Neuroscience Special Major

Catherine J. Norris
Psychology
Why study Neuroscience?

• Inherent interest in the relationships between body, brain & behavior
• Considering medical school or graduate studies in a related field
• Can’t decide between Psychology and Biology?
• ... a fundamental curiosity about the mysteries of the brain
Now, as humans, we can identify galaxies light years away. We can study particles smaller than an atom, but we still haven't unlocked the mystery of the three pounds of matter that sits between our ears. But today, scientists possess the capability to study individual neurons and figure out the main functions of certain areas of the brain. But a human brain contains almost 100 billion neurons, making trillions of connections. So Dr. Collins says it's like listening to the strings section and trying to figure out what the whole orchestra sounds like. So as a result, we're still unable to cure diseases like Alzheimer's or autism, or fully reverse the effects of a stroke. And the most powerful computer in the world isn't nearly as intuitive as the one we're born with.

- President Barack Obama on the BRAIN Initiative
What can you do with Neuroscience?

• Medical School
  – University of Chicago
  – ... many, many others!

• Graduate School in Neuroscience
  – U Penn
  – Princeton
  – Boston University
  – ... many, many others!

• Positions that require analytical problem solving skills and natural curiosity!
General Info

• Two Departments:
  – Biology
  – Psychology

• Two Options:
  – Course Special Major
  – Honors Major

• Three “tracks”:
  – Bio-heavy
  – Psych-heavy
  – Pretty equal

... prereqs come from BOTH departments, applications to the major are submitted to BOTH departments, you will be assigned (or can request) an advisor in the Dep’t that best reflects your plan of study
Pre-requisites

<table>
<thead>
<tr>
<th>Subject</th>
<th>Courses</th>
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<tbody>
<tr>
<td>Biology</td>
<td>BIOL 001: Cellular and Molecular Biology</td>
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<tr>
<td></td>
<td>BIOL 002: Organismal and Population Biology</td>
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<tr>
<td>Chemistry</td>
<td>CHEM 010: General Chemistry</td>
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<td>CHEM 022: Organic Chemistry I</td>
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<tr>
<td>Math/Stat</td>
<td>MATH 015: Elementary Single-Variable Calculus</td>
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<td>STAT 011: Statistical Methods</td>
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<td>Psychology</td>
<td>PSYC 001: Introduction to Psychology</td>
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<td>PSYC 025: Research Design and Analysis</td>
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All prereqs MUST be completed & GPA requirements met BEFORE being admitted to the Neuroscience Special Major. BUT:

- If you haven’t completed all, you can apply and be deferred until they are complete
- There’s some leniency in grades, especially during your first term
NOTE about Prereqs... ~90% of Neuro Special Majors have NOT completed all of their prerequisites before applying for the major.

THIS IS EXPECTED! And totally normal. We will simply defer you from acceptance until you complete all prereqs. This has no bearing whatsoever on your standing in the major. You will not miss out on opportunities. I promise. 😊
In addition to Prereqs...

- At least 8 elective credits
- ... Including a Comprehensive Requirement (Neuroscience Thesis)

... for a total of a minimum of 10 credits for the major
Group A: Neuroscience Electives at least 5 credits

• (at least) 1 Foundation Course
  – PSYC 030: Behavioral Neuroscience
  – BIOL 022: Neurobiology
  [NOTE: As of 2020, BIOL 022 is only offered every other year…]

• Core Courses
  – BIOL: 020, 029, 030
  – PSYC: 031, 031A, 091

• (at least) 1 **Group A** Seminar:
  – BIOL: 121, 123, 124, 127, 129, 131, 134; PSYC: 032/132 (2 credits)
  – PSYC: 130, 131, 131A (1 credit)
  – PSYC 032/132 (2 credits) – **NEW!!!**

…other courses may also qualify as Group A electives
Group A: Neuroscience Electives

BIOL 022  Neurobiology [Foundation Course*]
PSYC 030  Behavioral Neuroscience [Foundation Course*]

* At least one Foundation Course must be included. Both are recommended. Note that BIOL 022 (Neurobiology) is only offered every other year.

