

SCAN Foundations

PSYCH 511.003 Spring 2025

2025-01-08

Foundations of Social, Cognitive, and Affective Neuroscience (SCAN)

Instructor

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Meeting Location and Time

467 Moore Thursdays, 1-4 PM

About the course

The first scientific psychologists were physiologists fascinated by the possibility of understanding the mind by studying the brain. In this course, we will explore the historical roots and contemporary challenges associated with the study of biological approaches to complex adaptive behavior. In doing so, we will read and examine critically primary source readings that discuss basic patterns and processes of brain structure and function. The goal is to provide students with a basic foundation of knowledge about the structures and functions of the nervous system that can provide the basis for future study.

This course is one of two required courses for the [Specialization in Cognitive and Affective Neuroscience \(SCAN\)](#).

Prerequisites

Undergraduate coursework in neuroscience or physiological psychology such as the equivalents of PSYCH 260 or BIO 469/470.

January 13-17

Thursday, January 16

Topics

- Structure of the course
- Levels of analysis
- Causality in brain and behavior
- Does neuroscience need behavior? If so, what does psychology need?

Readings

- Required:
 - Krakauer et al. (2017)
 - Parada and Rossi (2018)
- Optional:
 - Siddiqi et al. (2022)
 - Churchland and Sejnowski (1988)
 - Favela (2020)
 - Ross and Bassett (2024)

Materials

- [Slides](#)
- [Exercise 01](#) assigned | [PDF](#) |

January 20-24

Wednesday, January 22

- [Exercise 01](#) write-up due | [Canvas dropbox](#) |

Thursday, January 23

Topics

- Neuroanatomy lab

Readings

- [Neuroanatomy notes](#)

Materials

- [Slides](#). [PDF](#)
- [Allen Brain Atlas](#).
- [Exercise 02](#) distributed | [PDF](#) |

January 27-31

Wednesday, January 29

- [Exercise 02](#) due | [Canvas dropbox](#) |

Thursday, January 30

Topics

- Cellular neuroscience I
 - Anatomy
 - Physiology
 - * Resting potential

Readings

- [Cellular neuroscience notes](#) | [PDF](#) |
- Optional:
 - Zeng and Sanes (2017)
 - Oliveira et al. (2015)
 - Distéfano-Gagné et al. (2023)

Materials

- [Slides](#) | [PDF](#) |
- [Exercise 03](#) distributed. | [PDF](#) |

February 3-7

Thursday, February 06

Topics

- Cellular neuroscience II
 - Action potential
 - Synaptic transmission
- [Exercise 04](#) assigned. | [PDF](#) |

Readings

- [Cellular neuroscience notes](#)

Materials

- [Slides](#)

February 10-14

Wednesday, February 12

- [Exercise 03](#) write-up due. | [Canvas dropbox](#) |

Thursday, February 13

Topics

- Neurochemistry
 - Neurotransmitters
 - Hormones
- Neurocomputing

Readings

- [Neurochemistry notes](#)
- Optional: Sarkar et al. (2016).

Materials

- [Slides](#)
- [Exercise 05](#) distributed | [PDF](#) |

February 17-21

Wednesday, February 19

- [Exercise 04](#) write-up due | [Canvas dropbox](#) |

Thursday, February 20

Topics

- Methods in neuroscience

Readings

- Watch: MITCBMM (2019)
- Review: “Cognitive Psychology and Cognitive Neuroscience/Behavioural and Neuroscience Methods” (n.d.)
- Recommended:
 - Cohen (2017)
 - Hillman (2014)
- Optional:
 - Koch et al. (2022)

Materials

- [Methods notes](#)
- [Exercise 06](#) distributed | [PDF](#) |

February 24-28

Wednesday, February 26

- [Exercise 05](#) write-up due | [Canvas dropbox](#) |

Thursday, February 27

Topics

- Evolution of the nervous system

Readings

- Required:
 - Charvet and Finlay (2012)
 - Hofman (2014)
- Optional:
 - Castrillon et al. (2023)

Materials

- [Notes](#)
- [Exercise 07](#) distributed | [PDF](#) |

March 3-7

Wednesday, March 05

- [Exercise 06](#) write-up due | [Canvas dropbox](#) |
- [Final project](#) proposal due

