

BYU Neuroscience



Stefania Ashby, Ph.D.
Assistant Professor
Psychology
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Dr. Ashby is interested in understanding how the brain supports our ability to form generalized semantic memories and how those memories impact decision-making. In particular, she is interested in examining how we process misinformation we frequently encounter online, in personal conversations, and on social media. Her research uses functional MRI (fMRI) and neural pattern analyses to examine how memories for misinformation and retractions are processed and stored in the brain. She also uses behavioral testing to study ways in which we can better process retractions to reduce the impact misinformation has on future decision-making.



Michael D. Brown, Ph.D.
Professor, Cell Biology 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.



Garrett Cardon, Ph.D.
Assistant Professor
Communication Disorders
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Dr. Cardon is a cognitive neuroscientist and audiologist currently working on projects related to atypical sensory processing in autism and other developmental disabilities, as well as cortical plasticity in adults and children with hearing loss. To investigate brain-behavior relationships related to the above, he uses EEG and MRI/fMRI. Dr. Cardon is also investigating how to facilitate empathy between autistic and neurotypical individuals through both scientific and artistic representations of the mind.



Steven K. Charles, Ph.D.
Associate Professor
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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

Psychology

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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.



Jeffrey Edwards, Ph.D.

Professor, Cell Biology and
Physiology

Neuroscience Director

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Dr. Edward's lab studies the mechanisms mediating learning and memory as well as Reward/Addiction pathways. Using electrophysiology, pharmacology molecular biology, optogenetics and behavioral 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

Associate Director of

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Dr. Gale investigates the effects of infectious disease on neurocognitive and neuropsychiatric function. More broadly, he also studies neuroepidemiology including novel determinants associated with brain-behavior relationships.



Dawson Hedges, M.D.

Professor

Department of Psychology

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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.



Ramona O. Hopkins, Ph.D.

Professor, Psychology

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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 post-traumatic 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.



Julianne Holt-Lunstad, Ph.D.

Professor
Psychology

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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.



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.

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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Dr. Larson's research utilizes a convergence of information from neuropsychology and cognitive neuroscience methodologies to examine the mechanisms of cognitive control in healthy individuals and cognitive dysfunction following traumatic brain injury (TBI). He uses 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. He also studies how exercise influences cognitive functioning, the role of inhibitory control in food and diet behaviors, and the role of psychopathology (e.g., obsessive-compulsive disorder [OCD] and depression) in influencing cognitive control processes and concomitant brain activity.



Rebecca A. Lundwall, Ph.D.

Associate 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
Psychology

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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.



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.



Rebekka Matheson, M.D.

Assistant Professor
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.



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.



Ryley Parrish, Ph.D.
Assistant Professor
Cell Biology
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The Parrish lab is addressing key questions related to epilepsy and seizure disorders. We are particularly interested in mechanisms of endogenous inhibitory restraint and spontaneous seizure termination. We also seek to understand the role of a cellular event known as a cortical spreading depression in seizure termination, a phenomenon which is also associated with migraines. Finally, the lab is working to understand the mechanisms of prolonged seizure activity, known as status epilepticus, which is often pharmacoresistant. The lab uses electrophysiology, optogenetics, live network imaging, and computer programming to address our biological questions.



Chris L. Porter, Ph.D.
Associate Professor
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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).



Perry Ridge Ph.D.
Associate Professor
Biology
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Dr. Ridge's laboratory focuses on the genetics of Alzheimer's disease and developing computational methods/algorithms to interpret data mined from complex genomic datasets. Dr. Ridge's current research areas include:

- Studying the relationship of the mitochondrial genome to Alzheimer's disease.
- Performing family-based studies to identify rare genetic risk factors for disease
- Determining the functional effects of synonymous mutations in known Alzheimer's disease genes
- Developing algorithms to predict the translational effects of genomic variants and to perform haplotype-based association studies.

Finally, Dr. Ridge is part of the recently funded Natives Engaged in Alzheimer's Research grant—a large collaboration of several academic institutions to build a cohort of American Indians, Alaskan Natives, Native Hawaiians, and Pacific Islanders. Dr. Ridge is co-director of the bio specimen repository and his laboratory will lead genetic analyses of the cohort.



Michael R. Stark, Ph.D.
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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.



Trace Stay

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Dr. Stay's lab is focused on studying how sensory signals are represented and transformed into motor outputs in neural circuits. This provides both an opportunity to carefully delineate healthy function in specific sensory systems as well as describing principles of adaptation that could apply across multiple circuits. We focus on the vestibulo-ocular reflex for its high plasticity and circumscribed anatomical circuit. Using in vivo electrophysiology, optogenetics, and behavioral assays, we seek to understand 1) how vestibular and visual signals are combined and transformed through the cerebellum and brainstem, and 2) what external factors influence long-term retention of learned changes in motor skill memory. Ultimately this research could potentially help develop treatments for individuals with vestibular deficits (e.g. a vestibular implant), and provide insight into neural mechanisms underlying behavioral learning. Undergraduate researchers at any level of experience are encouraged to contact Dr. Stay to express interest.



Sterling Sudweeks, Ph.D.

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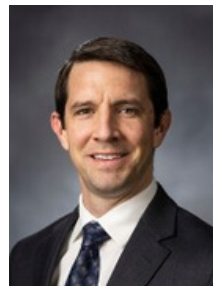
Dr. Sudweeks studies neurotransmitter receptors that act as ion channels. These ligand-gated ion channels are involved in synaptic transmission and are implicated in several pathological conditions. They are also the pharmacological targets in many therapeutic situations. These ion channels are expressed 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.

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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.



Seth Taylor

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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.

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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.