# **Neuroscience Special Major**

Frank Durgin Psychology

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# Neuroscience Faculty Advisor for Sophomore Planning

#### Frank Durgin (fdurgin1) Professor of Psychology

#### With excellent support from:

Kim Hoang (khoang1): PSYC Academic Adv.



# Why study Neuroscience?

- Inherent interest in the relationships between body, brain & behavior
- Considering medical school or graduate studies in a related field
- Combination of 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 Special Major

- Three "styles":
  - 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 (course and honors)

Biology	BIOL 001: Cellular and Molecular Biology		
	BIOL 002: Organismal and Population Biology	B Ave	
Chemistry	CHEM 010: General Chemistry	J	
	CHEM 022: Organic Chemistry I		
Math/Stat	MATH 015: Elementary Single-Variable Calculus		B Ave
	STAT 011: Statistical Methods		
Psychology	PSYC 001: Introduction to Psychology	ΒΛνο	
	PSYC 025: Research Design and Analysis	D AVE	

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 and during COVID

### 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 have a neuroscience advisor. You will not miss out on opportunities.



#### In addition to Prereqs...

- At least 8 elective credits
- ... Including a Comprehensive Requirement (e.g., 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)

... 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: THIS LIST IS OUT OF DATE; please see the neuroscience website for the correct information...

<u>BIOL 020</u>	Animal Physiology
BIOL 021	<u>Neuroethology</u>
BIOL 029	Developmental Neurobiology
BIOL 030	Animal Behavior
<u>BIOL 121</u>	Neural Systems and Behavior seminar
BIOL 122	Reverse Engineering the Brain
<u>BIOL 123</u>	Learning and Memory seminar
<u>BIOL 124</u>	Hormones and Behavior seminar
<u>BIOL 127</u>	Advanced Topics in Behavioral Biology
<u>BIOL 129</u>	Developmental Neurotoxicology
<u>BIOL 131</u>	Animal Communication seminar
<u>BIOL 134</u>	Evolution of Social Behavior
PSYC 031	Cognitive Neuroscience
PSYC 031A	Social, Cognitive, and Affective Neuroscience
PSYC 091	Advanced Topics in Behavioral Neuroscience
PSYC 130	Behavioral Neuroscience seminar
PSYC 131	Cognitive Neuroscience Seminar
PSYC 131A	Psychology and Neuroscience: The Social Brain seminar
PSYC 032/13	<u>32 Perception, Laboratory Course &amp; Seminar</u> (2 credits)



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
- PSYC 102, 103, 104, 105, 110: Research Practica Perception & Cognition, Behavioral Neuropharmacol, Mind & Language, Psych & Neuroscience, Cog Neuro

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 (1 foundation, 4 other group A credits) including...
- Complete 3 2-credit preparations to include at least 1 BIOL and 1 PSYC prep, and at least 1 (normally 2, 1 BIOL/1 PSYC) Group A seminar:
  - BIOL: Seminar + prereq = 2 credits
  - PSYC: Core course/Seminar Combo = 2 credits
- Complete an Honors Thesis (BIOL 180 for 1 or 2 credits or PSYC 180 for 2 credits)
- For special majors, there is NO Honors Minor (all four honors preps are in Neuroscience).



# Neuroscience Honors Theses (Ex.)

<u>Brandon Bastien (2017)</u>: 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"

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

<u>Cecilia Paasche (2016)</u>: Metaphors make the brain work harder: An event-related potential study of extended metaphors suggests depth of processing advantage to figurative language <u>Makayla Portley (2018)</u>: A new elbow in the number perception function: Number processing changes at 20

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

<u>Rebecca Senft (2015)</u>: 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?

- Request an advisor for sophomore planning
- 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.)



### Next Steps

- Monday, Mar. 1 Deadline to indicate your intended program (majors/minors) through <u>mySwarthmore</u>.
- Thursday, Mar. 4 See Sophomore Plan advisor in the Majors and Minors section in <u>mySwarthmore</u>. - I will have office hours...
- Monday, Mar. 8 Deadline to draft your sophomore plan for initial review
- Monday, Mar. 8 Wednesday, Mar. 17 Meet individually (as needed) with faculty advisor to develop/review plan.
- Thursday, Mar. 18 Deadline to submit your sophomore plan.

For more info:

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https://www.swarthmore.edu/biology/neuroscience