms of reconciliation and reciprocity in nonhuman primates.

Daniel D. Dilks (Psychology)
dilks@emory.edu, Assistant Professor
Human vision: How does this functional organization get wired up in development?; and how does the visual cortex change in adulthood? Dilks uses a variety of methods, including psychophysics and functional magnetic resonance imaging (fMRI) as well as transcranial magnetic stimulation (TMS).

Keith Easterling, (Neuroscience and Behavioral Biology)
keaster@emory.edu, Senior Lecturer

David Edwards (Psychology)
edwards@emory.edu, Professor
Hormonal correlates of athletic competition, performance and ability.
Faculty Research Interests*

**Jocelyne Bachevalier** (Psychology) jbachev@emory.edu, Professor
Ontogenetic development and decline of memory functions in primates.

**John Banja** (Ethics) jbanja@emory.edu, Professor of Rehabilitation Medicine, Assistant Director of health science ethics at the Center for Ethics

**Gary Bassell** (Whitehead) gary.bassell@emory.edu, Professor
Mechanisms involved in mRNA trafficking and local protein synthesis and assess their function in axon guidance, regeneration and synaptic plasticity. Studying how impairments in these processes may underlie defects in Spinal Muscular Atrophy and Fragile X Syndrome

**Pat Bauer** (Psychology) pbauer@emory.edu, Associate Dean
Development of memory from infancy through childhood, with special emphasis on the determinants of remembering and forgetting; and links between social, cognitive, and neural developments and age-related changes in autobiographical or personal memory.

**Gregory Berns** (Psychology) gberns@emory.edu, Professor
Functional magnetic resonance imaging, computer modeling and neuroeconomics. The relationship of neural systems to decision making by using a combination of computational and functional imaging techniques.

**Michael Borich** (Physical Therapy) michael.borich@emory.edu, Assistant Professor
Harness the plastic capacity of the human nervous system in health and disease in an effort to improve rehabilitation outcomes for individuals with neurologic injury and disease.

**Nicholas Boulis** (Neurosurgery) nboulis@emory.edu, Associate Professor
Biological neurorestoration and neuromodulation through the use of cell, protein and gene delivery to the nervous system.

**Patricia Brennan** (Psychology) pbren01@emory.edu, Professor
The area of developmental psychopathology. The role of Psychophysiology and emotion in aggressive behavior.

**Patrick Cafferty** (Biology) Patrick.w.cafferty@emory.edu, Lecturer
Molecular interactions within cells to the complex behavioral patterns exhibited by members of a community.

**Ronald L. Calabrese** (Biology) rcalabre@biology.emory.edu, Professor
Motor pattern generation and its modulation: electrophysiological and computational approaches.

**PSYC 323. Drugs and Behavior**
A review of the behavioral and neurobiological actions of all the major psychoactive drugs, focusing on how drugs alter behavior by influencing brain mechanisms.

**PSYC 325. Primate Social Psychology (Same as BIOL 325)**
Recent progress in the field of primate social behavior, particularly the role of cognition in complex social strategies. The course will evolve into an understanding of the actions of several drugs in the brain and consequent effects on behavior.

**PSYC 350. Behavior Modification**
Use the principles of behavior to enhance human functioning. Application of basic research and theory from experimental psychology to personal, social, and educational problems.

**PSYC 414. Brain & Cognitive Development**
This course examines developmental changes in brain function and organization linked to different aspects of sensory language, and non-language cognitive processes during the first three years of life.

**PSYC 415. Sleep & Dreaming**
Study of the neural mechanisms and phenomenology of sleep and dreaming in humans and other animals as a basis for discussing implications for behavior, cognition, evolution, and related philosophical issues.

**PSYC 420 (WR). Psychobiology of Visual Perception**
Prerequisites: Psychology 110 and 111 or Biology 141 and 142. Theories and research about how the brain interacts with mind in generating perceptions. (Fulfills Writing Requirement.)

**PSYC 425. Brain Imaging (Same as NBB 425)**
This course will focus on the application of imaging technology to the study of brain function and anatomy. We will cover the history of the development of brain imaging methods, methods, the technical basis for various imaging methods, and learn to apply imaging methods in the realms of both basic and clinical science.

**PSYC 426. Neuropsycharmacology & Placebo (Same as NBB 426)**
Prerequisites: Biology 141 and 142, Chemistry 141 and 142. Taken after introductory biology and chemistry courses. The focus will be drug development, namely the process by which a condition to be treated is identified and then medications are developed, tested, and finally distributed to patients.

