

# COGNITIVE SCIENCE COLLOQUIUM SERIES

## COGNITIVE SCIENCE COLLOQUIUM

Spring 2025

January 24

**Emily Bray**, Assistant Professor, College of Veterinary Medicine, University of Arizona

TITLE: Deciphering the minds of our canine companions: an in-depth exploration into their cognitive development

ABSTRACT: Better understanding how dogs think is a valuable endeavor: their cognition bears similarities to our own, and it enables them to perform diverse roles in our society, leading to them partnering with humans in more ways than any other animal. In my talk, I will provide an overview of our long-term research into the development of canine cognitive skills. For over a decade, we have been implementing a battery of standardized tasks in over 1,000 individuals from a population of assistance dogs. These tasks are designed to measure cognitive traits, such as impulse control, memory, and interest in humans, as well as temperament traits captured from dogs' initial reactions to and subsequent recoveries from being exposed to novel objects and unexpected events. By testing dogs at different ages, we can begin to determine when skills of interest start to emerge and how they change over development. By testing many of the same dogs at multiple timepoints, we can look at the extent to which puppy behavior predicts adult behavior. And by testing dogs with known pedigrees, we can calculate how much of the variation that we see in any given trait is due to genetics (i.e., the heritability of each trait).

January 31

**Mary Helen Immordino-Yang**, Professor of Education, Psychology & Neuroscience Brain & Creativity Institute; Rossier School of Education, University of Southern California

TITLE: *Transcendence!*: Supporting youths' coordinated neural development of abstract thinking, social emotion, and self-awareness

ABSTRACT: The proclivity to think and feel deeply about complex issues and ideas is a hallmark human achievement—a foundation of global society as well as of personal growth. This achievement rests on capacities for *transcendent thinking*, that is, on one's abilities and dispositions to consider the broader personal, ethical and systems-level implications that transcend situations and pertain to bigger concepts, values and identities. In this talk I will discuss our transdisciplinary, longitudinal studies of transcendent thinking in adolescents, demonstrating its underlying neural dynamics, its power to predict future brain and psychosocial development, and its role in neural resilience. The findings reveal a novel predictor of mid-adolescents' neural development and underscore the active role adolescents play in their own brain development through the meaning they make of the social world. Next, I will share some of our new brain, interview, and classroom observation data from urban public secondary teachers as they teach, grade students' work, provide student feedback, and the like. The findings shed light on the neural correlates of social skill in a highly trained domain-- that of secondary

teaching. For those interested in educational innovation, they also present new ways to think about the emotional and social work involved in skilled teaching, with implications for teacher professional development.

February 7

**Maria Polinsky**, Professor, Linguistic, University of Maryland, College Park

TITLE: Exceptive and exclusive constructions: Syntax and Cross-linguistic distribution

ABSTRACT: (join work with Eric Potsdam and Luisa Seguin) Natural language allows us to express universal statements (e.g., *All dogs bark*), and languages also have means of expressing exceptions to such generalizations, via exceptive constructions (e.g., *All dogs bark except basenjis*). Within the exceptive construction, one recognizes the associate (*all dogs*) and the exceptive phrase (*except basenjis*) which in turn consists of the exceptive marker (*except* in the example above; consider also English *but, other than, save, except for*) and the exception (*basenjis*). Linguistic means of expressing exclusion have received modest attention from philosophers of language and semanticists, whose focus has been primarily on English. Beyond that small body of work, little is known about exceptive constructions across the world's languages: how they are built, what their distribution is within and across languages, and how they compare to other constructions expressing comparison or contrast. In this talk, I present and analyze the landscape of exceptive constructions in several natural languages focusing on the structural contrast between free/connected exceptives and phrasal/clausal exceptives. I will then link this exploration to more general issues of ellipsis and case-marking in exceptive phrases. Time permitting, I will also consider the difference between exceptives and exclusive constructions (as in *Dogs aside, I did not see any mammals in this zoo*). Unlike exceptives, exclusives do not express negative inferences (that something is not part of a generalization) and they are compatible with more associate types than exceptives. Despite conceptual differences, exceptives and exclusives are often encoded by the same marker, and I will address this homophony by considering the Italian marker *eccetto* that can introduce both constructions in some varieties of Italian (Seguin 2024).

February 14

**Stephen Cowen**, Associate Professor, Psychology, University of Arizona

TITLE: Action everywhere all at once: Neural synchronization to movement in the hippocampus, prefrontal cortex, and motor cortex

ABSTRACT: The activities of neurons in brain regions involved in cognition are intricately coupled to movement. How might such coupling support cognition? What happens when coupling is disrupted in aging or Parkinson's disease? How do drugs such as ketamine influence interactions between the brain and body? This talk will explore these questions, drawing on data collected in my laboratory using high-density neuronal recordings from healthy, aged, and parkinsonian rats.

February 21

**Kyрана Tsapkini**, Associate Professor, Neurology, Johns Hopkins School of Medicine

TITLE: Neuromodulation-induced neuroplasticity in primary progressive aphasia:

mechanisms, predictors and challenges

**ABSTRACT:** Primary progressive aphasia (PPA) is a neurodegenerative syndrome characterized predominantly by the gradual impairment of language abilities. In this talk, I will explore the efficacy of combining transcranial direct current stimulation (tDCS) with language therapy to enhance language outcomes but also how we can predict and personalize treatment. I will examine clinical, imaging and life-style predictors or responsiveness to tDCS as well as mechanisms such as functional connectivity and neurotransmitter changes. I will then address what we have learned and what we can learn about neuroplasticity in the context of neurodegeneration and how this knowledge can affect our treatment approaches and especially neuromodulation.

February 28

**Lynn Nadel**, Regents Professor Emeritus, Psychology, University of Arizona

**TITLE:** A Discussion of Current Challenges to American Science - and Some Things You Can Do About It!

March 21 (Cancelled)

**Kia Nobre**, Roger N Shepard Visiting Scholar, Wu Tsai Professor of Psychology, Associate Director and Center Director, Center for Neurocognition and Behavior, Yale University

**TITLE:** Focusing attention on sensory x memory contents to guide behavior

**ABSTRACT:** The ability to anticipate, select, prioritize, and prepare the relevant contents is fundamental to flexible, proactive, and adaptive cognition. Traditionally, these attention functions have been investigated in relation to extracting relevant contents from the incoming sensory stream. Much more recently, the ability to focus attention on contents of internal, memory representations was recognized and garnered experimental interest. Research on “internal attention” reveals fascinating ways in which neural systems and mechanisms differ from those in “external attention”. We are now ready for the next steps. During natural behavior in extended and dynamic contexts, the focus of attention shifts seamlessly between sensory and memory contents. In my talk, I will highlight some unique properties of internal attention and share our early attempts to understand how attention brokers between external and internal contents to ground adaptive cognition.

March 28

**Yuhua Yu**, Postdoctoral Research Associate, Neuroscience of Emotion & Thought (NET) Lab, University of Arizona

**TITLE:** Decoding the Spontaneous Mind: unravel the dynamics of neural processes with latent brain states

**ABSTRACT:** Cognition unfolds over time, with mental states dynamically shifting both spontaneously and in response to external contexts. Characterizing the dynamic processes requires computational approaches that move beyond static representations of brain activity. Latent brain state modeling has emerged as a powerful tool for studying neural dynamics across diverse contexts. With unsupervised machine learning methods like hidden Markov models, this modeling approach provides rich insights into the temporal dynamics of time-sustained cognition. In this talk, I will present two studies to

illustrate the general strategy and strengths of latent state modeling. The first is an fMRI study examining the neural dynamics of unconstrained thought, where participants verbalized their stream of consciousness. By associating the brain state dynamic with moment-to-moment think-aloud content, we provide new information on the neural substrates of spontaneous thought. The second study used electroencephalogram data to investigate metaphor generation, a goal-directed activity involving creative spontaneity. Despite differences in the task contexts and imaging modality, both studies underscore the critical role of transient brain dynamics in shaping cognition.

April 4

**Veronica Yan**, Associate Professor, Department of Educational Psychology, University of Texas, Austin

TITLE: Promising Learning Strategies from the Cognitive Sciences...And their Underutilization

ABSTRACT: Educational policies often fail to take into account learning theories and they also often produce very small effects that often fail to replicate. In contrast, experiments based on the cognitive psychology of learning often produce much larger and more replicable effects. This suggests that the science of learning has the potential to revolutionize educational practice. I focus on one promising principle as an illustrative example—interleaved practice—and describe both the laboratory and field research behind it. I also, however, highlight the difficulties of translating cognitive principles into generalizable practice.

April 11

**Leah Kapa**, Assistant Professor, Speech Language & Hearing Sciences, University of Arizona

TITLE: The Relationship between Language and Executive Functioning: Insights from Developmental Language Disorder

ABSTRACT: Previous research has established a positive relationship between language abilities and executive functioning in childhood. However, the nature and the directionality of the relationship remains unclear. Children with developmental language disorder (DLD), who have impaired language in the absence of intellectual disability or other explanatory diagnoses, provide interesting insights into the nature of this relationship. In this talk, I will share work from my lab comparing executive functioning between children with typical language and those with DLD, examining the link between executive functioning skills and language learning outcomes in young children with DLD, and considering how language may (or may not) support cognitive skills in children with language impairment.

April 18

**Bruno Olshausen**, Professor, Helen Wills Neuroscience Institute, School of Optometry, UC Berkeley, Director, Redwood Center for Theoretical Neuroscience

TITLE: Neural Computations for Geometric Reasoning

ABSTRACT: In order to survive in complex, three-dimensional environments, animals must possess the ability to represent geometric structure and to perform computations on it.

Here I propose an approach that is rooted in observations of animal behavior and informed by both neurobiological mechanisms (recurrence, dendritic nonlinearities, phase coding) and mathematical principles (group theory, residue numbers). What emerges from this approach is a neural circuit for factorization that can learn about shapes and their transformations from image data, and a model of the grid-cell system based on high-dimensional encodings of residue numbers. These models provide efficient solutions to long-studied problems that are well-suited for implementation in neuromorphic hardware or as a basis for forming hypotheses about visual cortex and entorhinal cortex.

April 25

**Eve Isham**, Assistant Professor, Cognition & Neural Systems, Director, Consciousness-Action-Time Lab, University of Arizona

TITLE: Magic, Illusions, and Psychology

ABSTRACT: Magic, as a performing art, has captivated the audience for centuries. However, magic is also a scientific pursuit. Magicians test and refine their methods, formulate hypotheses, manipulate sensory inputs, direct attention, and create false beliefs. While intended as entertainment, magic also provides valuable insights into the workings of the mind. In this presentation, I will explore how magic serves as a medium for studying psychological sciences. Inspired by a magic effect, I will present ongoing research that examines the potential role of visual attention and top-down processing on a psychological force. Additionally, if time permits, we will explore how the belief in free will plays a role in the effectiveness of a magic effect.

### **COGNITIVE SCIENCE COLLOQUIUM** **Fall 2024**

September 6

**Sandiway Fong**, Associate Professor, Linguistics, University of Arizona

TITLE: Parsing and the Strong Minimalist Thesis (SMT)

ABSTRACT: We describe a new project, the *SMT Parser*, an implemented computer program that uses simplest Merge and follows the Strong Minimalist Thesis (SMT) design principle, Chomsky GK (2021). There is a narrative due to Noam Chomsky that Nature unlocked recursive Merge with Language *Organ*-Specific Conditions (LSC) such as *Theta Theory* when modern humans, viz. *homo sapiens*, arrived on the scene a few hundred thousand years ago, see (Berwick & Chomsky 2017). Recursive Merge permitted modern humans to construct complex thought expressions not possible before, and the result was the subsequent explosion of symbolic and intellectual activity seen in the archaeological record and today. In terms of the evolutionary timescale, this was a very recent event, leaving no time to evolve more complex mechanisms other than the simplest possible form of Merge. All surviving humans since then share this same language/thought capability. Once evolved, possibly by some mutation, simplest Merge applied to language now becomes part of our genetic endowment. Moreover, the SMT implies Nature makes optimal use of this new-found mechanism, necessary given the computational limits of

biology. The operation of the language organ is not just maximally simple (for evolutionary plausibility), but also must be computationally efficient, as the brain is largely chemical-based, see (Valentin 2002). Language can (optionally) be externalized via different modalities, e.g. speech and sign. Although there has been no time to evolve other mechanisms or for Nature to tinker with and complexify Merge, it is a fact that modern humans can effectively parse and interpret externalized language. How does that happen if essentially there is only Merge available? In other words, isn't it a mystery that we can parse externalized language at all? This project explores Merge computation through formalization and computer simulation of the combinatorics of the theory. We show how a parser can operate using just Merge and the LSC Theta Theory to manage the computational complexity of the Workspace from which parses are derived. The goal of the SMT Parser project is to suggest that this scenario is not only plausible but can be made efficient enough without positing (evolutionarily implausible) additional parsing mechanisms. If so, unlocking Merge is all that was needed.

September 13

**Tom McCoy**, Assistant Professor, Linguistics, Yale University

TITLE: Understanding neural networks via the problem they are trained to solve

ABSTRACT: Neural network language models, such as ChatGPT, have shown tremendous advances in recent years. However, these systems are notoriously difficult to understand and control - an issue that limits their usefulness as models of cognition. In this talk, I will discuss a perspective that mitigates these issues: approaching neural networks from the perspective of the problem that they are trained to solve (i.e., viewing them at Marr's computational level). The first part of the talk will discuss how this perspective enables us to predict some important limitations of large language models - an analysis supported by evidence of surprising failure modes that GPT-4 displays on seemingly simple tasks. In the second part of the talk, I will show how the same perspective can also enable us to control neural networks by connecting them to structured Bayesian models. We apply this approach in a case study based on language learning, where our goal is to distill the symbolic priors of a Bayesian model into a neural network. Like a Bayesian model, the resulting system can learn linguistic patterns from a small number of examples; like a neural network, it can also learn aspects of English syntax from a naturalistic corpus. Overall, these results show how it is both possible and beneficial to combine Bayesian models and neural networks, two popular approaches within computational cognitive science that have often been viewed as antagonistic.

September 20

**Paul Hill**, Researcher/Scientist IV, Human Spatial Cognition Lab, University of Arizona

TITLE: Effects of Healthy and Pathological Aging on The Precision of Episodic and Spatial Memory

ABSTRACT: The ability to remember unique experiences and details from the past declines during healthy aging and is often an early symptom of debilitating neurodegenerative diseases, such as Alzheimer's dementia. Episodic memory is a multifaceted construct, and the effects of advancing age on memory are equally complex. In this talk, I will discuss

some of the neural and sensorimotor factors that contribute to age differences in memory performance. First, I will present neuroimaging data that illustrate how patterns of neural activity in posterior visuospatial cortical regions contribute to age differences in the ability to encode and subsequently retrieve precise, high-resolution event details from memory. Next, I will describe recent work using immersive virtual reality technology that indicates age differences in spatial memory are mitigated by the presence of enriched body-based sensory cues. Throughout my talk, I will discuss several of the methodological limitations of laboratory-based memory assessments that may overstate the magnitude of age differences in memory performance.

September 27

**Massimo Piattelli-Palmarini**, Professor, Linguistics & Cognitive Science, University of Arizona

TITLE: Normal Language in Abnormal Brains

ABSTRACT: There is little doubt that, in the adult, specific brain lesions cause specific language deficits. Yet, brain localizations of linguistic functions are made problematic by several reported cases of normal language in spite of major brain anomalies, mostly, but not exclusively, occurring early in life. The signal cases are hydrocephaly, spina bifida and hemispherectomy. Many patients have normal syntax and lexicon but suffer from grave problems in the use of language (they are linguistically dyspraxic), showing that the interface is affected. These cases are discussed and possible solutions are suggested: namely a vast redundancy of neurons and/or the role of microtubules as neuron-internal processors and key factors in signaling and guiding the growth and reconfiguration of the brain.

October 4

**Richard Zemel**, Trianthe Dakolias Professor of Engineering and Applied Science, Professor, Department of Computer Science, Columbia University

TITLE: Integrating Past and Present in Continual Learning

ABSTRACT: Continual learning aims to bridge the gap between typical human and machine-learning environments. The continual setting does not have separate training and testing phases, and instead models are evaluated online while learning novel concepts. As in the real world, where the presence of spatiotemporal context helps us retrieve learned skills in the past, a realistic online learning setting also features an underlying context that changes throughout time. Object classes are correlated within a context and inferring the correct context can lead to better performance. I will describe a novel memory model that can make use of spatiotemporal information from the recent past. I will also present a unifying framework we have formulated for unsupervised continual learning, which disentangles learning objectives that are specific to the present and the past data. Finally we will consider open issues and challenges in continual learning.

October 11

**Jonathan Tullis**, Associate Professor, Educational Psychology, University of Arizona

**TITLE:** The Mind Reader's Dilemma: How We Misjudge What Others Know

**ABSTRACT:** Accurately estimating others' knowledge is vital when navigating social environments. For example, teachers must anticipate their students' understanding to plan lessons and communicate effectively. Yet, research consistently shows we have systematic biases in our estimates about what other people know. One's own knowledge, for example, has been labeled a "curse" because it can bias estimates of what others know. In this talk, I will examine situational factors and individual differences that exacerbate or reduce biases in estimates about what others know. Within a cue-utilization framework of social metacognition, I propose that predictions of others' knowledge are dynamically generated by estimators who weigh available and salient cues. I argue that the availability of diagnostic cues and the failure to appropriately shift among relevant cues causes systematic impairments in predictions.

October 18

**Valeria Pfeifer**, Postdoctoral Research Associate III, Psychology, Naturalistic Observation of Social Interaction (NOSI) Lab, University of Arizona

**TITLE:** Figurative Language as a Window into Emotion: Insights from Experimental and Observational Methods

**ABSTRACT:** Experiencing emotions is part of daily life. Often, when we encounter them in us or others, we use language to communicate about them. Literal language quickly reaches its limits in expressing complex concepts such as emotions or emotional states, and we might rely on figurative language. For example, instead of saying that we are angry, we might swear, state that we are fuming, or send a frowning emoji to let others know how we feel. Such non-literal expressions are rich and provide crucial insights into how we recognize, experience, and manage emotions in the self and others. In this talk, I will highlight the figurative language and emotion interface by discussing two kinds of figurative language and what they reveal about emotion. First, I will discuss recent work on using verbal irony to manage felt negativity from different communicative perspectives. I will then focus on swear language, discussing its neural signature, naturalistic use, and how these two approaches can inform each other. Synthesizing findings from experimental and observational approaches, I argue for the importance of figurative language in emotion and cognition more broadly.

October 25

**Stephen Adamo**, Assistant Professor, Cognition & Neural Systems, Psychology, University of Arizona

**TITLE:** From Theory to Applied: Utilizing psychophysics research to better understand how radiologists interpret medical images

**ABSTRACT:** Visual search, the act of looking amongst distractors, can be as mundane as looking for keys on a cluttered desk or as severe as looking for signs of cancer in a medical image. Unfortunately, visual search can be quite error-prone, which is problematic in critical real-world searches such as those performed by baggage screeners and radiologists. One visual search pitfall known to cause errors is the subsequent search miss (SSM) effect—observers are prone to miss a second target after a first target is detected. In

my talk, I will discuss my research on the SSM effect from a theoretical perspective and its application to breast cancer detection in radiology.

November 1 (Zoom)

**Joanna Bryson**, Professor, Ethics and Technology, The Hertie School of Governance

TITLE: Science and Power in the Context of AI Policy

ABSTRACT: Suddenly those of us who work in and with AI have moved from the academic margins into a whirlwind of power, money, international security, and hype. Fortunately, computational social sciences can help us understand these new contexts, and likely consequences of technological (and climactic) transformations. In this talk I review primarily simulation results explaining that cooperation is natural, despotism is too (in some contexts), trust depends on absence of information, and polarisation on economic precarity. I then pivot to data science supporting the polarisation model and then showing the power dynamics of at least some of the transnational AI regulatory games we are observing.

Nov 8

**Christopher Honey**, Associate Professor, Department of Psychological & Brain Sciences

John Hopkins

TITLE: Timescales of Neural and Mental Context

ABSTRACT: From second to second, we experience the moments of our lives as connected: hearing a fragment of sound, we perceive it as part of a mockingbird's melody; reading one word, we understand it as part of a meaningful sentence; and reading an entire sentence, we understand it as part of a larger argument. This talk concerns how recent information persists and combines in our minds and brains, on the scale of several minutes.

Nov 15

**Sara Benham**, Assistant Professor, College of Nursing and Health Sciences, University of Vermont

TITLE: Leveraging tools of network science to characterize sound and word learning in children with typical and atypical language development

ABSTRACT: The application of network science to empirical paradigms in cognitive and linguistic processing has provided critical insights into the nature of the mental lexicon (e.g., Levy et al., 2021; Vitevitch et al., 2014). A growing area of research is the implementation of network science for detecting the structure and organization of word learning processes in children (Beckage et al., 2011; Stella et al., 2017). For many children, learning sounds and words unfolds seamlessly over time. However, for preschoolers with developmental language disorder (DLD), the process of mapping a phonological form to a referent results in difficulties in sound production accuracy and stability (Benham et al., 2018; Benham & Goffman, 2020; 2022). I will demonstrate how principles of network science, rooted in a graph theoretical approach, provide new insights into: 1) mechanisms of disorder for children with DLD; and 2) emergent patterns in young learners' speech sound production. I will present findings from a series of studies in which children

between the ages of 2 and 8 years with typical and atypical language development produce novel disyllabic words, some that are paired with a consistent visual referent, and some that are not. Using a combination of novel network science analyses and standard phonological measures, I show that, for preschoolers with DLD, the incorporation of a referent with a novel word form induces the production of stable syllable sequences but does not affect segmental or phonetic feature accuracy. Typically developing children who are 2 years old show a different pattern of results: sound feature accuracy is disrupted by a referent, but not syllable organization. These findings elucidate the interactivity of words and sounds within the mental lexicon and also point to new directions in our understanding of the phonological factors underpinning word learning. This work ultimately demonstrates how the study of phonology across key developmental periods can be enhanced by tools of network science, providing new insights into the shifting organization of sounds and words.

Nov 22

**Gus Hahn-Powell**, Assistant Professor, Linguistics, University of Arizona

TITLE: Uncovering linguistic features of intergroup bias in open-ended descriptions of synthesized human images

ABSTRACT: The language people use to describe their in-groups and out-groups differs systematically across human languages (e.g., Maass et al., 1989; Graf et al., 2012). In this collaborative work, we present a pilot study that uses synthesized human images manipulated to encode the independent variable of perceived race, and elicit English language descriptions of these images to examine forms of linguistic intergroup bias. By developing methods for automatically detecting such differences, we can surface cases of biased communication and reveal new dimensions of author identity.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Spring 2024**

January 19

**Joy Geng**, Professor, Psychology, Center for Mind & Brain, UC Davis

TITLE: Informational shortcuts in attentional guidance

ABSTRACT: Visual search is a complex task that humans perform many times throughout the day. Examples include searching for the perfect snack in a supermarket, looking for a misplaced phone in a cluttered room, or finding a friend in a busy restaurant. The efficiency with which we perform these tasks has a significant impact on the quality of our lives. When we can find what we're looking for quickly, we move through our daily tasks with ease. However, when it is difficult, we waste time or even fail to achieve our final goals of making a meal, getting to an appointment, or socializing with a friend. Successful search processes rely on attentional mechanisms to organize knowledge of the past and expectations of the future to optimally sample information from the external world to guide behavior. But how do we do this? In this talk, I'll describe work we've been doing in the lab that looks at how attentional guidance uses coarse-but-adaptive information to guide

attention toward targets, but target decisions rely on more precise and complete target information. We suggest that the guidance and decision stages of visual search use different template information in order to maximize search efficiency.

January 26

**Oliver Schilke**, Associate Professor, Management and Organizations, University of Arizona

TITLE: Honor Among Crooks: The Role of Trust in Obfuscated Disreputable Exchange

ABSTRACT: When people want to conduct a transaction, but doing so would be morally disreputable, they can obfuscate the fact that they are engaging in an exchange while still arranging for a set of transfers that are effectively equivalent to an exchange. Obfuscation through structures such as gift giving and brokerage is pervasive across a wide range of disreputable exchanges, such as bribery and sex work. In this paper, we develop a theoretical account that sheds light on when actors are more versus less likely to obfuscate. Specifically, we report a series of experiments addressing the effect of trust on the decision to engage in obfuscated disreputable exchange. We find that actors obfuscate more often with exchange partners high in loyalty-based trustworthiness, with expected reciprocity and moral discomfort mediating this effect. However, the effect is highly contingent on the type of trust; trust facilitates obfuscation when it is loyalty-based, but this effect flips when trust is ethics-based. Our findings not only offer insights into the important role of relational context in shaping moral understandings and choices about disreputable exchange but also contribute to scholarship on trust by demonstrating that distinct forms of trust can have diametrically opposed effects.

February 2

**Mary-Frances O'Connor**, Associate Professor, Psychology, University of Arizona

TITLE: The Neurobiology of Grief

ABSTRACT: Grieving can be thought of as a form of learning, the necessity of updating our brain's predictions from presence of our loved one in myriad situations to their absence. Theoretical models of prolonged grief suggest that maladaptive motivational tendencies (e.g., perseverative proximity-seeking of the deceased; excessive avoidance of reminders) interfere with a person's ability to adapt following their loved one's death. We sought to identify correlates of prolonged grief based on the tendency to approach or avoid reminders of the loss and test the role of oxytocin in shaping behaviors. Older adults participated in a within-subject, double-blind, randomized study, with a counterbalanced intranasal oxytocin and placebo sessions. In a standardized Approach Avoid Task, participants viewed photos from each category: (1) deceased spouse, (2) living loved one, (3) stranger, (4) grief-related scenes (e.g., tombstone, casket) and (5) neutral scenes. Participants pushed or pulled a joystick based on photo frame color, and relative approach/avoidance bias to each stimulus category was computed using median response time. Millisecond differences in approach and avoidance behavior to photos of the deceased discriminate prolonged grief disorder and suggest a role for automatic processes of attention, which may contribute to difficulty with new learning after loss.

February 9

**Daniela Palombo**, Associate Professor, Psychology, University of British Columbia

TITLE: Bringing to mind the best and worst: The role of emotion in memory and imagination

ABSTRACT: Memory is a record of our personal history. This record contains the narrative of our lives, grounding us in who we are. Extensive data demonstrates that memories are tuned towards the emotionally significant, optimizing our survival and well being. But the relationship between emotion and memory is complex and multifaceted. In the first part of my talk, I will discuss my work on the dynamic relationship between emotion and memory, with a particular focus on how emotion colors the way we remember the temporal unfolding of events. In the second part of my talk, I will explore the intricate relationship between emotion, memory, and imagination. As important as our memories are, humans spend the majority of their time imagining and fantasizing about experiences they've never actually had. The pieces of such imaginings are drawn from memory, but the product is something new. In doing so, we use our mind's eye to paint a picture of the best and worst possible outcomes that we might face, aiding in our ability to plan and predict what is to come. Hence, in both parts of my talk, I will delve into how humans harness emotional experiences—from memory and from imagination—in adaptive (and sometimes maladaptive) ways. My talk will touch on cognitive and neural perspectives.

February 16

**Evan MacLean**, Associate Professor, Veterinary Medicine, Director, Arizona Canine Cognition Center (ACCC), University of Arizona

TITLE: Companion Dog Models of Cognitive Aging

ABSTRACT: Dogs are a valuable model for aging research, including studies of cognitive decline and dementia. With advanced age, some dogs spontaneously develop cognitive impairments and neuropathology resembling features of Alzheimer's disease. However, most research on these processes has been conducted with beagles in laboratory environments. More recently, companion dogs (dogs living in private households) have been proposed as powerful models of aging due to a wealth of features shared with humans including high levels of genetic and phenotypic diversity, exposure to human living environments, comparable disease risk and burdens, and access to a sophisticated healthcare system. In this talk I will present recent studies from my lab characterizing cognitive aging and dementia in companion dog populations. I will highlight the role of spontaneous problem-solving measures in supporting rapid large-scale data collection and provide an overview of our cognitive research in the Dog Aging Project, a nationwide study of the genetic and environmental determinants of aging in ~50,000 dogs.