Thursday, March 06

Topics

- Development of the nervous system

Readings

- Required:
 - Cao, Huang, and He (2017)
 - Blumberg and Adolph (2023)
- Optional:
 - Larsen et al. (2023)
 - Rakic (2009)

Materials

- [Notes](#)
- [Exercise 06](#) distributed | [PDF](#) |

March 10-14 *Spring Break*

March 17-21

Wednesday, March 19

- [Exercise 07](#) write-up due | [Canvas dropbox](#) |

Thursday, March 20

March 24-28

Wednesday, March 26

- [Exercise 08](#) write-up due | [Canvas dropbox](#) |

Thursday, March 27

March 31 - April 4

Thursday, April 03

April 7-11

Thursday, April 10

April 14-18

Thursday, April 17

April 21-25

Thursday, April 24

April 28 - May 2

Thursday, May 01

Topics

- Beethoven and the Cerebral Symphony

May 4-9

Thursday, May 08

- [Final Project](#) write-up due | Canvas dropbox

References

- Blumberg, Mark S, and Karen E Adolph. 2023. "Protracted Development of Motor Cortex Constrains Rich Interpretations of Infant Cognition." *Trends in Cognitive Sciences* 27 (3): 233–45. <https://doi.org/10.1016/j.tics.2022.12.014>.
- Cao, Miao, Hao Huang, and Yong He. 2017. "Developmental Connectomics from Infancy Through Early Childhood." *Trends in Neuroscience* 40 (8): 494–506. <https://doi.org/10.1016/j.tins.2017.06.003>.
- Castrillon, Gabriel, Samira Epp, Antonia Bose, Laura Fraticelli, André Hechler, Roman Belenya, Andreas Ranft, et al. 2023. "An Energy Costly Architecture of Neuromodulators for Human Brain Evolution and Cognition." *Science Advances* 9 (50): eadi7632. <https://doi.org/10.1126/sciadv.adi7632>.
- Charvet, Christine J, and Barbara L Finlay. 2012. "Chapter 4 - Embracing Covariation in Brain Evolution: Large Brains, Extended Development, and Flexible Primate Social Systems." In *Progress in Brain Research*, edited by Michel A Hofman and Dean Falk, 195:71–87. Elsevier. <https://doi.org/10.1016/B978-0-444-53860-4.00004-0>.
- Churchland, P S, and T J Sejnowski. 1988. "Perspectives on Cognitive Neuroscience." *Science* 242 (4879): 741–45. <https://www.ncbi.nlm.nih.gov/pubmed/3055294>.
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- Cohen, Michael X. 2017. "Where Does EEG Come from and What Does It Mean?" *Trends in Neurosciences* 40 (4): 208–18. <https://doi.org/10.1016/j.tins.2017.02.004>.
- Distéfano-Gagné, Félix, Sara Bitarafan, Steve Lacroix, and David Gosselin. 2023. "Roles and Regulation of Microglia Activity in Multiple Sclerosis: Insights from Animal Models." *Nature Reviews. Neuroscience* 24 (7): 397–415. <https://doi.org/10.1038/s41583-023-00709-6>.
- Favela, Luis H. 2020. "Cognitive Science as Complexity Science." *Wiley Interdisciplinary Reviews. Cognitive Science* 11 (4): e1525. <https://doi.org/10.1002/wcs.1525>.
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- Koch, Christof, Karel Svoboda, Amy Bernard, Michele A Basso, Anne K Churchland, Adrienne L Fairhall, Peter A Groblewski, et al. 2022. "Next-Generation Brain Observatories." *Neuron* 110 (22): 3661–66. <https://doi.org/10.1016/j.neuron.2022.09.033>.
- Krakauer, John W, Asif A Ghazanfar, Alex Gomez-Marin, Malcolm A MacIver, and David Poeppel. 2017. "Neuroscience Needs Behavior: Correcting a Reductionist Bias." *Neuron* 93 (3): 480–90. <https://doi.org/10.1016/j.neuron.2016.12.041>.

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- Sarkar, Amar, Soili M Lehto, Siobhán Harty, Timothy G Dinan, John F Cryan, and Philip W J Burnet. 2016. “Psychobiotics and the Manipulation of Bacteria–Gut–Brain Signals.” *Trends in Neurosciences* 39 (11): 763–81. <https://doi.org/10.1016/j.tins.2016.09.002>.
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