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### Neuroscience and Behavioral Biology Program

1462 Clifton Road, Suite 304  
FAX: 404-727-7471  

[www.nbb.emory.edu](http://www.nbb.emory.edu)

- **Paul R. Lennard**, Director  
  paul.lennard@emory.edu  
  Phone: 404-727-4235

- **Alan Weinstein**, Academic Department Administrator  
  alan.weinstein@emory.edu  
  Phone: 404-727-4929

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

- **Clare Sterling**, Staff  
  e.clare.sterling@emory.edu

*Please call the office if you have additional questions.*
STUDY ABROAD OPPORTUNITIES

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-tow 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) MPhl (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 Masters 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 ran 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.

| 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.

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__________________________ |

<table>
<thead>
<tr>
<th>Course</th>
<th>Please Check</th>
<th>Semester Course</th>
<th>Notes</th>
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<tbody>
<tr>
<td>BIOL 141</td>
<td>___</td>
<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>BIOL 142</td>
<td>___</td>
<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>1 yr of CHEM w/ Lab</td>
<td>___</td>
<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>MATH 111*</td>
<td>___</td>
<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>QTM 100</td>
<td>___</td>
<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>NBB 201/Anth 200</td>
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<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>NBB 301/Biol 360</td>
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<td>Semester Course</td>
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<tr>
<td>NBB 302/Psyc 353</td>
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<td>Semester Course</td>
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<tr>
<td>NBB 401W or 402W</td>
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<td>Semester Course</td>
<td>Notes</td>
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<tr>
<td>Elective 1</td>
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<td>Semester Course</td>
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<td>Elective 2</td>
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<td>Elective 7</td>
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<td>Elective 8</td>
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<td>Semester Course</td>
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*Contact NBB with any questions*
EMORY COLLEGE GENERAL EDUCATION REQUIREMENTS

The general education component of an Emory undergraduate education is organized to present an array of intellectual approaches and perspectives as ways of learning rather than a prescribed body of content. Its purposes are to develop students’ competencies in the skills and methods of writing, quantitative methods, a second language, and physical education; to acquaint students with methodologies that characterize the humanities, the social sciences, and the natural sciences as the three broad divisions of learning in the arts and sciences; to deepen students’ perspectives on national, regional, and global history and culture, and to give every student some exposure to an interactive seminar experience. These purposes are met by a student’s choosing from a range of individual courses within a clearly defined framework.

General Stipulations
A score of 4 or 5 on certain Advanced Placement examinations can be used to satisfy General Education Requirements. These Advanced Placement examination scores must be submitted to the Office of Admission prior to the end of the student's first semester at Emory College of Arts and Sciences.

All courses used to satisfy the General Education Requirements must be taken for a letter-grade, except for Area VIII (Personal Health) and Area IX (Physical Education and Dance).

Questions
Questions in reference to general education requirements should be directed to the College Office academic counselors or deans.

Degree Applications
Degree applications will be signed by the NBB Office NOT your advisor. Please allow one week for processing. The degree applications are updated each semester, so please confirm that you have the appropriate application before submission. The application may be found at
http://college.emory.edu/home/assets/documents/degree/degree-application.pdf
### College General Education Requirements