February 23

**Brianna McMillan**, Assistant Professor, Psychology, Smith College

TITLE: Connecting through language: How cognition and context shape children's language development

ABSTRACT: Our ability to connect with others by describing our inner states and our outer experiences through language is a remarkable achievement. In the first three years of life, young children exhibit an exceptional capacity for language mastery, a task that often

proves challenging for adults without significant effort. How do we go from knowing nothing to being able to communicate with others in such a short period? This age-old question has led to a diverse field of research that seeks to better understand the mechanisms that drive how children learn their native language. Much of this work has focused on either the cognitive or the environmental influence, examining these constructs in isolation from one another. However, children learn language in a complex and dynamic way, influenced by both their cognitive abilities and their environmental context working in concert with one another. In the first part of my talk, I will discuss experimental studies examining how complex auditory environments affect early word learning – highlighting the increased attentional demands that everyday experiences, such as background noise place on the young learner. In the second part of the talk, I will discuss observational data that examines how reciprocal relations between children’s cognitive skills and parent-child interactions shape children's language development. Together, these studies highlight the interconnectedness of cognitive and experiential mechanisms in promoting language development.

March 1

**Charles Noussair**, Professor, Eller Professor of Economics, Director, Economic Science Laboratory, University of Arizona

TITLE: Emotions and Asset Prices

ABSTRACT: Popular commentators associate asset market behavior with emotional states. For example, a stock market is said to be "exuberant" when prices are increasing. The market is said to exhibit "fear" when prices are falling. The experimental research described in the lecture studies the possible scientific underpinnings behind this intuition of a relationship between market activity and emotions. The research explores the direction of causality: Do the emotions of traders affect asset prices or does the market activity affect emotions? The experiments show clearly that it is the latter. We also discuss the relationship between emotional states, beliefs about future prices, and market price.

March 15

**Kelsey Lucca**, Assistant Professor, Psychology, Arizona State University

TITLE: Social influences on curiosity in early childhood

ABSTRACT: Curiosity is a hallmark of childhood and one of the strongest drivers of early learning. Despite the importance of early curiosity, we know very little about the factors that shape curiosity during childhood, when individual differences are first emerging. In this talk, I will present three studies that examine the developmental building blocks of curiosity and the social factors that shape them. The first study examines the underlying structure of children’s curiosity in the United States, South Korea, and Turkey using a newly developed scale designed to tap into multiple aspects of curiosity-driven behaviors. The second, using an explore-exploit task with children from the United States and Turkey, tests whether an uncertainty-focused mindset intervention can boost children’s curiosity-driven exploration. The third experiment examines whether children’s social curiosity (i.e. interest in learning about others) is malleable, and if increasing children’s social curiosity boosts their willingness to engage in prosocial behaviors (e.g. sharing). Together, this work

aims to provide new insights into the nature and function of early curiosity, as well as the social influences that shape it across early development.

March 22

**Paul Cisek**, Roger N Shepard Visiting Scholar, Professor, Neuroscience, University of Montréal

TITLE: Rethinking behavior in the light of evolution

ABSTRACT: In psychology and neuroscience, the brain is usually described as an information processing system that encodes and manipulates representations of knowledge to produce plans of action. This view leads to a decomposition of brain functions into putative processes such as object recognition, working memory, decision-making, action planning, etc., inspiring the search for the neural correlates of these processes. However, neurophysiological data do not support many of the predictions of these classic subdivisions. Instead, there is divergence and broad distribution of functions that should be unified, mixed representations combining functions that should be distinct, and a general incompatibility with the conceptual subdivisions posited by theories of information processing. In this talk, I will explore the possibility of resynthesizing a different set of functional subdivisions, guided by the growing body of data on the evolutionary process that produced the human brain. I will summarize, in chronological order, a proposed sequence of innovations that appeared in nervous systems along the lineage that leads from the earliest multicellular animals to humans. Along the way, functional subdivisions and elaborations will be introduced in parallel with the neural specializations that made them possible, gradually building up an alternative conceptual taxonomy of brain functions. These functions emphasize mechanisms for real-time interaction with the world, rather than for building explicit knowledge of the world, and the relevant representations emphasize pragmatic outcomes rather than decoding accuracy, mixing variables in the way seen in real neural data. I suggest that this alternative taxonomy may better delineate the real functional pieces into which the human brain is organized and can offer a more natural mapping between behavior and neural mechanisms.

March 29 (Claire Sargent Cancelled)

**Lynn Nadel**, Regents Professor Emeritus, Psychology, University of Arizona

TITLE: Hippocampus: Action at a Distance

ABSTRACT: The hippocampal formation provides the core of a context-based memory system that enables actions at both spatial and temporal removes. It does this by creating representations of context – what O'Keefe and I labelled 'cognitive maps', that are critical to acting at a distance. Most simply, these internal maps allow organisms to act on the basis of entities (objects, people, goals, etc.) that are at some distance, and not within visible, audible or olfactory range. Context representations support environment re-identification, allowing animals to correctly link up information gathered in the same environment over multiple occasions separated by significant temporal gaps. They support, as well, retrieval of contextually-appropriate knowledge, bringing information gathered in the past to bear on present behavior and future planning. My talk will review evidence in support of these assertions about the hippocampus and consider various

implications of its role in action at a distance.

April 5

**Duane Watson**, Professor, Psychology and Human Development, Vanderbilt University

TITLE: Understanding how language experience drives language understanding

ABSTRACT: The language environment is critical for language learning and vocabulary growth in children and in predicting the difficulty of processing words and sentences in adults. However, psycholinguists have traditionally measured language experience by aggregating over populations. In this talk, I will share experimental evidence suggesting that an individual's specific experience with language is linked to their specific preferences for different constructions. By using NLP tools to analyze the linguistic properties of participants' favorite websites, we compare effects of internet reading habits to effects of cognitive factors such as working memory and inhibitory control on reading skill. Consistent with constraint-based and Bayesian models of language comprehension, we find that a person's everyday language environment is an important predictor of language comprehension.

April 12

**Sudha Ram**, Anheuser-Busch Professor of MIS, Entrepreneurship & Innovation

Director of INSITE: Center for Business Intelligence and Analytics, Eller College of Management, University of Arizona

TITLE: Integrating Network Science with Prediction Models

ABSTRACT: Network Science is at the heart of some of the most revolutionary technologies of the 21st century, powering everything from Google to Facebook, Netflix, and Amazon. Networks permeate science, technology, business, and nature to a large extent. Modeling of large networks, with millions of nodes and billions of links, is a useful way to reveal interesting insights into underlying network structures and their dynamics. Prediction models can be enhanced by using network science along with machine learning, informed by social science theories. In this talk, I will address approaches for extracting implicit relationships in complex systems and show how they can be integrated with machine learning to improve prediction results.

April 19

**Mary Peterson**, Professor, Psychology & Cognitive Science, University of Arizona

TITLE: There's More to Object Detection than Meets the Eye: Evidence for a Dynamical Interactive Theory of Conscious Object Detection

ABSTRACT: How does conscious object detection occur? A critical component is the determination of which borders in the input are boundaries of objects. In the 20<sup>th</sup> century, the predominant view was that object detection was a feedforward process based on image features only (an exclusive view). Research in my laboratory supports an alternative view in which viewers' experience is also a factor and ambiguity precedes conscious object detection. Prospective objects on opposite sides of borders compete to be perceived; their meaning as well as their shape is activated unconsciously; and feedback as well as feedforward processing precedes object detection. We show that ambiguity

occurs and is resolved unconsciously even when one outcome is nearly universally perceived. Our data support a Bayesian account in which cortico-cortical and cortico-thalamic feedback precedes object detection.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2023**

September 8

**Lars Chittka**, Professor, Sensory & Behavioral Ecology, School of Biological and Behavioral Sciences, Queen Mary, University of London

TITLE: The Mind of a Bee

ABSTRACT: Most of us are aware of the hive mind—the power of bees as an amazing collective. But do we know how uniquely intelligent bees are as individuals? Lars Chittka draws from decades of research, including his own pioneering work, to argue that bees have remarkable cognitive abilities. He shows that they are profoundly smart, have distinct personalities, can recognize flowers and human faces, exhibit basic emotions, count, use simple tools, solve problems, and learn by observing others. They may even possess consciousness. Chittka illustrates how bee brains are unparalleled in the animal kingdom in terms of how much sophisticated material is packed into their tiny nervous systems. He looks at their innate behaviors and the ways their evolution as foragers may have contributed to their keen spatial memory. Chittka also examines the psychological differences between bees and the ethical dilemmas that arise in conservation and laboratory settings because bees might feel and think.

September 15

**Mihai Surdeanu**, Associate Professor, Computer Science, University of Arizona

TITLE: Neuro-symbolic Approaches for Explainable Natural Language Processing

ABSTRACT: Deep learning approaches to natural language processing (NLP) such as ChatGPT have achieved tremendous successes recently. However, these systems are difficult to understand, augment, or maintain as needs shift. In this talk I will discuss two of our recent efforts that aim to bring explainability back into deep learning methods for NLP. In the first part of the talk, I will introduce an explainable approach for information extraction (IE), an important language understanding task that focuses on finding structured information in text such as who did what to whom when and where. Our approach mitigates the tension between generalization and explainability by jointly training for the two goals. The proposed method uses a multi-task learning architecture, which jointly trains a classifier for information extraction, and a sequence model that labels words in the context that explain the decisions of the previous classifier. We show that, even with minimal guidance for what makes a good explanation, the sequence model learns to provide accurate explanations. Further, we show that the joint training generally improves the performance of the IE classifier. In the second part of the talk, I will discuss a neuro-symbolic architecture for information extraction that preserves the advantages of both directions, i.e., the generalization power of neural methods and the pliability of

symbolic approaches. Our modular approach contains two components: a declarative rule-based model and a neural component. The former implements information extraction with a set of explainable rules that rely on syntax; the latter increases the generalizability of rules by semantically matching them over text. I'll show that the proposed approach outperforms all neural models on a challenging IE task. More importantly, I'll show that the underlying symbolic representation can be locally modified to correct model mistakes without retraining the neural component.

September 22

**Diyi Yang**, Computer Science Department, Natural Language Processing Group  
Stanford University

TITLE: Challenges and Progress towards Socially Aware NLP for Positive Impact

ABSTRACT: Despite the remarkable performance of NLP these days, current systems often ignore the social part of language, e.g., who says it, or what goals, and with what social implications, all of which severely limits the functionality of these applications and the growth of the field. This talk will discuss some of our recent efforts towards socially aware NLP via two studies. The first part looks at how large language models work in the context of social understanding, and how human-AI collaboration can reduce costs and improve the efficiency of social science research. The second part introduces CARE, an interactive AI agent that supports counselors through LLM-empowered feedback and deliberate practices. I conclude by discussing the challenges and hidden risks of building socially aware NLP systems for positive impact.

September 29

**Sarah Phillips**, Postdoctoral Scholar, Georgetown University Medical Center

TITLE: Constraining what is combinatorially possible using *heads*

ABSTRACT: As we learn our languages, we decompose continuous linguistic signals into discrete units and recombine them in novel ways. *What constrains our ability to flexibly compose words together?* Studies investigating the neural bases of composition reveal early sensitivity in the left anterior temporal lobe (LATL), regardless of whether the words being composed appear in their canonical order (“red cup” vs. “cup red”) or the words come from the same language (“icicles melt” vs. “icicles noga”). However, behavioral evidence from three different bilingual groups (Arabic/English, Korean/English, Spanish/English) suggests distributional norms around heads of expressions (e.g., nouns in nominal expressions) affect overall processability. I will argue that more work on acquisition (in particular, bilingual development) is required to further our understanding of how feature(s) that denote heads of projections are abstracted away as well as whether and, if so, when they play a role during language development.

October 6

**Cory Inman**, Assistant Professor, Cognition & Neural Science, University of Utah

TITLE: Cog Néuro GO: Capturing and enhancing episodic memories made in the wild

ABSTRACT: The ultimate goal of neuroscience is to understand and explain real-world behavior in terms of brain activity, and to use these insights to develop therapeutic

approaches for neural disorders. By using mobile recording devices synchronized with intracranial EEG recordings in epilepsy patients with an implanted deep brain recording system, we can study the neural basis of human activities such as navigation and real-world memory encoding in a way that captures the complexity, scale, and functional characteristics of real-world experiences. We asked five participants to learn a 0.75-mile route around campus while hippocampal electrophysiology was recorded. Subjects walked the route 7-8 times across two days, with the 1st walk guided (encoding) and 6-7 of the walks navigated by the participants themselves (navigation retrieval; 28.5 total miles). Findings across all participants suggest that theta band power significantly increases when participants are navigating outdoors relative to indoor navigation. We also find evidence that temporal lobe theta band power changes immediately around spatial event boundaries. Taken together, these initial neural findings support our hypothesis that medial and lateral temporal lobe activity changes around real-world event boundaries. Future studies will investigate the potential of direct brain stimulation to enhance episodic memory for real-world experiences. Related to this future goal, Dr. Inman will also discuss his prior work demonstrating that direct amygdala stimulation can enhance declarative memory in humans.

October 13

**Mary Rigdon**, Associate Professor, Political Economy & Moral Science, University of Arizona

TITLE: Gender Differences in Competitiveness: The Role of Social Incentives

ABSTRACT: The conventional view among economists has long been that the persistent wage gap is due to an underlying competitiveness gap: simply, women are less competitive than men and as a result, women pursue competitive careers at a lower rate than men, which would explain the wage gap since more competitive careers are more lucrative. Mary's research challenges this narrative: women don't have a lower desire to compete; they are motivated differently. As shown by her research, funded by the National Science Foundation and pursued with Alessandra Cassar, Professor of Economics at the University of San Francisco, if incentives are structured to reflect these motivational differences, women are just as competitive as men. Mary's work sets out to change perceptions about the gender wage gap, help explain why it persists and, most importantly, explore how we can close it. In her talk, she will discuss the social incentives that close the gender competitiveness gap in several laboratory experiments and explore the implications of the results for mechanism design in the labor market.

October 27

**Ramesh Balasubramaniam**, Ph.D., Professor, Cognitive Science, University of California, Merced

TITLE: The role of the motor system in beat perception and timing

ABSTRACT: Neural mechanisms supporting time perception are relevant to a broader understanding of how the human brain utilizes time in cognition and action. In this talk, I will focus on musical timing and review extensive previous work surrounding the perception of musical rhythms. First, I will try to define commonly used but ambiguous

concepts including neural entrainment, simulation and prediction in the context of musical timing. Next, I will summarize recent work from our laboratory on sensorimotor timing during perception and performance. And finally, I will review the behavioral and neural evidence for the role played by the motor system in time and rhythm perception.

November 3

**Stephen Pratt**, Professor, School of Life Sciences, Arizona State University

TITLE: Collective Cognition in Ant Societies

ABSTRACT: Social insects are paradigms of decentralized organization. Complex colony traits emerge from the interactions of many leaderless workers, each applying appropriate decision rules to limited local information. In this talk, I will describe efforts to understand this process through a combination of experimentation and computational analysis. This work uses nest site choice by colonies of rock ants act as a model system for collective intelligence. Sharing the burden of information processing contributes to enhanced colony performance, or “wisdom of crowds”, but I will show that it can sometimes instead lead to paradoxically worse performance. I will also describe how information theory can shed new light on the distinctive communication behavior that allows colony members to share information about nest sites and other important resources.

November 17

**Aneta Kielar**, Assistant Professor, Speech, Language & Hearing, University of Arizona

TITLE: What is Primary Progressive Aphasia and what can we do to help those affected by this syndrome?

ABSTRACT: Alzheimer’s disease can result in a progressive and debilitating loss of language function manifesting as the logopenic variant of Primary Progressive Aphasia (lvPPA). In such cases, the neuropathological changes associated with AD accumulate in the left posterior temporo-parietal regions that support language processing, disrupting the dorsal language network that critically supports phonological skills for spoken and written language. The resulting language profile is characterized by reduced and slowed speech production, word retrieval difficulties, and impaired reading and writing. Although treatment research is in its early stages, there is limited, but encouraging, evidence that behavioral treatment directed toward strengthening weakened phonological skills can improve language function. Given the debilitating and progressive nature of the impairment, there is a pressing need to develop targeted interventions that would maximize the function of residual components of critical language networks and potentially slow the language decline. In my laboratory we are working to improve language function in PPA by combining speech language therapy with fMRI-targeted transcranial direct current stimulation (tDCS) applied over preserved brain regions in the language processing network. Our work to date suggests a particularly robust outcome after active tDCS with further consolidation of learning over rest phase, and maintenance at follow-up. Our study is the first to document that improved phonological skills can result in better functional communication ability (text-level writing) relevant to the everyday lives of individuals living with PPA. Our study contributes to a growing body of evidence

demonstrating that tDCS is a safe intervention that has potential to enhance benefits of speech-language treatment.

December 1

**Matthew Grilli**, Associate Professor, Psychology, Clinical Director, Human Memory Lab, University of Arizona

TITLE: Episodic memory and semantic memory interactions: Evidence from aging and amnesia

ABSTRACT: In the fields of cognitive psychology and cognitive neuroscience, an enduring theoretical framework suggests that episodic memory and semantic memory are separate forms of long-term, conscious memory supported by distinct brain systems. However, a growing body of research has revealed a significant degree of cognitive interaction and neural overlap between episodic memory and semantic memory. In this presentation, I will share my lab's recent research findings that shed light on how the interplay between episodic memory and semantic memory can provide us with fresh insights into the memory patterns associated with older age. Additionally, I will discuss our latest research on amnesia, which suggests that there is substantial overlap in the neural bases underlying episodic memory and semantic memory, including in the medial temporal lobes. Throughout the presentation, I will try to connect my lab's findings with recent theories related to conscious forms of long-term memory and associated aspects of cognition, especially as they relate to the medial temporal lobes.

### ***COGNITIVE SCIENCE COLLOQUIUM Spring 2023***

January 20

**Signy Sheldon**, Associate Professor, Department of Psychology, McGill University

TITLE: The role of episodic memory construction in driving differences in remembering

ABSTRACT: Remembering events from our lives requires us to engage episodic memory processes to construct mental representations of these events upon retrieval. When constructing such representations, these episodic memory processes can flexibly access different sets of details related to an event, which is why the same memory can be recalled differently, both across scenarios and individuals. In this talk, I will discuss the episodic memory mechanisms that drive such differences in event memory. First, I will present work that illustrates how individuals can strategically construct memories differently to meet changing retrieval goals and how this impacts tasks like planning and decision-making. Next, I will present neuroimaging data that indicates there are separable hippocampal-cortical processes that support constructing memories which emphasize different content: either the perceived details or conceptual details from an event. I will discuss how the existence of these separable mechanisms can explain both individual differences in remembering real-world experiences as well as how remembering changes with age. This talk will end with a discussion of the adaptive functions for having such distinctions in the way we remember.

January 27

**Maya Henry**, Associate Professor, Speech, Language & Hearing Sciences, Moody College of Communications, University of Texas, Austin

TITLE: Neural markers of decline and recovery in primary progressive aphasia

ABSTRACT: Primary progressive aphasia is a neurodegenerative disorder wherein speech and language gradually deteriorate. This devastating condition offers a unique window into brain-behavior relations for language as well as the process of network-based neurodegeneration. In this talk, I will discuss structural and functional neuroimaging studies of PPA, which help us to understand the dynamic interplay of spared and impaired brain networks in both decline and recovery of speech-language function.

February 3

**Robert Henderson**, Associate Professor, Linguistics, University of Arizona

TITLE: Signaling without Saying: The semantics and pragmatics of dogwhistles

ABSTRACT: A dogwhistle is a piece of language that sends one message to an outgroup while at the same time sending a second (often taboo, controversial, or inflammatory) message to an ingroup. We propose an analysis of dogwhistles in the setting of social meaning games that treats them as signaling the persona of the speaker, and in some circumstances enabling an enrichment of the conventional meaning of the expression. We compare this account with views in terms of conventional implicature, invited inference, and classical gricean implicature. We further show how this formal framework allows, not just a account of dogwhistles, but opens up a way to analyze a variety of sociopragmatic phenomena involving trust, reliability, ideology, standpoints, etc. from a probabilistic game-theoretic perspective.

February 10

**Carl Craver**, Ph.D., Professor, Philosophy, Philosophy-Neuroscience-Psychology Program, Washington University in St. Louis

TITLE: Amnesia and the Ordinary Conception of Time

ABSTRACT: The thesis that the “ordinary conception of time” requires the capacity for episodic memory is common in neuroscience and philosophy alike. In neuropsychology, this thesis is expressed in the contrapositive thesis that people with episodic amnesia are “trapped in time.” In philosophy, it is expressed as the thesis episodic memory is a constitutive of developmental requirement for thinking and reasoning about time. Here I reconsider the neuropsychological thesis in light of evidence from my work with Shayna Rosenbaum to study people with episodic amnesia. I argue that people with episodic amnesia have temporal concepts, preferences, and decision-making quirks as neurotypical controls. I conclude by suggesting possible sources of the ordinary conception of time besides episodic memory.

February 17 (Zoom)

**Oliver T. Wolf**, Professor, Department of Cognitive Psychology, Institute of Cognitive Neuroscience, Faculty of Psychology, Ruhr University Bochum, Germany

TITLE: The influence of stress on memory and extinction in humans

ABSTRACT: Stress causes an increase in the stress hormones (nor)adrenalin and cortisol. By influencing the amygdala, the hippocampus and prefrontal regions they exert opposing effects on memory storage (consolidation) and memory retrieval. We therefore may remember aspects of a stressful event for a lifetime but might fail to retrieve studied information during an exam. In my talk I will provide examples of experimental laboratory studies illustrating these effects in humans at the behavioural and neural level. Moreover, developmental changes as well as disorder specific alterations will be discussed. Finally, the findings will be transferred to the area of extinction and a recently developed model (Stress Timing affects Relapse, STaR model) will be described. This research demonstrates that while the acute stress response typically promotes successful adaptation this may come at certain costs increasing the susceptibility to mental disorders in vulnerable individuals.

February 24

**Nicholas Strausfeld**, Regents Professor, Neuroscience, University of Arizona

TITLE: Ground patterns, brain evolution, and function across phyla

ABSTRACT: Efforts to ascribe parts of the brain as materialistic drivers of “mind” and “behavior” were first seriously undertaken in the early 19<sup>th</sup> century by adherents of German *romantische Naturphilosophie*. In 1818, for example, Carl Carus published the first study that compared mammalian brains to suggest functional commonality. Franz Josef Gall, before his intellectual decay into craniology, was celebrated as a pioneering anatomist whose explorations of the human brain led to his insistence that cortical elaboration into numerous gyri indicated their specific roles in rational thought, the faculties of creativity, industriousness and social values. His view inspired the French polymath Félix Dujardin in 1850 to claim comparable functions for the folded neuropils of the honey bee brain’s *corps pédonculés*, centers in arthropods now universally acknowledged to mediate long-term memory of events and places, eliciting comparisons with the vertebrate hippocampus. The notion that arthropod and vertebrate brains appear to possess corresponding circuitry was entertained in 1937 by Santiago Ramón y Cajal, realizing that the existence of such similarities might benefit explorations at the level of anatomical arrangements of neurons, which in arthropods are manageable in terms of neuronal multiplicity. In this seminar I will review this background leading to evidence for broad transphyletic correspondences of the arthropod and vertebrate fore- and midbrain, albeit set against a cultural background of engrained resistance to such notions. One difficulty has been to identify which aspects of chordate and arthropod brains reflect true segmental organization and hence possible homology. The persistent notion that the brain is segmented can be traced to a very British source: namely, the late Victorian biologist Edwin Goodrich who claimed that vertebrate and arthropod brains were segmented in a manner that reflects segmentation of the trunk’s nervous system; a view uncomfortably reminiscent of Johanne Goethe’s “vertebral theory” of the skull discredited by T. H. Huxley’s 1858 Croonian lecture. Goodrich’s views were then, as they are now, deeply misleading. Yet they persist. Newly demonstrated for the arthropod brain and its ventral nervous system is evidence from gene expression and morphological alignments of extant

and fossilized brains that the brain is not segmented now, nor was ancestrally, and that it is fundamentally distinct from the segmented ganglia of the trunk. Gene expression defining the arthropod brain into three unique domains shares much in common with gene expression studies of comparable divisions of the vertebrate fore- and midbrain, also fundamentally distinct from the hindbrain and spinal cord. The prediction is that such genetic–developmental similarities across phyla, reflecting genealogical correspondences, will encourage explorations of total circuits mediating advanced cognition by small but sophisticated brains.

March 3

**Matt Bedke**, RNS Shepard Visiting Scholar, Professor, Philosophy, University of British Columbia

TITLE: Explaining Normative Phenomenology

ABSTRACT: When we have normative thoughts about what *\*ought\** to be done, or what *\*ought not\** to be done, or simply what counts as a *\*good reason\** for action, there is a distinctive phenomenology involved. Roughly, it is a phenomenology of being directed to do something but not directed by anyone in particular. In this paper I articulate this phenomenology in terms of *\*authoritative guidance\**. I then consider whether it can be explained. After canvassing a few options, I offer a broadly projectivist explanation where normative phenomenology is a projection of our sentiments. More precisely, normative phenomenology understandably results from a certain combination of sentimental phenomenology plus psycho-semantic rules for using normative concepts.

March 17 (Zoom)

**Martha Farah**, Professor, Psychology, University of Pennsylvania

TITLE: Neuroscience of socioeconomic status: Is it relevant to policy?

ABSTRACT: SES neuroscience, using imaging and other methods, has revealed generalizations of interest for population neuroscience and the study of individual differences. But beyond its scientific interest, SES is a topic of societal importance. Does neuroscience offer any useful insights for promoting socioeconomic justice and reducing the harms of poverty? In this talk I will use research from my own lab and others' to argue that SES neuroscience currently provides converging support for already established principles, which may have extra rhetorical force for some policy-making audiences. However, SES Neuroscience is a young field, and there is potential for future substantive new contributions to SES-related policy. I will attempt to forecast some ways in which practical new solutions to the problems of poverty may emerge from neuroscience.

March 24

**Carol Barnes**, Regents Professor, Director, Evelyn F. McKnight Brain Institute, Psychology  
**Lynn Nadel**, Regents Professor, Psychology

TITLE: Stalking the Seahorse: Studying the Hippocampus across the Lifespan

ABSTRACT: Carol Barnes and Lynn Nadel will talk about their research on the hippocampus, across the lifespan.-They will situate their work in debates over the past 50 years about this critical brain structure - offering insights into what got them interested in

the hippocampus in the first place, and what they think they have contributed to our current understanding about it.

March 31

**Nicole Holliday**, Assistant Professor, Linguistics & Cognitive Science, Pomona College

TITLE: Sociophonetic Variation and Human Interaction with Digital Voice Assistants

ABSTRACT: As technology that relies on speech is increasingly integrated into modern American society, voice assistants are becoming a more significant part of our everyday lives. This talk will present the results of three studies that focus on social perception of voice assistants, voice quality variation among the assistants themselves, and how one assistant's "tone of voice" evaluation reinforces systematic linguistic bias. Results of the first study demonstrate how listeners engage in racialized judgments of digital voice assistants and that these judgments interact with perceptions of the personality of such assistants, providing evidence that listeners personify these voices. Results of the second study shed light on the voice quality features that may trigger judgments of speaker race and personal characteristics, even when the speaker is non-human. Finally, results of the third study show the ways in which speech recognition technology can reinforce and perpetuate bias against already marginalized groups of speakers. A more comprehensive understanding of how sociolinguistic variation interacts with the design of such assistants may help us to understand how listeners process variation and make judgments of voices, both digital and human. Additionally, a thorough analysis of how computational systems police speaker behavior can help us address systematic inequality as the linguistic line between humans and computers becomes increasingly porous.

