

BYU Neuroscience



Michael D. Brown, Ph.D.

Professor, Physiology and
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As a full-time teaching professor, Dr. Brown focuses on helping students to have an excellent experience in his courses. He does not run a research lab. Dr. Brown's previous research includes the study of axon and dendrite extension during nervous system development and regulation of the cytoskeleton during cell motility and division.



Steven K. Charles, Ph.D.

Associate Professor
Mechanical Engineering
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As a biomedical engineer, Dr. Charles investigates how humans control their movements, what goes wrong in movement disorders, and how to use technology to evaluate, assist, or rehabilitate patients with movement disorders. His research draws on knowledge and practices from biomechanics, neuroscience, robotics, and rehabilitation.



Derin Cobia, Ph.D.

Assistant Professor
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Dr. Cobia's laboratory is focused on the implementation of computational anatomy tools to study neuropsychiatric diseases, particularly schizophrenia. His interests are in the clinical and biological heterogeneity that exists in schizophrenia by taking a cognitive neuroscience perspective. His work has involved linking cognitive and neurobiological characteristics to important clinical dimensions (e.g., negative symptoms) of the illness. Dr. Cobia also conducts research in a rare language-based dementia known as Primary Progressive Aphasia.



Jeffrey Edwards, Ph.D.

Professor, Physiology and
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Dr. Edwards' lab studies the mechanisms mediating learning and memory as well as Reward/Addiction pathways. Using electrophysiology, pharmacology and molecular biology techniques the lab studies synaptic plasticity, the cellular mechanism allowing our brains to learn and adapt. We study synaptic plasticity in the hippocampus, the region involved in learning and memory and the ventral tegmental area, the reward region of the brain. The goal is to understand normal brain function and as a result apply this to abnormal states such as epilepsy and Alzheimer's in the hippocampus and addiction in the ventral tegmental area.



Shawn Gale, Ph.D.

Associate Professor
Psychology
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Dr. Gale's research mainly focuses on neurologic populations including traumatic brain injury, epilepsy, stroke, and carbon monoxide poisoning, with an emphasis on the utilization of neuroimaging techniques and their correlation with cognition.



Dawson Hedges, M.D.

Professor
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In his cognitive epidemiology research, Dr. Hedges investigates factors that contribute to neurodegenerative diseases and neuropsychiatric outcomes with a particular focus on -the effects of chronic infection and inflammation.



J. Dee Higley, Ph.D.

Professor

Psychology

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Dr. Higley's research is focused on individual differences in developmental outcomes and psychopathology and focuses on the importance of parental and other environmental influences and genetic influences on the developing brain and its behavioral correlates. His research assesses the role of these factors on addiction, adding new perspectives on how genetic and environmental influences interact to produce behavioral outcomes. Research from his laboratory shows that traits such as impulse control, aggressiveness, and sociality competence are mediated by CNS serotonin functioning and that psychopathological behaviors such as severe impulsivity and alcohol abuse are found in subjects with impaired central serotonin activity. A second line of research studies the effect of gene X environment interactions. This re-search shows that psychopathological outcomes are a result of early parental treatment (or the lack thereof) which is modulated by genetic background.



Julianne Holt-Lunstad, Ph.D.

Professor

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Dr. Holt-Lunstad's research examines the association between our social relationships and physical health and longevity, the pathways (e.g., cardiovascular, neuroendocrine, genetic, metabolic, immune, and neural) by which this association occurs, potential moderating factors, and how relationships may be applied in interventions aimed at improving health and reducing risk. Her work is interdisciplinary and takes a multilevel approach—utilizing diverse methods (self-report, biological, and behavioral data) and concepts.



Ramona O. Hopkins, Ph.D.

Professor, Psychology

Neuroscience Director

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Dr. Hopkins' research focuses on brain-behavior relationships. One area of research examines the effect of critical illness on cognitive and psychological function (i.e., anxiety, depression, and posttraumatic stress disorder) and the relationship between cognitive function and brain imaging. Another area of research assesses whether interventions such as physical or cognitive rehabilitation can improve cognitive function following critical illness. A third area of research focuses on memory and how memory is affected following brain injury.