EFFECTIVE FALL 2009 - REFER TO EMORY COLLEGE WEBSITE FOR INCOMING FRESHMAN

<table>
<thead>
<tr>
<th>I. First Year Seminar (FSEM)</th>
<th>1st yr Fall or Spring (circle sem.)</th>
<th>Course number</th>
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<tr>
<th>II. First Year Writing Requirement (FWR)</th>
<th>1st yr Fall or Spring (circle sem.)</th>
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<tbody>
<tr>
<td>ENG 101/ENG 181/CPLT 110 (circle class)</td>
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<tr>
<th>III. Continuing Writing Requirement (WRT)</th>
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<td>2.</td>
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<td>3.</td>
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<td>Course number</td>
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<thead>
<tr>
<th>IV. Mathematics and Quantitative Reasoning (MQR)</th>
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<td>Course number</td>
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<tr>
<th>IV. Science, Nature, Technology (SNT)</th>
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<tbody>
<tr>
<td>1. Lab course</td>
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<td>2.</td>
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<td>Course number</td>
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<tr>
<th>VI. History, Society, Cultures (HSC)</th>
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<td>2.</td>
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<td>Course number</td>
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<thead>
<tr>
<th>VII. Humanities, Arts, Performance (HAP/HAL)</th>
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<tbody>
<tr>
<td>1. Language course (HAL)</td>
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<tr>
<td>2. Language course (HAL)</td>
</tr>
<tr>
<td>3. (HAP or HAL)</td>
</tr>
<tr>
<td>4. (HAP or HAL)</td>
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<td>Course number</td>
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<tr>
<th>VIII. Personal Health (HTH)</th>
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<tbody>
<tr>
<td>PE 101</td>
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<tr>
<td>Semester and year</td>
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<table>
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<tr>
<th>IX. Physical Education and Dance (PED/PPF)</th>
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</thead>
<tbody>
<tr>
<td>1. Principles of Physical Fitness</td>
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<td>2.</td>
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6 // Neuroscience and Behavioral Biology

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 study abroad exchange program with the University of St. Andrews in Scotland.

NBB Major Requirements
The major requires a minimum of nine courses (thirty-six 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 eight NBB approved electives are needed.

All majors are required to take the following introductory foundation courses: QTM 100; Biology 141 and Biology 142; 1 year of Chemistry with lab; and one semester of Calculus (Math 111 or Math 115)*. 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 and sponsorship by a member of the neuroscience and behavioral biology core faculty. Students must complete QTM 100 and two semesters of undergraduate research NBB 495A (4 hrs) & NBB 495BW (4hrs)* as well as attending a biweekly Honors seminar. In addition, students are required to enroll in at least one graduate – level course of undergraduate research.

*Contact NBB with any questions

Donald G. Stein (Emergency Med, 1648 Pierce Dr, 404-712-9704)
donald.stein@emory.edu, Professor
Develop a safe and effective treatment for traumatic brain injury (TBI) and stroke

Irwin Waldman (Psychology, 36 Eagle Row, Rm. 475, 404-727-7430)
psiyw@emory.edu, Assoc. Professor
Developmental psychopathology research and methods.

Elaine Walker (Psychology, 36 Eagle Row, Rm. 487, 404-727-7438)
elaine.walker@emory.edu, Professor
The precursors and neurodevelopmental aspects of psychopathology, especially schizophrenia.

Kim Wallen (Psychology, 36 Eagle Row, Rm. 387, 404-727-4125)
kim@rmy.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.

Jay Weiss (Psychiatry & Behavioral Science, A-510N Emory West Bldg, 404-712-9771)
jweiss1@emory.edu, Professor
Neuroimmunology; interaction of immune system with brain and behavior.

George Wilmot (Neurology, Woodruff Mem. Bldg, Ste 6303, 404-727-3965)
chip.wilmot@emory.edu, Assistant Professor
Clinical outcome measures in ataxia patients, motion analysis, motor physiology, phenotype-genotype correlations in neurodegenerative disease.

Phillip Wolff (Psychology, 36 Eagle Row, Rm. 479, 404-727-7140)
pwolff@emory.edu, Associate Professor
From a cognitive science perspective, the relationship between language and cognition.

Carol Worthman (Anthropology, 214 Geosciences Bldg., 404-727-4489)
worthman@emory.edu, Professor
Biological anthropology, human reproduction, human development, developmental epidemiology, biocultural and life history theory.

Paul Wolpe (Ethics, Ethics Center 404 727-3150)
pwolpe@emory.edu, Asa Griggs Candler Professor of Bioethics
Neuroethics which examines the ethical implications of neuroscience.