April 7

**Vicky Lai**, Assistant Professor, Psychology, University of Arizona

TITLE: The role of emotional contexts in the cognitive/neural representations of words

ABSTRACT: Traditionally, word meaning representations are treated as entries in a mental lexicon, hence relatively static. In this talk, I will report several brainwave (ERP or Event Related Potential) studies that show that the cognitive-neural representations of words are fluid and flexible in emotional contexts. In one study, we manipulated the speaker context, by putting the language users in a positive or a negative mood before they read. In another study, we inserted positive and negative facial emojis before words, to investigate the effect of emojis on subsequent words. In study 3, we used swear words as contexts, and examined the processing of the nouns after the swears. In study 4, we created sentential contexts that were loaded with emotion and investigated whether the subsequent word representations vary in emotional contexts. Across all of the studies, significant changes were found, but the timings of the changes are earlier in word and sentential contexts than in speaker context.

April 14

**Yotam Shmargad**, Associate Professor, Government and Public Policy, University of Arizona

TITLE: Social norms and discussion dynamics in online news comments and on Twitter and

Reddit

**ABSTRACT:** Online discussions are performed under the gaze of fellow users. To increase engagement, platforms often let users evaluate the comments made by others through rating systems, such as Likes or Down/Up votes. Understanding how such ratings shape, and are shaped by, features of the underlying discussion is important for our understanding of online behavior. In two studies, I focus on increasingly concerning aspects of online discussions: incivility and toxic language use. In the first study, I draw on the theory of normative social behavior (TNSB) to analyze over 6,000 online news comments. I find that repeated incivility by the same person is more likely when their initial incivility was affirmed by both descriptive norms (incivility in nearby comments) and injunctive norms (Up votes). In a second study, I apply this empirical framework to discussions on Twitter and Reddit surrounding the January 6th capitol riots. I find evidence that TNSB drives toxic commenting on Twitter, but less so on Reddit. Twitter users appear to be more reactive than Reddit users, which may be the reason why discussions on Twitter are more likely to feature sustained cascading of toxic comments. I discuss several mechanisms that could explain why social norms are more influential on Twitter than on Reddit.

April 21

**Jonathan Smallwood**, Ph.D., Professor, Department of Psychology, Queen's University

TITE: States of mind and brain

**ABSTRACT:** A core goal of psychology and neuroscience is to understand the patterns of thought that occupy our daily lives and how these contribute to well-being and productivity. Contemporary views suggest that the landscape of ongoing thought is heterogeneous and can be influenced by features of both the person and the context in which they exist. This talk considers recent work that uses state-of-the-art experience sampling and advanced brain imaging methods to understand the different features of ongoing experience, their context dependence and how these are supported by different brain systems. These studies reveal distinct patterns of thought that emerge in a context dependent manner in both the lab and in daily life. These include patterns of episodic social cognition, that emerge during social interaction or during states of mind-wandering, and patterns of deliberate task focus that are linked to the process of executive control and emerge while at work or during complex task in the laboratory. Studies using brain imaging establish that these distinct patterns of thought have specific associations with brain activity, particularly with regions of association cortex, including the fronto-parietal and the default mode networks. Together, this work demonstrates that the landscape of ongoing thought is heterogeneous, reflected in the activity of multiple neural systems and supports features of cognition important for acting efficiently in the moment, as well as the capacity to explore distant times and places using imagination.

**COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2022**

September 9

**Jeffrey Stevens**, Associate Professor, Psychology, University of Nebraska, Lincoln

TITLE: Mechanisms of impulsivity in humans and other animals

ABSTRACT: From the temptation of decadent desserts to the desire to immediately respond to that annoying social media post, controlling impulses can be difficult for the young and old, the human and nonhuman. In humans, we think of impulsivity as a behavioral trait that pervades different aspects of our lives. But do other species exhibit impulsivity as a trait? Here, we take a comparative approach across humans, nonhuman primates, birds, fish, and dogs to investigate impulsivity across contexts to assess whether it exists as a trait in other species. We then explore potential cognitive mechanisms underlying impulsive decision making and how we might leverage those mechanisms to build decision environments that nudge people into making more patient choices.

September 16

**Liad Mudrik**, Professor, Physiological Sciences, Tel Aviv University

TITLE: Taking a neuroscientific-philosophical approach in studying free will and consciousness

ABSTRACT: For centuries, questions about the nature of consciousness or the existence of free will were considered outside the realm of scientific investigation. Yet in recent decades, studies in neuroscience and cognitive science have taken a stab at these questions, giving rise to new empirical findings and novel theories. In this talk, I will describe three attempts to translate these long-lasting philosophical questions into empirically testable ones, regarding the role of consciousness in voluntary action, the relations between conscious experience and neural activity, and the possible dissociation between phenomenal consciousness and access consciousness. I will further highlight some of the challenges entailed in such works and suggest that our understanding of these highly complex and intricate phenomena can substantially benefit from a multidisciplinary dialogue, tying together experimentalists and philosophers.

September 23

**Karen Schloss**, Associate Professor, Psychology, Wisconsin Institute for Discovery, University of Wisconsin-Madison

TITLE: Building a framework of assignment inference to understand expectations about the meaning of visual features in visual communication

ABSTRACT: Visual communication is fundamental to how humans share information, from weather patterns to disease prevalence, to their latest scientific discoveries. When people attempt to interpret information visualizations, such as graphs, maps, diagrams, and signage, they are faced with the task of mapping perceptual features onto meanings. Sometimes, visualization designs include legends, labels, or accompanying verbal descriptions to help determine which visual features mean what. However, people have expectations about how visual features will map to concepts (called inferred mappings), and they find it more difficult to interpret visualizations that violate those expectations. Traditionally, studies on inferred mappings distinguished factors relevant for visualizations of categorical vs. continuous information. In this talk, I will discuss recent work that unites

these two domains within a single framework of assignment inference. Assignment inference is the process by which people infer mappings between perceptual features and concepts represented in encoding systems. I will begin by presenting evidence that observers infer globally optimal assignments by maximizing the “merit,” or “goodness,” of each possible assignment. I will then discuss factors that contribute to merit in assignment inference and explain how we can model the combination of multiple (sometimes competing) sources of merit to predict human judgments. This work has increased our understanding of people’s expectations about the meanings of visual features, which can be used to make visual communication more effective and efficient.

September 30

**Genesis Arizmendi**, Postdoctoral Fellow, University of Texas, Austin

TITLE: Connecting the pieces: An interdisciplinary approach toward improving outcomes for Spanish English learning children

ABSTRACT:-Spanish English learning children are the largest minoritized group of emergent bilingual learners in the US public schools. However, questions remain unanswered regarding accurate identification of learning disabilities and how to best serve the needs of such a diverse community of learners. With the continuing growth of emergent bilinguals in the schools, there is a need to bridge disciplines to inform practice. I will discuss how an interdisciplinary approach can provide greater insight into the intersection between cognition, language, and academics, and how to utilize that understanding to improve outcomes.

October 7

**Alessandra Giorgi**, Professor, Linguistics and Comparative Cultural Studies, University of Venice

TITLE: Danger! Towards an integrated model of syntax, prosody and gesture for warning expressions

ABSTRACT: In this work I consider the properties of certain expressions of warning and propose an integrated model of syntax, prosody and gesture, along the lines discussed in Giorgi & Dal Farra (2019) for surprise and surprise-disapproval, based on the theoretical framework of the Minimalist Generative Model (Chomsky 1995, 2000, 2013).-Expressions of warnings can be explicit – for instance, imperatives such as beware (of), watch out (for), look out, be careful etc – or can be much more similar to assertions, as in the following case:

In a context where I see that John is stepping in a big puddle, I warn him and say:

1) C’è una pozzanghera!

There is a puddle!

Apparently, the sentence in (1) is identical to a simple assertion, realized as a presentational sentence, but is understood as a warning because of its prosodic contour and typical gesture patterns.-I will argue that the syntactic representation to be associated with (1) is not the one representing a simple presentational sentence but is more similar to the imperative structures.- I will show that this peculiar syntax triggers the characteristic prosody and gesture found in (1), in a way similar to surprise and surprise-disapproval

sentences.-This analysis is a further confirmation that pragmatics – i.e., the contribution of the context to the interpretation – is not an isolated component of grammar, in that the phenomena in question can be better accounted for in a perspective where the various components of grammar are actually integrated.

October 14 (Zoom)

**Noam Chomsky**, Laureate Professor Linguistics, Agnese Nelms Haury Chair

**Massimo Piattelli-Palmariini**, Professor Linguistics, and Cognitive Science

**Thomas Bever**, Regents Professor, Linguistics

TITLE: A Three-Way Conversation on Language and Mind

ABSTRACT: The conversation will start with Chomsky's explanation of the difference, in linguistics, between description and explanation. We will then continue with the Poverty of the Stimulus, an instance of Plato's Problem: how can we know so much with so little evidence? Then we will see how and why, when there is a conflict between communicability and syntactic computation, syntactic computation always prevails. This has interesting consequences for the problem of language evolution.

October 21

**Rain Wuyu Liu**, Assistant Professor, Communications, University of Arizona

TITLE: Social Normative Interventions in Promoting Health and Environmental Behaviors

ABSTRACT: Social norms are "rules and standards that are understood by members of a group, and that guide or constrain social behavior without the force of law" (Cialdini & Trost, 1998, p. 152). Frequently, normative messages are exchanged among group members through communication (Kincaid, 2004), including *descriptive norms*, one's perceptions about the prevalence of behavior (i.e., what is commonly done by others) and *injunctive norms*, one's perception of what is socially approved or disapproved (Cialdini et al., 1990). Normative influence on promoting healthy and environmental attitudes and behaviors has been well documented. In this talk, I will present findings from my previous and ongoing research on health and environmental issues (e.g., COVID-10 prevention, food waste reduction, reusable bag promotion among grocery shoppers), guided by the theory of normative social behaviors (TNSB; Lapinski & Rimal, 2005), which offers a model of the normative influence on behaviors, moderated by cognitive mechanisms, including outcome expectations, group identity, and injunctive norms.

October 28

**Janet Metcalfe**, Professor, Psychology, Columbia University

TITLE: A metacognitive model of curiosity

ABSTRACT: It is proposed that one kind of curiosity—which we call Curiosity 1—can be understood in terms of the Region of Proximal Learning (RPL) framework—a metacognitive framework that underpins motivation to learn.-This framework proposes that people feel most curious when they feel they are on the verge of knowing or understanding. The processes, conditions, and outcomes specified by the RPL view of curiosity will be reviewed along with several lines of relevant evidence including (1)

differences in the conditions under which experts and novices seek information or, alternatively, mind wander, (2) experiments investigating people's choices of whether to study materials for which they have high versus low feelings of knowing, (3) results related to people's engagement with corrections to errors made with high confidence, and (4) curiosity, attentional, EEG, and learning data related to the tip-of-the-tongue state. In addition to Curiosity 1, however, we also propose that there is a second kind of curiosity, which we call Curiosity 2. As will be discussed, Curiosity 2 is based on different and sometimes even opposing cognitive/motivational principles from those in evidence for Curiosity 1. The conflation of Curiosity 1 and Curiosity 2 has resulted in considerable confusion in the literature.

November 4

**Hong Hua**, Professor, Optical Sciences, University of Arizona

TITLE: The quest for a harmonious blend of bits and atoms

ABSTRACT: Imagine a world with a harmonious blend of atoms and bits, enabled by novel physical sensors, human interfaces, and cloud-based computing technologies, through which we sense more, we see more, and we understand more. This world provides instant access to past and present knowledge tailored to users' needs and automates many daily tasks and activities from our workplaces to our living spaces. It remains unknown how this emerging technology will play its evolutionary role on our humanity. In this talk, I will start with a brief overview of the OASIS project which aims to establish a regional ecosystem focusing on optics for autonomous services and intelligent systems that will create seamless interfaces between the intelligence of the digital world, humans, and the atomic world. I will then particularly review the recent progress, challenges and opportunities for developing virtual and augmented reality displays for improved visual comfort.

November 18 (Zoom)

**Afra Alishahi**, Associate Professor, Department of Cognitive Science and Artificial Intelligence, Tilburg University

TITLE: Getting closer to reality: Grounding and interaction in models of human language acquisition

ABSTRACT: Humans learn to understand speech from weak and noisy supervision: they manage to extract structure and meaning from speech by simply being exposed to utterances situated and grounded in their daily sensory experience. Emulating this remarkable skill has been the goal of numerous studies; however, researchers have often used severely simplified settings where either the language input or the extralinguistic sensory input, or both, are small-scale and symbolically represented. I present a series of studies on modelling visually grounded language understanding.

December 2

**Peng Peng**, Assistant Professor, Department of Special Education, University of Texas, Austin

TITLE: Understanding the mutualism of executive function and reading with development

ABSTRACT:-I will present a series of studies on the mutualism between executive function

(EF) and reading among different samples during development. The first study, based on the latent growth models with structured residuals, demonstrated longitudinal reciprocal relations between reading and EF in high-performing students, but not in a general population sample or students with reading difficulties. Such longitudinal reciprocal relations between EF and reading seemed to be driven mostly by practice in reading and schooling, not by socioeconomic status. The second study, based on the meta-profiling analysis and meta-analytical structural equation modelling of 378 studies, showed the unique contributions of EF to reading difficulties even after controlling for language skills, and a reading difficulty-EF deficits vicious circle with development. That is, for strong readers, EF and reading may facilitate each other during development, whereas for poor readers, EF and reading may constrain each other during development. The third study presented a domain-specific EF training model to demonstrate how to embed EF into academic tasks to improve EF training transfer effects on academic performance. Implications were discussed on how to trigger and strengthen the reciprocal relations between reading and EF during development to potentially close the achievement and cognition gap between poor readers and their typically developing peers.

### ***COGNITIVE SCIENCE COLLOQUIUM Spring 2022***

January 21

**Jonathan Tullis**, Associate Professor, Educational Psychology, University of Arizona  
TITLE: Always Something There to Remind Me”: Reminders modify memory and produce generalization

ABSTRACT: New people can remind us of old friends, new music can remind us of oldies, and new examples can remind us of prior knowledge. More broadly, encoding novel stimuli can prompt us to access and retrieve prior relevant episodes, and these prior episodes can guide our understanding of the novel stimuli. Reminders, stimulus-prompted retrievals of past specific episodes, are a fundamental component of cognition that are theorized to underlie a broad array of vital cognitive skills, including problem solving, categorization, and potentially spacing effects in memory. In this talk, I will discuss the cognitive processes that underlie reminders, the factors that affect whether reminders occur, and the consequences of reminders on memory and generalization. Our results show that reminders (1) can cause improvements or interference in memory, (2) are driven by association and distinctiveness, and (3) can yield generalization across episodes. Reminders allow us to use the past in the present and play a role in transitioning knowledge from a catalogue of episodic memories to flexible and semantic storage.

January 28

**Caleb Warren**, Associate Professor, Eller College of Management, University of Arizona  
TITLE: What makes people, brands, and products cool?

ABSTRACT: Firms want to design cool products, marketers want to create cool brands, and

consumers want to become cool themselves, but the literature does not offer a blueprint for what coolness means or what features characterize cool people, products, and brands. My co-authors and I use a range of methods, including focus groups, depth interviews, essays, surveys, psychometric experiments, and neuroimaging, to conceptualize coolness and identify a set of characteristics associated with cool people, products, and brands. Collectively, our studies build a broad understanding of what coolness is, how it is different from general desirability, and how it changes over time. Coolness is a dynamic, socially constructed, positive trait attributed to people, products, and brands inferred to be appropriately autonomous. Thus, coolness has two core dimensions: autonomy and general positivity. These dimensions can take slightly different forms in people, products, and brands, but all cool entities are seen as being independent in a desirable way. In one set of studies, we distinguish values and personality traits that make people seem cool from values and traits that merely make people seem good. In another set of studies, we use experiments and neuroimaging to distinguish cool product designs from designs that seem funny or normal. In a third set of studies, we use qualitative data, surveys, and experiments to identify the characteristics of cool brands, and how these characteristics change over time. At first, most brands become cool to a small niche, at which point they are perceived to be more subcultural, rebellious, authentic, and original. Over time, some cool brands become adopted by the masses, at which point they are perceived to be more popular and iconic.

February 4

**Brian Levine**, Professor, Psychology, University of Toronto

TITLE: Autobiographical memory: Individual differences and assessment of the subjective state of mental time travel

ABSTRACT: Many students of memory are interested in the degree to which laboratory findings can generalize to real life. One such naturalistic activity is autobiographical memory. Due to its multifaceted nature and subjectivity, autobiographical memory provides a unique challenge to assessment. In this talk, I will describe evidence from three different methods used to assess autobiographical memory: the Autobiographical Interview, the Survey of Autobiographical Memory, and the staged event method. I will present insights these have yielded in the areas of selective effects on episodic and semantic memory, neural correlates of autobiographical memory, aging, individual differences, and memory accuracy.

February 18

**Tamar Kugler**, Associate Professor, Management and Organizations  
University of Arizona

TITLE: Three Tales of Organizational Cooperation

ABSTRACT: In this talk I will present a series of new experimental results looking at precursors of cooperative behavior in the context of groups and the workplace. We will discuss the effect of organizational employee retention and termination procedures on collaboration, trust and sabotage behaviors among retained employees, how within and between group power asymmetries impact intergroup conflict and competition and

examine how the allocation of less and more desirable work tasks affects future employee effort, motivation and cooperation dynamics.

February 25 (Zoom)

**Susanna Schellenberg**, Professor, Philosophy, Rutgers University

TITLE: Visual Space, Constancy and Vision Science

ABSTRACT: This paper discusses parameters for accounting for variance and invariance in perception by distinguishing between external, mind-independent perspectival properties and mind-dependent appearance properties, on the one hand, and between external, mind-independent intrinsic properties and mind-dependent constancy properties. It discusses several ways of accounting for the variant aspect of perception in terms of external mind-independent perspectival properties.

March 4 (Zoom)

**Penny M. Pexman**, Professor, Psychology, University of Calgary

TITLE: Children and Sarcasm: Developing a Taste for Irony

ABSTRACT: One of the challenges children face in learning to navigate the social world is created by the fact that people often speak indirectly, for example, with sarcasm or verbal irony. Research has shown that typically developing children don't usually begin to convey and appreciate ironic intent until the early school years. These findings suggest that children's use and appreciation of ironic language develop over a fairly long developmental window and are related to their cognitive development and social experiences. Most of these insights have come from research that is focused on the product of interpretation: the understanding that children convey through verbal descriptions, ratings, or yes/no decisions. In a series of studies, we developed methodology that allows us to explore the *process* of children's irony interpretation. Using a variant of the visual world paradigm, we track children's eye gaze and reaching behavior as they judge speaker intent for ironic language that unfolds in real time in short puppet shows. We have used this paradigm to identify factors that make irony particularly challenging for children. Most recently, those studies have helped us to devise a training paradigm to teach children about sarcastic speech. I'll discuss what our findings tell us about theories of pragmatic development, and how we can help those who struggle with sarcasm.

March 18

**Nima Toosizadeh**, Assistant Professor, Biomedical Engineering, University of Arizona

TITLE: Nonlinear Dynamic Analysis of Motor and Neural Network Function for Early-stage Alzheimer's Disease Detection

ABSTRACT: Early and objective screening of cognitive decline can: 1) establish a baseline; 2) facilitate tracking cognition over time; and 3) help to ensure appropriate care for cognitive health; however, less than half of older adults are presently screened for dementia by outpatient providers. In our current project within an interdisciplinary research team, we validate a multimodal approach incorporating simultaneous assessment of brain function and motor performance for detecting cognitive impairment among older adults with early-stage Alzheimer's disease and Alzheimer's type mild

cognitive impairment. For this, we will expose participants to dual-tasking to accentuate brain function alterations due to the neurological diseases, while measuring motor performance using motion sensors and brain function using functional near infrared spectroscopy (fNIRS). Using this non-invasive and objective approach, we will be able to measure cognitive status of hospitalized older adults, especially in rural areas where access to MRI or PET scan is limited. Further, we will understand the underlying neural mechanism across brain networks among older adults with cognitive impairment, useful for rehabilitation programs.

March 25

**John Allen**, Professor, Psychology, Director, Psychophysiology Laboratory, Director, Depression Risk Laboratory, University of Arizona

TITLE: Messing with the mind: Altering resting-state brain activity to reduce perseverative thinking and target mental disorders

ABSTRACT: Humans have the capacity to create mental representations and engage in forms of mentation that are relatively independent of the current environmental context, taking the form of daydreaming, reminiscing and future planning among others. Among this class of thought, perseverative negative thinking (PNT) in the form of rumination and worry is observed in a number of mental disorders. As such, PNT represents a transdiagnostic feature of depressive and anxiety disorders, which are among the leading causes of disability worldwide. Converging evidence implicates heightened activity within the brain's default mode network (DMN) when individuals engage in this kind of thinking. Thus interventions that alter DMN connectivity may be promising approaches for reducing PNT and symptoms in disorders characterized by PNT. In this talk, I will present work from two approaches that can alter DMN connectivity: low-intensity transcranial focused ultrasound (litFUS) and guided ingestion of psilocybin. Spoiler alert: in several studies, litFUS results in changes in mood and attention that are accompanied by decreases in DMN connectivity. Suspense remains: Following multiple weekly visits for the psilocybin intervention, will OCD patients show decreases in symptom severity and accompanying changes in DMN connectivity?

April 1 (Zoom)

**Yael Niv**, Professor, Psychology and Neuroscience, Princeton Neuroscience Institute

TITLE: Latent causes, prediction errors, and the organization of memory

ABSTRACT: No two events are alike. But still, we learn, which means that we implicitly decide what events are similar enough that experience with one can inform us about what to do in another. We have suggested that this relies on an implicit parsing of incoming information into "clusters" according to inferred hidden (latent) causes. Moreover, we have suggested that unexpected information (that is, a prediction error) is key to this separation into clusters. In this talk, I will demonstrate these ideas through behavioral experiments showing evidence for clustering in animals and humans, and illustrating the effects of prediction errors on the organization of memory. I will then tie the different findings together into a hypothesis about how information about events is organized in our brain.

April 8

**Carol Barnes**, Professor, Psychology, Director, Evelyn F. McKnight Brain Institute, Director, Division of Neural Systems, Memory and Aging, University of Arizona

TITLE: Remarkable selectivity of changes in the hippocampus that contribute to aging cognition

ABSTRACT: Aging is associated with specific impairments of learning and memory, some of which are similar to those caused by damage to temporal lobe structures. For example, healthy older humans, monkeys and rats all show poorer spatial memory than do their younger counterparts, a cognitive domain known to rely on the hippocampus. Rats and monkeys do not spontaneously develop age-related neurodegenerative diseases such as Alzheimer's or Parkinson's, which make them good models for assessing functional alterations associated with the normative aging process in humans. We have learned a great deal over the past several decades about the impact of age on the cellular characteristics of CA1 and CA3 pyramidal cells and dentate gyrus granule cells in the hippocampus. While cell numbers in these regions remain stable across the lifespan, age-related changes in synapse function, plasticity and gene expression have been observed to occur in this structure. These age-related changes clearly have an impact on the dynamics of behaviorally driven network activity across ensembles of neurons, and experiments are described that suggest fundamental alterations in the way these circuits operate. Critically, some of the region- and cell-specific changes during aging can be viewed as consistent with selective brain adaptation or compensation. These data have driven a conceptual shift away from the idea of inevitable passive brain deterioration with time, to the view that the brain is capable of remarkable abilities to adapt across the lifespan. Clearly, therapeutic approaches that aim to optimize brain aging and cognitive health need to take this into account when designing their intervention strategies.

April 15

**Stephen Adamo**, Post Doctoral Fellow, The Attention and Memory Lab, University of Central Florida

TITLE: "Satisfaction of Search" to "Subsequent Search Misses": A review of multiple-target search errors across radiology and cognitive science

ABSTRACT: For over 50 years, the satisfaction of search effect has been studied within the field of radiology. Defined as a decrease in detection rates for a subsequent target when an initial target is found within the image, these multiple target errors are known to underlie errors of omission (e.g., a radiologist is more likely to miss an abnormality if another abnormality is identified). More recently, they have also been found to underlie lab-based search errors in cognitive science experiments (e.g., an observer is more likely to miss a target 'T' if a different target 'T' was detected) and renamed to the subsequent search miss (SSM) effect. In my talk, I will discuss how my research has investigated: (1) current SSM theories (i.e., satisfaction, perceptual set, and resource depletion theories), (2) eye movement errors that underlie the SSM effect, and (3) SSM errors in 3D imaging. Finally, I will present my new Attentional Template theory of SSM errors and discuss future directions my research is taking to bring the study of SSM errors back to radiology.

April 22 (Zoom)

**Martin Wiener**, Assistant Professor, Psychology, George Mason University

TITLE: How movements shape the perception of time

ABSTRACT: Movement and time are naturally intertwined. However, while it has long been known that our sense of time can affect our movements, relatively recent research has begun to also show the converse – that our movements can affect the sense of time. Here, I will present recent work that displays this relationship, in which movements, either performed, imagined, or observed, can influence the perception of time. Through this work, which relies on measuring precise kinematics of the observer, two phenomena are found: movements can both enhance our sense of time and bias it. To explain these effects, I will present a model of Bayesian cue combination, in which movements afford the most precise representation of temporal intervals. Further, two modes of neural instantiation will be presented, in which movements can influence time either through “active sensing”, in which they shape responses directly in sensory cortices, or “feedforward enhancement”, in which downstream activity in motor regions alters the memory for timed events. Evidence for both modes will additionally be presented. Further, cue combination provides several predictions of how movements should affect time estimates; a final series of experiments will be presented that address these predictions. Altogether, these results suggest that humans engage the motor system while measuring intervals of time, even when overt movements are not required for the task.

April 29

**Priyanka Shah-Basak**, Assistant Professor, Neurology, Medical College of Wisconsin

TITLE: Neuromodulation in Aphasia

ABSTRACT: Stroke is a leading cause of aphasia, a language impairment affecting multiple aspects of human communication including language production, comprehension, reading and writing. Approximately 180,000 new cases of aphasia are identified per year, and 1 million or 1 in 250 are currently living with aphasia in the United States. In the weeks and months following stroke, a majority of patients experience partial recovery and regain some language functions, but they seldom make a full recovery. Some patients continue to experience moderate to severe impairments, which undermine their social, vocational, and emotional well-being. They find everyday conversations difficult resulting in increased dependency on caregivers for daily activities, inability to work, social isolation and often depressive symptoms. While outpatient speech and language therapies are available, the observed treatment effects are often inconsistent across patients, and modest at best. There is a need to develop new treatment strategies that can effectively boost therapeutic benefits. *Neurorehabilitation* approaches guided by theoretical models of language impairments and our understanding of neural changes underlying aphasia recovery are needed to enhance language recovery after stroke. One approach that is being widely investigated is pairing noninvasive brain stimulation, particularly transcranial direct current stimulation (tDCS) and transcranial magnetic stimulation (TMS), with language therapies for therapeutic enhancements. However, a number of mechanistic questions

such as where to target stimulation for best results and the neural bases of stimulation-induced therapeutic gains, remain open. In this talk, I will review the existing literature on the use of tDCS and TMS as treatment boosters in post-stroke aphasia. I will then focus on tDCS and tDCS parameters that are crucial for neurorehabilitation applications in aphasia. Finally, I will discuss results from our studies using resting-state magnetoencephalography (MEG) to investigate the neural underpinnings of tDCS, and end with future directions.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2021**

September 10

**Andrew Wedel**, Professor, Linguistics, University of Arizona

TITLE: The role of communication efficiency in shaping language

ABSTRACT: Over the last century, we've gained a great deal of evidence that language structures evolve in ways that optimize communication efficiency. In the lexicon for example, Zipf (1939) famously showed that words which are more predictable tend to be shorter, and vice versa. This relationship reduces overall speaker effort while preserving communication accuracy. In the first part of this talk, I will review some of the most interesting recent findings that illustrate the apparent influence of communication efficiency on lexicons and grammars. In the second part, I will present two strands of our research in this area that are based on the fact that listeners process the speech stream incrementally, continually updating their lexical search as the phonetic signal unfolds. As a consequence, segments earlier in words contribute on average more disambiguating information to lexical access than later segments. If languages evolve to optimize communication efficiency, we expect therefore the most informative segments should be concentrated early in words where they can do the most work in lexical disambiguation - and further that this tendency should be strongest for the least predictable words where comprehension accuracy depends more on the acoustic signal. Here I'll show data from a wide range of languages that this is in fact the case: words that are on average less predictable have relatively more informative early segments, while preserving a longer tail of redundant, confirmatory segments. Second, I'll review our recent work suggesting that the relatively low information of late segments in a word may influence the development of phonological rules which impact lexical identification. In a typologically-balanced sample of 50 languages, we find that phonological rules which neutralize lexical distinctions (e.g., word-final obstruent devoicing in German) are common at word-ends, but very rare at word-beginnings, where neutralization would more negatively impact lexical identification. Interestingly, we find this asymmetry within our dataset in languages from every family and from every region of the world, suggesting that a bias toward word-final neutralization is a strong language universal. This is what we would expect if this asymmetry stems from a basic property of human linguistic cognition.

