Neuropsychology/Neuroscience Concentration in Psychology
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Undergraduates are fascinated by neuroscience, as the nervous system is central to everyone’s perceptual, cognitive and behavioral experience. As we develop more sophisticated functional and structural techniques for understanding the brain, psychologists need to grasp the biology that underlies our psychology, and its implications for the broader community. Local institutional partners receive millions of dollars in federal funding for neuroscience research, offering opportunities for undergraduates to pursue graduate and post-graduate studies related to drugs, anxiety, depression, sleep, bias, autism, multiple sclerosis, Parkinson’s disease, Alzheimer’s disease, adolescent brain development and other topics of critical interest. Two regional U.S. Congressional representatives, Democrat Earl Blumenauer (OR) and Republican Cathy McMorris-Rogers (WA), co-chair the House Neuroscience caucus, and Representative Blumenauer has referred to the Pacific Northwest as a “neuroscience powerhouse.” Communicating how the brain generates behavior is also essential to building understanding and support for further research and education. A third local representative, Suzanne Bonamici (OR), is the Democratic co-Chair of the House Science, Technology, Engineering, Arts & Mathematics (STEAM) caucus. The need for undergraduate training in neuroscience and innovative, arts-integrated teaching and community engagement is clear.

I developed and have taught neuroscience courses at Portland State University consistently since 2000, when I began to offer classes in Speech & Hearing Sciences, University Studies, and Psychology. In 2011, I was invited by Sherwin Davidson, then Chair of the Psychology Department, to help develop an undergraduate concentration for Psychology in Neuropsychology/Neuroscience. Over the next 7 years, I worked with Sherwin and other instructors to develop the concentration that currently exists, consisting of 11 courses in Psychology and 10 from other disciplines (https://www.pdx.edu/psy/pathways-through-psychology#Neuropsychology/Neuroscience%20Concentration). I now teach or co-teach 7 of the these courses for the concentration.

Sequenced coursework. The concentration is built on one of the two introductory courses in psychology, namely, Psychology as Natural Science (PSY 200), which provides a foundation for the courses to follow. These include the core Introduction to Neurophysiological Psychology course (PSY 451), which focuses on regionally relevant research and techniques pioneered at OHSU, including rsfc-MRI and DTI. I created the Advanced Neurophysiological Psychology course (PSY 410), which directly integrates graduate students from OHSU to inform and educate our undergraduates (and myself) about current, federally funded research. Courses are designed to highlight community connections, and opportunities to learn about and engage with local resources. Perception (PSY 347), for example, is co-taught by artist and University Studies adjunct instructor Jeff Leake, and involves visits to the permanent collection at the Portland Art Museum, while Psychopharmacology (PSY 410) incorporates a visit from Bret King, the Multnomah County Sheriff’s Deputy who developed the “Faces of Meth” program.
My teaching is based on “applied neuroscience;” that is, how students can better understand the biological basis of perception, cognition, behavior and development, as well as gain useful implicit skills by engaging directly with community organizations, K-12 classrooms, research laboratories, artists, policy makers and the public at large. This approach also introduces undergraduates to diverse educational and career options, and offers actionable knowledge and insight into how their own strengths in psychology and neuroscience teaching, research, policy and the arts might contribute to a greater understanding of the brain and behavior, and to a better world. Students in these undergraduate courses routinely participate in outreach through a nonprofit I co-founded with Jeff known as nwnoggin.org. Students also engage with their community through a Psychology course I developed called Neuroscience Outreach: The Brain in Real Life (PSY 410). Jeff Leake and I also created a new three course Freshman Inquiry (FRINQ) sequence on the Science of Creativity and Learning for the University Studies department. We piloted these courses in spring 2018, and they’ve been approved for the upcoming 2018-19 academic year.