David W. Wright (Emergency Medicine, 531 Asbury Cir., EHU Annex, Ste 340, 404-616-6021)
david.wright@emory.edu, Assistant Professor-TT, Co-Director EMRC
The preclinical and clinical assessment of neuroprotectants as agents to enhance neuro-plasticity and neurorecovery for traumatic brain injury (TBI) and stroke. Examining the role of exogenous progesterone and pregnenolone in the post injury/recovery phase of TBI.
Hillary R. Rodman (Psychology, 36 Eagle Row, Rm. 381, 404-727-2391) 
hrodman@emory.edu, Associate Professor
The organization, development, and plasticity of visual cortex, particularly “extra-striate” areas. Neural bases of face/object recognition and “blind-sight” and the evolution of cortical areas are major topics of interest.

Leah Anderson Roesch (NBB, 1462 Clifton Rd Suite 304, 404-727-6160) 
leah.roesch@emory.edu, Lecturer
Molecular basis of neurodegenerative disease. SIRE - undergraduate research working with students doing research in all fields – from vocal pedagogy, to women in politics, to theater set design to molecular basis of neurodegenerative disease!

Deboleena Roy (NBB, Women's Studies, 128 Candler Library, 404-727-7083) 
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, 4127 WMB, 404-712-2393) 
sanchez@emory.edu, Assistant Professor
Effects of early adverse experiences on development of nonhuman primates, focusing on emotion regulation, stress reactivity and relaxed neurobiological substrates.

Krish Sathian (Rehab Ctr. Modular Bldg 150, 404-727-1366) 
krish.sathian@emory.edu, Associate Professor of Rehabilitation Medicine
Tactile perception, its neural basis and its alteration in neurological disorders.

Iain Shepherd (Biology, 1131 Rollins Research Ctr., 404-727-2632) 
ishephe@emory.edu, Assistant 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, 210 Geosciences Bldg., 404-727-4200) 
anths@emory.edu, Professor
Symbolic and psychological anthropologist of Oceania, Polynesian and U.S. rituals.

Yoland Smith (Yerkes, 954 Gatewood Road, 404-727-8556) 
ysmith01@emory.edu,
Elucidate various aspects of the synaptic circuitry of the primate basal ganglia

Sam Sober (Biology, 1510 Clifton Rd Rm 2006, 404-727-5846) 
samuel.j.sober@emory.edu, Assistant Professor
Relationship between neural activity, muscular activation, and task performance by investigating singing behavior in finches.

Amanda Starnes (Biology, Rollins 2125, 404-727-6932) 
amanda.starnes@emory.edu, Senior Lecturer
Veterinary medicine

Course Descriptions, NBB Core Courses

NBB 201. Foundations of Behavior (Same as ANT 200)
Spring. 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. (New General Education Requirements: Area II B2 - Natural Sciences/Non-Lab)

NBB 301. Introduction to Neurobiology (Same as BIOL 360)
Spring and Fall. 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)
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. Prerequisites: 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. (New General Education Requirements: 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
Independent Research

**NBB 495A. Honors Research**
Fall, Spring, Summer. Only open to senior NBB majors enrolled in the NBB/College Honors Program. For every credit hour attempted, registrants spend a minimum of three hours in the laboratory working under the direction of their faculty research mentor to collect data that addresses their thesis question. 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-Req: Permission of instructor and QTM 100. Cannot be taken concurrently with NBB 495B or NBB 499R. A minimum of eight hours of NBB 495A, 495B(W), or 499R accepted as a maximum of two electives toward the NBB Major. 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.

**NBB 495B (W). Honors Research**
Fall, Spring, Summer. Open only to senior NBB majors enrolled in the NBB/College Honor Program. For every credit hour attempted, registrants spend a minimum of three hours in the laboratory working under the direction of their faculty research mentor to collect data that addresses their thesis question. Registrants also attend meetings to present progress reports, discuss how to write proposals, papers, and give oral presentations. To receive credit, for the course and to satisfy the senior-year writing requirement, a student thesis must be accepted by the Honors Program. Pre-Reqs: Permission of instructor; QTM 100; NBB 495A (with permission of instructor, may substitute NBB 499R). Cannot be taken concurrently with 499R. May not receive credit for NBB 495B(W) if also taking NBB 497W, NBB 498R under the direction of the same faculty mentor during the same semester. A minimum of eight hours of NBB 495A, 495B(WR), or 499R is accepted as a maximum of two electives toward the NBB major.