September 17

**Jennifer Savary**, Associate Professor, Marketing, University of Arizona

TITLE: When Payments Go Social: The Use of Person-to-Person Payment Methods Attenuates the Endowment Effect

ABSTRACT: Decades of research have documented a robust pattern known as “the endowment effect,” such that sellers often demand more to relinquish a good than buyers are willing to pay to acquire the same good. However almost all research to date on this phenomenon has used traditional payment methods, such as cash. In this project we examine how Person-to-Person (P2P) payment methods (e.g. Venmo, Zelle, Paypal) affect consumers’ pricing decisions in the context of the endowment effect. Building on theories related to mental associations and social norms, we predict that when consumers use P2P payment methods, they are more likely to converge on a mutually acceptable price, and the endowment effect will attenuate. This occurs because over time, people develop a set of beliefs and norms about transacting with others in a social context. P2P payment methods influence pricing decisions by inadvertently evoking these social norms and subtly prompting consumers to take into account the perspective of their transaction partner. As a result, people make somewhat less selfish, more cooperative pricing offers: sellers accept somewhat lower prices, and buyers pay somewhat more, attenuating the endowment effect. Importantly, this occurs even though people explicitly report that the transaction is with a stranger they do not know. Seven studies using consequential and hypothetical choices test this proposal and conceptual framework. Finally, a market simulation indicates that P2P can increase successful transactions in a marketplace by more than 15%.

September 24

**Katalin Gothard**, Professor, Physiology, University of Arizona

TITLE: How the Amygdala May Turn Expectations Into Emotional Experience

ABSTRACT: The amygdala plays a central role in emotion and social behavior, yet its role in processing social and affective touch has not been established. Tactile stimuli, processed initially by the somatosensory cortex, acquire affective salience downstream from early processing stages possibly in the amygdala. We monitored simultaneously neural activity in the somatosensory cortex and the amygdala of monkeys that received alternating blocks of either innocuous, gentle air puffs or grooming-like touch from a trusted trainer. We expected neurons in the somatosensory cortex to encode the physical features of puff and touch stimuli whereas neurons in the amygdala were expected to differentiate between the neutral, non-social puff and the pleasant, social touch. The pleasantness of touch was inferred from the autonomic state of the recipients. During grooming blocks, monkeys appeared less vigilant, closed their eyes, had lower heart rates, and increased vagal tone. In contrast, during periods of puff delivery, high levels of vigilance and sympathetic arousal were evident. Surprisingly, during grooming, neurons in the amygdala stopped responding to tactile stimuli, even if the stimuli were delivered to the same areas of the skin that showed reliable responses to puff. This suggests the presence of a gating mechanism in the amygdala. Instead of responding to each touch stimulus, a set of amygdala neurons signaled with sustained changes in baseline firing rate throughout the touch blocks. These findings suggest that while receiving affective touch, the amygdala may be decoupled from

monitoring the external environment, while tonically signaling to the rest of the brain the social-behavioral context and affective state of the recipient.

October 1

**Cameron Buckner**, Associate Professor, Philosophy, University of Houston

TITLE: Imagination and the Prospects for Empiricist AI

ABSTRACT: In current debates over deep-neural-network-based AI, deep learning researchers have adopted the goals of philosophical empiricism and associationism, and deep learning's critics have redeployed arguments from philosophical rationalism and nativism. One of the most influential arrows in the rationalist quiver is summarized by Fodor's claim that the ability to create new compositional representations is required for cognition. In a centuries-displaced debate, Fodor applauds Hume for acknowledging this burden but criticizes Hume for appealing to the imagination to discharge it. Fodor claims that an associationist appealing to the imagination constitutes "cheating", and notes that Hume never explains how the empiricist imagination actually works. More recently, deep learning researchers have claimed that generative deep neural network models (such as Generative Adversarial Networks, Variational Autoencoders, and Transformers) can perform one or more of the roles ascribed to the imagination by cognitive psychology and neuroscience. In this talk, I canvass these models and their achievements to arbitrate this dispute between Humean empiricism and Fodorian rationalism, in the process extracting more general lessons about empiricist cognitive architecture and the prospects for deep-learning-based AI.

October 15

**Vinodkumar Prabhakaran**, Senior Research Scientist, Google, LLC., Research Affiliate, Stanford University

TITLE: NLP and Society: Undesirable Societal Biases as Barriers to Those in the Margins

ABSTRACT: As natural language processing (NLP) techniques are increasingly being used in various day-to-day applications, there is growing awareness that the decisions we as researchers and developers make about our data, methods, and algorithms have immense impact in shaping our social lives. In this talk, I will outline a growing body of research on ethical implications of NLP technologies, especially around fairness failures along various axes. I will discuss ways in which machine learned NLP models may reflect, propagate, and sometimes amplify social stereotypes about people, potentially harming already marginalized groups. I will cover research from our team at Google, as well as the larger research community on ways to detect and address these issues, and discuss the open challenges in this space.

October 29

**Martina Poletti**, Assistant Professor, Brain and Cognitive Science, University of Rochester

TITLE: The Interplay of Attention and Eye Movements at the Foveal Scale

ABSTRACT: Human vision relies on a tiny region of the retina, the foveola, to achieve high spatial resolution. Foveal vision is of paramount importance in daily activities, yet its study is challenging, as eye movements incessantly displace stimuli across this region. Building on recent advances in eye-tracking and gaze-contingent display, we have examined how

attention and eye movements operate at the foveal level. We have shown that exploration of fine spatial detail unfolds following visuomotor strategies reminiscent of those occurring at larger scales. Together with highly precise control of attention, this motor activity is linked to non-homogenous processing within the foveola and selectively modulates sensitivity both in space and time. Therefore, high acuity vision is not the mere consequence of placing a stimulus at the center of gaze: it is the outcome of a synergy of motor, cognitive, and attentional processes, all finely tuned and dynamically orchestrated.

Nov 5

**Brad Story**, Professor, Speech, Language & Hearing Sciences, University of Arizona

TITLE: Transformation of discrete phonetic segments into speech based on the acoustic relativity of the vocal tract

ABSTRACT: The vocal tract is typically defined as the airway extending from the larynx to the lips. During the production of speech, a neutral and talker-specific configuration of the airway is modulated almost continuously by the movements of the tongue, jaw, lips, velum, and larynx. From an acoustic perspective, the airway can be considered to be a non-uniform conduit whose shape at a given instant of time supports a specific pattern of acoustic resonances that transmit information related to both the intended message and the identity of the talker. This presentation will summarize recent development of a model in which individual speech segments that comprise a word, phrase, or sentence are specified as relative deflections of the resonance frequencies of the neutral vocal tract configuration and then transformed to time-dependent modulations of the airway. The output of the model is artificial speech that can be presented to listeners. Examples will demonstrate the construction of speech with the model, results from a recent perceptual experiment, and few speech illusions that may occur with constraints imposed on the vocal tract or when distortions of the speech signal occur.

November 12 (Zoom)

**Daniel Balliet**, Professor, Experimental and Applied Psychology, University of Amsterdam

TITLE: Interdependence and the Evolution of Human Cooperation

ABSTRACT: Human life history involves a high degree of mutual dependence, such as within activities of parenting, labor, and resource sharing, to name a few. The exact kinds of interdependence Humans experience, now and in the ancestral past, have been intensely debated amongst philosophers and scientists. Assumptions about Human interdependence can influence models about the evolution of human social behavior, and especially how humans have evolved to cooperate. In this talk, I will describe how prior theory, and research has been constrained by an over-reliance on the Prisoner's Dilemma as a model of Human interdependence and cooperation. I will share a theoretical perspective that emphasizes how humans have experienced a great variety of interdependence, which can be described (in part) by four dimensions: (1) mutual dependence, (2) asymmetrical dependence (i.e., power), (3) conflicting-versus-corresponding interests, and (4) coordination. My lab has recently developed measures of how people infer their interdependence in social interactions and relationships along these dimensions, and I will share how we have used this method, in combination with

experience sampling, to document how people think about the interdependence they experience with others in daily life. I will discuss some implications of this research for understanding how humans evolved to cooperate, and how cooperation varies across societies.

November 19

**Anna Dornhaus**, Professor, Ecology & Evolutionary Biology, University of Arizona

TITLE: Why isn't everyone smarter? The limits of cognition and organization, with data on bees, ants, and humans

ABSTRACT: Biology and psychology, broadly speaking, have approached the understanding of 'cognition' from different viewpoints; but in both fields, we tend to see high 'intelligence' as the pinnacle, and therefore natural goal, of evolution. However, we know from decades of research in both fields that heuristics and fixed behaviors can also be very efficient in problem solving. In this talk I will illustrate both how 'intelligence' may be more and less commonly used than we may think, and bring up the question of what is limiting the use of 'intelligent' problem solving strategies. In particular, inspired by issues in computing and AI, I will discuss what we know about whether it is computational power or input data that are limiting 'intelligent' solutions in animal and human behavior.

### ***COGNITIVE SCIENCE COLLOQUIUM Spring 2021***

January 22 (Zoom)

**Roeland Hancock**, Assistant Research Professor, Department of Physiological Sciences, University of Connecticut

TITLE: Genetic topology of the language network

ABSTRACT: I will discuss recent work that combines behavioral genetics and functional brain imaging to examine sources of individual variation in the language processing network, and better delineate the functional architecture of the multiple, hierarchically interacting neural systems that underlie language faculty. I first discuss the use of genetic correlation to investigate how shared genetic factors may contribute to covariance in spatially distributed language-related task fMRI activation within left temporal and inferior frontal cortex. These results broadly provide novel support for a dorsal/ventral dual stream model of language processing, with dorsal and ventral streams having distinct genetic influences, yet also raise questions about the role of premotor cortex (PMC) and the anterior temporal lobe (aTL) within language networks. In light of this genetic map, I will suggest that popular hierarchical divisions of incremental language processing models (e.g. from lexical co-occurrence statistics to probabilistic context free grammar) do not reflect the natural architecture of the language network and briefly discuss models that may better account for interactions between these levels.

January 29 (Zoom)

**Liz Chrastil**, Assistant Professor, Neurobiology and Behavior, University of California,

Irvine

**TITLE:** Using spatial navigation to understand human learning and memory

**ABSTRACT:** Navigation is a central part of daily life. For some, getting around is easy, while others struggle, and certain clinical populations display wandering behaviors and extensive disorientation. Working at the interface between immersive virtual reality and neuroimaging techniques, my research uses these complementary approaches to inform questions about how we acquire and use spatial knowledge. In this talk, I will discuss both some of my recent work and upcoming experiments that center on three main themes: 1) how we learn new environments, 2) how the brain tracks spatial information, and 3) how individuals differ in their spatial abilities. More broadly, I will discuss how navigation lends insight into processes of human learning and memory. The behavioral and neuroimaging studies presented in this talk inform new frameworks for understanding spatial knowledge, leading to novel approaches to answering the next major questions in navigation, learning, and memory.

Feb 5 (Zoom)

**Alison Hawthorne Deming**, Professor, English, University of Arizona

**Evan Maclean**, Assistant Professor, Anthropology, University of Arizona

**TITLE:** A discussion on intelligence

**ABSTRACT:** Intelligence is an important but controversial concept in both science and society. In this interactive session we will discuss intelligence from the perspective of a comparative psychologist (Evan MacLean) and a poet (Alison Deming). We will also solicit ideas and perspectives from others in the group so please come prepared to contribute to an interactive session probing the nature of intelligence!

Feb 12 (Zoom)

**Miriam Spring**, Assistant Professor, Neuroscience, University of British Columbia

**TITLE:** Eye movements as a window into decision making

**ABSTRACT:** Seeing and perceiving the visual world is an active and often multimodal process that involves orienting eyes, head and body towards an object of interest. It is also a highly dynamic process during which the eyes continuously scan the visual environment to sample information. Eye movements are used in many contexts and by many research disciplines, ranging from developmental and cognitive psychology to computer science and art history, to measure visual perception, object categorization, recognition, and other mental processes. My research group uses human eye movements as sensitive indicators of performance in real-world interceptive tasks. Tasks such as catching prey or hitting a ball require prediction of an object's trajectory from a brief glance at its motion, and an ultrafast decision about whether, when and where to intercept. I will present results from two research programs that use eye movements as a readout of these types of decision processes. The first series of studies investigates go/no-go decision making in healthy human adults and baseball athletes and reveals that eye movements are sensitive indicators of decision accuracy and timing. The second set of studies probes decision making in patients with motor deficits due to Parkinson's disease and shows differential impairments in visual, motor and cognitive function in these patients. I will conclude that

eye movements are both an excellent model system for prediction and decision making, and an important contributor to successful motor performance.

February 19 (Zoom)

**Sara Aronowitz**, Assistant Professor, Philosophy and Cognitive Science, University of Arizona

TITLE: What is cognitive structure

ABSTRACT: In this talk, I'll present some of my recent theoretical and experimental work on the variety of information structures that we use to solve problems. What do these structures have in common, and how do structures of different types interact in learning? I'll present two cases from explanation and memory. (1) In response to why-questions, people offer both narrative and abstract explanations. These two structures, I'll argue, work together to allow us to understand and communicate - and data from adult learners suggests that both structures are in some sense equally explanatory. (2) In memory, spatial (and spatio-temporal) map-like structures have been posited to extend to all kinds of knowledge domains beyond the literally spatial. But what is lost when we extend the concept of a map this far? Putting these cases together, we see that even simple learning problems are not best solved by finding the "right" structure but instead require a more complex array of structures.

March 5 (Zoom)

**Debbie Kelly**, Professor, Psychology, University of Manitoba

TITLE: Crumbling Foundations: Age-related Decline in Geometric Cue Use During Spatial Reorientation

ABSTRACT: Orientation is the critical first step in navigation. When lost, or in a new environment, one must reorient to determine which direction to begin traveling. Considerable research over the years has shown a diversity of species use featural (e.g., color or pattern) and geometric (e.g., distance or direction) information from objects or boundaries to reorient. Interestingly, even when featural cues are present and reliably predict the location of a hidden target, many animals encode geometric information from the surfaces of an enclosed environment. Geometry has been argued to provide a foundation upon which featural cues are built. However, the encoding of geometry may decline with age. The crumbling foundations of a spatial representation may leave older individuals lost in featurally familiar environments. My research presentation will take a comparative approach to examine this possibility.

March 12 (Zoom)

**Anne Charity Hudley**

Professor, Linguistics, University of California, Santa Barbara

TITLE: A Dialogic Model of Linguistic and Racial Identity Development for Black College Students

ABSTRACT: Knowledge about language and culture is an integral part of the quest for educational equity and empowerment, not only in PreK-12 but also in higher education. As Black students transition from high school to college, they work to add their voices and

perspectives to academic discourse and to the scholarly community in a way that is both advantageous and authentic. The Talking College Project is a Black student and Black studies centered way to learn more about the particular linguistic choices of Black students, while empowering them to be proud of their cultural and linguistic heritage. One key question of The Talking College Project is: how does the acquisition of different varieties of Black language and culture overlap with identity development, particularly intersectional racial identity development? To answer this question, we used a community based participatory research methodology to conduct over 100 interviews with Black students at several Minority-Serving Institutions, Historically Black College, and Predominantly White Universities. Prior to the pandemic, we also conducted ethnographies on over 10 college campuses. Based on information collected from the interviews and our ethnographies, it is evident that Black students often face linguistic bias and may need additional support and guidance as they navigate the linguistic terrain of higher education. I will present themes and examples from the interviews that illustrate the linguistic pathways that students choose, largely without sociolinguistic knowledge that could help guide their decisions. To address the greater need to share information about Black language with students, I highlight our findings from interviews with Black students who have taken courses in educational linguistics to demonstrate the impact of education about Black language and culture on Black students' academic opportunities and social lives. We have a focus on how this information particularly influenced those who went on to be educators. These findings serve to help us create an equity-based model of assessment for what educational linguistic information Black students need in order to be successful in higher education and how faculty can help to establish opportunities for students to access content about language, culture, and education within the college curriculum. We address the work we need to do as educators and linguists to provide more Black college students with information that both empowers them raciolinguistically AND respects their developing identity choices.

March 19 (Zoom)

**Catherine Brooks**, Associate Professor, Director of the iSchool, University of Arizona

TITLE: Popular Discourse around Deepfakes

ABSTRACT: This research interrogates the discourses that frame our understanding of deepfakes and how they are situated in everyday public conversation. It does so through a qualitative analysis of popular news and magazine outlets. This project analyzes themes in discourse that range from individual threat to societal collapse. This paper argues that how the deepfake problem is discursively framed impacts the solutions proposed for stemming the prevalence of deepfake videos online. That is, if fake videos are framed as a technical problem, solutions will likely involve new systems and tools. If fake videos are framed as a social, cultural, or as an ethical problem, solutions needed will be legal or behavioral ones. As a conclusion, this paper suggests that a singular solution is inadequate because of the highly inter-related technical, social, and cultural worlds in which we live today.

April 9 (Zoom)

**Melville Wohlgemuth**, Assistant Professor, Neuroscience, University of Arizona

**TITLE:** Sensorimotor integration for active sensing behaviors

**ABSTRACT:** A major goal in neuroscience is to dissect the neural circuits that support complex behaviors. Comparative approaches are fundamental to the success of this goal, to separate species specializations from general principles, and to understand the brain in light of its evolved functions. Our lab uses the echolocating bat as a model to understand the role of an interconnected cortico-collicular brain circuit in processing information from the environment to adapt active sensing behaviors. In humans, this process typically involves assessing visual information for the control of head and eye movements; for the bat, auditory information is used to adapt features of sonar vocalizations, positioning of the head and ears, and kinematics of flight control. The same brain structures involved in auditory spatial attention in humans have been co-opted by the bat for their echolocation behaviors: namely the inferior and superior colliculus in the midbrain, as well as auditory cortex. These structures form an interconnected loop that processes incoming auditory information for the purposes of species-specific orienting behaviors. Today's talk will focus on efforts to understand how the superior colliculus processes auditory information, its role in driving the bat's orienting echolocation behaviors, and preliminary work on the inferior colliculus to understand auditory response topologies for processing natural sounds. From this work, we have identified general rules by which the brain processes sensory information for the purpose of adaptive spatial attention behaviors.

April 16 (Zoom)

**Peter Turkeltaub**, Associate Professor, Neurology, Georgetown University Medical Center

**TITLE:** Biological Mechanisms of Language Outcomes After Stroke

**ABSTRACT:** About one third of people who have a stroke experience aphasia, a loss of language and communication ability that can have devastating consequences on a person's life. Most people with aphasia never fully recover, even with maximal medical care and speech-language therapy. A major goal of research is thus to understand the brain basis of aphasia recovery, with the hope that this information will lead to improved biologically based treatments. For many years, neuroimaging studies have described topological patterns of changes in brain activity in people with aphasia, suggesting that recovery involves recruitment of tissue around the stroke in the left hemisphere known as "perilesional recruitment," along with recruitment of a mirror-image language network in the right hemisphere, and possibly engagement of "domain general" non-linguistic processors to support recovery. The field has been somewhat lacking, however, in tests of clear biological mechanistic hypotheses to explain these observations. I will present several neuroimaging studies examining brain structure, function, and connectivity to investigate specific hypotheses regarding the biological mechanisms that might underlie changes in language networks after stroke. The results challenge some commonly held ideas regarding the brain basis of aphasia recovery.

April 23 (Zoom)

**Shaowen Bao**, Associate Professor, Physiology, University of Arizona

**TITLE:** Hearing Loss and Cognitive and Emotional Disorders

**ABSTRACT:** Compared to individuals with normal hearing, those with a mild, moderate,

and severe hearing impairment, respectively, had a 2-, 3-, and 5-fold increased risk of dementia. Hearing loss is also associated with anxiety and depressive disorders. I will discuss our ongoing animal research on how noise-induced hearing loss impacts hippocampus and amygdala functions, and its potential connection to cognitive and emotional disorder.

April 30

Student Showcase (Zoom)

Paulo Ricardo da Silva Soares, Ph.D. Candidate, Computer Science, University of Arizona

TITLE: Designing an Intelligent Collaborative Agent for Urban Search and Rescue Missions

ABSTRACT: Intelligent agents have been widely used to assist humans in several daily situations. In most cases, however, these agents cannot reason about people's beliefs and desires and fail to effectively bond with their human mates. Some works have tried to attenuate this issue by computationally encoding human mental states. However, problems are usually constrained to a single-person domain, and inference is usually policy-driven. In this talk, I will comment on the work I have been doing to design a collaborative agent to reason about people's beliefs and interact with them in a virtual urban search and rescue mission. First, I will present some results we got in a single-player case showing that the agent can infer how much participants know about the mission design based on their behaviors. Next, I will display our current efforts to extend the model to a multiplayer context in which the agent must keep track of individual and shared mental states. Finally, I will discuss our future direction, which takes affective states into account - grounded by neural and physio data - as well as agent-to-human communication.

Li-Chuan (Matt) Ku

Ph.D Candidate, Cognition and Neural Systems , University of Arizona

TITLE: Attention and regulation during emotional word comprehension in older adults: Evidence from event-related potentials and brain oscillations

ABSTRACT: Older adults often show a positivity bias effect during information processing, focusing more on positive than negative information. Prior studies that reported such effect were primarily based on pictures, not words. They also primarily focused on emotional valence (positive, negative), leaving out the important emotional dimension of arousal - how intense our bodies experience the emotions (high, low). The present study investigated how age affects the comprehension of emotional words with different valence (positive, negative) and arousal (high, low). Older and younger participants read positive/negative and high/low-arousing words and pseudowords, and make word or non-word judgements, while their brainwaves (EEG) were recorded from the scalp. We found that age matters: Older adults showed increased N400s and left frontal alpha decreases (300-450 ms) for low-arousing positive as compared to arousal-matched negative words, suggesting a positivity bias effect dependent on arousal during lexical retrieval. Older adults also showed a mid-frontal theta increase (500-700 ms) than younger adults for the low-arousing negative words. This possibly indicates older adults' down-regulation of

negative meanings, especially in low-arousing negative words. Taken together, our data supported that the age-related positivity bias effect depends on arousal, consistent with the strength and vulnerability integration model of aging.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2020**

September 4 (Zoom)

**Adarsh Pyarelal**, Research Scientist, School of Information, University of Arizona

TITLE: Building machines that understand humans

ABSTRACT: As anyone who's been frustrated by Siri or Alexa can readily verify, computers just don't *get* us. While artificially intelligent (AI) agents are getting quite good at understanding Adexplicit instructions, they still struggle to understand implicit information conveyed through prosody, facial expressions, informal/imprecise language, etc. This difficulty presents a major obstacle to the development of AI 'theory of mind', i.e., the ability to infer the beliefs, desires, and intentions of humans. In this talk, I will give an overview of ToMCAT (Theory of Mind-based Cognitive Architecture for Teams) - a 4-year project aimed at developing AI agents with social intelligence and testing them in a Minecraft-based virtual testbed.

September 11 (Zoom)

**Christopher Baldassano**, Assistant Professor, Psychology, Columbia University

TITLE: Cognitive maps: events, spaces, semantics, and development

ABSTRACT: Understanding and remembering realistic experiences in our everyday lives requires activating many kinds of structured knowledge about the world, including spatial maps, temporal event scripts, and semantic relationships. My recent projects have explored the ways in which we build up this schematic knowledge (during a single experiment and across developmental timescales) and can strategically deploy these cognitive maps to construct event representations that we can store in memory or use to make predictions. I will describe my lab's ongoing work developing new experimental and analysis techniques for conducting functional MRI experiments using narratives, movies, poetry, virtual reality, and "memory experts" to study complex naturalistic schemas.

September 25 (Zoom)

**Samuel Gershman**, Roger N. Shepard Visiting Scholar, Associate Professor, Psychology, Harvard University

TITLE: Predictive maps in the brain

ABSTRACT: In this talk, I will present a theory of reinforcement learning based on a "predictive map" that can be used to efficiently evaluate different states of the environment. I show how such a map explains many aspects of hippocampal representation. The map can be decomposed to reveal latent structure resembling entorhinal grid cells. I will then present evidence that humans employ such a predictive

map to solve reinforcement learning tasks. Finally, I will discuss the role of dopamine error signals in learning the predictive map.

October 2 (Zoom)

**Dwight Kravitz**, Associate Professor, Cognitive Neuroscience, Department of Psychological & Brain Sciences, George Washington University

TITLE: Predicting functional organization and its effects on behavior

ABSTRACT: In many ways, cognitive neuroscience is the attempt to use physiological observation to clarify the mechanisms that shape behavior. Over the past 25 years, fMRI has provided a system-wide and yet somewhat spatially precise view of the response in human cortex evoked by a wide variety of stimuli and task contexts. The current talk focuses on the other direction of inference; the implications of this observed functional organization for behavior. To begin, we must interrogate the methodological and empirical frameworks underlying our derivation of this organization, partially by exploring its relationship to and predictability from gross neuroanatomy. Next, across a series of studies, the implications of two properties of functional organization for behavior will be explored: 1) the co-localization of visual working memory and perceptual processing and 2) implicit learning in the context of distributed responses. In sum, these results highlight the limitations of our current approach and hint at a new general mechanism for explaining observed behavior in context with the neural substrate.

October 9 (Zoom)

**Gondy Leroy**, Professor, MIS, Eller College of Management, University of Arizona

TITLE: Design and Development of Decision Support Tools for Surveillance of Autism Spectrum Disorders (ASD) using HER

ABSTRACT: In this presentation, I will provide a high level overview of a natural language processing (NLP) information system that can help improve, speed up, and facilitate reporting of cases of ASD using free text in EHR. I will show the approach and results of rule-based and machine learning algorithms to automatically recognize phenotype expression of ASD in text as well as label a child as ASD or not through review of the EHR free text. I will discuss current results and problems encountered because this is a low resource area. I will also show examples of new analyses made possible with this type of data creation and biases to be taken into account. I hope to conclude with a discussion with the audience of new promising areas and potential extensions, applications, and collaborations.

October 16

**Winslow Burlison**, Professor, Assistant Director and Director of Research, School of Information, University of Arizona

TITLE: Motivational Environments: Cyberlearning, Digital Health, and Society's Grand Challenges

ABSTRACT: Novel forms of human computer interaction and learning sciences, applied to health, technology, education, and innovation are radically transforming the socio-technical environments in which we interact. Affective learning companions personally

tailor interactions to mitigate *Stuck* and promote *Flow*. Supportive dressing systems adapt to the needs of persons living with cognitive impairment. Smart home and assistive technologies can foster independence for people living with autism. The *University of Arizona Holodeck*, a powerful *Experiential Supercomputer*, is empowering transdisciplinary collaborations advancing convergent research, education, and innovation.

October 23 (Zoom)

**Maureen Ritchey**, Assistant Professor, Psychology Department, Boston College

TITLE: Making Memories: Brain networks supporting episodic binding and reconstruction

ABSTRACT: When we remember an event, we weave together its specific features into a coherent episode. In effect, we rebuild the world in our minds. How does the human brain accomplish this feat? In this talk, I will discuss the hippocampal and cortical network interactions that transform experience into memory. This transformation process begins at encoding, as feature representations are bound through the hippocampus and embedded within the spatiotemporal structure of events. As memories are retrieved, cortico-hippocampal networks interact to reconstruct these features into a richly detailed experience. I will highlight recent work suggesting that, within the posterior medial cortico-hippocampal network, there are distinct subnetwork alliances that support different aspects of episodic representations. Finally, I will discuss ongoing efforts to modulate the reconstruction of emotional memories, leveraging what we know about making memories to make them feel better.