BIOL 020  Animal Physiology
BIOL 029  Developmental Neurobiology
BIOL 030  Animal Behavior
BIOL 121  Neural Systems and Behavior seminar (2 credits)
BIOL 123  Learning and Memory seminar (2 credits)
BIOL 124  Hormones and Behavior seminar (2 credits)
BIOL 127  Advanced Topics in Behavioral Biology (2 credits)
BIOL 129  Developmental Neurotoxicology (2 credits)
BIOL 131  Animal Communication seminar (2 credits)
BIOL 134  Evolution of Social Behavior (2 credits)
PSYC 031  Cognitive Neuroscience
PSYC 031A  Social, Cognitive, and Affective Neuroscience
PSYC 130  Behavioral Neuroscience seminar (1 credit)
PSYC 131  Cognitive Neuroscience Seminar (1 credit)
PSYC 131A  Psychology and Neuroscience: The Social Brain seminar (1 credit)
PSYC 032/132  Perception, Laboratory Course & Seminar (2 credit)
Group B Electives: Courses in Related/Overlapping Areas

• BIOL:
  Genetics, Cell Biology, Omics, Devel Bio, Systems Bio, Evolution, and many Bio seminars

• CHEM 038: BioChem

• COGS 001: Intro to Cognitive Science

• CPSC: Intro, Bioinformatics

• MATH 056: Modeling

• PSYC:
  Cog Psych, Psych of Language, Social Psych, Clinical Psych, Developmental Psych, Computing for Psych, & several Psych seminars

  Technically, there is NO Group B requirement for the major!
Group C: Research Electives

- BIOL 098: Neuroscience Thesis Research
- PSYC 096/097: Senior Thesis
- PSYC 099: Senior Neuroscience Thesis

Technically, there is NO Group C requirement for the major! BUT... most options for the Comp Req will draw from Group C.
Comprehensive Requirement

The comprehensive requirement is a *Neuroscience Research Thesis*, a complete scientific paper based on a research project conducted in Biology or Psychology or some other area related to neuroscience. Typically completed by:

1. Group C Elective, or
2. Separate Research Project (e.g., completed over the summer or as part of a BIOL seminar)
Comprehensive Requirement (Ex.)

Research Practica:

Perception & Cognition (PSYC 102, Durgin):
  Comparing ERPs for metaphors and similes (turned into a neuroscience thesis)

Behavioral Neuropharmacology (PSYC 103, Schneider):
  Propranolol as a potential adjunct to exposure therapy in the treatment of pathological fear memory: an animal model
  Preventing recovery of fear memory following exposure therapy: reconsolidation versus prediction error

Psychology & Neuroscience (PSYC 105, Norris):
  The Role of Intergroup Bias in Visual Perspective Taking
  Gait Synchrony & Social Cooperation
  Imitation Fails to Improve Emotion Recognition
  The Effects of Posture and Mimicry on Perceptions of Warmth & Competence
Comprehensive Requirement (Ex.)

Senior Thesis Research in Psychology:

Eliminate the Negative, Accentuate the Positive: Investigating the Effects of Emotion Regulation of Ambivalence (Norris)

It's not what you said, it's what you didn't say: How comprehenders use context to model alternative speaker utterances in pragmatic inferencing (Grodner)

Meditation & Attention: Can a single session of mindfulness meditation temporarily improve attentional control in naïve college students? (Norris)

Perceptual biases and comparison biases in noisy 2D orientation displays (Durgin)

Rigidity in adults with ASD when establishing common ground during a referential communication task (Grodner)

There’s nothing wrong with being a little dense: Density drives visual aftereffect of number (Durgin)
Comprehensive Requirement (Ex.)