**NBB 499R. Undergraduate Research**
Fall, Spring, Summer. Credit is variable up to four hours. For every credit hour attempted, registrants spend a minimum of three hours in the laboratory working under the direction of their faculty research mentor to collect data that addresses their research questions. Registrants also attend meetings to present progress reports of their ongoing research, discuss how to write proposals, papers, and give oral presentations. A minimum of eight hours of NBB 495A, 495B(W), or 499R accepted as a maximum of two electives toward the NBB major, independent research in neurobiology and behavior. 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.

Research – College credit only

**NBB 497W (WR). 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 a minimum of three hours working under the direction of their faculty research mentor. Is not an elective toward 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. When taking one semester, course only counts as college credit.

**NBB 498R. 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 a minimum of 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.

Kate O'Toole (Biological, Callaway)
kate.k.otoole@emory.edu, Lecturer
My own research training has focused on understanding the role of transmembrane proteins in cellular functions, in particular, how ion channels mediate neurotransmission in normal and disease states of the adult nervous system.

Chikako Ozawa-de Silva (Anthropology, Geosciences Bldg, 305, 404-727-4467)
cozawad@emory.edu, Assistant Professor
Medical anthropology, anthropology of body and mind, discourse of selfhood, therapies and healing practices, suicide, psychiatric disorders and meditation, religious practices.

Lisa Parr (Yerkes, 404-727-3653)
parr@rmy.emory.edu, Assistant Research Professor
Social cognition in chimpanzees. 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.

Paul Plotsky (WMB 4105, 404-727-8257)
paul.plotsky@emory.edu, Professor
Interaction between genes and the perinatal environment in shaping the developing nervous system. Using rodent and nonhuman primate models in collaboration with clinical researchers, he has developed animal models of vulnerability to a variety of psychiatric and medical diseases.

Todd Preuss (Pathology Yerkes, 954 Gatewood Road, 404-727-7739)
tpreuss@rmy.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, 2105 Rollins Research Ctr, .404-727-5191)
astrid.prinz@emory.edu, Assistant Professor
Computational and experimental methods to study pattern generation and homeostatic regulation in small neural networks.

James Rilling (Anthropology, 114 Anthropology Bldg, 404-727-2391)
jrillin@emory.edu, Assistant Professor
Neural bases of human behavior, evolution of social behavior, comparative primate neurobiology, human brain evolution.

Mark Risjord (Philosophy, 112 Bowden Hall, 404-727-2160)
mrisjor@emory.edu, Associate Professor
The relationship between scientific judgment and moral or political evaluation in the philosophy of science.
Tony Martin (Environmental Studies MSC E516, 404-727-6476) 
paleoman@learnlink.emory.edu Professor of Practice

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

Jennifer Mascaro (Anthropology 304, 404-727-4021) 
jmascaro@emory.edu Lecturer


Robert N. McCauley (Philosophy, 111 Bowden Hall, 404-727-0103) 
philrmn@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.

E. Christopher Muly (SOM: Psychiatry/Yerkes 2131B, 404-727-9603) 
ecmuly@rmy.emory.edu

Neuroanatomy of dopaminergic systems in primates

Darryl Neill (Psychology, 36 Eagle Row, Rm. 391, 404-727-7445) 
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, Math and Science Ctr N240, 404-727-9286) 
ilya.nemenman@emory.edu, Associate Professor

Theoretical physics and machine learning methods to develop coarse-grained models of information processing in systems biology

Wendy Newby (1946 Starvine Way, Suite 310 SAAC Bldg., 404-727-6766) 
wnewby@emory.edu, Assistant Dean

Understanding the interaction between learner characteristics, teaching practices, and instructional outcomes.