Oct 30 (Zoom) CANCELLED

**Jennie Gubner**, Assistant Professor, Music, College of Fine Arts, University of Arizona

TITLE: Re-imagining Dementia Education through Ethnomusicology and Arts-based Research

ABSTRACT: How can the field of ethnomusicology contribute to dementia research and education? How can arts-based research methods be used to produce new kinds of knowledge that enrich the ways students from within and beyond the health sciences understand aging and cognitive decline? How might ethnographic and arts-based dementia education models help us reimagine how we can better train students to be active agents in the production of age-friendly, inclusive societies. In this presentation I will speak about my role as an ethnomusicologist working in the field of dementia research and education over the last 5 years. I will draw on my experiences designing college courses about music and dementia and participating in inter-professional dementia research and training opportunities in collaboration with geriatricians and neurologists. As a faculty member on the UA Health Sciences Strategic Initiative "Next-Generation Models of Healthy Aging," I will advocate the potential of arts-based dementia education models in teaching interdisciplinary listening, recruiting workforce pipeline to support older adults, and reshaping perceptions of dementia through relationship-centered models of creative engagement and public storytelling.

November 6 (Zoom)

**Molly Gebrian**, Assistant Professor, Fred Fox School of Music, University of Arizona

TITLE: Music and early Language Acquisition

ABSTRACT: The phrase “music is the universal language” is ubiquitous in our culture, but this talk will explore the idea that, rather than music being a language, language can best be understood as a type of music. Infants first experience language not as a content-rich utterance, but rather as pure sound, devoid of any concrete meaning but full of interesting and varied acoustic information. Music perception is often treated as an ancillary ability in our culture and is thought to mature more slowly than language perception and acquisition. This talk will demonstrate that, to the contrary, not only do music and language abilities develop in parallel, but musical hearing and ability are essential for successful language acquisition. A review of the relevant literature in infant and child development, cognitive neuroscience, and musicology will show that the ability to hear musically is fundamental to our identity and linguistic abilities as human beings.

Nov 13 (Zoom)

**Gina Kuperberg**, Professor, Cognitive Science, Tufts University

TITLE: Does hierarchical predictive coding mediate language comprehension? Evidence from multimodal neuroimaging

ABSTRACT: One of the most fundamental questions in Cognitive Science is how the brain is able to extract meaning from streams of rapidly unfolding, noisy linguistic inputs. The process of language comprehension can be understood as probabilistic inference — the use of a hierarchy of linguistic and non-linguistic knowledge (a generative model) to infer the underlying representations that best explain the linguistic input. It has been proposed that the brain carries out this type of probabilistic inference using an algorithm known as hierarchical predictive coding. Although the term predictive coding has sometimes been used in a broad sense to describe any type of predictive processing by the brain, it actually refers to a specific computational architecture that was originally used to simulate extra-classical receptive-field effects in the visual system, and that has since been extended into a more general theory of cortical function. Predictive coding inherits many of the basic principles of parallel, interactive and constraint-based accounts, which have transformed our understanding of language processing over the past few decades. It also instantiates probabilistic prediction at multiple levels of linguistic representation, which is thought to play a major role in ensuring that real-time language comprehension is both fast and accurate. However, it is distinguished both from classic connectionist models and from more general predictive processing frameworks by committing to a particular arrangement of feedforward and feedback connections and flow of activity, both within and across different levels of the cortical hierarchy. In addition to its biological plausibility, this framework makes principled predictions that address some of the most fundamental questions in the neurobiology of language: When, where and how does incoming information interact with prior top-down contextual constraints as it becomes available to successive levels of the cortical hierarchy over time? Can contextual predictions pre-activate item-specific representations, and if so, at what levels of representation? And how is the brain able to rapidly shift away from prior predictions so that it can rapidly and flexibly respond to systematic changes in the underlying message? In this talk, I will

address some of these questions, discussing the evidence we already have, and the evidence we still need to support the hypothesis that the brain carries out predictive coding during language comprehension.

November 20 (Zoom)

**Sol Lim**, Assistant Professor, Systems and Industrial Engineering, University of Arizona

TITLE: Human Motion Analysis with Inertial Sensing and Predictive Modeling for Improved Health and Well-being

ABSTRACT: Wearable sensing technologies that gained popularity with health and fitness tracking present many new opportunities for human factors & ergonomics research. Obtaining interpretable and actionable information from the vast amounts of data generated by these sensors will require merging traditional ergonomics theory and first principles with statistical techniques adept at handling large data. My research presents a framework for combining wearable inertial sensing, biomechanical modeling, and predictive modeling techniques for ergonomics assessment. Examples include estimating exposures to manual material handling tasks of different intensity and duration, with insights on the body's biomechanical response to external loads in dynamic tasks. This study was motivated by the high prevalence of overexertion injuries from high force exertions and awkward postures during manual material handling which account for one-third of all work-related injuries costing the US economy \$13.7 billion annually. The developed approach is aimed at overcoming some of the conventional challenges of manually measuring workers' exposures to force exertions and work postures in non-routinized work such as in variable material handling (e.g., UPS/Amazon fulfillment centers), patient-care (e.g., nurses, patient transporters), and construction work. I will conclude with an overview of other on-going studies to illustrate the broad potential of low-cost wearable sensing and predictive modeling for improve human health and well-being.

December 4

**Stacey Tecot**, Associate Professor, School of Anthropology, University of Arizona

TITLE: The socioendocrinology of raising babies: insights from defiant lemurs

ABSTRACT: Determining how species mitigate environmental stress to survive and reproduce is central to an understanding of human and non-human primate evolution and health, and is also critical for forecasting the fates of species in the face of climate change and habitat degradation. An estimated 98% of lemurs are threatened with extinction, and the strategies that they have evolved to cope with challenges in their environment may be insufficient to respond to more recent, relatively abrupt challenges caused by human activities. Here, I focus on the evolution and proximate mechanisms of shared infant care, reproductive timing, and the stress response. I use a combination of detailed behavioral and physiological data on the red-bellied lemur as well as comparative data across species to determine how lemurs negotiate reproduction and survival in a naturally dynamic environment, and how anthropogenic factors might impact those strategies.

**COGNITIVE SCIENCE COLLOQUIUM**  
**Spring 2020**

January 24

**Heidi Harley**, Professor, Department of Linguistics, University of Arizona

TITLE: Lexical semantics and the self (joint work with Shaun Nichols)

ABSTRACT: Prevailing philosophical accounts of persons attempt to analyze the notion of self or person in terms of other familiar notions. On one prominent account, the person is the *mind*. On another prominent view, the person is the *body* or the *brain*. A third view is that the person is the *soul*. We argue that none of these views of the self is consistent with the lexical semantics of the terms *mind*, *body*, and *soul*, for these terms are all instances of *intrinsically relational nouns* which presuppose a possessor. The relational character of these nouns is revealed by their behavior in various grammatical contexts. Prototypical nouns like *flower*, *man*, and *toy* are nonrelational. The extension of non-relational nouns consists of a set of individuals. For example, *Mark is a man* just in case  $m \in [[\text{man}]]$ . In addition to nonrelational nouns, there are also several well-documented classes of relation-denoting nouns. Nouns like *friend*, *child*, and *tail* necessarily express a relation between two arguments and are hence *relational nouns*. In the case of a relational term like *friend*, the extension of the noun is a set of ordered pairs. *Mark is the friend of Joan* just in case  $\langle m, j \rangle \in [[\text{friend (of)}]]$ . In addition, with relational nouns, since the relation is specified in the lexicon, the relation expressed in a phrase like *Susan's friend* can be identified based entirely on the lexical semantics of the head noun – it's the friend relation. By contrast, with *Susan's flower*, the relation being expressed can't be read off of the head noun. It could be that Susan grew the flower, bought the flower, picked the flower, etc. This is because *flower* is not an intrinsically relational noun, so we can't infer from the word itself what the relation is between Susan and the flower. There are syntactic distinctions that can differentiate relational and non-relational nouns (see, e.g. Barker 2011: 1111). In English, non-relational nouns cannot take a postnominal genitive of (*N of X*):

(1) #the toy of Lassie

but relational nouns can:

(2) the tail of Lassie

With this postnominal genitive test in hand, we can check our nouns of interest:

(3) a. #the person of Einstein

b. the mind of Einstein

c. the body of Einstein

d. the soul of Einstein

We see here that *person* patterns with nonrelational nouns but *mind*, *body*, and *soul* pattern with relational nouns. The test with postnominal genitives is English-specific. We introduce a new test for relational nouns that is not specific to English. Roughly speaking, existential sentences quantify over entities (or entity correlates of properties) (see, e.g., McNally 2011). Nonrelational nouns like *dog* denote entities, but with relational nouns the denotation is, as we've seen, more complex. Thus, we might expect that relational nouns behave differently in existential constructions than non-relational nouns. And that's exactly what we find:

- (4) a. There is a dog in the room.
- b. #There is a tail in the room.
- c. There are 2 chairs in the room.
- d. #There are 8 legs in the room.

If *mind*, *body*, and *soul* are relational nouns, then we should also find infelicities in the relevant existential constructions, and indeed we do:

- (5) a. There is a person in the room.
- b. #There is a mind in the room.
- c. #There is a body in the room.
- d. #There is a soul in the room.

(There are, of course cases in which we might accept strings like (5b-d). In a morgue it might be appropriate to say (5c), but this is because the body has effectively become dispossessed from the self. In a similar way, (4b) is acceptable if the room contains a tail that has been docked from a dog.) One advantage of this test is that existential constructions are found in all languages. So we can apply the test more broadly. We provide evidence from four genetically unrelated languages: Hindi (Indo-Iranian), Tagalog (Austronesian) and Korean (Koreanic) and the isolate Basque. In each case, we find the same kind of pattern as in (5a-d). Thus, the evidence from lexical semantics indicates that *mind*, *body* and *soul* encode a relation between a property and something else. Presumably that something else is the self – the person whose mind, body or soul they are. We conclude that considerations from lexical semantics show that, absent a substantially revisionist view, the self can't be identified with mind, body, or soul.

January 31

**Linda B. Smith**, Distinguished Professor, Department of Psychological & Brain Sciences, and The Program in Cognitive Science, Indiana University, Bloomington

TITLE: Learning from the infants' point of view

ABSTRACT: Learning depends on both the learning mechanism and the regularities in the training material, yet most research on human and machine learning focus on the discovering the mechanisms that underlie powerful learning. I will present evidence from our research focusing on the statistical structure of infant visual learning environments. The findings suggest that the statistical structure of those learning environments are not like those used in laboratory experiments on visual learning, in machine learning, or in our adult assumptions about how teach visual categories. The data derive from our use of head cameras and head-mounted eye trackers capturing FOV experiences in the home as well as in simulated home environments in the laboratory. The participants range from 1 month of age to 24 months. The observed statistical structure offers new insights into visual object recognition and object name learning. The observed statistics also suggests we may need to rethink our ideas about the properties of learning environments that make learning easier or harder.

February 7

**Eve Isham**, Assistant Professor, Cognition and Neural Systems, Director, Consciousness-Action-Time Lab, Department of Psychology, University of Arizona

TITLE: Timing of intent in consciousness research

ABSTRACT: How are timing and the passage of time integrated within consciousness? The subjective experience of when and how long an event lasted play an important role in our daily activities. We have a sense of how long we have mourned a loss and a sense of the moment when we decided to pull a trigger on a gun. However, due to their subjective nature and difficulty verifying, such internal temporal experiences are difficult to pin down and investigate in an objective fashion. In the current presentation, I will discuss the timing of intent in decision making – ranging from the theoretical concept to methodological concerns and empirical quantification. Subsequently, I will discuss how the timing of intent is integrated within consciousness research, serving an important role in influencing future thoughts and behaviors.

February 14

**Kevin Lin**, Associate Professor, STEM Instruction, Department of Mathematics, University of Arizona

TITLE: Information-bearing degrees of freedom in neural circuitry: A mathematical perspective

ABSTRACT: How does neuronal activity represent information and enable nontrivial computations? Given its observed complexity and variability, what aspects of neuronal dynamics can be used to reliably encode and process information? In this talk, I will report on an effort to formulate this question mathematically, focusing specifically on the use of spike timing for encoding information, and discuss what one can learn from such an exercise. Time permitting, I will also survey recent progress in the literature on correlated spiking events in balanced neural circuitry, and what implications this may have for the question at hand. A broader purpose of this talk is to convince the audience that mathematical modeling and thinking (beyond statistics!) can be useful for understanding neuronal dynamics, and to that end I will try to make this talk as accessible as possible to those without a background in computational neuroscience or mathematical modeling.

February 21

**Joel Lawrence Voss**, Associate Professor of Medical Social Sciences, Neurology--Ken & Ruth Davee Department, and Psychiatry & Behavioral Sciences, Northwestern University

TITLE: Stimulating the hippocampal network to test episodic mechanisms

ABSTRACT: Episodic memory depends on the hippocampus and its coordination with a distributed network of interconnected structures. Recent findings indicate that this hippocampal network can be modulated using network-targeted transcranial magnetic stimulation. This offers the powerful opportunity to directly test hypothesized functional properties of the hippocampal network by measuring the memory changes that occur in response to stimulation. I will describe the progress that has been made in this area to date. Increases in fMRI activity correlation due to stimulation predict corresponding increases in episodic memory ability, indicating that successful performance relies on the interregional coordination of hippocampal network activity. Furthermore, distinct hypothesized posterior-medial and anterior-temporal functional network components are differentially modulated by stimulation, thereby demonstrating their functional

independence. The prominent hypothesis that hippocampal network coordination for memory occurs via the synchronization of activity in the theta-frequency band has also been supported by network-targeted stimulation, which more robustly influences hippocampal network activity and memory when delivered using theta patterns versus non-theta patterns. Finally, I will describe our recent work using theta-patterned stimulation during simultaneous fMRI scanning to measure the immediate impact of stimulation on the hippocampus and its role in the network-wide effects of stimulation. Collectively, these findings suggest that it is possible to cause highly specific changes in episodic memory by appropriately targeting portions of the hippocampal network with noninvasive stimulation, yielding new insights regarding brain mechanisms of memory.

February 28

**Barbara Landau**, Dick and Lydia Todd Professor of Cognitive Science, Department of Cognitive Science, Johns Hopkins University

TITLE: Genes, brains, and spatial representation: Evidence from Williams syndrome

ABSTRACT: One of the holy grails for developmental cognitive neuroscience is to understand the complex causal chain from gene to mind throughout development. At present, we are far from understanding this chain in detail. In this talk, I will argue that developmental timing can serve as a unifying mechanism to explain atypical cognitive profiles resulting from genetic impairment along with their relationship to typical developmental profiles. To illustrate, I will use the case of Williams syndrome—a genetic syndrome that gives rise to an unusual profile of severely impaired spatial representation together with spared language. A first-pass hypothesis about the cognitive phenotype emphasized the apparent dissociation of these two cognitive systems, suggesting that the genetic deficit targets one system while leaving the other intact. However, detailed studies of spatial representation in people with Williams syndrome, along with comparative studies of typically developing children, reveal a very different picture-- one which suggests a mechanistic explanation using the lens of developmental timing. This picture radically changes the conversation about how and why genetic deficits result in atypical cognitive profiles.

March 27

**Lila Bozgeyikli**, Assistant Professor, School of Information, University of Arizona

TITLE: Towards Better User Experiences in Extended Reality

ABSTRACT: As the interactive technology rapidly evolves, so do their implications on user experience in the field of human-computer interaction. Improving user experience yields increased benefits from interactive systems in various domains, such as education, training and well-being. My talk will include the discussion of experiments that were driven by this motivation and explore the effects of novel interaction methods and systems on user experience and performance in extended (i.e., virtual and augmented) reality. I will discuss the results of recently completed experiments and their implications for future extended reality systems, in-progress experiments with partial results, and future work.

April 17 (Zoom)

**Leah Kapa**, Assistant Professor, Department of Speech Language & Hearing Sciences  
University of Arizona

TITLE: The role of private speech in executive function deficits among children with developmental language disorder

ABSTRACT: Many children with developmental language disorder (DLD) have executive function deficits in addition to their language impairment. Establishing how language and executive function may be related in these children is important for understanding the nature of DLD, for informing approaches to improve executive functioning in this population, and for our broader understanding of the interface between language and cognition. One possibility is that children with DLD have executive function deficits because, unlike peers with typical language abilities, they are less successful in utilizing self-directed or private speech to control their behaviors while completing difficult tasks. I will summarize the current state of knowledge about the development of private speech in children with DLD relative to typical peers. I will also present recent data from preschoolers with DLD showing how private speech production during a nonverbal sustained attention task relates to their task performance and the effects of encouraging or preventing private speech on children's Tower of Hanoi and card sorting scores. The implications of these findings for explaining executive function deficits in DLD and for the treatment of DLD will be discussed.

April 24 (Zoom)

**Gus Hahn-Powell** Assistant Professor, Department of Linguistics, University of Arizona

TITLE: Generating scientific hypotheses through machine reading

ABSTRACT: Machine reading is a research program in artificial intelligence centered on teaching computers to read and comprehend natural language text. Through large-scale machine reading of the scientific literature, we can greatly advance our understanding of the natural world. In this talk, I will introduce a method for extracting causal statements from the full text of biomedical publications to assemble a network of millions of relations (X increases/decreases Y). By aligning this graph with a large-scale venue-level citation network (journal A cites journal B), we can estimate the degree of communication taking place between fields and generate novel hypotheses through Swanson linking (Stegmann and Grohmann, 2003) that bridge isolated communities engaged in complementary research.

May 30, (Zoom)

Student Showcase

Katie Esterline, M.A., Cognitive and Neural Systems, Department of Psychology, University of Arizona

TITLE: Word learning and sleep in habitually and non-habitually napping children

ABSTRACT: Daytime napping contributes to memory in young children. Importantly, children transition out of regular daytime napping between ages 3-5 years, and the impact of this transition on learning and memory is unclear. In this talk I will present research that examines word learning performance of habitually napping and non-habitually napping

children after a delay including sleep or wakefulness. The implications of this research for understanding the relationship between sleep and memory in development will be discussed.

Valeria Pfeifer, M.A., Cognitive and Neural Systems, Department of Psychology  
University of Arizona

TITLE: Emojis and Text: An ERP study

ABSTRACT: Emojis are a popular tool to express non-verbal cues used in face-to-face communication digitally. In this study, we investigate how facial emojis are processed using event-related potentials (ERPs). Specifically, we tested how the placement of emojis in an emotionally ambiguous text message impacts processing. Our data showed that emojis sent before a text message are processed at a perceptual-emotional level, as indexed by an increased N170 for happy emojis compared to upset emojis. The very same emojis sent after a text message are processed differently at a conceptual level, as indexed by an increased P200 for upset emojis compared to happy emojis. Our data provide further evidence for the differential disambiguation effects of happy/upset emojis on text messages. Overall, this study contributes to the understanding of processing at the emoji-text interface.

## ***COGNITIVE SCIENCE COLLOQUIUM*** ***Fall 2019***

September 6

**Vladimir C. Pravosudov**, Professor of Zoology, Department of Biology, University of Nevada, Reno

TITLE: Environmental variation and the evolution of spatial cognition in food-caching birds

ABSTRACT: Animals show large variation in cognitive abilities, both across and within species, and an important question is why such variation exists. Food-caching birds are well known to store extremely large numbers of individual food caches and to rely on these food caches to survive the winter and they rely on spatial memory to find their caches. Food-caching parids (chickadees and tits) make more food caches than any other bird species – some parids have been reported to store hundreds of thousands of individual caches every year. Compared to non-caching species, food-caching species appear to have better spatial memory and a larger hippocampus, a brain region associated with spatial learning and it is hypothesized that such differences have evolved because of extreme dependence on food caches. We have been investigating variation in spatial ability within two chickadee species by comparing birds living in environments with large differences in winter climate severity. More severe and longer winters should be associated with more dependence on food caching and hence on spatial memory for survival. Our work indeed confirms that populations from harsher winter environments have better spatial memory and a larger hippocampus, across latitudinal, longitudinal and elevation gradients of climate. Our data also show that spatial cognition is under natural selection and that selection is likely to produce differences in cognition associated with different

environments.

September 13

**Martin M. Monti**, Associate Professor, Department of Psychology & Department of Neurology, Brain Injury Research Center, University of California at Los Angeles

TITLE: Disappearing into nothingness: Disorders of consciousness

ABSTRACT: The neural mechanisms that give rise to the subjective feeling of consciousness remain debated and controversial. In this presentation I will focus on conditions typically acquired after severe brain injury, such as coma, the vegetative state, and the minimally conscious state, as a model to understand the neural mechanisms accompanying the loss and recovery of consciousness. Specifically, I will try to trace an arc through the main revolutions that have occurred in this field, from pinpointing the limits of our ability to understand who is conscious and who is not, to the functional and structural phenotype of patients with/without consciousness, to how this knowledge is helping us devise novel interventions to help restore consciousness and cognition in these patients.

September 20

**Adele E. Goldberg**, Professor of Psychology, Princeton University,

TITLE: Meaning and metaphor\*

ABSTRACT: Words typically convey a rich and varied array of related meanings. A common way that word meaning is extended is via conceptual metaphors. For instance, we can talk about experiences as if they were food (*a bitter pill; a treat*). Such metaphorically extended words and phrases are regularly used even when literal paraphrases exist, which raises the question as to why metaphorical language is so common. fMRI work has found that literal meanings remain active even when words are used metaphorically, which may imply that metaphorical uses of words have richer semantic representations. Moreover, recent work has found that metaphorical statements and short stories activate the amygdala more than carefully matched literal paraphrases, indicating that conceptual metaphors may be more emotionally engaging than their literal counterparts. \*Much of the work discussed was done in collaboration with Francesca Citron of Lancaster University.

September 27

**Giorgio Coricelli**, Professor of Economics & Psychology, University of Southern California

TITLE: Brain, emotion and decision-making: Regret and envy learning

ABSTRACT: In decision-making when we choose among alternatives, we may have the opportunity to compare the consequences of our choices with the consequences of foregone options, or with the consequences of choices other people made. In a private context, the unfavorable counterfactual comparison between obtained and foregone outcomes (what might have been) can generate regret. In a social environment, unfavorable social comparison might generate interpersonal negative counterfactuals and elicit envy. In my talk, I will discuss how private and social counterfactual emotions may be useful to improve our decision.

October 4

**Joseph L. Sanguinetti**, Associate Director, Center for Consciousness Studies, University of Arizona; Research Assistant Professor, University of New Mexico

TITLE: Sonication-enhanced mindful awareness: A new research direction

ABSTRACT: The brain changes and adapts as a result of experience. Learning to play the piano, for example, leads to structural and functional neuroplastic changes in the brain. The same is true for mindfulness meditation, an attention-based practice that requires effortfully focusing on present-moment experience. The neuroplastic changes induced by mindfulness correlate with enhanced physiological health, cognitive performance, emotional stability, and overall well-being. Mindfulness-based interventions are growing in popularity as they help to ameliorate mental, physical, and emotional symptoms and facilitate positive behavior change. However, mindfulness practice is difficult and time-consuming for most patients, creating a significant barrier to therapeutic effects. Thus, a technology that accelerates mindfulness training would be clinically valuable because the benefits would be more accessible to patients. In this talk, I present an overview of our recent work combining a novel form of brain stimulation, transcranial ultrasound, with mindfulness training. Transcranial ultrasound is a form of noninvasive neuromodulation with millimeter precision where researchers sonicate the brain with non-thermal, low-intensity ultrasound. By sonicating select brain networks during mindfulness training, we seek to promote neuroplasticity and facilitate the acquisition of the core attention skills at the heart of mindfulness. The goal is to enhance the effectiveness of mindfulness training, thereby making mindfulness-based interventions and their benefits more widely accessible. Specifically, we will discuss the efforts of our laboratory to create a sonication-enhanced mindfulness intervention that addresses pain management and addiction treatment.

October 11

**Francesca Frassinetti**, Associate Professor, Department of Psychology, University of Bologna

TITLE: The link between spatial attention and time: Evidence in brain damaged patients

ABSTRACT: Prism adaptation is a procedure used for studying visuomotor plasticity in healthy individuals, as well as for alleviating spatial attentional deficit in right brain damaged patients with neglect. The adaptation is achieved by performing goal-directed movements while wearing prismatic lenses that induce a lateral displacement of visual information. This results in an initial movement error that is compensated by a recalibration of sensory-motor coordinates; consequently, a lateral perceptual, motor and attentional bias occurs in the opposite direction after prism removal. Recent empirical studies demonstrated the modulatory effects of a shift of spatial attention induced by prismatic adaptation on different aspects of time, such as the abilities to estimate time duration and to mentally travel in the future and in the past. In young healthy participants, leftward and rightward shifts of spatial attention through prismatic adaptation lead to an underestimation and overestimation of time duration, respectively. Right brain damaged patients present time underestimation deficits that are significantly greater when associated with neglect syndrome. This evidence highlights the role of a right hemispheric network in time perception, in addition to its control of spatial attention engaged in spatial

representation of time. On the other hand, left posterior parietal cortex mediates the prismatic adaptation effects on time and the left middle frontal gyrus plays a key role in the maintenance of such effects over time. Recently, prismatic adaptation has proven effective in modulating “conceptual” aspects of time, such as humans’ ability to travel mentally back and forward in time (mental time travel, MTT). In healthy participants, leftward and rightward shifts of spatial attention facilitates recognition of past and future events, respectively. Right brain damaged patients with neglect show a deficit in processing events that are yet to happen (relative-future) and this difficulty is correlated with their spatial deficit. Relevantly, leftward-prismatic adaptation, ameliorating spatial deficits, also reduces temporal impairment concerning the abilities to both correctly estimate time and travel in time. For this reason, the impact of a brain lesion and the prismatic adaptation effects on time processing can have relevant implication for rehabilitation.

October 16

Wednesday 10AM, Educ. 351 – Special Colloquium

**Martin Pickering**, Director of Research, School of Philosophy, Psychology, and Language Sciences, University of Edinburgh

TITLE: Language use and social interaction

ABSTRACT: We present a theory of dialogue as a form of cooperative joint activity. Dialogue is treated as a system involving two interlocutors and a shared workspace that contains their contributions and relevant non-linguistic context. The interlocutors construct shared plans and use them to “post” contributions to the workspace, to comprehend joint contributions, and to distribute control of the dialogue between them. A fundamental part of this process is to simulate their partner’s contributions and to use it to predict the upcoming state of the shared workspace. As a consequence, they align their linguistic representations and their representations of the situation and of the “games” underlying successful communication. The shared workspace is a highly limited resource, and the interlocutors use their aligned representations to say just enough and to speak in good time. We end by applying the account beyond the “minimal dyad” to augmented dialogue, multi-party dialogue, and monologue. (This talk is based on my forthcoming CUP book with the same title, with Simon Garrod.)

October 25

**Benjamin Clark**, Professor, Department of Psychology, University of New Mexico,

TITLE: Neurobiology of spatial disorientation: Insights from neurodegenerative and developmental disorders

ABSTRACT: The seminar will cover recent research from our laboratory investigating the neural mechanisms of spatial orientation with specific emphasis on a class of limbic system neurons called “head direction” cells. I will describe our work investigating the loss of this spatial capacity in neurodegenerative disorders such as Alzheimer’s disease and in neurodevelopment disorders such as Fetal Alcohol Spectrum Disorders.

November 1

**Donna Rose Addis**, Professor, Department of Psychology, University of Toronto

TITLE: Episodic memory and episodic simulation: One and the same?

ABSTRACT: Over the past decade, episodic memory has been reconceptualised as future-oriented. Relevant psychological theories have started from the premise that remembering and imagining are distinct neurocognitive processes and thus have to account for the overlapping cognitive and neural substrates. For instance, in our 2007 ‘constructive episodic simulation hypothesis’, Schacter and I argued that details from episodic memories of past events provides the content for simulating future events. Here, I draw on contemporary philosophical and psychological perspectives to update and refine this theoretical position. I will argue that, fundamentally, remembering and imagining are instantiations of the same neurocognitive process – constructive episodic simulation – and that differences between past and future events arise from differences in representational content.

