

43rd Annual Winter Conference on the Neurobiology of Learning and Memory

January 3-6th, 2019 in Park City, UT



Program at a Glance:

Thursday January 3

- 3:00 - 4:00 p.m. *Registration, outside Prospector 1-2*
- 4:00 - 6:00 p.m. **Dave Olton Data Blitz**, Hoffman & Allen
- 6:30 - 8:00 p.m. *Pizza Party*, Atrium
- 8:00 - 10:00 p.m. **Schemas: Memory Interactions**, Tran and Bakker

Friday January 4

- 7:45 - 8:00 a.m. *Breakfast*
- 8:00 - 9:30 a.m. **Memory Enhancement**, Stark (*Yay, a morning session!*)
- 4:00 - 6:00 p.m. **Systems Genetics in Learning and Memory**, Kaczorowski
- 8:00 - 10:00 p.m. **How the Amygdala Modulates Memory Consolidation**, Inman

Saturday, January 5

- 12:30 - 3:00 p.m. *"The High West Distillery Tour"* (tour begins at 1p, please meet in Marriott lobby at 12:30p or at 12:55p at the High West Saloon in downtown Park City; <https://www.highwest.com/tours.php>; kari.hoffman@vanderbilt.edu)
Plan is for lunch after tour
*still room on tour as of Jan. 3, 10pm
- 4:00 - 6:00 p.m. **Developmental Neurobiology of Learning & Memory**, Stanton & Bucci
- 8:00 - 10:00 p.m. **Spatial Memory and Head Direction**, Clark

Sunday, January 6

- 11:30 a - 2:30 p.m. *Bowling @ Jupiter Bowl* (kids welcome!; <http://jupiterbowl.com/>; organized by Leila Allen lallen@fiu.edu and Manuella Yassa manuella.yassa@uci.edu)
- 4:00 - 6:00 p.m. **Memory and Decision Making**, Mattfeld
- 7:30 - 11:00 p.m. *Banquet*

Thursday January 3th, 2019

Registration 3:00 -4:00 p.m. (Just outside Prospector 1-2)

Session 1 – Dave Olton Data Blitz

Time: 4:00 to 6:00 p.m.

Location: TBA

Description: If you would like to present in the session, please email Kari Hoffman (kari.hoffman@vanderbilt.edu) or Tim Allen (tallen@fiu.edu) with the title of your presentation. Presentations are limited to 5 minutes including discussion. Presentations are limited to 1 slide with a single panel. Please submit the data blitz title by Monday, **November 26** for full consideration for inclusion, after which we will continue accept data blitzes on the basis of availability.

Pizza Party

Time: 6:30 -8:00 p.m. Location: Atrium

Session 2 – Schemas: An opportunity for memory interactions, integration and transformation

Session Chairs: Tammy Tran (Johns Hopkins) and Arnold Bakker (Johns Hopkins)

Time: 8:00 to 10:00pm

Studies of learning and memory often assess the retention of highly constrained experiences adhering to the rigorous experimental control required in the lab. However, as in real-world learning, no experience occurs in isolation and new learning occurs in the context of complex and highly individualized past experiences and representations. How are individual experiences stored in separate representations (memory specificity), and how are individual representations connected across different experiences (memory generalization)? What is the overlap between the current experience and the previous experience and how does this information influence the encoding, storage and retrieval in brain regions involved in memory function? This session will discuss current work in animal models, healthy adults and patients, and focus on how schemas can emerge from individual goal directed experiences and how schemas may be represented at the neuronal and network levels.

Meg Schlichting (University of Toronto)

Integrating related memories in support of flexible behavior

Dasa Zeithamova (University of Oregon)

Specific and generalized memories representing concepts

Sam McKenzie (NYU)

Dynamic lateral inhibition accompanies pattern separation in CA1 and MEC

Asaf Gilboa (Rotman Research Institute at Baycrest)

Neural processes supporting schema instantiation

Friday January 4th, 2018

Session 3 – How much can we really enhance memory?

Session Chair: Craig Stark (UCI)

Time: 8:00 to 9:30 a.m.

