

### Michal Ben-Shachar

Speech production and visual word recognition both rely on long range white matter pathways which connect distant brain regions engaged in processing different aspects of linguistic information. We use diffusion MRI to quantify structural properties of white matter pathways in children and adults who have had typical or atypical development of speech production or reading. We use targeted behavioral measures in the same individuals to identify structure-function relationships. I will present recent data from our studies of reading development in full term and preterm born children, as well as new results from our ongoing studies of white matter pathways in adults who stutter. We will discuss the contribution of these findings to our understanding of plasticity and change in the extended language system during typical and atypical development.

### Jane Roberts

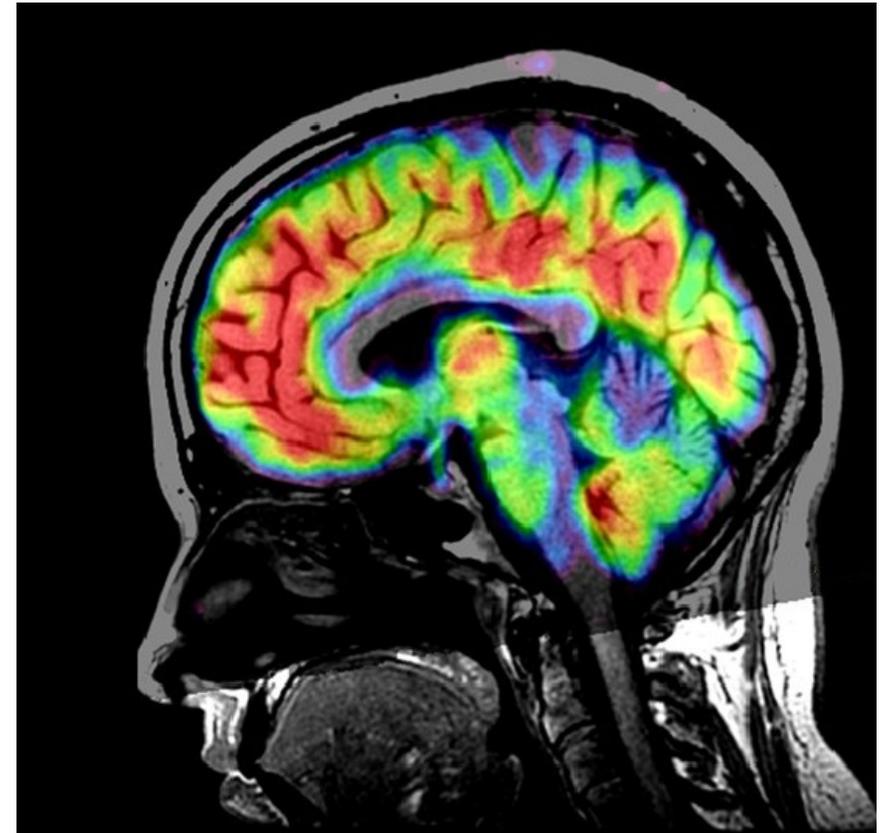
Fragile X syndrome is a single gene disorder associated with reduced protein expression (FMRP) and a fairly well defined phenotype. Fragile X is the leading heritable cause of intellectual disabilities and autism spectrum disorder. As such, it provides an excellent model for examining cognitive profiles within a constrained single gene disorder. Reading difficulties have been a hallmark feature of fragile X syndrome. However, there is variability in the level of literacy attainment, and very little research has examined the cognitive or genetic processes involved. I will present findings from a series of studies from our group aimed at increased understanding of multiple facets of reading including phonological awareness and potential mechanistic factors of protein expression, autism severity and intellectual ability, looking at growth trajectories.



College of Arts & Sciences  
Institute for **Mind & Brain**

### Institute for Mind and Brain

The Institute for Mind and Brain was founded in January of 2013 with the mission to help coordinate interdisciplinary research efforts in cognitive neuroscience across the University of South Carolina; identify and leverage opportunities for collaboration and external funding; present a cohesive face for research efforts in cognitive neuroscience; and generally serve as a hub for research and doctoral student training in human cognitive neuroscience at the University of South Carolina. The Institute is pleased to host the 2015 Conference on Neural Plasticity and Learning, which is planned to be the first of a series of annual conferences on topics within cognitive neuroscience.