November 8

**Andreas Blume**, McClelland Professor of Economics, Head, Department of Economics, University of Arizona

TITLE: Mediated talk: An experiment

ABSTRACT: Theory suggests that mediation has the potential to improve information sharing. This paper experimentally investigates whether and how this potential can be realized. It is the first such study in a cheap-talk environment. We find that mediation encourages players to use separating strategies. Behavior gravitates toward pooling with direct talk and toward separation with mediated talk. This difference in behavior translates into a moderate payoff advantage of mediated over direct talk. There are systematic departures from the equilibrium prediction, characterized by over-communication by senders in the initial rounds of direct talk, stable under-communication by senders under mediated talk, and over-interpretation (attributing too much information to messages) by receivers under both direct and mediated talk.

November 22

**Martin Dufwenberg**, Karl and Stevie Eller Professor of Economics, Director, Institute of Behavioral Economics, University of Arizona

TITLE: Lies, peers & honest submissions

ABSTRACT: I present and combine three papers about graft & honesty. First, I introduce the notion of “perceived cheating aversion.” Second, I extend and apply this idea to “peer evaluation tournaments.” Third, in relation to the experimental results of that study, I make a proposal for how to best evaluate research papers submitted for publication. [The three papers are “Lies in Disguise – A Theoretical Analysis of Cheating” which is joint with Martin A. Dufwenberg; “Peer Evaluation Tournaments” which is joint with Christina Gravert & Katja Görlitz; and “Sealed Envelope Submissions Foster Research Integrity” which is joint with Peter Martinsson.]

December 3

Student Research Showcase

Katie Esterline and Valeria Pfeifer will represent Cognitive Science

**COGNITIVE SCIENCE COLLOQUIUM**  
**Spring 2019**

January 18

**Suzana Herculano-Houzel**, Associate Professor, Psychological Sciences; Associate Director for Communications, Vanderbilt Brain Institute, Vanderbilt University

TITLE: Life slows down when you have more neurons

ABSTRACT: Sure, having more neurons in the cerebral cortex must make it capable of more complex and flexible cognition, so our sixteen billion cortical neurons place humans at a clear cognitive advantage over all other animals. But in this talk I'll argue that the most consequential effect of having so many neurons is something else: more time to mature and then to live once independence is reached. With more cortical neurons comes more time to gather information, build knowledge, and exchange it with past and future generations – hand in hand, of course, with the increased computational capacity that makes it all possible.

January 25

**Melaine Sekeres**, Assistant Professor of Psychology and Neuroscience, Baylor University

TITLE: Run for the cure: Using exercise to minimize cognitive impairment and neurotoxicity following cancer treatment

ABSTRACT: Patients receiving radiotherapy and chemotherapy treatments for brain and non-brain cancers, commonly report cognitive disturbances in memory and executive function. Treatment disproportionately impacts the ability to form new (anterograde) memories, while relatively sparing older (retrograde) memories. Growing evidence from pre-clinical studies in rodents confirm clinical reports in patients and suggest that such cognitive disturbances are mediated by the neurotoxic effects of the radiation and chemotherapeutic drugs which reduce hippocampal volume, neurogenesis, and white matter, and increase expression of pro-inflammatory cytokines. Exercise is a modifiable lifestyle factor with known therapeutic benefits. Considerable overlap exists between the cellular mechanisms supporting running-enhanced cognition, and cellular mechanisms altered by chemotherapy and radiation treatment, including opposing effects on neurogenesis, and inflammatory cytokines. I will discuss findings in patients and rodents suggesting exercise, and running in particular, may be an effective means of promoting functional recovery from radiotherapy and chemotherapy treatment-related cognitive impairment.

February 1

**Mandy J. Maguire**, Associate Professor of Behavioral and Brain Sciences, University of Texas at Dallas

TITLE: Using event related potentials and neural oscillations to study developmental changes in language comprehension and word learning

ABSTRACT: EEG, primarily via ERPs (Event Related Potentials), has provided a window into

complex and difficult to assess aspects of cognition and language processing for decades. Current advances in data collection and analysis have led to an increase interest in expanding EEG analyses to include studies of event related neural oscillations. The multidimensionality of this data (simultaneous changes in multiple frequency bands at each electrode site) and the fact that neural oscillations are less time limited than ERPs have made them particularly interesting for studying language and language development. Here we review a series of studies using ERPs and neural oscillations to study language comprehension and word learning in children and adults. Overall the findings indicate that ERPs and neural oscillations provide complimentary but sometimes unique windows into language development. These studies provide new insights about developmental changes in neural engagement related to semantics, syntax and word learning. We will discuss implications of this work as well as new applications for using ERPs and neural oscillations during word learning tasks to study the vocabulary gap between children from low- and higher SES homes in grade school.

February 15

**Zoe Drayson**, Assistant Professor of Philosophy, University of California at Davis

TITLE: Inferential cognition

ABSTRACT: What does it mean to describe a cognitive process as inferential? In cognitive science it is common to make a distinction between processes that are inferential and processes that are associative. There is, however, no consensus as to how this distinction should be drawn. I explore various options in the literature and situate them in the context of broader questions about cognition. Some philosophers, for example, argue that inferential thought is necessarily conscious and thus deny that unconscious processes are genuinely inferential. There is a related concern that inference is tied to notions of rationality and reasoning in a way which renders us responsible for our inferential cognition, which is difficult to reconcile with unconscious processes over which we have no control. I discuss the way that some of these considerations play out with respect to the psychological and philosophical literature on implicit bias.

February 22

**Gerry Altmann**, Professor, Department of Psychological Sciences, University of Connecticut; Director, Connecticut Institute for the Brain and Cognitive Sciences

TITLE: The challenge of event cognition: Object recognition at the interface of episodic and semantic memory

ABSTRACT: To understand the event corresponding to e.g. “the chef chopped the onion” requires understanding (i) that the things under consideration have properties shared with other similar things (i.e. inherited from their type), (ii) that they have specific properties that uniquely distinguish them from other things of the same type (i.e. they are specific tokens), and (iii) that these properties change over time; the chef and the onion have (intersecting) histories that started with them in one state and ended with them in another. These histories are in fact trajectories of changes in state across time and space, and their intersection defines the interactions between objects (in this case, the action of the chef on the onion). To comprehend events therefore requires that we access knowledge about

types of objects and combine this with knowledge about the dynamic episodic properties of individual tokens – that is, it requires creating on- the-fly representations of object tokens and their changes in state. In this talk I shall outline an account of how this might be accomplished in a brain that is able to distinguish the systematic associations that define semantic memory for object types from the non-systematic accidental associations that define the episodic characteristics of object tokens. The talk will include some slime mould, fMRI, and EEG, but presented for the neuroscientific novice.

March 1

**Jay Nunamaker**, Regents' and Soldwedel Professor of Management Information Systems, Computer Science, and Communication; Director, UA BORDERS Center

TITLE: AVATAR-Automated Virtual Agent for Truth Assessment in Real-Time

ABSTRACT: The automated interviewing system called AVATAR is designed to screen people for credibility assessment and deception detection. This talk will focus on an overview description of the AVATAR technology and an AVATAR demonstration. Who is better at distinguishing truth-tellers from liars—A person or an artificial agent? Humans are notoriously poor at detecting lies and other tell-tale signs of malintent. Using artificial intelligence and sensor technologies, BORDERS researchers are developing an AVATAR-based screening system that may be able to identify suspicious behavior more accurately than any human. The AVATAR Kiosk is designed to flag suspicious behavior that should be investigated more closely by a human agent in the field. This “primary screening” technology is designed for use at ports of entry, including border crossings and airports. The kiosk also has many other security applications such as visa processing, asylum requests and personnel screening and interviewing. Generation Four:-Technology and Sensors. BORDERS researchers have investigated over 300 psychophysiological and behavioral cues including vocalics, linguistics, kinesics, cardiorespiratory, eye behavior, and facial skin temperature. Based on findings, the AVATAR is equipped with non-invasive and non-intrusive instruments that record an individual’s physiological and behavioral reactions during the interview process: Kinesics and facial emotion—Computer vision algorithms via video camera Vocalics—Computer aural perception algorithms via-audio—microphone Saccade, gaze duration, pupillometry—eye-tracking via near infrared camera Linguistic content—natural language processing via deception detection algorithms Physiological—Heart rate, respiratory rates, blood pressure, heat signature around eye on nose, mouth. The Many Faces of the AVATAR. BORDERS research shows that people react differently to various types of AVATARS. For example, the AVATAR’S gender, ethnicity and demeanor may produce dissimilar effects on the person being screened. Other factors include the AVATAR’S perceived power, trustworthiness, composure, expertise, likability and attractiveness. This finding has important implications for future screening practices. For example, human agents may select different AVATARS based on the individual being screened. Cultural considerations and context are also significant and must be taken into account. What is BORDERS? BORDERS is a multi-university research center established in 2008 by the Department of Homeland Security (DHS) as a Center of Excellence in border security and immigration until 2016 for \$21 million. The total funding for the AVATAR project is \$31 million. Presently BORDERS is funded by the US Army and NSF. Partners include

University of California, Santa Barbara, Stanford University, Dartmouth University, University of Maryland, Rutgers, West Virginia University, Clarkson University, San Diego State University and University of Nebraska at Omaha.

March 15

**Jacqueline Gottlieb**, Professor of Neuroscience; Principal Investigator, Zuckerman Institute, Columbia University

TITLE: Mechanisms of curiosity and information sampling in humans and non-human primates

ABSTRACT: The vast majority of neuroscience research focuses on tasks in which participants have extensive prior knowledge about the relevant features, usually via explicit instructions that strongly constrain what they should memorize, attend to or learn. In natural behavior however, we rarely have the benefit of such explicit instruction. Instead, our brains must endogenously decide which one, of the practically infinite set of available signs and cues, to use to guide our learning, perception and action. Because of our field's overwhelming reliance on the "instructed cognition" paradigm, the mechanisms of active sampling remain very poorly understood. I will review the significance of this lacuna for current theories of cognition and decision making. I will then discuss behavioral and neurophysiological evidence pertaining to this question from our laboratory, with a focus on single neuron responses in the parietal cortex during the sampling of instrumental (decision-relevant) cues and during sampling of non-instrumental information motivated by curiosity. Time permitting, I will also describe studies analyzing instrumental and curiosity-based sampling in humans using new behavioral tasks and electroencephalography (EEG). Together, these studies begin to reveal the distributed processes through which the brain estimates the benefits and costs of gathering information and implements active sampling policies.

March 22

**Catherine Hatley**, Assistant Professor of Psychology, New York University

TITLE: Developmental tuning of action selection

ABSTRACT: Computational reinforcement learning models provide a framework for understanding how individuals can evaluate which actions are beneficial and which are best avoided. To date, these models have primarily been leveraged to understand learning and decision-making in adults. In this talk, I will present studies characterizing developmental changes, from childhood to adulthood, in the cognitive representations and computations engaged to evaluate and select actions. I will discuss how these changes may optimize behavior for an individual's developmental stage and unique life experiences.

March 29

**Noam Chomsky**, Laureate Professor of Linguistics, Agnese Nelms Haury Chair, University of Arizona

TITLE: Language architecture and evolution: Some current perspectives

ABSTRACT: Language has been an object of fascination since classical antiquity, but it was not until the development of the theory of computation by mid-20th century that it became

possible to formulate and investigate effectively the Basic Property of human language: a language L determines an unbounded array of hierarchically structured expressions, each of which is interpreted semantically as an expression of thought, each of which can be externalized in some sensory modality (typically speech). The general faculty of language FL specifies the possible human languages. The theory of FL (UG, “universal grammar”) must be rich enough to account for the properties of each particular language L, but also simple enough to account for the acquisition of each L and the evolution of FL. -These goals have been approached in revealing ways in recent years, with some surprising results that challenge long-held ideas. I will review progress in this direction, along with open problems and deeper mysteries.

April 5

**Nick Chater**, Professor of Behavioral Science, Warwick Business School, University of Warwick, Roger N. Shepard Distinguished Visiting Scholar

TITLE: Virtual bargaining: A microfoundation for the theory of social interaction

ABSTRACT: How can people coordinate their actions or make joint decisions? One possibility is that each person attempts to predict the actions of the other(s), and best-responds accordingly. But this can lead to bad outcomes, and sometimes even vicious circularity. An alternative view is that each person attempts to work out what the two or more players would agree to do, if they were to bargain explicitly. If the result of such a "virtual" bargain is "obvious," then the players can simply play their respective roles in that bargain. I suggest that virtual bargaining is essential to genuinely social interaction (rather than viewing other people as instruments) and may even be uniquely human. This approach aims to respect methodological individualism, a key principle in many areas of social science, while explaining how human groups can, in a very real sense, be "greater" than the sum of their individual members. This viewpoint has implications for the nature of communication, the ‘moral emotions,’ and the emergence of norms, rules and institutions.

April 12

**Logan T. Trujillo**, Assistant Professor, Department of Psychology, Texas State University

TITLE: Testing the free energy principle for the brain during visual categorization in humans

ABSTRACT: According to the theory of active inference, the brain predicts sensations and infers their causes via a generative model of the world. Active inference is achieved when the brain minimizes its free energy, an information-theoretic upper bound on the difference between the brain’s current and predicted states; this minimization of brain free energy is termed the “Free Energy Principle (FEP)”. Perception and action correspond to two ways a brain can minimize free energy: i) changing its beliefs about the world (i.e. its generative model), or ii) acting on the world in order to change sensory input in accordance with its beliefs. The free energy principle may provide a general explanation for how the brain realizes perception and action; however, empirical confirmations of this principle are currently limited. This talk will report my efforts to empirically quantify the free energy of global states of the human brain by combining techniques from experimental psychology, electroencephalography, computational modeling, and machine learning. These efforts focus on global brain free energy states arising during the active inference of visual

category structure (2-AFC categorization of Gabor stimuli, where the categories are defined by a combination of stimulus orientation and spatial frequency). I find that global brain free energy is lowest when the brain's discrimination of visual categories matches the reported perception of these categories, whereas global brain free energy is highest when the neural discrimination and the reported perception are mismatched. This finding is as expected if visual categorizations are based on a relatively accurate generative model of the true visual category structure. Moreover, total global brain free energy correlates with the free energy and choice precision parameters of a computational model of the categorization task (a partially observable Markov decision process implementing approximately Bayes-optimal decisions). These findings provide evidence for a relationship between visual categorization, active inference, and brain free energy minimization.

April 19

**Yejin Choi**, Assistant Professor, Department of Computer Science and Engineering, University of Washington

TITLE: From native physics to folk psychology: Modeling common sense in language

ABSTRACT: Intelligent communication requires reading between the lines, which in turn, requires rich background knowledge about how the world works. However, learning and reasoning about the obvious, but unspoken facts about the world is nontrivial, as people rarely state the obvious, e.g., “my house is bigger than me.” In this talk, I will discuss how we can reverse engineer aspects of commonsense knowledge—ranging from naive physics to more ABSTRACT social commonsense knowledge—from how people use language. A key insight is this: the implicit knowledge people share and assume systematically influences the way people use language, which provides indirect clues to reason about the world. For example, if “Jen entered her house”, it must be that her house is bigger than her. In this talk, I will present two complementary formalisms that can organize and represent various aspects of commonsense knowledge: commonsense frames and graphs. In particular, I will introduce ATOMIC, an atlas of everyday commonsense reasoning, organized through 877k textual descriptions of inferential knowledge. Compared to existing resources that center around taxonomic knowledge, ATOMIC focuses on causes and effects of everyday events (e.g., “if X pays Y a compliment, then Y will likely return the compliment”). I will then present two complementary approaches—probabilistic inference and deep neural networks—that can learn to reason about commonsense knowledge encoded in language. I will conclude the talk by discussing the challenges in current models and formalisms, pointing to avenues for future research.

April 26

Cognitive Science Graduate Student Showcase

Mingli Liang, Psychology Department

TITLE: Human frontal delta-theta dynamics cod distance and time inside teleporters

ABSTRACT: Past studies have suggested the critical role of hippocampal low-frequency oscillations in spatial navigation. Additionally, cortical and hippocampal theta oscillations

often synchronize, suggesting the importance of cortical oscillations to movement-related coding as well. - In a recent study, we found increased scalp frontal-midline delta-theta oscillations during movement involving free ambulation when compared to standing-still in healthy humans. -One intriguing question, given these findings, regards the precise drivers of such low-frequency oscillations. -While past studies have suggested spatial distance (Vass et al. 2016) and movement speed (Watrous et al. 2011) may both contribute to low-frequency oscillations, temporal components may also be a significant driver. To address this issue, participants navigated a plus maze containing four target stores at the end of each arm. Four teleporters were also dispersed in each arm involving different spatial distances and temporal intervals. In a trial, participants first entered a teleporter, and upon exiting, were teleported back to the center of a plus maze, at which time they were instructed to find a target store. In the spatial distance condition, participants judged how far they travelled inside the teleporters; in the temporal interval condition, participants judged temporal interval on the basis of temporal interval or spatial distance (short vs. long), participants decided which target store to visit. As in the prior study, we used the omnidirectional treadmill to provide locomotion-based VR navigation experiences, simultaneously recording scalp EEG during teleportation and navigation epochs. Preliminary results showed that participants were able to discriminate between different spatial/temporal teleportation experiences at above chance levels and were able to apply the cues to find the appropriate targets. Analyses involving scalp EEG will test whether 1) frontal-midline theta oscillations persist during teleportation without the presence of visual, vestibular and proprioceptive input, regardless of spatial or temporal conditions 2) whether frontal-midline theta oscillations code space, time, or both. Our findings will help advance our understanding of the role of low-frequency oscillations in memory and navigation and deepen our understanding of the nature of “cognitive map” regarding whether a time code and a distance code co-exist in the spatial knowledge.

Alyssa Sachs, Speech, Language, and Hearing Sciences

TITLE: A retrospective study of long-term improvement on the Boston Naming Test

PURPOSE: Lexical retrieval impairment is a universal characteristic of aphasia and a common treatment focus. Although naming improvement is well documented, there is limited information to shape expectations regarding long term recovery. This was the motivation for a retrospective study of longitudinal data on the Boston Naming Test (BNT). Methods. BNT scores were analyzed from a heterogeneous cohort of 42 individuals with anomia associated with a range of aphasia types. The data were collected over the course of 20 years from individuals who had participated in treatment and received at least two BNT administrations. A linear mixed model was implemented to evaluate effects of initial BNT score, time post onset, and demographic variables. For those over age 55, BNT change was evaluated relative to data from the Mayo Clinic’s Older American Normative Studies (MOANS).

RESULTS: There was a significant average improvement of +7.67 points on the BNT in individuals followed for an average of two years. Overall, the average rate of improvement was +5.84 points per year, in contrast to a decline of 0.23 points per year in a healthy adult cohort from the MOANS. Naming recovery was approximately linear, with significant main

effects of initial BNT score (i.e., initial severity) and time post onset; the greatest changes were noted in those whose initial severity was moderate.

CONCLUSIONS: These findings indicate a positive prognosis for naming improvement over time regardless of demographic factors and provide estimates for clinical predictions for those who seek rehabilitation during the chronic phase.

## **COGNITIVE SCIENCE COLLOQUIUM**

### **Fall 2018**

August 31

**Kobus Barnard**, Professor of Computer Science, UA Department of Computer Science

TITLE: Multiple-gaze geometry: Inferring novel 3D locations from gazes observed in monocular video

ABSTRACT: I will briefly discuss the current success of black box classifiers and how they can be less suitable for explanatory and/or mechanistic models that need to use restricted (domain specific) representations. -I will then present work on inferring what is going on videos of people using strong natural representations within a Bayesian framework. More specifically, this framework treats observed image data as being evidence for underlying models that explain it, and going from data to model is achieved using Bayesian inference executed using MCMC sampling. Using this approach, we are able to track the 3D location of people using a single, uncalibrated video camera (e.g., we do not know, in advance, things like the focal length of its lens, which we infer as part of the process). I will then discuss recently published work on including the gaze directions of the participants, and how our approach for explicitly representing the scene in 3D naturally provides for inferring who is looking at whom or what. Finally, as suggested by the TITLE, I will discuss how our approach-can discover 3D locations of what people tend to look at, including locations not visible to the camera. This emerges from our approach rather intuitively, as the intersection of gaze angles rooted in different points in space provides evidence for 3D locations. Finally, I will mention a few possible extensions that we are considering. While the nuts and bolts of our approach are quite technical, I will attempt to provide a largely non-mathematical understanding of such models and the associated inference engines. This work is in collaboration with former UA CS PhD students Ernesto Brau, Jinyan Guan, and Tanya Jeffries.

September 7

**Terry Regier**, Professor of Linguistics and Cognitive Science, Department of Linguistics, Cognitive Science Program, University of California at Berkeley

TITLE: Semantic typology and the Sapir-Whorf hypothesis in computational perspective

ABSTRACT: Why do languages have the semantic categories they do, and what do those categories reveal about cognition and communication? Word meanings vary widely across languages, but this variation is constrained. I will argue that this pattern reflects a range of language-specific solutions to a universal functional challenge: that of communicating precisely while using minimal cognitive resources. I will present a general computational

framework that instantiates this idea and will show how that framework accounts for cross-language variation in several semantic domains. I will then address the Sapir-Whorf hypothesis - the claim that such language-specific categories in turn shape cognition. I will argue that viewing this hypothesis through the lens of probabilistic inference has the potential to resolve two sources of controversy: the challenge this hypothesis apparently poses to the widespread assumption of a universal groundwork for cognition, and the fact that some findings supporting the hypothesis do not always replicate reliably.

September 14

**Stephen Cowen**, Assistant Professor, UA Department of Psychology

TITLE: How ketamine alters brain activity and potential mechanisms for its therapeutic and dissociative effects

ABSTRACT: Although ketamine was developed in the 1960s as an anesthetic, the potential therapeutic applications for the drug have expanded considerably in the last decade. For example, hour to days-long exposure can provide weeks-to-month reduction of treatment-resistant depression, post-traumatic stress disorder (PTSD), chronic pain, and L- DOPA-induced dyskinesias associated with the treatment of Parkinson's disease. Ketamine is also a popular recreational drug due to its powerful dissociative and perceptual effects that include feelings of disembodiment and vivid perceptual hallucinations. Despite its widespread use and its potential for abuse, little is understood about the neural mechanisms that underlie ketamine's therapeutic or dissociative effects. In this talk, we will review our research investigating ketamine's capacity to produce profound changes in neuronal synchrony throughout the brain. We will also discuss how changes in synchrony may contribute to ketamine's effects on perception and its use as a potential treatment for Parkinson's disease and L-DOPA-induced dyskinesias.

September 21

**Karen Schloss**, Assistant Professor, Department of Psychology and Wisconsin Institute for Discovery, University of Wisconsin at Madison

TITLE: Color inference for visual communication

ABSTRACT: Visual reasoning allows people to translate visual input into conceptual understanding. The visual reasoning system presumably evolved so organisms could quickly and flexibly interpret visual input in their natural environment. Now, humans leverage this system for visual communication by creating synthetic environments, or visualizations, for others to interpret. These visualizations include the graphs, maps, and diagrams that are central to science communication. Interpreting visualizations is easier when the encoded mappings between concepts and visual features match people's expectations, or inferred mappings. To harness this principle in visualization design, it is necessary to understand what determines people's inferred mappings. In this talk, I will present the Color Inference Framework for how people make conceptual inferences from color, and how those inferences influence judgments about the world. I will then discuss studies on color-coding systems for recycling and for colormap data visualizations. The results of these studies demonstrate that inferred mappings are context dependent and flexible, influenced by perceptual relations among colors in visual displays and relative

activation of concepts in people's minds. The results have implications for designing effective and efficient media for visual communication.

September 28

**Linda Restifo**, Professor of Neurology, Neuroscience, and Cellular & Molecular Medicine, UA Department of Neurology

TITLE: Size matters: Heads, brains, and neurons in genetic intellectual disabilities

ABSTRACT: Nearly one thousand human genes are known to be essential for the development of neurotypical cognitive function. Conversely, deleterious mutations in any one of these genes cause intellectual disability (ID), either in isolation or as part of a syndrome. For a substantial fraction of these disorders, small head size (microcephaly), due to impaired brain growth, is detectable during the first few years of life. Almost all of the genes involved are very highly conserved, meaning that they are present and control brain development in simpler organisms, such as the fruit fly, *Drosophila melanogaster*. Members of my research team have investigated mutants of several ID-and-microcephaly genes in *Drosophila*. We discovered that their brain neurons extend small arbors of branches when cultured in vitro, but each one has a distinct abnormality. We have also used cultured neurons to identify drugs that reverse defects caused by mutations. I will present the key data in support of a strategy to develop safe and effective drugs for improving brain development in children with microcephaly-associated ID.

October 5

**Jane M. Carrington**, Associate Professor, UA Nursing

TITLE: Nurse-to-Nurse communication using the Electronic Health Record with implications for decision-making and patient outcomes

ABSTRACT: Nearly 100,000 patients die each year in our nation's hospitals due to miscommunication. Unfortunately, the implementation of the current electronic health record (EHR) has done little to improve this statistic. -The EHR has increased legibility of the health record, supports data entry, and has made the record available through the network to all members of the health care team. -Nurses have also reported, however, that retrieval of patient information is difficult. -Furthermore, the patient data collected in the current EHR is not considered valuable towards continuing care of patients. These attributes threaten the effectiveness of the current EHR as a communication system. Nurses have stated their primary source of patient information is the change of shift hand-off. Unfortunately, the hand-off is also an ineffective communication system. The hand-off is often plagued with errors. Interestingly, for the same patient, the EHR and the hand-off rarely align due to missing and inconsistent patient information. In addition, the current EHR and hand-off pose a threat to effective nurse-to-nurse communication and decision-making for patients who experience a change in status. Of particular interest are patients who experience a clinical event (CE) or pain, fever, bleeding, changes in output, respiratory status or level of consciousness. The hypothesis of my research is that effective nurse-to-nurse communication can reduce unexpected deaths for patients who experience a clinical event. -My research has focused on language used by nurses to describe CEs in the EHR and hand-off, nurse-EHR interaction and decision-making. -My team is working

towards solutions to improving the EHR using strategies that include natural language processing, machine learning, and artificial intelligence Here I will present an overview of my research exploring nurse-to-nurse communication of CEs and decision-making and their impact on patient outcomes.

October 12

**Arne David Ekstrom**, Associate Professor, UA Department of Psychology

TITLE: Decoding how we represent space when we navigate

ABSTRACT: While the field has made significant progress in understanding how other species navigate, many fundamental questions remain regarding how humans accomplish this important everyday function.-Here, we present studies that attempt to understand our unique and flexible code for space.-We present experiments investigating the interface between cartographic maps and spatial representation, cued recall and spatial representation, and verbal/linguistic codes and spatial representation. Together, these findings will explore key differences in our navigational code compared to other species, suggesting that cognitive representations for cartographic maps and language are dynamically integrated with space to a greater extent than suggested previously.

October 19

**Gary Lupyan**, Associate Professor, Department of Psychology, University of Wisconsin at Madison

TITLE: From perception to symbolic thought: How language augments human cognition

ABSTRACT: Language is often held to be one of the defining traits of our species. Yet for all its claimed importance, most cognitive scientists work under the assumption that language, while useful for communicating pre-existing thoughts, plays a minor if any role in their construction. I will argue that this view is mistaken and that words play a much more central role in forming useful mental representations than is generally acknowledged. I will show how the use of language actively modulates performance on “nonverbal” tasks from low-level perception to higher-level reasoning. Taken together, the results suggest that some of the unique aspects of human cognition may stem from the use of words to flexibly transform mental representations into more categorical states. These findings have relevance for understanding the cognitive consequences of language impairments and for questions concerning linguistic relativity.

October 26

**Changxu Wu**, Professor, UA Department of Systems & Industrial Engineering

TITLE: Human performance modeling and its applications in systems engineering

ABSTRACT: This research seminar introduces the major research activities at the Cognitive System at University of Arizona, focusing on human cognition/performance modeling with its applications in systems engineering (e.g., human-in-the-loop transportation systems and human-machine interaction). Human performance modeling is a growing and challenging area in human factors and cognitive systems engineering. It builds computational models based on the fundamental mechanisms of human cognition and human-system interaction, employs both mathematical and discrete event simulation

methods in industrial engineering, and predicts human performance and workload in real-world systems. It can be used to design, improve, and evaluate systems with human in the loop. Current and future research topics will also be introduced.