Daniel Kay, Ph.D.

Assistant Professor

Psychology

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Dr. Kay is interested in understanding the mechanisms and functions of sleep. He investigates sleep disturbances in relation to transdiagnostic features of psychiatric disorders across units of analysis, from genes and circuits to self-report and behavior. His sleep research laboratory is currently conducting two major projects that will help answer how sleep can be used to prevent and treat psychiatric disorders such as depression.



Brock Kirwan, Ph.D.

Associate Professor

Psychology

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Dr. Kirwan is interested in how the brain forms and retains long-term declarative memories and how we use those memories to guide future actions. He uses functional MRI (fMRI), event-related potentials, and behavioral testing techniques in his research. More information about the Kirwan lab can be found at kirwanlab.org.



Michael J. Larson, Ph.D.

Professor
Psychology
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Utilizing a convergence of information from neuropsychology and cognitive neuroscience methodologies to examine the mechanisms of cognitive dysfunction following traumatic brain injury (TBI). Event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI) to show brain-based changes in how people monitor and manage their environment following head injury. Motivation, negative affect, and psychopathology (e.g., obsessive-compulsive disorder [OCD] and depression) in influencing cognitive control processes and concomitant brain activity.



Rebecca A. Lundwall, Ph.D.

Assistant Professor
Psychology
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Dr. Lundwall's research focuses on tracking developmental changes in cognitive abilities, such as attention, and investigating how these changes impact behavior, including academic success, the development of social problem-solving, and other functional skills. She has conducted studies of genetic influences on reflexive attention (attention to suddenly appearing stimuli), but is also interested in developmental changes with autism and following a concussion. She is hopeful that the research will eventually lead to more effective interventions that prevent or minimize developmental problems with cognition.



Steven Luke, Ph.D.

Associate Professor
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The major focus of Dr. Luke's research is reading, which is a complex activity that involves many different processes, most notably language and vision. He also studies other aspects of language, such as language development and word and sentence comprehension, as well as other visual tasks, such as scene perception and visual search. Many different groups participate in my studies, including children and adolescents, second language learners, and individuals from various clinical populations. His research primarily uses eye-tracking technology, although he also uses MRI and EEG to study how the brain understands and integrates visual and language information during reading and other tasks.



Rebekka Matheson, M.D.

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Psychology
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As a full-time teaching professor, Dr. Matheson does not run a research lab. Dr. Matheson is a graduate of the University of Rochester School of Medicine, where she took additional graduate coursework in the neurosciences. Her clinical interests included neurology, psychiatry, and addiction medicine. Her previous research interests include the neurophysiology and neuroanatomy of reward circuitry with application to deep-brain stimulation for psychiatric disease. Now she is interested in studying ways to facilitate the transition from undergraduate STEM programs to graduate and professional programs.



David McPherson, Ph.D.

Professor

Communication Disorders

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Dr. McPherson's research is in the area of electrophysiology of language, brain function, and auditory development. His lab is looking at the plasticity of the speech perception and language areas of the brain and their ability to process linguistic information in both normal and disordered individuals (i.e., speech and language disorders). As part of these studies, Dr. McPherson's lab studies electrophysiological correlates of psychoacoustic function. The laboratory is well equipped to study all areas of sensory function.



Tricia Merkley, Ph.D.

Assistant Professor

Psychology

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Dr. Merkley's research focuses on neuroimage analysis and neuropsychological assessment to investigate brain changes following traumatic brain injury and how they relate to neurobehavioral functioning during recovery. These studies consider effects of TBI in both pediatric and adult populations, with the recognition that traumatic brain injury can adversely affect future brain development in childhood, in addition to impacting cognitive abilities that were previously developed.



Jared Nielsen, Ph.D.

Assistant Professor

Psychology

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In the Nielsen Brain and Behavior Lab, they are interested in answering questions about the organization of the brain and how neurological and psychiatric illnesses disrupt its organization. To answer these questions, they use a variety of analytical techniques to extract quantitative information from MRI scans.



Chris L. Porter, Ph.D.