The University of South Carolina  
Institute for Mind and Brain  
2015 Conference on  
Neural Plasticity and Learning  
October 23, 2015

## Program

- 7:45 Breakfast
- 8:45 *Welcome, **Doug Wedell, Director, Institute for Mind and Brain***
- 9:00 *Implicit learning: Cognitive consequences of human neuroplasticity. **Paul Reber, Northwestern University***
- 10:00 *The long and the short of it: Plasticity in semantic memory. **Rutvik Desai, University of South Carolina***
- 10:30 Break
- 11:00 *Transcranial direct current stimulation to improve behaviour and brain functions in health and disease. **Marcus Meinzer, University of Queensland, Australia***
- 12:00 *Functional and structural brain changes associated with brain damage. **Julius Fridriksson, University of South Carolina***
- 12:30 Lunch Break and Poster Session
- 2:00 *The development of white matter pathways that support reading and speech: Insights from diffusion MRI studies in typical and atypical populations. **Michal Ben-Shachar, Bar-Ilan University, Israel***
- 3:00 *Reading in clinical populations: Fragile X syndrome and autism. **Jane Roberts, University of South Carolina***
- 3:30 Break
- 4:00 *Plasticity of the auditory-motor system in health and disease. **Gottfried Schlaug, Beth Israel Deaconess Medical Center and Harvard Medical School***
- 5:00 *Forum Discussion moderated by **Chris Rorden, University of South Carolina***
- 6:00 Adjournment

## POSTERS

Posters will be up throughout the day. Poster presenters should be by their posters from 1:00-2:00 to answer questions. Details on posters can be found on program insert.

## ABSTRACTS FOR TALKS

### Paul Reber

The memory systems of the brain include explicit, conscious memory and a separate type of implicit learning from experience that occurs without awareness of the content learned. These two different types of memory depend on different neural mechanisms, but both contribute to our ability to learn complex cognitive abilities. The relatively less studied mechanisms of implicit learning reflect the automatic, non-conscious extraction of statistical regularities from the environment and from behavior. These processes contribute to a wide variety of learning phenomena, including skills, habits, intuition, language acquisition, and cognitive rehabilitation. The neural basis of implicit learning is hypothesized to depend on pervasive, inherent neuroplasticity throughout the brain that adaptively reshapes neural processing. A broad model of human memory systems will be presented together with examples of the consequences of this learning process with implications of this model for understanding learning in complex, real-world contexts.

### Rutvik Desai

Semantic memory is used pervasively in everyday life. I will discuss the idea that on a long term evolutionary scale, semantic memory is built through plastic use of systems originally dedicated for sensory and motor functions. Existing sensory and motor systems are exploited to ground lexical concepts. Plasticity and flexibility of semantic memory continues to exist at a short millisecond scale. I will discuss experiments that show how activation of conceptual content and the nature of its grounding changes in the face of immediate task demands and stimulus characteristics. These data underscore the flexible and interactive nature of memory systems and brain organization in general.

### Marcus Meinzer

Transcranial direct current stimulation (tDCS) is a non-invasive brain stimulation technique during which weak electrical currents are administered to the scalp to modulate human brain function. I will review recent studies of our group that have successfully used tDCS to (1) induce short- and long-term behavioural improvement in healthy young and older individuals and patients with different medical conditions (2) and addressed the neural underpinnings of those improvements using functional magnetic resonance imaging.

### Julius Fridriksson

Neuropsychology was founded on the premise that localized brain damage could reveal something about the function of the damaged regions. Many foundational studies were based on this premise. For example, the cases of Mr. Leborgne (studied by Paul Broca) and H.M. (studied by Brenda Milner et al.) provided some initial insights into the cortical location of speech processing and memory, respectively. Although a strong relationship has been revealed between certain behavioral impairments and localized brain damage (e.g. in stroke), recent studies suggest structure and function are significantly altered in brain regions not directly included in the frank lesion. I will discuss some of our data that shed light on the relationship between cortical damage and altered structure and function in both proximal and distal cortical regions with primary emphasis on impaired language processing in persons with aphasia.