November 2

**Charles Noussair**, Professor of Economics, UA Eller Department of Economics

TITLE: Emotions and economic decision making

ABSTRACT: This talk describes a number of studies relating emotional state and economic decision making. Two technologies that are new to economics are described. These are (1) the use of facereading software to measure and track emotional state, and (2) the use of 360-degree videos shown in virtual reality to induce emotions, The talk describes some results regarding the relationship between emotions and risk taking, honesty, cooperation, charitable giving, and reciprocity.

November 9

**Elizabeth Glisky**, Professor, UA Department of Psychology

TITLE: Enhancing memory in normally-aging adults

ABSTRACT: This talk will describe two sets of experiments looking at ways to enhance memory in older adults: -1) a cognitive strategy relying on self-referential processing, and 2) a social strategy relying on social interaction.

November 16

**Massimo Piattelli-Palmarini**, Professor, UA Departments of Linguistics & Psychology

TITLE: Normal language in abnormal brains

ABSTRACT: There is little doubt that, in the adult, specific brain lesions cause specific language deficits. Yet, brain localizations of linguistic functions are made problematic by several reported cases of normal language in spite of major brain anomalies, mostly, but not exclusively, occurring early in life. The signal cases are hydrocephaly, spina bifida and hemispherectomy. Many patients have normal syntax and lexicon but suffer from grave problems in the use of language (they are linguistically dyspraxic), showing that the interface is affected. These cases are discussed and possible solutions are suggested: namely a vast redundancy of neurons and/or the role of microtubules as neuron-internal processors and key factors in signaling and guiding the growth and reconfiguration of the brain.

November 30

**Laura Wagner**, Associate Professor, Department of Psychology; Director, Language Sciences Research Lab, The Ohio State University

TITLE: Performance factors influencing competence with linguistic aspect

ABSTRACT: It is frequently argued that children are competent with some dimension of language, but their knowledge is being masked by performance limitations. -However, in most cases, the evidence for these performance factors is indirect and the specific links between cognitive skills and linguistic forms is vague. -The current work examines a well-documented under-extension in children's language and the cognitive skills that predict

children's performance of it.-The linguistic phenomenon involves aspect: children prefer to say (and better comprehend) predicates describing bounded events with perfective rather than imperfective morphology and the reverse for unbounded events.-That is, despite the fact that all four of the following sentences are grammatical, children prefer "The girl closed the door" over "The girl was closing the door" and "The girl was listening to music" over "The girl listened to music".-Children and adults were tested on their ability to understand a range of aspectual combinations (both preferred and non-preferred) and were also tested on a series of independent cognitive assessments.-The results showed specific links between inhibitory control and vocabulary size with different non- preferred combinations that were consistent with formal semantic accounts of those linguistic forms.-More generally, the results show how it is possible to use performance to illuminate the nature of competence.

### **COGNITIVE SCIENCE COLLOQUIUM** **Spring 2018**

January 19

**Seana Coulson**, Associate Professor, Department of Cognitive Science, University of California, San Diego

TITLE: Conceptual mappings in brain and mind

ABSTRACT: I will discuss the importance of metaphoric and analogical mapping as organizing structures in cognition and suggest that maps and mappings are a fundamental aspect of neurophysiology. In order to demonstrate the role of mapping in language comprehension, I'll present results from several event-related potential (ERP) studies on the comprehension of metaphoric language. Finally, I consider the extent to which synesthesia provides a good model for the neural basis of metaphor.

January 26

**Kristy Hollingshead**, Research Scientist, Florida Institute for Human & Machine Cognition (IHMC)

TITLE: Everyday language as a signal of mental state

ABSTRACT: Language -- spoken or written -- is an activity that we all engage in every day. The way that we use language -- what we say and how we say it -- provides a surprisingly sensitive measure of our own mental state, and as such, may act as a predictor of future behavior. In fact, many mental and neurological health conditions present with changes in language and behavior, such as a switch in the types of topics discussed, a shift in word usage or syntax, variations in the speech signal, or differences in sleep patterns or social interactions. This talk will cover two studies in which natural language processing (NLP) techniques were applied to measure mental state and predict behavior. The first study focuses on assessing mental health disorders, specifically depression, anxiety, and schizophrenia, using language as captured from Twitter. The second study examines the occurrence of "outrage" in online discussions of cyberattacks, using anomaly detection to predict future cyberattacks. In both studies, timeseries analysis revealed interesting

patterns when compared to controls, and correlations to a timeseries of relevant events.

February 2

**Dominic McIver Lopes**, Distinguished University Scholar, Professor, Department of Philosophy, University of British Columbia

TITLE: Third space: Integrating aesthetics research through philosophy

ABSTRACT: After decades of neglect, the recent boom in research on aesthetic and artistic phenomena in the behavioural and brain sciences has led to some tentative but not yet profitable exchanges between the “two cultures” of the sciences and the humanities. The diplomacy is delicate, and a great deal is at stake, lest we saddle ourselves with a divided self-conception, one scientific and the other humanistic. However, Snow’s talk of “cultures” is an obstacle. In this talk, I suggest a better metaphor, one of “common space.” To bring us together, a common space needs to have three features: it must be comprehensively bounded, integrated, and layered. I’ll explain what I mean with examples.

February 16

**Brian McLaughlin**, Professor of Philosophy and Cognitive Science, Rutgers University

TITLE: Representational issues concerning normal geometrical misperception

ABSTRACT: Normal geometrical misperception occurs whenever the way something looks with respect to geometrical properties to a normal human perceiver in normal viewing circumstances differs from the way it in fact is.- Well-known visual illusions such as the Müller-Lyer arrows illustrate normal geometrical misperception.-Although the two arrow shafts are the same length, one looks longer than the other even to a normal human perceiver in normal viewing circumstances.-Normal geometrical misperception is not restricted to lab-induced stimuli or special cases. On the contrary, there is a large body of evidence that indicates that normal geometrical misperception is systematic and widespread.-Indeed, on the evidence, there is normal geometrical misperception virtually whenever a normal perceiver in normal viewing circumstances sees a scene.-The talk presents some of this evidence and explores what the fact of systematic, widespread normal geometrical misperception might indicate about visual representation, in particular, about representation in what Ken Nakayama calls “mid-level vision.”

February 23

**Kimberly M. Fenn**, Associate Professor, Department of Psychology, Michigan State University

TITLE: Psychology and the law: Is there a role of sleep?

ABSTRACT: The preponderance of exonerations convincingly shows that there are flaws in the criminal justice system in the United States. The National Registry of Exonerations reports that at least 2100 individuals were convicted of crimes that they did not commit and many of these individuals served years in prison before exoneration. These sorts of errors pose dire consequences in that innocent individuals suffer in prison and guilty perpetrators remain free to commit further crimes. In this talk, I will propose that a relatively unexplored factor, sleep, contributes to efficacy of the criminal justice system. Sleep consolidates memory whereas sleep deprivation is associated with a wide range of

cognitive deficits, including decreased executive function and impaired decision making ability. This is relevant to psychology and the law because legal actors (e.g., police, witnesses, suspects) may make important decisions having not obtained sufficient sleep. For example, approximately one half of police departments require officers to work 12-hour shifts or rotating shifts, resulting in fewer hours of lower-quality sleep. Insufficient sleep likely also affects witnesses and suspects of crimes. Most Americans do not obtain sufficient sleep each night, a trend which is growing worse with time. I will discuss ongoing work in my laboratory that explores how sleep and insufficient sleep may contribute to successes and failures in the criminal justice system.

March 16

**Muhammad Spocter**, Director, Master of Science in Anatomy Program; Assistant Professor, Department of Anatomy; Doctor of Osteopathic Medicine Program, Des Moines University

TITLE: From Big Bad Wolf to Man's Best Friend: Domestication and its effect on the Canid brain

ABSTRACT: The domestication of animals marked a major turning point in human prehistory and dramatically affected the behavior and morphology of several target species, including that of the domestic dog. In this talk we will review evidence for changes in brain and brain component size in domestic species and will highlight some key anatomical differences as it relates to the brain of the domestic dog and some of its closest living relatives.

March 23

**Tom Griffiths**, Professor of Psychology and Cognitive Science; Director of Computational Cognitive Science Lab and the Institute of Cognitive and Brain Sciences, University of California, Berkeley 2017-2018 Roger N. Shepard Distinguished Visiting Scholar

TITLE: Universal psychological laws and the algorithmic level of analysis

ABSTRACT: One of Roger Shepard's many contributions to psychology is the idea that there might exist universal psychological laws – principles that characterize the behavior of any intelligent organism, regardless of where they are in the universe. Over the last couple of decades methods such as rational analysis have been used to derive candidate universal laws, starting with the ABSTRACT problems faced by organisms and asking what ideal solutions to those problems look like. However, this approach typically disregards another kind of universal constraint – that all organisms have limits on their computational resources and competition for their time. In addition, for many aspects of the mind that we might seek to explain – phenomena such as scientific discovery, creativity, and imagination – the key questions we want to answer are not about the ABSTRACT problem being solved, but about the method by which it is being solved. -I will present a new framework for engaging with these questions, based on the idea of pushing the principle of optimization that is implicit in the derivation of universal psychological laws to what David Marr called the algorithmic level of analysis. -The resulting approach, which we call "resource rational analysis," can help to explain some of the ways in which people deviate from classic rational models and provides a way to derive new universal psychological laws at the

algorithmic level.

March 30

**Bradley S. Gibson**, Professor, Department of Psychology, University of Notre Dame

TITLE: Does ADHD reflect a core deficit in working memory?

ABSTRACT: Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopment disorder arising from heterogeneous causal pathways. One major pathway is thought to involve deficient executive functioning, and within this pathway, working memory (WM) has been identified as a core deficit underlying the disorder. But, this understanding has not kept pace with contemporary cognitive theories which currently construe WM as a complex construct consisting of multiple components, including executive attention, the focus of attention, and temporal-contextual retrieval dynamics. In addition, each of these components may also be modulated by arousal mechanisms. In this talk, I will interpret behavioral evidence within the framework of the Temporal Context Model of memory search and I will conclude that individuals with ADHD do not have a core deficit in WM. Instead, what appears on some behavioral measures as a deficit in one component of WM—the ability to use temporal-contextual cues to retrieve goal-relevant information—actually reflects deficient modulation by arousal mechanisms such as alertness or sustained attention.

April 6

**Steven Bethard**, Assistant Professor, School of Information, University of Arizona

TITLE: Does ADHD reflect a core deficit in working memory?

ABSTRACT: Humans can easily read a written narrative and infer the underlying timeline, but this type of language understanding remains a difficult challenge for machines. Human language is rarely explicit in the way that would be most convenient for a computer, and events, times, and temporal relations are often implicit, left to be inferred by the reader. In this talk, I will examine the language of time through two lenses: (1) how well humans are able to make explicit their implicit inferences about time, and (2) how computers can be trained to make similar inferences. These two viewpoints are intertwined, as the machine learning methods we use to teach computers about language rely on humans to provide them with high quality examples annotated explicitly with their implicit semantics. I will show that a variety of ways of encoding human knowledge about timelines are needed to support machine understanding of the language of time.

April 13

**Jennifer S. Trueblood**, Assistant Professor, Department of Psychology, Vanderbilt University

TITLE: The dynamics of choice

ABSTRACT: An important question in decision-making is how preferences for different options are constructed and evolve over time. Dynamic models provide a way to explore the underlying cognitive processes involved in choice behavior, which I will illustrate in two applications. In one application, I will discuss how people make decisions when faced with multiple alternatives and how preferences are influenced by context. For example, most of

us recognize that a store's layout (i.e., the context created by product placement) can influence what we buy. In a second application, I will discuss how framing effects in risky decision-making arise from the dynamic interplay of affective and deliberative reasoning systems. In particular, I will show how a dynamic dual process model can account for the influence of time pressure on risky choice behavior.

April 20

**Dan Jurafsky**, Professor and Chair of Linguistics, Professor of Computer Science, Stanford University

TITLE: "Does this vehicle belong to you?" Processing the language of policing for improving police-community relations

ABSTRACT: -Police body-worn cameras have the potential to play an important role in understanding and improving police-community relations. -In this talk I describe a series of studies conducted by our large interdisciplinary team at Stanford that use speech and natural language processing on body-camera recordings to model the interactions between police officers and community members in traffic stops. -We draw on linguistic models of dialogue structure and of interpersonal relations like respect to automatically quantify linguistic aspects of the interaction from the text and audio. -I describe the differences we find in the language directed toward black versus white community members, and offer suggestions for how these findings can be used to help improve the fraught relations between police officers and the communities they serve.

April 27

**Daniel Mirman**, Associate Professor, Department of Psychology, University of Alabama at Birmingham

TITLE: Neuroanatomy of core language systems: A data-driven journey

ABSTRACT: The classic Wernicke-Lichtheim-Geschwind model of the neural basis of spoken language is undergoing major revisions due to the development of non-invasive brain imaging methods and advances in analysis techniques. These new methods have made it possible to apply the classic "lesion method" at a much finer anatomical scale. In several recent studies, we have used machine learning and data science methods to examine large datasets from individuals with language deficits after stroke (aphasia). These studies have identified the cognitive sub-systems that support language processing and the neural basis of those sub-systems. The resulting functional and neuroanatomical model of spoken language processing forms an important bridge between basic research on the neural basis of language and the real-world problem of aphasia diagnosis and treatment.

May 4

Cognitive Science Graduate Student Showcase

Trianna Oglivie

TITLE: Group versus individual delivery of enhanced conversational recast

PURPOSE: This study examines the effects of Enhanced Conversational Recast for treating

morphological errors in preschoolers with Developmental Language Disorder. The study assesses the effectiveness of this treatment in a group (n=2) setting and the possible benefits of exposing a child to their treatment partner's target in addition to his or her own. **METHOD:** Twenty children were assigned to either an individual (n=10) or group (n=10, 2 per group) condition. Each child received treatment for one morpheme target for 5 weeks. Children in the group condition had a different target from their treatment partner. Pre- and post-treatment measures compared correct usage of the target morpheme and a control morpheme. For children in the group condition, the correct usage of their treatment partner's target was also compared.

**RESULTS:** Significant treat effects occurred for both treatment conditions for morphemes treated directly. There was no statistically significant difference between the treatment conditions immediately post-treatment or at follow-up. Children receiving group treatment did not demonstrate significant gains in producing their partner's target despite hearing the target modeled during treatment.

**CONCLUSIONS:** This study provides the evidence base for Enhanced Conversational Recast Treatment in a small group setting, the most frequently used treatment setting in schools. Results indicate the importance of either attention to the recast or expressive practice (or both) to produce effective doses in this treatment.

Siyu Wang

**TITLE:** What is the nature of decision noise in random exploration?

**ABSTRACT:** The explore-exploit tradeoff is a fundamental behavioral dilemma faced by all adaptive organisms. Should we explore new options in the hopes of finding a better meal, a better house or a better mate, or should we exploit the options we currently believe to be best? Striking the right balance between exploration and exploitation is a hard computational problem and there is significant interest in how humans and other animals make explore-exploit decisions in practice. One particularly effective strategy for solving the explore-exploit dilemma is choice randomization. In this strategy, the decision process is corrupted by noise meaning the high value "exploit" options are not always chosen and exploratory choices are sometimes made by chance. In theory, such "random exploration" can be surprisingly effective in explore-exploit problems and, if implemented correctly, can come close to optimal performance. Recent work suggests that humans actually use random exploration to solve simple explore-exploit problems. Despite this progress a number of questions remain about the nature of random exploration as there are a number of ways in which seemingly stochastic choices could be generated. In one strategy, that we call the "external noise strategy", participants can rely on stochasticity in the world and allow irrelevant features of the stimulus to drive choice. In another strategy call "internal noise strategy", people could rely on stochastic processes within their own brains. In this work, we modified our recently published "Horizon Task" in such a way as to distinguish these two strategies. Using both a model-free and model-based analysis of human behavior we show that both types of noise are present in explore-exploit decisions, but that random exploration is dominated by internal noise. This suggests that random exploration is dominated by internal noise. This suggests that random exploration depends on adaptive noise processes in the brain which are subject to (perhaps unconscious) cognitive control.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2017**

September 1

**Lynn Nadel**, Regent's Professor, Department of Psychology, University of Arizona

TITLE: Hippocampus: Why memory and space?

ABSTRACT: The hippocampus has been linked to two core cognitive functions: memory and spatial/cognitive maps. In this talk I consider why these two apparently distinct psychological functions engage the same neural system. Data from behavioral and neuroimaging studies will be described, and a fair amount of speculating will be done.

September 8

**Mary Alt**, Associate Professor, Department of Speech, Language & Hearing Sciences, University of Arizona

TITLE: Working memory profiles of children with dyslexia, language impairment, and typical development

ABSTRACT: Compared to children with typical development (TD), children with dyslexia (DYS), language impairment (LI), or both (DYS/LI) often demonstrate working memory deficits. It is unclear how pervasive the deficits are, or whether the deficits align with diagnostic category. The purpose of this study was to determine whether different working memory profiles would emerge on a comprehensive battery of central executive, phonological, and visuospatial working memory tasks and whether these profiles were closely associated with group membership. This talk will review: (1) our team's work to build a comprehensive battery of working memory for children; (2) the use of data from that battery to test models of working memory; (3) the resulting working memory profiles that emerge for children with different clinical diagnoses.

September 15

**J. Christopher Maloney**, Professor, Department of Philosophy, University of Arizona

TITLE: The phenomenal character of perceptual experience: Direct realism redux

ABSTRACT: Contrast perception with other modes of conscious cognition. First you see - and later well remember - a rose to be red. Your perceptual experience and its trailing memory concur in content but differ in conscious phenomenal character. What is like to see the rose differs from what it is like to remember the same. Why? Why if all thought is just representation? Some reply by denying the presupposition. They insist that difference in character demands difference in content after all. Others concede the presupposition. However, they contend that a perceptual experience owes its peculiar character to being the content or target of a monitoring cognitive state. Each answer flounders. It is not the content, but rather the vehicle, of perceptual representation that secures perception's phenomenal character. For in perception the mind extends into its environment to convert stimuli into self-referential representations. As wrongly disparaged direct realists once

rightly proposed, perception fulfills its phenomenal promise by permitting direct acquaintance with the world. What it is like to see is to adopt the scene to see.

September 22

**Mary A. Peterson**, Professor, Department of Psychology; Director, Cognitive Science Program, University of Arizona

TITLE: Toward a new understanding of object perception

ABSTRACT: Visual perception was long understood as a serial feedforward process in which, at a very early stage of processing, borders between regions in the visual input were assigned as bounding contours to the region on one side; this constituted object detection (aka figure assignment). The other region, lacking a shaping contour, was perceived as a locally shapeless ground to the object. On this feedforward view, object memories and semantics were accessed only after object detection occurred and only for objects ("figures"), not for grounds. Research in my laboratory shows that this traditional view is incorrect, and favors the alternative view that before object detection, a fast pass of processing activates multiple possible object hypotheses that could fit both sides of borders. These hypotheses compete for perception at high and low levels of the visual hierarchy. The winner is detected/perceived; the loser is suppressed. In my talk, I will review some history and then summarize five recent experiments consistent with the view that object detection occurs via hierarchical Bayesian inference.

September 29

**R. Alison Adcock**, Assistant Professor, Psychiatry and Behavioral Sciences; Core Faculty, Center for Cognitive Neuroscience

TITLE: Motivation as neural context regulating learning

ABSTRACT: Motivation guides and animates behavior based on representation of counterfactuals from memory. The role of motivation in reinforcement learning has long been well studied, particularly in animal paradigms that require extrinsic incentives; yet neuroscience is, ironically, only recently coming to study how motivation guides memory, including the assembly of complex models of the world and the pursuit of knowledge – motives that guide science itself. The last several years have seen an explosion of methods for examining the biology of human cognition and behavior and relating it to rich traditions and findings in animals. In particular, the ability to quantify neural activity associated with distinct motivational states using functional neuroimaging now offers exciting insights into neuromodulatory systems associated with motivation and the neural foundations of adaptive memory formation. These biological findings, in turn, point to new behavioral predictions and questions about learning and memory. The work of the Adcock laboratory is to understand how motivation shapes memory formation and to help leverage that understanding to improve education and learning-based therapies. In this presentation, I will review our recent work guided by hypotheses grounded in both animal models and human clinical insights, selectively targeting the neural architecture of motivational states during memory formation, to understand how they influence both maladaptive ideas and successful human adaptation.

October 6

**Lee Ryan**, Professor and Head, Department of Psychology, University of Arizona

TITLE: Contributions of perirhinal and postrhinal cortex to memory: Implications for aging and Alzheimer's disease

ABSTRACT: A prominent view of perirhinal cortex (PRC) and postrhinal/parahippocampal cortex (POR/PHC) function is that these structures are tuned to represent objects and spatial information, respectively. My colleagues and I have recently proposed an alternative view that derives from known anatomical connectivity, neuroimaging data, and the impact of lesions of these structures on cognition. We suggest that PRC and PHC/POR participate in two computationally distinct cortical- hippocampal pathways. A 'sparse' pathway forms gist-like representations of scenes/environments. A 'detail' pathway processes information about specific sensory features necessary for discrimination across sensory modalities. Importantly, PRC and POR/PHC participate equally in both these pathways. -I will discuss recent evidence suggesting that the 'detail' pathway may be more vulnerable in normal aging, while functional changes in "sparse" representations may be an early marker of Alzheimer's pathology.

October 13

**Jessica Andrews-Hanna**, Assistant Professor, Psychology and Cognitive Science, University of Arizona

TITLE: The dynamics of thought: Language as a window into wandering and sticky minds

ABSTRACT: A remarkable characteristic of the human mind is its propensity to wander away from the here-and-now. Along the "stream of consciousness", our thoughts meander through time and space, constructing mental models of possible futures and providing narrative to our lives. Despite the importance of spontaneous mental activity, methodological challenges and historical biases in cognitive science have thwarted its scientific study. Recent years have brought growing interest and understanding of "mind-wandering," yet little is known about the content, correlates and consequences of mind-wandering in daily life, nor how such thoughts unfold and transition over time. -In this talk, I will 1) describe results from a daily experience sampling study seeking insight into the costs and benefits of off-task thought, 2) introduce a neuroscientific framework for understanding mind-wandering by its dynamic properties, and 3) describe preliminary studies highlighting the potential for language and conceptual processing to illuminate dynamic trajectories of thought, with important implications for mental health.

October 20

**Sepideh Friberg Sadaghiani**, Assistant Professor of Psychology, University of Illinois, Urbana-Champaign

TITLE: Network dynamics underlying cognitive control

ABSTRACT: Cognitive control involves focusing on relevant environmental signals and coordinating complex behaviors. These processes are fundamental to all goal-directed cognition resulting in universal importance in function and dysfunction of the brain. Understanding the neurobiological basis of these functions requires concurrent

investigation of the brain at several spatial and temporal scales from control networks spanning across lobes to fine-scale electrophysiological mechanisms. I will present such a multi-modal approach that characterizes cognitive control functions such as alertness and selective attention in terms of concrete neurobiological mechanisms. I will furthermore discuss how the study of intrinsic or spontaneous background activity in the brain may explain lapses in these cognitive control functions. These findings are integrated in the formulation of a comprehensive model of cognitive control that motivates future investigations.

October 27

**LouAnn Gerken**, Professor, Department of Psychology, University of Arizona

TITLE: Parallels between non-linguistic and linguistic generalizations by infants and adults

ABSTRACT: Shepard, Hovland, and Jenkins (1961) defined six types of non-linguistic visual categories, including 2 rule-based categories (single feature and exclusive OR) and a non-rule-based family resemblance category. In research with adults, the order of supervised learning is single feature > exclusive OR > family resemblance (> indicates “easier than”). However, in unsupervised learning (no feedback), the order is: single feature > family resemblance > exclusive OR. Recently, researchers classified phonological rules of a variety of human languages in terms of the Shepard categories and found the order to mirror that of supervised learning: single feature > exclusive OR > family resemblance (> indicates “more frequently encountered in human language than”). Since language learning is assumed to be unsupervised, what is the reason for the frequency of rule types across languages? The answer that I will propose is that, while adults are very poor at learning exclusive OR linguistic rules and very good at learning family resemblance rules, infants are a whiz at learning exclusive OR rules. Thus, the frequency of phonological rule types across languages reflect what infants, not adults, are most adept at learning.

November 3

**Jody Culham**, Professor, Department of Psychology; Graduate Program in Neuroscience; Brain and Mind Institute, Western University, London, Canada

TITLE: “The treachery of images”: Why brains, babies and adults react differently to real objects than photos

ABSTRACT: Psychologists and neuroimagers commonly study perceptual and cognitive processes using images because of the convenience and ease of experimental control they provide. However, real objects differ from pictures in many ways, including the availability and consistency of depth cues and the potential for interaction. Across a series of neuroimaging and behavioral experiments, we have shown different responses to real objects than pictures, in terms of the level and pattern of brain activation as well as visual preferences. Now that these results have shown quantitative and qualitative differences in the processing of real objects and images, the next step is to determine which aspects of real objects drive these differences.

November 17 CANCELED-**Michael I. Norton**, Harold M. Brierley Professor of Business Administration, Harvard Business School, Harvard University

**COGNITIVE SCIENCE COLLOQUIUM**  
**Spring 2017**

April 28

Graduate Student Showcase

Stanley Donahoo, Graduate Student, Department of Linguistics, University of Arizona

TITLE: The Swearing Brain: Language Comprehension Insights

ABSTRACT: Expressives are speaker-oriented, not-at-issue content (Potts, 2005). How is the expressive dimension of language processed and represented? The present study focuses on the most clearly expressive items, swear words (damn, shit, hell, etc.). The study of swear words is important to linguistics and cognition in general. For instance, patients with aphasia or stroke can often recite automatic chunks include swearing (Van Lancker & Cummings, 1999), even when the left hemisphere language areas are completely offline. Thus, swear words provide a testing ground for language processing and representation. In a lexical decision task, participants (N=34) read swear words (shit), negatively valenced but non-swear words (sick), neutral content words (lend), neutral function words (while), and pseudowords. The results show that swear words took longer to access than negatively valenced content words, but were accessed as quickly as the function words. The difference between swear words and negatively valenced but non-swearing words suggests that there is more to the expressive dimension than merely a heightened emotional state. An ongoing EEG experiment (N=9 so far) is further testing the neural basis of expressive language.

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Bryan Kromenacker, Graduate Student, Department of Psychology, University of Arizona

TITLE: Engagement matters: pupil size and performance on a difficult mental task mediate performance reduction on a subsequent physical task

ABSTRACT: Self-control depletion theory claims to account for between-task performance changes in terms of the consumption of a limited cognitive resource. Dual-task designs have been used to demonstrate that increased self-control on an initial effortful task predicted decreased self-control on a later categorically distinct effortful task, supporting a non-rational (i.e., not based upon explicit value calculation) resource-like effect. These accounts struggle to identify specific mechanisms linking them to rational theories of effort, and the reported effect size has recently come into question. Subject engagement during the depleting task is often assumed, but systematic disengagement may account for inconsistencies in the observed effect. We recreated a common dual-task depletion paradigm using a computer-automated design allowing for measurement of individual task performance as well as pupil size. We found evidence that task engagement measures do indeed account for some individual variation in the depletion effect, offering a possible explanation for inconsistent group-level effects.