Course Descriptions

**Psychology as Natural Science** (PSY 200): One of two introductory psychology courses at PSU. Developed the “master class” resources (slides, syllabus, etc.) for this course in 2016. Course covers the scientific foundations of human behavior on the “natural sciences” side of Psychology, in areas such as physiological and biological psychology, cognitive, ethical, and emotional development, sensation and perception, learning, consciousness, and memory. This course also focuses on experimental design and teaches students how to critically evaluate psychological research. This course acts as a gateway for many students into the Neuroscience concentration, awakening their interest in the biological underpinnings of psychological processes.

**Introduction to Physiological Psychology** (PSY 451): The study of the nervous system and how it underlies behavior. This course introduces students to the structure and function of the nervous system, methods used to study the brain and behavior, and specific cognitive functions (attention, memory, language) that are currently under study.

**Advanced Neurophysiological Psychology** (PSY 410): This course teaches students to gather, evaluate and present scientific information, and aims to promote better understanding of the nervous system through discussion and presentation of current topics in neuroscience, a visit to the Oregon National Primate Research Center, and exposure to graduate students directly involved in original research. Organized and coordinated (2011-2018) with OHSU Behavioral Neuroscience to integrate graduate students into Advanced course.

**Perception** (PSY 347): This course, co-taught with an artist, covers biological mechanisms that underlie sensory detection of specific categories of stimuli (visual, auditory, chemical, mechanical, and so on), and CNS networks involved in perceptual discrimination, interpretation, and complex cognitive responses. We look at how these critical, adaptive networks develop, and how they are influenced by drugs and decay. Through visits to the Portland Art Museum and opportunities for students to create objects that help them reflect on and explore concepts, we learn how artists have approached, understood and integrated aspects of sensory detection and
perception into often extraordinary works that compel, move, and inspire.

**Psychopharmacology (PSY 410):** Neuropsychopharmacology is the study of how drugs affect the nervous system, and how drug actions alter physiology and behavior. This course introduces students to the structure and function of the nervous system, techniques used to study drug actions and effects, treatment strategies, law enforcement approaches, and the specific molecular and behavioral influence of alcohol and other drugs (including opioids, cocaine, methamphetamine, nicotine, caffeine, cannabinoids and hallucinogens).

**Cognitive Neuroscience of Memory (PSY 410):** Memory is inherent in the structure of our neural networks, and depends on changes in how neurons communicate. This course explores various forms of memory, and their reliance on distinct networks in the brain. We investigate memory disorders, including amnesia, PTSD and drug addiction, and memory consequences of stroke, trauma, alcoholism and Alzheimer’s disease.

**Neuroscience Outreach: The Brain in Real Life (PSY 410):** A practicum course designed to get students out of their undergraduate classrooms, and into the local community, along with other undergraduates and graduates from Portland State University, WSU Vancouver, Oregon Health & Science University, and the Pacific Northwest College of Art. Students collaborate and prepare three week courses on the brain and behavior for K-12 students in Portland and Vancouver Public Schools, directly participate in introducing topics in neuroscience, and lead arts-integrated classroom projects and activities.

**Neurology of Speech & Hearing (SPHR 461):** This course teaches students how the nervous system underlies communication, from how neurons communicate with each other to how they form networks that carry out complex behaviors such as hearing and speech/sign. Topics covered include electrical and chemical transmission, the structure and functional divisions of the nervous system, the central auditory system, and brain regions that participate in the production and comprehension of speech and language.

**Science of Creativity and Learning (University Studies Freshman Inquiry (FRINQ)):** Three course sequence. Creativity is one of the most complex and uniquely human behaviors that we exhibit. By exploring the biological drives behind our aesthetic experiences, and by examining physically what happens when we engage in creative activities, we learn a great deal about how we perceive and interact with the world. In this course students examine how vision, touch and other stimuli support perception, explore the history of anatomical study and the depiction of brains and bodies in medical texts and art, the neurobiological mechanisms that generate behavior, and how stimuli affect the nervous system, driving conscious and unconscious responses that lead us to create and learn.