**PSYC 427. Biological Foundations of Behavior: Hormones, Brain and Behavior**
Prerequisites: Prior completion of at least ONE of the following: PSYC 110, 103, NBB 201 or NBB 302. PSYC 320 is highly recommended. The goal of this course is to explore the biological basis of behavior in a writing intensive, peer-oriented environment. We will read and discuss classic and current primary literature, and practice writing in style characteristic of scientific discussion.

**PSYC 440. Animal Communication**
Functions, evolution, ecology, and significance of animal communication systems in a wide taxonomic range from insects to primates. (Fulfills Writing Requirement.)

**PSYC 473. Advance Seminar in Abnormal Psychology**

**PSYC 474. Seminar: Developmental Psychology**

**PSYC 475. Seminar Personality & Social Psychology**

**PSYC 476. Seminar Biological Foundations of Behavior**

*Advanced Psychology Seminars have variable topics. Requires approval NBB.*
Additional Courses:

The NBB program requires 7 electives. From the list of courses below, one and only one of them can be used as an elective. The remaining 6 electives must be taken from the courses listed above.

- Biol 205 Comparative Vertebrate Anatomy with lab
- Biol 250 Cell Biology
- Biol 264 Genetics: A Human Perspective
- Biol 301 Intro Biochemistry I
- Biol 302 Intro Biochemistry II
- Chem 203 Advanced Reactivity
- Chem 204 Macromolecules
- Chem 221 Organic Chemistry I (with lab)
- Chem 222 Organic Chemistry II (with lab)
- Chem 301 Biochemistry I
- Chem 302 Biochemistry II
- CS 153 Computing for Bioinformatics
- Math 207: Probability and Stats w/ Applications
- Math 361 Probability and Statistics I
- Math 362 Probability and Statistics II

Course Descriptions, Electives: Other

CHEM 468 SWR. Perspectives in Chemistry* (*Requires written NBB approval.)

ECON 481. Neuroeconomics (Same as NBB 481)
Prerequisites: Economics 201 and 212, or NBB 301 and 302, or consent of instructor. This course is designed to provide students with an introduction to the field of neuroeconomics. Upon completion of the course, students will have a basic understanding of the tools used to study the neurobiology of decision-making.

ECS 490W. Emory College Seminar* (Requires written NBB approval)
ENGS 386/386(W). Literature and Science* (Requires written NBB Approval)
ENG 389/389(W). Special Topics: Literature* (Requires written NBB Approval)
ENVS 385/385W. Topics: Environmental Science* (Requires written NBB Approval)

MUS 309. The Musical Brain (Same as NBB 300)
Prerequisites: Any one of the following courses: Biol 120; Biol 141,142; OR Music 114; Music 121-122. The course will examine the subjective experience and neural substrates of music perception and performance. Each week the class will participate in a dialog between musicians and neuroscientists examining both the experiential and mechanistic approach to music by asking questions such as "What makes something musical and how are the complex sounds of music processed by the brain?" Relationships of music to language, emotion and memory are examined as well as development of the musical mind from infancy to adulthood. Music therapy impact and evolution of musicality in animals and humans will be investigated.

PHIL 316 BioEthics
This course explores the central questions of biomedical ethics, such as end-of-life issues, abortion, and justice in the distribution of health care.

PHIL_OX 382R. Topics in Philosophy, (I.e. Philosophy of the Mind)* (Requires written NBB Approval)
Examinations of proposed solutions to the mind-body problem, and such topics as consciousness, personal identity, machine intelligence, and the possibility and character of a scientific psychology. (Oxford only)

PHIL 425/425W. Philosophy of Science
Examination of scientific rationality and scientific method; topics covered include intertheoretic relations and the character of scientific change, concepts, theories, and explanations.

PHIL 482 (W). Topics in Philosophy (i.e. Philosophy of Medicine)* (Requires written NBB Approval)
Fertility and emphasizes interaction of sociocultural context with biology in reproduction and sexuality. Further topics: infertility, deviance, demographic transition, and population policy.

PHYS 227 Modern Med Physics
Explores some of the ways in which principles and methods used in physics are applied to problems in modern medicine. Includes a study of the physics of modern imaging systems such as MRI, CT, and PET as well as more traditional areas (x-ray, radiation, and nuclear medicine physics). Mathematical and statistical ideas will be developed as needed. For pre-med students, students in health or biological sciences, or physics majors who are curious about medical physics.

PHYS 380/385. Topics in Physics * (Requires written NBB approval)

PHYS 434. Physical Biology (Same as BIOL 434)
Prerequisite: consent of instructor. This course will emphasize that all living systems have evolved to perform certain tasks in specific contexts.

Rel 370 – Special Topics in Religion (I.e. Cognitive Science of Religion) * (Requires written NBB Approval)