*******This is brand new morning session for the meeting, so set the alarm clock!*******

Ever since scientists started studying memory over a century ago, we have been fascinated with the many cognitive and biological factors that have been shown to modulate memory. This includes things like repetition, spacing, attention, encoding strategy, and emotional content. In this session, we will take a new look at the question of memory enhancement, asking "What are some of the the most promising molecular/cellular pathways and broad strategies that have been shown to improve memory overall? This session will span from molecular and cellular network memory enhancement mechanism in animals model systems (Silva) to studies in humans looking at the effects of physical exercise (Suzuki) and environmental enrichment (Stark) on memory performance. Our hope is that by focusing on memory enhancement, we gain new perspective on aspects of the basic mechanisms of memory function in the mammalian brain.

Alcino Silva (UCLA)

Molecular, cellular and network mechanisms of memory enhancement: utility and costs

Doug Oberlin, Suzuki Lab (NYU)

The effects of physical activity on cognition in humans

Craig Stark (UCI)

Human environmental enrichment effect on memory

Session 4 – Systems genetics analyses of learning and memory and the transition to dementia

Session Chair: Catherine Kaczorowski (Jackson Labs)

Time: 4:00 to 6:00pm

Individual differences in cognitive ability in adulthood are highly heritable, and may confer protection against aging-related cognitive decline and other dementias (i.e. cognitive reserve). Thus, a complete understanding of the genetic regulators of cognitive abilities is needed to assess whether these same gene networks and pathways are underlying disease. This session will provide new results from genomics analyses of learning and memory, aging and Alzheimer's disease using state-of-the-art resources that better match genetic variation in the human population.

Kristen O'Connell (Jackson Labs)

The role of hypothalamic dysfunction in aging and Alzheimer's disease

Clarissa Parker (Middlebury College)

Genome-wide analysis for conditioned fear in Diversity Outbred mice

Greg Carter (Jackson Labs)

Modeling the genetics and genomics of late-onset Alzheimer's disease

Catherine Kaczorowski (Jackson Labs)

Session 5 – The brain's save button: How the amygdala modulates memory consolidation

Session Chair: Cory Inman (Emory)

Time: 8:00 to 10:00 pm

The proposed session will revolve around a central question: What are the cognitive and neural mechanisms by which specific memories are prioritized to be 'saved' or consolidated in long-term memory? For example, memories for emotional events tend to persist, whereas neutral events are often forgotten. This prioritization of emotional events is mediated by the amygdala, which modulates memory consolidation processes in the hippocampus and related medial temporal cortices. The proposed session will cover the rich history establishing emotional arousal and the amygdala as a modulator of memory consolidation (McGaugh), recent advances in precisely controlling this memory enhancement process using optogenetic stimulation in rodents (LaLumiere) and direct electrical stimulation in humans (Inman), and the use of emotional arousal to enhance memory consolidation in an applied context, such as the classroom (Nielson). Following the talks, we will have a lively discussion of the next steps in understanding emotion and the amygdala's role in the prioritization of memories. This discussion will span what studies are needed to further uncover the cellular and molecular mechanisms of amygdala-mediated memory enhancement to the application of this knowledge to help patients with memory impairments in real-world settings.

James McGaugh (UCI)

Emotional arousal and amygdala activation modulate memory consolidation

Ryan LaLumiere (Univ. of Iowa)

Optogenetic dissociation of amygdala influences on different kinds of memories

Cory Inman (Emory)

Direct electrical stimulation of the amygdala enhances declarative memory in humans

Kristy Nielson (Marquette)

Arousal-induced modulation of memory: from laboratory to classroom

Saturday January 5th, 2018

Session 6 – Developmental neurobiology of learning and memory

Session Chairs: Mark Stanton (Univ. of Delaware) and David Bucci (Dartmouth)

Time: 4:00 to 6:00 pm

The ontogeny of learning and memory has been extensively studied for over 50 years. Growth of this field has been influenced by the neurobiology of learning and memory, a discipline that has expanded even more dramatically during the same period. But many opportunities for further integration of these two research areas remain to be pursued. This session will address these points with illustrative examples that convey the diversity of learning and memory phenomena, brain systems, and periods of postnatal development, that comprise contemporary research on the developmental neurobiology of learning.