Lynne Nygaard (Psychology, 36 Eagle Row, Rm. 379, 404-727-0766) 
lnygaard@emory.edu, Associate Professor

Research interests include the perception of speech and other auditory events.

Laura Otis (English, Callaway Ctr. N-306, 404-727-2234) 
lotis@emory.edu, Professor

Dr. Otis compares the ways that neuroscientists and literary writers conceive of memory, identity, and visual and auditory perception.

Course Descriptions, Electives: NBB

**NBB 221. Research Methods in NBB**

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. What questions are researchers in NBB exploring? 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. NBB encompasses a large and diverse range of research questions, approaches and methods, and so we will explore cutting-edge research at Emory ranging from intracellular molecular studies, to animal behavior manipulations, to clinical studies, to medical humanities and neuroethics. 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)**

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.

**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 361 (WR). Experimental Neurobiology Lab**

Prerequisites: NBB 301 and permission of instructor. A course in experimental neuroscience designed for juniors who may be interested in research. One module stems from the current research linking a single gene, the vasopressin 1a receptor, to monogamous behavior in voles. The second module will teach students to handle primary cultures of neurons and glia and to use immunocytochemistry and current imaging techniques to identify cell types and cellular structures. (Fulfills Writing Requirement.)

**NBB 370. Variable topics, of special interest, in the field of Neuroscience and Behavioral Biology.**
NBB 404 (WR). Roots 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 explores 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. Drug Development

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.

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.

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.

Paul Lennard, Director (NBB, 1462 Clifton Road, Suite 304, 404-727-4235) pjlenna@emory.edu, Associate Professor
Pathogenesis of primary myopathies, progression of degenerative neuromuscular diseases.

Allan Levey (SOM: Neurology, WMRB 6005, 404-727-7220) allan.levy@emory.edu, Professor of Psychiatry
Investigating Alzheimer’s and Parkinson’s diseases.

Richard Levinson (School of Public Health, 404-727-7703) rlevins@sph.emory.edu
Social determinants of health risk behavior; prevention of HIV/AIDS; and access to and utilization of health services.

Scott Lilienfield (Psychology, 36 Eagle Row, Rm. 473, 404-727-1125) slilien@emory.edu, Associate 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, 2131 Rollins Research Center, 404-727-5274) robert.liu@emory.edu, Assistant Professor
Computational neurobethology-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, Emerson Hall, 404-727-9348) 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, 36 Eagle Row, Rm. 373, 404-727-7470) dmaney@emory.edu, Assistant Professor
Neural circuitry underlying communication behavior. How animals perceive, process, and respond appropriately to social signals.

Joe Manns (Psychology, 36 Eagle Row, Rm. 481, 404-727-7459) jmanns@emory.edu, Assistant 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, Hughes Science Initiative & ECCSE, 404-727-9696) pmarsters@learnlink.emory.edu, Director/ECCSE
Science teaching and pedagogy in K-12, undergraduate and graduate programs.
Benjamin Hampstead (Rehabilitation Medicine, 1441 Clifton Rd, Suite 150, 404-728-4837) bhampst@emory.edu, Assistant 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, 36 Eagle Row, Rm. 369, 404-727-5853) robert.hampton@emory.edu, Assistant Professor
Comparative cognition. Memory monitoring and metacognition in nonhuman primates Neurobiology of learning, memory, and cognition.

Shawn Hochman (Physiology, Whitehead Bldg, Rm. 644, 404-712-3131) shawn.hochman@emory.edu, Assistant Professor
Neuromodulatory 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, and in association with Restless Legs Syndrome (RLS), pain, and locomotion.

Linton Hopkins (Neurology/Emory Clinic A, 404-778-3452) lhopkin@emory.edu, Professor Emeritus (retired).
Emory Dreifuss muscular dystrophy; myasthenia gravis; demyelinating neuropathy; ALS

Leonard Howell (2214B Division of Neuroscience-Yerkes, 404-727-7786) 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.