Senior Thesis Research in Biology:

Novelty induces behavioral and glucocorticoid responses in a songbird artificially selected for divergent personalities (Baugh)

Short-term chemosensory-mediated memory deficits in *Drosophila melanogaster* with targeted mushroom body inactivations (Siwicki)

Aggression effects on sleep in *Drosophila melanogaster* (Siwicki)

Characterization of rippling behavior and effects of light exposure in *Drosophila melanogaster* larvae (Siwicki)

The effects of cholesterol absorption inhibition on the dietary preference of saturated versus polyunsaturated fatty acids in Djungarian hamsters (*Phodopus sungorus*) (Hiebert Burch)

The effect of caloric restriction and stress on binge eating in estrogen-treated Djungarian hamsters (Hiebert Burch)
Neuroscience Honors Major

• Fulfill all the requirements for Neuroscience
• Complete 3 2-credit preparations - to include at least 1 BIOL and 1 PSYC prep, and at least 1 (preferably 2, 1 BIOL/1 PSYC) Group A seminar:
  • BIOL: Seminar = 2 credits
  • PSYC: Core course/Seminar Combo = 2 credits
• Complete a 2-credit Neuroscience Research Thesis (BIOL or PSYC 180)
• No Honors Minor
Brandon Bastien (2017): The Waiting and Mating Game: Condition Dependent Mate Sampling in Female Gray Treefrogs (*Hyla versicolor*)

Emma Close (2018): Do food stimuli distract and/or focus attention for chronic dieters? An ERP Investigation

Abigail Dove (2016): Sleep plasticity due to sexual experience in *Drosophila melanogaster*

Olivia Leventhal (2018): ERP responses to non-binary uses of “they”

Caela Long (2016): Hormonal and molecular effects of restraint on formalin-induced pain-like behavior in male and female mice

Cecilia Paasche (2016): Metaphors make the brain work harder: An event-related potential study of extended metaphors suggests depth of processing advantage to figurative language

Makayla Portley (2018): A new elbow in the number perception function: Number processing changes at 20

Fran Reckers (2018): Friend or Foe?: The Effects of Friendship on Emotional Responses to Paired Gamble Outcomes

Rebecca Senft (2015): Distribution and Abundance of Glucocorticoid and Mineralocorticoid Receptors throughout the Brain of the Great Tit (*Parus major*)

Elisabeth Tawa (2015): What’s the right (hemisphere) way to think about metaphor?

Yuhao Xu (2017): Intuition or Deliberation? An ERP Study of Cooperative Decision Making
What do YOU need to do now?

- Get an advisor in BIOL or PSYC (depending on what track you are more interested in)
- Complete the Prereqs
- Think about your Sophomore Plan:
  - How do you plan to complete the major? When are the courses you want to take being offered?
  - How do you plan to complete the Comprehensive Requirement? (If NOT a Research Practicum, then start reaching out to professors early to talk about a plan for doing research.)
Neuroscience Faculty Advisors

Alex Baugh (abaugh1): BIOL *(on sabbatical 2020-21)*
Frank Durgin (fdurgin1): PSYC
Jeff Gauthier (jgauthi2): BIOL
Cat Norris (cnorris2): PSYC *(on sabbatical 2020-21)*
Allen Schneider (aschnei1): PSYC *(on sabbatical now)*

... Kim Hoang (khoang1): PSYC Academic Adv.
Next Steps

• Monday, Feb. 10 @ 1:00 PM – Deadline to submit your intended program (majors/minors) through mySwarthmore.

• Thursday, Feb. 13 – See Sophomore Plan advisor(s) name(s) in the Majors and Minors section in mySwarthmore.

• Friday, Feb. 14 – Deadline to sign up for an advising session with Sophomore Plan advisor.

• Weeks of Feb. 17 & Feb 24 – Meet individually (as needed) with faculty advisor to develop/review plan.

• Monday, Mar. 2 @ 1:00 PM – Deadline to submit your sophomore plan.
For more info:

cnorris2@swarthmore.edu
Slides posted online
https://www.swarthmore.edu/biology/neuroscience