Rick Richardson (UNSW)

What can infantile amnesia tell us about memory and the brain?

John Freeman (Univ. of Iowa)

Neural mechanisms underlying the ontogeny of associative learning

Tom Wills (UCL)

The post-natal development of neural mechanisms for memory consolidation

Maria Alvarado (Emory)

Modeling neurocognitive effects of pediatric anesthetic exposure in nonhuman primates

Session 7 – Spatial memory and the head direction cell system

Session Chair: Ben Clark (UNM)

Time: 8:00 to 10:00pm

Head direction cells are found throughout the rodent limbic system and are often regarded as a neural 'compass' providing a moment-to-moment representation of spatial orientation in an environment. While much is known regarding the sensory basis of the limbic head direction signal, less is known regarding its relationship with spatial learning and memory. Speakers in this session will discuss current progress towards this gap in the literature by describing the network dynamics of the signal, how damage to the head direction cell system impacts spatial learning and memory, how this signal is processed across spatial frames of reference including its relationship with landmark learning and 3D space, and presenting evidence supporting the notion that head direction signals play a role in the generation of cortical-hippocampal representations of spatial location.

Darlene Skinner (Memorial University of Newfoundland)

Directional Heading and Spatial Learning

Adrien Peyrache (McGill)

Thalamo-Cortical Processing of the Head-Direction Signal

Jeffrey Taube (Dartmouth)

Are Head Direction Cell Responses Commutative in 3D - And Why it Matters

Aaron Wilber (Florida State Univ.)

Parietal Cortex Mediated Reference Frame Transformation for Spatial Orientation

Sunday January 6th, 2018

Session 8 – Memory and decision making

Session Chair: Aaron Mattfeld (FIU)

Time: 4:00 to 6:00pm

This session focuses on research from both humans and animal models centered on a core idea in the study of memory and decision-making: past experiences guide behavior. While the neurobiological mechanisms supporting the influence of memory on decision making are studied across numerous labs, and it has been shown that the hippocampus and medial prefrontal cortex play critical roles, much

remains unknown about their impact on action selection. Speakers in this session will provide an overview of current behavioral and neurobiological evidence demonstrating the influence of past experiences on action selection. We will focus our discussion on the mechanisms that support this interaction and the degree to which evidence identified in non-human animal studies can inform research in humans, and vice versa.

Sheri Mizumori (Univ. of Washington)

A role for the lateral habenula in the behavioral implementation of memory and decision systems

Shantanu Jadhav (Brandeis)

Hippocampal-prefrontal interactions underlying memory-guided decisions

Katherine Duncan (Univ. of Toronto)

Hippocampal contributions to configural reinforcement learning in humans

Aaron Mattfeld (FIU)

Hippocampal, striatal, and neocortical contributions to conditional memory-guided behavior

Business Meeting

Time: 6:30-6:30 pm Location: Prospector 1-2

Banquet

Time: 7:30-10:00 pm Location: Prospector 1-2

Social Activities

Tour: Saturday "*The High West Distillery Tour*" (tour begins at 1p, please meet in Marriott lobby at 12:30p or at 12:55p at the High West Saloon in downtown Park City; <https://www.highwest.com/tours.php>; kari.hoffman@vanderbilt.edu)

Plan is for lunch after tour

Dinners

- January 4 – Pizza Party – For registrants or guests at no extra cost
- January 5 – Dinner (hosted dinners and on your own)
- January 6 – Dinner (hosted dinners and on your own)
- January 7 – Banquet – \$40 for registrants and guests

Cash Bar (Timbres)

- Friday, Saturday, Sunday evenings
- 10:00 pm-12:00 am

For Families:

- Jupiter Bowling (<http://jupiterbowl.com/>)
- Tanger Outlets (<http://www.tangeroutlet.com/parkcity>): Shopping
- Ice skating (<http://www.resortcentericerink.com>)
- Alpine Coaster @ Park City (<http://www.parkcitymountain.com/summer/alpine-coaster.aspx>)
- Utah Olympic Park (<https://www.visitparkcity.com/visitors/resorts/utah-olympic-park/>): ski jump, bobsled, ropes course