Associate Professor

School of Family Life

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Dr. Porter's research interests include the socialization of behavioral and psychophysiological components of young children's individual characteristics (temperament, emotionality) with particular interest on linkages to individual differences in emerging neural control on children's heart rate variability (i.e., cardiac vagal tone). Additional interests include familial and individual factors influencing the formation of early childhood attachment systems and familial and individual factors influencing the transition to parenting and the emergence of parenting belief systems (self-efficacy).



Mickle South, Ph.D.

Professor

Psychology

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Dr. South's lab studies the contributions of the limbic system to the development of symptoms of autism spectrum conditions. He and his team are interested in the overlap between anxiety and autism using experiments designed to activate the amygdala, orbitofrontal cortex, and the anterior cingulate. His lab is currently involved in studies using a variety of psychophysiological measurements and EEG along with functional MRI.



Michael R. Stark, Ph.D.

Professor, Physiology and
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Dr. Stark's research focuses on early nervous system development in vertebrates. He has been primarily interested in how cells make fate decisions to become a certain cell type in the nervous system. Some of his research has addressed questions related to patterning of the nervous system, neuronal cell determination, and the molecular steps leading to cellular differentiation. More recent projects in the lab have focused on CNS development and neural tube defects in the early embryo that lead to anencephaly and spina bifida.

**Scott C. Steffensen, Ph.D.**

Professor
Psychology

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Research in Dr. Steffensen's lab is devoted to the characterization of neuronal circuits and adaptive neuronal processes involved in drug abuse and natural rewarding behaviors. In animal studies, using electro-physiological, neurochemical, immunohistochemical, microscopic imaging, and behavioral methodologies, we study the role of midbrain GABA neurons in regulating dopamine neurotransmission, which is dysregulated during alcohol dependence. In human studies, using electroencephalographic techniques, we study potential peripheral biomarkers of brain dopamine and treatment strategies to elevate brain dopamine. Dr. Steffensen's goal is to identify what molecular substrates in the midbrain adapt to chronic drug use and to subsequently explore treatment strategies that might reverse drug dependence. This research is currently funded by two NIH grants.

**Sterling Sudweeks, Ph.D.**

Associate Professor,
Physiology and
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Dr. Sudweeks studies neurotransmitter receptors that act as ion channels. These ligand-gated ion channels are involved in synaptic transmission and are implicated in several pathological conditions. They are also the pharmacological targets in many therapeutic situations. These ion channels are expressed in both the central and peripheral nervous systems. Specific receptors for the neurotransmitters gamma-aminobutyric acid (GABA), serotonin (5-HT₃), glycine (GlyR), and acetylcholine (nAChRs) are all members of the ligand-gated ion channel superfamily.

**Arminda Suli, Ph.D.**

Assistant Professor, Physiology
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Dr. Suli's research focuses in understanding the development and formation of neurocircuits at the genetic and molecular level. There are two main projects in the lab: 1. Understanding the formation of synapses in mechanosensory hair cells, the specialized sensory cells that mediate hearing and balance in mammals and are additionally used in fish and amphibians as part of the lateral line sensory system to detect prey and predators. 2. Identification and development of neurons in the midbrain that receive and integrate inputs from multiple sensory systems, such visual, auditory and somatosensory, and which coordinate appropriate motor response to external stimuli.

**Dixon Woodbury, Ph.D.**

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Dr. Woodbury's research is in molecular neuroscience and focuses on membrane biophysics, particularly vesicle/membrane fusion and its regulation by SNARE proteins. SNARE proteins form the molecular motor that drives exocytosis and are the target of tetanus and botulinum toxin. Additional research looks at effects of alcohols and cholesterol on exocytosis. More information about the Woodbury lab can be found at woodburylab.byu.edu.

**Jordan Yorgason, Ph.D.**

Assistant Professor, Physiology
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Jordan Yorgason and colleagues are interested in the neurobiology of motivation for natural and drug rewards. The laboratory uses electrophysiology, electrochemistry, functional microscopy and behavioral techniques to study the effects of opiates on anxiety related brain circuitry. We are also interested in how psychostimulants affect midbrain dopamine circuitry, and how dopamine underlies learned associations for drug seeking behavior. We are continually developing new techniques to study the pathology of addiction.