Dieter Jaeger (Biology, 2129 Rollins Research Ctr., 404-727-8139) djaeager@biology.emory.edu, Associate Professor
Prolonged depolarizations in Purkinje cells following brief inputs to the granule cell layer. The function of synaptic input in the basal ganglia.

Jaffar Khan (SOM:Neurology: Neuromuscular, 404-616-4013) jkhan@emory.edu, Associate Professor.
Engaged in research in medical education, focusing on creative and effective methods for training students, residents, and fellows. My activities include analysis of primary outcomes data and participation in local, national, and international consortia on medical education.

Melvin Konner (Anthropology, 106 Geosciences Bldg, 404-727-4195) antmk@mindspring.com, Professor
Human nature and child development in evolutionary and cross-cultural perspective.

Michelle Lampl (Anthropology, 218C Geosciences Bldg, 404-727-2214) mlampl@emory.edu, Associate Professor
Biological mechanisms underlying normal human growth and development, maternal child health, nutrition.

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. 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
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 New 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 399. Intro to Mentored Research
Fall, Spring, Summer. Permission only. Credit is variable up to four hours maximum. Appropriate for students during their first semester(s) of lab/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 482R. Frontiers in Neuroscience
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.)
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 305. 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 306. Primate Mating Strategies**
Prerequisite: Anthropology 302. Comparative study of primate mating strategies and sexual behavior.

**ANT 307. 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.

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

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**Keith Easterling** (NBB, 1462 Clifton Road, Suite 304, 404-727-4743) keaster@emory.edu, Senior Lecturer

**Henry Edelhauser** (Ophthalmology, 404-778-5853) ophtffe@emory.edu
Surgical pharmacology, corneal physiology, drug delivery and ocular toxicology.

**David Edwards** (Psychology, 36 Eagle Row, Rm. 485, 404-727-4128) edwards@emory.edu, Professor
Hormonal correlates of athletic competition, performance and ability

**Eugene Emory** (Psychology, 36 Eagle Row, Rm. 499, 404-727-7455) eemory@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, Whitehead 405P, 404-727-6250) art@cellbio.emory.edu, Professor
Enhancing functional recovery following injury to the peripheral nervous system. Investigating the roles played by the neurotrophins BDNF and NT-4/5 in that enhancement, as well as in the reformation of synapses at both neuromuscular junctions and spinal motoneurons.

**Nicholas Fotion** (Philosophy, 214 Bowden Hall, 404-727-7672) philnf@emory.edu, Professor
Moral philosophy (metaethics, medical ethics, military ethics), and philosophy of language (speech-act theory, pragmatics).

**Kristen Frenzel** (NBB, 1462 Clifton Rd Suite 304, 404-727-1317) 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, 36 Eagle Row, Rm. 389, 404-727-7444) psybg@emory.edu, Professor
Nonhuman primate vocal communication and its biological and evolutionary relationships to cognition and social behavior.

**Stephan Hamann** (Psychology, 36 Eagle Row, Rm. 371, 404-727-4261) 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) and the effect of emotion on memory; the application of neuroimaging techniques to memory research; perception of emotion in facial expression.
Patrick Cafferty (Biology, 2011 Rollins Research Ctr. 404-727-7587)
Patrick.w.cafferty@emory.edu, Professor

Ronald L. Calabrese (Biology, 2113 Rollins Research Ctr. 404-727-0319)
rkalabre@biology.emory.edu, Professor
Motor pattern generation and its modulation: electrophysiological and computational approaches.

C. Monica Capra (Economics, 328 Rich Bldg, 404-727-6387)
mcapra@emory.edu, Assistant Professor
Experimental and Behavioral Economics (Neuroeconomics): using laboratory experiments to study decision making in economic environments

Kenneth Carter (Oxford-Psychology, 214A Seney) 770-784-8439)
kenneth.carter@emory.edu, Associate Professor
Researching systematic reviews of psychiatric medications.

