BYU Neuroscience



Stefania Ashby, Ph.D. Assistant Professor, Psychology **1024 KMBL, 801-422-4888**

Dr. Ashby is interested in understanding how the brain supports our ability to form generalized semantic memories and how those memories impact decisionmaking. 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 decisionmaking.



Garrett Cardon, Ph.D. Assistant Professor, Communication Disorders 130 TLRB, 801-422-5994

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.



Michael D. Brown, Ph.D. Professor, Cell Biology and Physiology 2029 LSB, 801-422-5859 michael_brownebyu.edu

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 350J EB, 801-422-7369 skcharles@byu.edu

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 1036 KMBL, 801-422-9497 derin_cobia@byu.edu

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.



Shawn Gale, Ph.D. Associate Professor, Psychology Associate Director of Neuroscience 1126 KMBL, 801-422-9757 shawn_gale@byu.edu

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.



Jeffrey Edwards, Ph.D. Professor, Cell Biology and Physiology Neuroscience Director 3046 LSB, 801-422-8080 jeffrey_edwardsebyu.edu

By combining electrophysiology with pharmacology, molecular biology (qPCR), optogenetics, behavioral studies, and immunohistochemistry, Dr. Edwards lab investigates synaptic plasticity—the cellular mechanism that enables our brains to learn and adapt. Our research focuses on synaptic plasticity in two key brain regions: the hippocampus, which plays a central role in learning and memory, and the ventral tegmental area, the brain's reward pathway. The ultimate goal is to understand normal brain function and apply this knowledge to abnormal conditions, such as stress, PTSD, and Alzheimer's disease in the hippocampus, as well as the effects of drug exposure (e.g., psychedelics, morphine, THC, and polysubstance use) on the ventral tegmental area.



Dawson Hedges, M.D. Professor, Department of Psychology 1072 KMBL, 801-422-6357 dawson_hedges@byu.edu

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.



Julianne Holt-Lunstad, Ph.D. Professor, Psychology 1024 KMBL, 801-422-1324 julianne.holt-lunstad@byu.edu

Dr. Holt-Lunstad's research examines the association between our social relationships and physical health and pathways cardiovascular, longevity, the (e.q., 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 diverse approach-utilizing methods (self-report, biological, and behavioral data) and concepts.



Daniel Kay, Ph.D. Assistant Professor, Psychology 1090 KMBL, 801-422-7949 daniel_kay@byu.edu

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.



Steven Luke, Ph.D. Associate Professor, Psychology 1062 KMBL 801-422-5978 steven_luke@byu.edu

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.



Michael J. Larson, Ph.D. Professor, Psychology 244 TLRB, 801-422-6125 michael_larson@byu.edu

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 1064 KMBL 801-422-5977 rebecca_lundwallebyu.edu

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.



Preston Manwaring, Ph.D. Associate Professor, Electrical and Computer Engineering 450Q EB, 801-422-7092 preston_manwaring@byu.edu

Dr. Manwaring is a professor of computer engineering and neuroscience. He recently left the MedTech industry to research novel physiological sensors, medical devices for low- and middle-income countries, and neuro-monitoring and -modulation. His current projects include a contactless fetal heart monitor, a radio-frequency neuromodulation and monitoring device, a whole-body vibration platform and monitoring system to study attention and focus, a whole-body vibration treatment platform for eating disorder investigations, and a tilt-table device to study brain hemodynamics.



Rebekka Matheson, M.D. Assistant Professor, Psychology 1030 KMBL, 801-422-2954 rebekka_matheson@byu.edu

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.



Eric Melonakos, Ph.D. Assistant Professor, Cell Biology and Physiology 3017 LSB, 801-422-8541 eric.melonakos@byu.edu

The Melonakos Lab is interested in how neural activity gives rise to consciousness. General anesthesia and sleep are two states defined by a reversible loss of consciousness, making them useful tools for studying which neural features are necessary to generate the conscious state. Synchronous neural activity is a hallmark of general anesthesia and sleep. However, the mechanisms and functions of synchronous neural activity under these and other states remain incompletely understood. The lab uses modern neuroscience techniques, such as in vivo calcium imaging, optogenetics, electrophysiology, and computational tools, to investigate the origins and functions of synchronous neural activity in rodent models.



Tricia Merkley, Ph.D. Assistant Professor, Psychology 293 TLRB, 801-422-7658 tricia_merkley@byu.edu

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 1070 KMBL, 801-422-5294 jarednielsen@byu.edu

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 3051 LSB, 801-422-6399 ryley_parrish@byu.edu

The Parrish lab is addressing key questions related to epilepsy and seizure disorders. We are particularly interested in mechanisms of endogenous inhibitory Dr. Ridge's laboratory focuses on the genetics of restraint and spontaneous seizure termination. We also Alzheimer's 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, School of Family Life 2102B JFSB, 801-422-5806 chris porterebyu.edu

Dr. Porter's research interests include the socialization of behavioral and psychophysiolog-ical 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 4102 LSB, 801-422-7564 perry.ridge@byu.edu

disease and developing computational seek to understand the role of a cellular event known as a 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. Professor, Cell Biology and Physiology 4005B LSB, 801-422-9498 michael starkebyu.edu

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 These ion channels are expressed in both the central and 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.



Sterling Sudweeks, Ph.D. Associate Professor, Cell Biology and Physiology 3045 LSB, 801-422-8752 sterling_sudweeks@byu.edu

Dr. Stark's research focuses on early nervous system 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. 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.



Trace Stay Assistant Professor, Psychology 1050 KMBL, 801-422-9118 stayebyu.edu

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. Usina 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.



Arminda Suli, Ph.D. Associate Professor, Cell Biology and Physiology 3048 LSB, 801-422-2646 asuli@byu.edu

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, Ph.D. Assistant Professor, Cell Biology and Physiology 2027 LSB, 801-422-0246 seth_taylor@byu.edu

Dr. Taylor researches the molecules involved in guiding the formation of proper connections between cells in the nervous system. He uses a combination of molecular biology, genetics, microscopy and RNA sequencing to understand these developmental events and processes. His research specialties include: Confocal Microscopy, Single-cell RNA Sequencing, and Cellular Neuroscience.



Jordan Yorgason, Ph.D. Assistant Professor, Cell Biology and Physiology 2028 LSB, 801-422-2402 jordanyorg@byu.edu

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.



Dixon Woodbury, Ph.D. Professor, Cell Biology and Physiology **3066 LSB, 801-422-7562** dixon_woodbury@byu.edu

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.