Nancy Collop (Pulmonology, Pulmonology, 404-7 12-7533)
nancy.collop@emory.edu, Professor
Research interests include diagnostic testing for sleep-disordered breathing and standards for polysomnography.

jcubells@genetics.emory.edu, Medical Director
Expanding work into biochemical, physiological and psychological traits associated with psychiatric illness.

Michael Crutcher (NBB, 1462 Clifton Rd Suite 304, 404-727-5011)
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.

Daniel D. Dilks (469 Psychology Building, 36 Eagle Row. 404-727-2980)
dilks@emory.edu, Assistant Professor
Research focuses on three questions about human vision: i) How is the visual cortex functionally organized?, ii) How does this functional organization get wired up in development?, and iii) how does the visual cortex change in adulthood? To address these questions, Dilks uses a variety of methods, including psychophysics and functional magnetic resonance imaging (fMRI) as well as transcranial magnetic stimulation (TMS).

Frans de Waal (Psychology, 36 Eagle Row, Rm. 399, 404-727-3695)
dewaal@rmy.emory.edu, Professor
Social behavior and social cognition emphasizing mechanisms of reconciliation and reciprocity in nonhuman primates.

ANT 323. Sex Differences: Biological Bases
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, and malnutrition.

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

ANT 385. Various Topics (As Approved by NBB).
Rotating topics in Anthropology. Please refer to the most recent atlas for the most recent course offerings from Anthropology.
Course Descriptions, Electives: Biology

**BIO 241/241-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).

**BIO 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 included are orientation and migration, genetic and environmental influences on behavior, population regulation, courtship and mating strategies, and parental behavior. Prerequisites: Biology 141 and 142

**BIO 325. Primate Social Psychology (Same as ANT 304 and 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.

**BIO 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.

**BIO 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.

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

**BIO 402/402. 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 Corequisite: NBB 301 or Biology 360 (Fulfills Writing Requirement).

**BIO 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.

**BIO 440/4405. Animal Communication (Same as PSYC 4405)**
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.)

Faculty Research

**Jocelyne Bachevalier** (Psychology, 36 Eagle Row, Rm. 397, 404-727-9765) jbachev@emory.edu, Professor
Ontogenetic development and decline of memory functions in primates.

**John Banja** (Ethics, Ethics Center 404 727-4804) jbanja@emory.edu, Associate Professor of Rehabilitation Medicine, Assistant Director of health science ethics at the Center for Ethics

**Lawrence W. Barsalou** (Psychology, 36 Eagle Row, Rm. 483, 404-727-4338) barsalou@emory.edu, Professor
The acquisition, representation, and use of knowledge, ranging across perception, memory, language, and thought. The perceptual bases of the human conceptual system, the construction of categories to achieve goals, the roles of situations in conceptual processing, and the representation of individuals.

**Gary Bassell** (Whitehead Bldg 40SK, 404-727-3772) gary.bassell@emory.edu Professor
The mechanisms involved in mRNA trafficking and local protein synthesis and assess their function in axon guidance, regeneration and synaptic plasticity. We are also studying how impairments in these processes may underlie defects in Spinal Muscular Atrophy and Fragile X Syndrome

**Patricia J. Bauer** (Psychology, 36 Eagle Row, Rm. 365, 404-712-8460) pbren01@emory.edu, Associate Professor
The area of developmental psychopathology. The role of Psychophysics and emotion in aggressive behavior.
Course Descriptions, Electives: Other

CHEM 468SWR. Variable Topics
Requires approval by NBB office.

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 approval by NBB office.

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 205. Introduction to Biomedical Ethics
Moral issues related to medical practice and research, such as right to life, death and treatment, allocation of medical resources, confidentiality, abortion, and coercion in experimentation.

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 350 (W). 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 360/PHIL_OX 385R. Philosophy of the Mind
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.

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.

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

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 GENISIS 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
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.

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 ANT 304 and 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 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. Brain Repair (when offered)

PSYC 474. Brain and Cognitive Development (when offered)

PSYC 475. Introduction to Human Neuropsychology (when offered)
The evolution of the pathways associated with processes like fatty acid metabolism, glycolysis, and respiration will be explored.