April 21

**Aneta Kielar**, Assistant Professor, Department of Speech, Language, and Hearing Sciences, University of Arizona

TITLE: Language Related and Spontaneous Oscillatory Responses in Acquired Language Disorders

ABSTRACT: Mapping oscillatory neural activity with magnetoencephalography (MEG) is a powerful method for revealing the functional organization of different aspect of language, and the changes associated with stroke. Considerable changes in the cortical representation of language processing can follow stroke. However, the neural mechanisms mediating recovery and relative contributions of each hemisphere are not well understood. In the present set of studies, I used MEG to understand the roles of perilesional and contralesional activity in recovery of semantic and syntactic processing in patients with post-stroke aphasia, and to explore the role of right hemisphere in language recovery. The resting state MEG and fMRI, as well as blood flow measures were used to identify dysfunctional cortex. In healthy controls, a left-lateralized temporo-frontal “ventral network” responded to semantic anomalies during sentence comprehension, and a bilateral fronto-parietal “dorsal network” responded to syntactic anomalies. For participants with aphasia, I observed compensatory recruitment in the right hemisphere. Interestingly, the distribution of this effect was depended on the type of linguistic information that was processed. Better recovery of semantic processing was associated with a shift to the right hemisphere components of the ventral network. In contrast, recovery of syntax was mediated by dorsal brain regions, bilaterally. The analysis of resting state activity indicated that reduced BOLD variability was associated with aging, whereas spontaneous MEG measures were more sensitive to the cortical abnormalities associated with stroke. Furthermore, reduced MEG complexity in perilesional tissue was correlated with hypoperfusion as assessed with arterial spin labeling, while no such relationship was apparent with BOLD variability. These findings suggest that MEG signal complexity offers a sensitive index of neural dysfunction in perilesional tissue in chronic stroke, and that these effects are distinguishable from those associated with healthy aging. The resting state measures may be useful indicators of cortical dysfunction that is potentially reversible with treatment and may be used to assess the effectiveness of interventions.

April 14

**Ying-hui Chou**, Assistant Professor, Department of Psychology, University of Arizona

TITLE: Repetitive Transcranial Magnetic Stimulation and Functional Connectivity Mapping in Clinical and Psychological Research

ABSTRACT: Repetitive transcranial magnetic stimulation (rTMS) is a non- invasive neuromodulation technique that has been closely examined as a possible treatment for a number of diseases. Although accumulating evidence suggests that rTMS can be utilized to enhance motor or cognitive function in clinical populations, little is known about how the rTMS modulates brain activities and how these changes correlate with improvement of function. Functional connectivity measured by resting-state fMRI has played an essential role in understanding brain functional networks in healthy individuals and clinical populations. Resting-state functional connectivity is defined as the temporal co-activation

level of spontaneous fMRI signals between spatially distinct brain regions when participants are not required to perform a perceptual or behavioral task.

In this talk, Dr. Ying-hui Chou will first present an overview of rTMS and resting-state connectivity separately. Then she will talk about her research that combines both rTMS and resting-state connectivity to investigate the therapeutic rTMS effects on brain connectivity. The long-term goal of Dr. Chou's lab is to adopt a multi-modal approach that combines rTMS and resting-state functional connectivity in conjunction with other brain imaging techniques to leverage the applications of rTMS and resting-state functional connectivity in the study of both normal and pathological conditions.

April 7

**Eric D. Smith**, Assistant Professor, Department of Educational Psychology, University of Arizona

TITLE: Glancing Through the Looking Glass: Perpetual Pretending and Bearable Behavior

ABSTRACT: The world of fiction appeals to many of us, through books, movies, and even pretending. The power of fictional content has prompted many research questions. How long in life do we engage in pretending? Do children transfer content from fictional worlds, like storybooks, into reality? In this talk, I address these overarching questions by 1) assessing Piaget's claim pretending ceases at 7 years of age; 2) demonstrating permeability in the fiction-reality boundary within the storybook realm; and 3) proposing a working model for fiction-reality breakdowns within the storybook domain.

March 24

**Evan MacLean**, Assistant Professor, School of Anthropology, University of Arizona

TITLE: The Fundamental Importance of Comparison in the Study of Cognitive Evolution

ABSTRACT: Since Darwin, understanding the evolution of cognition has been widely regarded as one of the greatest challenges for evolutionary research. In the last century, comparative psychologists have made great progress toward identifying aspects of cognition that humans share with other species, as well as cognitive processes that may be uniquely derived in our own lineage. Despite this progress, cognitive studies with animals have focused heavily on a few model species, with less effort toward broadly comparative, and explicitly phylogenetic approaches. I will present recent studies emphasizing the role of comparison in 'comparative cognition' to illustrate how these approaches can reveal major forces driving cognitive evolution and inform hypotheses for how and why cognition has evolved across species, including humans.

March 3

**Melissa C. Duff**, Associate Professor, Hearing and Speech Sciences; Director, Communication and Memory Laboratory, Vanderbilt Bill Wilkerson Center, Vanderbilt University School of Medicine

TITLE: The role of hippocampus in language use and processing

ABSTRACT: Language use requires the rapid and incremental processing of flexible and contextually defined linguistic forms that are formulated in rich, multi-modal environments. How this is accomplished in the brain, however, is an open question. While

attempts to link aspects of memory to particular properties of language are longstanding, the hippocampal declarative memory system has not received serious consideration as a neural/cognitive system involved in language use and processing. This is in part due to the long-held assumption that the hippocampal declarative memory system contributes only to long-term memory representations and not those that are available quickly enough to guide on-line information processing. Combining discourse analysis, eye-tracking, and neuropsychological methods I will present evidence for the proposal that the hippocampal declarative memory system is a key contributor to language use and processing. This proposal draws on the relational binding and representational flexibility that are hallmark characteristics of the declarative memory system, along with recent findings stretching the scope of hippocampus-dependent processes to functions that operate in-the-moment and on the narrowest of time-scales. Linking disruptions in language use and processing to the declarative memory system demonstrates how promiscuously the hallmark processing features of the hippocampus are called upon by a variety of cognitive domains, including language, and expands the network of neural and cognitive systems that support language use.

February 24

**Megha Sundara**, Associate Professor, Department of Linguistics, University of California, Los Angeles

TITLE: Acquisition of Verbs: A window to the mental representation of morphology and phonology

ABSTRACT: Verbs are difficult for infants to learn. Cross-linguistically, children have more nouns in their early vocabulary than verbs. In this talk, I will present perception data from English-learning infants within the first year of life to address when and how infants begin to learn verb forms. Then, I will use infants' abilities (or lack thereof) in relating multiple forms of verbs, like walk, walks, walked and walking, to answer how verbs are represented in the mental lexicon. Finally, I will discuss the implications of these findings for models of spoken word recognition.

February 17

**Julia L. Evans**, Professor, School of Behavioral and Brain Sciences, The University of Texas at Dallas

TITLE: Poles, Bowls and Dinosaur Bones: How Atypical Lexical Representations may be Derailing Sentence Comprehension for Children with Specific Language Impairment

ABSTRACT: Rumelhart (1979) argued that comprehension, like perception, should be likened to Hebb's (1949) paleontologist, who uses his or her beliefs and knowledge about dinosaurs in conjunction with the clues provided by the available bone fragments to construct a full-fledged model of the original. In this talk, I explore studies that suggest that, while real world knowledge is intact in children with SLI, deficits at the lexical level (the bone fragments) may be profoundly influencing sentence comprehension performance in children with SLI.

February 10

**Maryia (Masha) Fedzechkina**, Assistant Professor, Department of Linguistics, University of Arizona

TITLE: Processing and communication shape language learning and structure

ABSTRACT: Languages across the world—despite their diversity—also exhibit ABSTRACT commonalities. Most theories agree that these commonalities can be traced back to biases and limitations of human cognitive systems. Capturing cross-linguistic generalizations and understanding their causes has been one of the central objectives of linguistics and cognitive science as it can shed light on the nature of constraints underlying language processing and acquisition. My research examines the hypothesis that the cross-linguistic distribution of grammars can be accounted for, at least in part, in terms of their processing or communicative utility (cf. Bates & MacWhinney, 1982; Hawkins, 2004; Christiansen & Chater, 2008). Using a novel type of the miniature language learning paradigm, I identify biases that cause learners to deviate from the input they receive, thus changing the input to subsequent generations of learners and pushing the system towards language change. I present a series of experiments that investigate whether biases towards efficient information processing and efficient information transmission operate during language acquisition. Our findings support this hypothesis: when presented with inefficient input languages, learners produce languages that deviate subtly but systematically from the input towards more efficient linguistic systems. The newly acquired linguistic systems also tend to more closely resemble cross-linguistic patterns in syntax and morphology than the input learners receive. This suggests that at least some cross-linguistic commonalities originate in biases or limitations of human information processing and communication.

February 3

**Michael Hout**, Assistant Professor, Department of Psychology, New Mexico State University

TITLE: Becoming an expert at difficult visual search: Experience fine-tunes mental representations of target categories

ABSTRACT: In this (still ongoing) project, we investigated effects of expertise on accuracy and oculomotor behavior during difficult visual search. Participants completed up to 23 sessions, searching simultaneously for 20 different categorically-defined targets. Zero to three targets could appear on each trial, with variable frequency, akin to well-documented “prevalence effects.” Unsurprisingly, searchers got faster over time. Despite increased efficiency, with expertise, they were more likely to directly fixate targets, and to spend proportionately more time examining them, relative to distractors. Prevalence effects (better accuracy to more frequent targets) diminished but did not disappear across sessions, and more frequent targets were consistently located more quickly than infrequent ones. Importantly, despite receiving equal attention (indexed by oculomotor behaviors), low-frequency targets suffered more recognition failures (failure to perceive targets after direct fixation) than high-frequency targets. Our findings suggest that, with expertise, searchers refine their mental representations for target categories, particularly common ones, and become more effective at restricting attention to the most relevant features.

January 27

**Michael Grandner**, Assistant Professor, Department of Psychiatry, University of Arizona

TITLE: Neurocognitive Effects of Sleep Loss and Impact on Cardiometabolic Disease Risk

ABSTRACT: Sleep is implicated in a large number of physiologic regulatory properties.

Sleep loss has been implicated in cardiometabolic health risk factors including weight gain and obesity, hypertension, diabetes, hypercholesterolemia, and coronary disease. Sleep loss is also implicated in cognitive dysfunction, including decreased attention, impaired working memory and executive function, and problems with decision making. These two domains may overlap. Neurocognitive impairments due to sleep loss may interact with physiologic cardiometabolic risks to increase likelihood of obesity, cardiovascular disease, and diabetes. This presentation will provide an overview of sleep and cardiometabolic disease risk, sleep and neurocognitive function, and how these may overlap.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2016**

December 2

Graduate Student Showcase Presenters

Noah Nelson, Graduate Student, Linguistics-major; Cognitive Science- minor

TITLE: Targeted reduction of phonetic cues to promote lexical contrast

ABSTRACT: In speech, phonetic cues to the identity of segments are enhanced in response to competition from similar-sounding words (e.g., voice onset time: bat ~ pat). This is explained by two major theoretical approaches. Production-based approaches assume that activation of a word spreads to similar-sounding competitors, and feedback from those competitors further increases activation within the word, leading to increased phonetic durations. Perception-based approaches assume that, for segments that distinguish two words (e.g., /b/ and /p/ in bat ~ pat), the specific cues that differentiate those segments are made more contrastive. This greater contrast is assumed to increase the perceptual distance between competing words. Notably, perception-based approaches predict that competition can lead to reduction of phonetic cues if that reduction creates a greater contrast between competing words. Production-based approaches predict only enhancement of phonetic cues because the competition process leads to increases in activation. I present evidence from the Buckeye Corpus of Conversational Speech (Pitt et al. 2007) that two very different cues to segment identity in English can be contrastively reduced. This result is predicted by perception-based theories of competition effects but is difficult to reconcile with production-based approaches.

Adam King, Graduate Student, Linguistics

TITLE: Why Junk in the Trunk Matters: Less predictable words end with more redundant material

ABSTRACT: Much psycholinguistic research has shown that listeners process words

incrementally. For many words, the point at which sufficient information has been heard to positively identify the word (the "uniqueness point") occurs before the end of the word. For example, the three sounds in "cor-" could be part of several words, "corsair", "corsage", "corpus", but a single sound more, "corp-", can only be the word "corpus". As a consequence, material after the uniqueness point in a word (the "-us" in "corpus") is redundant. In my talk, I will present corpus data from English showing that words which are on average less predictable by their sentential context tend to have more of this redundant material. This supports the hypothesis that this extra material after the so-called uniqueness point plays a functional role in speech processing by providing additional redundant cues to unexpected words.

November 18

**Joshua Knobe**, Professor of Philosophy, Psychology, and Linguistics, Department of Psychology, Yale University

TITLE: The Essence of Psychological Essentialism

ABSTRACT: People appear to understand the social world in terms of essences. This notion plays a key role in the way that people ordinarily think about social categories (gender categories, religious categories, etc.) and also in the way that people think about individuals (the person you truly are deep down inside). But how exactly do people ascribe these essences? I present a series of new studies suggesting that people's judgments of essence can be affected in surprising ways with value judgments. These results provide support for the hypothesis that people's ordinary notion of essence is not a purely value-free scientific notion but a notion that is infused through and through with values.

November 4

**Judith F. Kroll**, Distinguished Professor, Department of Psychology, University of California, Riverside

TITLE: Bilingualism, Mind, and Brain

ABSTRACT: The use of two or more languages is common in most places in the world. Yet, until recently, bilingualism was considered to be a complicating factor for language processing, cognition, and the brain. In the past 20 years, there has been an upsurge of research that examines the cognitive and neural bases of second language learning and bilingualism and the resulting consequences for cognition and for brain structure and function over the lifespan. Contrary to the view that bilingualism adds complication to the language system, the new research demonstrates that all languages that are known and used become part of the same language system. A critical insight is that bilingualism provides a tool for examining aspects of the cognitive architecture that are otherwise obscured by the skill associated with native language performance in monolingual speakers. In this talk, I illustrate this approach to language processing and consider the consequences that bilingualism holds for cognition more generally.

October 28

**Lauren Emberson**, Assistant Professor, Department of Psychology, Princeton University

TITLE: How Does Structured Experience Support Perceptual Development? The Role of

## Top-down Information from Learning and Memory Systems

**ABSTRACT:** A hallmark of development is the tuning of perceptual systems to the structure of the environment. These perceptual changes support the development of key abilities such as language comprehension and face processing. I argue that learning and memory systems not only uncover the structure in real-world experience, they also use top-down or feedback connections to shape developing perceptual systems. To this end, I use functional near-infrared spectroscopy (fNIRS) to record the same physiological signals as fMRI (i.e., hemodynamic response) but using light instead of magnetic fields. This emerging neuroimaging modality allows spatial localization of neural signals while infants are awake and learning. Using fNIRS, I'll present evidence that perceptual systems are shaped by learning and top-down information early in life and within minutes of experience. Moreover, comparisons of typically-developing and at-risk populations (preterm infants) reveal that early deficits in learning-based changes in perceptual systems predict atypical developmental trajectories.

October 21

**Ervin R.-Hafer,** Professor of the Graduate School, Department of Psychology, University of California, Berkeley

**TITLE:** "Relating shared attention in simple psychophysical dual tasks to processing of natural speech spoken by multiple talkers."

**ABSTRACT:** Reduced performance found when we have to do two things at the same time is often blamed on informational overload, that is, on the need to share a limited attentional resource. In work to be presented here, I will describe results from two quite different conditions that reflect this problem. In one, a subject responds to the levels of simple auditory and visual stimuli when they are presented simultaneously, but otherwise independently, in a psychophysical dual task. In the other, a listener in a simulated cocktail party environment (albeit, w/o booze) derives meaning from speech coming from two different people, each speaking in a cadence descriptive of natural listening. In both conditions, our interest is in the difference between situations where there is a cost of shared attention (serial processing) and where there is not (parallel processing). Without promising closure on this ancient question, I hope to argue convincingly that knowledge of a seemingly related factor in the two conditions, the memories to which target stimuli are compared, provides insight into what it is that allows or prevents freedom from cost in multi-tasking.

October 14

**Mariam Aly,** Postdoctoral Research Associate, Princeton Neuroscience Institute, Princeton University

**TITLE:** Perception and Attention in Memory Systems

**ABSTRACT:** Research in cognitive neuroscience has traditionally progressed by studying different components of cognition largely in isolation. But ultimately, complex behavior is the result of the interplay between multiple aspects of cognition at the behavioral and the neural levels. With a combination of behavioral, neuroimaging (fMRI) and patient studies, I'll argue that the computations performed by brain regions allow them to critically and

flexibly support many different aspects of cognition, from attention to perception to long-term memory. In the first part of my talk, I'll show that at a behavioral level, perception shares functional commonalities with long-term memory, and traditional memory systems of the brain play a critical role in perception. In the second part of my talk, I'll show that attention modulates these "memory systems", and that this modulation has consequences for attentional and mnemonic behavior. Together, my research points to the utility of understanding the brain and behavior by thinking about the mechanisms that allow any given brain region to flexibly contribute to diverse aspects of cognition.

October 7

**Laura Schulz**, Associate Professor of Cognitive Science, Department of Brain and Cognitive Sciences, Massachusetts Institute of Technology-2016 Roger N. Shepard Distinguished Visiting Scholar

TITLE: Inferential economics: Self-knowledge and children's understanding of the costs and rewards of behavior

ABSTRACT: Across a series of studies, I will show that very young children reason about when learning will be easy and when it will be difficult. I will suggest that children's understanding of the costs and rewards of information affect both how they learn and how they teach, and I will discuss the ways in which reasoning about the costs and rewards of action gives children insight into others' mental states broadly. Finally, I will suggest that children actively assess their own abilities and that this affects how hard they try at challenging tasks.

September 30

**Jacqueline Snow**, Assistant Professor, Department of Psychology, Program in Cognitive and Brain Science, and Program in Integrative Neuroscience, University of Nevada, Reno

TITLE: "The treachery of images": how (and why) behavior and brain responses differ for real-world objects versus their representations

ABSTRACT: Ultimately, we aim to generalize and translate scientific knowledge to the real world, yet our current understanding of visual cognition is based almost exclusively on studies of impoverished stimuli. In this talk I will present convergent evidence from human behavioral, neuropsychological, and fMRI studies, showing that real objects elicit differences in behavior and neural coding, compared to matched image displays. I will discuss the underlying mechanisms for the observed effects and describe a range of innovative techniques and apparatus for 'bringing the real world into psychology and neuroscience'.

September 23

**Adam Ussishkin**, Associate-Professor, - Department of Linguistics, University of Arizona

TITLE: Morphology facilitates word recognition independently of phonology: evidence from auditory masked priming

ABSTRACT: Words consist of a phoneme or letter sequence that maps onto meaning. Most prominent theories of word recognition (auditory and visual) portray the recognition process as a connection between these small units and a semantic level. However, there is

a growing body of evidence suggesting in the priming literature that there is an additional, morphological level that mediates the recognition process. In morphologically linear languages like English, however, morphemes and letter or sound sequences are co-extensive, so the source of priming effects between related words could be due to simple phonological overlap as opposed to morphological overlap. In Semitic languages, however, the non-linear morphological structure of words reduces this confound, since the morphemes are interdigitated in a non-linear fashion. Semitic words are typically composed of a discontinuous root (made up of three consonants) embedded in a word pattern specifying the vowels and the ordering between consonants and vowels. Active-passive pairs in Maltese, the official language of Malta, illustrate this relationship (the root is underlined); e.g., fetaħ ‘open’-miftuħ ‘opened’.

In this talk, I report on a number of experiments our lab has carried out in Maltese and Hebrew investigating the extent to which the non-linear morphemes used in Semitic facilitate auditory word recognition, and to what extent potential priming effects are independent of the phonological overlap typically inherent in morphological relationships. These experiments make use of the auditory masked priming technique (Kouider and Dupoux, 2005). I show that not only do roots facilitate auditory word recognition in these languages, but that these morphological effects are independent of phonological overlap effects.

September 16

**Daniel Sullivan**, Assistant Professor, Department of Psychology, University of Arizona

TITLE: Exploring the Cultural Psychology of Time and Space

ABSTRACT: Researchers in cultural, cognitive, developmental, and social psychology have amassed a fascinating and unwieldy corpus of data on both uniformity and variation in the way people think about time and space. What is lacking in this area is (1) a comprehensive theory of how social structural and cultural factors (e.g., mode of subsistence; religion) are related to individual attitudes about and experiences of time, space, and their interrelation, that (2) may be utilized to empirically test psychological hypotheses. Drawing on the sociology of Anthony Giddens and David Harvey, my colleagues and I (Palitsky, Sullivan, Keefer, & Stewart, 2016; Sullivan, Keefer, Stewart, & Palitsky, in press) propose that time-space distancing is an interdisciplinary, multilevel construct suited to these functions. This construct refers to the extent to which, in a society, time and space are treated as “separate” dimensions, and individual activities are ABSTRACTed across distance and timespan. I will present some of our preliminary research showing the implications of cultural and individual variation in time-space distancing for well-being and health, as well as social and disordered cognition.

September 9

**Vicky Lai**, Assistant Professor, Department of Psychology & Cognitive Science Program, University of Arizona

TITLE: The Role of Metaphor in Embodied Cognition

ABSTRACT: Metaphors occur on average once every twenty words in daily language. It has been suggested that metaphors play a major role in the organization of semantic memory,

as cognitive and neural resources for dealing with concrete domains are recruited for the conceptualization of more ABSTRACT ones. In this talk I will discuss the when and the where of metaphor grounding and how such grounding may be enhanced in context. Our latest findings indicate that concrete senses, when used in a metaphorical way, are exploited further and made semantically richer for grounding the ABSTRACT concept of interest.

**COGNITIVE SCIENCE COLLOQUIUM**  
**Spring 2016**

April 22

Graduate Student Showcase, Speakers: Dylan Cooper and Katie Newman-Smith

Dylan Cooper, Graduate Student, Management (Major), Management and Organizations (Major), Cognitive Science (Minor)

TITLE: Social-Standing and Decision-Quality Goals in Advice Taking

ABSTRACT: Research in advice taking has traditionally assumed that people accept or reject advice based on perceptions of its usefulness for solving the issue for which it is offered. The research described in this talk tests whether anticipated social consequences of the use of advice are an additional antecedent of advice taking. I first differentiate between decision quality goals and social standing goals: Decision quality goals increase striving toward a good outcome, while social standing goals focus attention on the social effects of the act of taking or rejecting advice. For example, advisees may take advice when they fear that rejecting it will anger their advisor. I then propose that an advisor's relative expertise influences advice taking through decision quality goals, while the advisor's position in a formal hierarchy (i.e., supervisor, peer, or subordinate) influences advice taking through social standing goals.

Katie Newman-Smith, Graduate Student, Psychology (Major), Psychology (Minor)

TITLE: Using Targeted Memory Reactivation (TMR) to Induce Forgetting

ABSTRACT: Recent studies demonstrate memory improvement following targeted memory reactivation (TMR) using associated sounds or odors during sleep (see Oudiette & Paller, 2013 for review). TMR can also diminish fear conditioning (Hauner, Howard, Zelano, & Gottfried, 2013) and implicit social biases (Hu et al., 2015). Here we investigate whether TMR can induce forgetting in episodic memory. Eighteen participants completed two learning tasks prior to sleeping. In the first task, participants experienced a directed-forgetting task with words. Participants saw 46 words, with half followed by a 'forget' tone. For the second task, participants saw 28 novel object-location pairs. Objects were paired with their associated sounds. From these objects, we randomly chose five for reactivation and five for controls. At night, during the first period of slow wave sleep, we reactivated the five objects with the forget tone 20 times. One week later we tested participants memories of the objects and words using free-recall and recognition. Participants recalled fewer reactivated than control objects ( $t(1,17)=3.682$   $p = .002$ , Cohen's  $d = 1.23$ ). Of the

reactivated objects that were not recalled, participants were also less likely to remember their spatial locations ( $t(1,15) = -2.132$   $p = .05$ , Cohen's  $d = .764$ ) and had lower confidence in their answers ( $t(1,15) = -5.558$   $p > .001$ , Cohen's  $d = 1.983$ ). We demonstrate proof of concept that TMR can be used to reduce memory for objects one week later. Participants are less likely to recall the objects, and are also less likely to correctly locate those they successfully forgot. Future studies will determine whether TMR-forgetting can reduce stronger or more emotional memories, paving the way for novel therapeutic treatments for disorders including PTSD or phobias.

April 15

**Randall O'Reilly**, Professor, Department of Psychology and Neuroscience, Institute of Cognitive Science, Center for Neuroscience, University of Colorado, Boulder

TITLE: The Emergence of Symbolic Cognition from Sensory-Motor Dynamics

ABSTRACT: One of the greatest mysteries of human cognition is how higher-level symbolic processing emerges out of lower-level sensory-motor learning. We are developing biologically-based computational models that explore this transition, in the domain of active processing of visual displays, leading up to the ability to perform tasks such as the Raven's progressive matrices – a widely-used test of general fluid intelligence. It has been critical to incorporate the functions of the deep neocortical layers, and their interactions with the thalamus, to enable our models to exhibit the dynamic top-down attention required. These attentional mechanisms interact with bidirectional excitatory connectivity in the superficial cortical layers to support flexible access to visual information by executive function areas in the prefrontal cortex and basal ganglia.

April 8

**Jamie Edgin**, Assistant Professor, Department of Psychology; Director, Memory Development and Disorders Lab, University of Arizona

TITLE: Sleep: The beloved teacher?

ABSTRACT: In recent years there has been a resurgence of an age-old idea that adequate sleep is needed for healthy cognition and behavioral development. Numerous studies have pointed to sleep quality as a correlate of a child's level of executive function and behavior, language development, and school performance (Beebe, 2011; Bernier et al., 2013; Edgin et al., 2015). There is also evidence that knowledge may be consolidated across sleep periods (Gomez et al., 2006; Henderson et al., 2012). More recent work has pointed to the provocative notion that sleep might actually serve a mechanistic role in how the brain refines networks important for higher-level cognitive function (Huber & Born, 2014; Walker, 2006). In this talk I will discuss some knowns and unknowns regarding the relationship between sleep quality, physiology, and learning. I will draw examples from my research program, which examines the effects of early sleep quality on memory and learning in typical and atypical development.

April 1

**Andrew Lotto**, Associate Professor, Speech, Language and Hearing Sciences, University of Arizona

TITLE: The Sorcerer's Spectrum: Relative Perception in the Auditory System

ABSTRACT: The human ability to understand speech from talkers with widely varying vocal anatomy is remarkable. It has been proposed that humans solve the problem of acoustic variance in speech by relying on either innate (divinely-granted?) specialized processes or on substantial linguistic knowledge. I will present evidence that this ability is actually accomplished by a general auditory mechanism that likely evolved to handle the problem of detecting acoustic events in the presence of noise. I will then ask whether such a mechanism can also account for demonstrations that listeners tune their speech perception to accommodate speakers with a non-native accent or a different speaking style. If nothing else, I hope to demonstrate the usefulness of the first chapter of the first Harry Potter book for studying perception.

March 25

**Cathleen Moore**, -Professor, Psychological and-Brain Sciences, The University of Iowa

TITLE: Beyond parsing: Some functional consequences of perceptual organization in vision

ABSTRACT: Processes of perceptual organization, such as those that result in phenomena like grouping, surface completion, and figure-ground segregation, have been a central focus in vision research since at least the 19th century. One reason for this focus—besides the appeal of the phenomenology—is that perceptual organization is considered foundational; it parses the retinal image into the building blocks out of which more complex visual representations are built. Research has focused on understanding the rules of organization, such as “similarly colored items tend to be grouped together”, “aligned edges tend to be represented as continuous” and “surrounded regions tend to be represented as figure rather than ground.” In this talk rather than rules, I will consider some of the functional consequences of perceptual organization for downstream visual processing. Specifically, I will suggest that perceptual organization processes serve to establish changeable information “channels” that guide the updating of existing visual representations on the basis of newly sampled visual information. While not directly conflicting with more traditional treatments of perceptual organization, this view seeks to emphasize the functional role that perceptual organization plays in dynamic visual processing.

March 11

**Julie Miller**, Ph.D., Assistant Professor, Departments of Neuroscience and Speech, Language, and Hearing Sciences, University of Arizona

TITLE: The Role of the Basal Ganglia in Neural Control of Speech

ABSTRACT: Information from multiple brain regions contributes to neural control of speech, but in more recent years, studies have highlighted an important role for the basal ganglia in vocal learning and control. When neural circuits in the basal ganglia are disrupted by disorders or neurological diseases, communication is impaired. Insights into the normal and abnormal functioning of these vocal motor pathways have been obtained through studies using the songbird model. I will present data on molecular mechanisms important for vocal learning and control including the role of dopamine.

March 4

**Noa Ofen**, Assistant Professor, Life-Span Cognitive Neuroscience, Institute of Gerontology, Wayne State University

TITLE: The Development of Memory Systems in the Human Brain

ABSTRACT: Episodic memory – the ability to encode, maintain and retrieve information – is critical for everyday functioning at all ages, yet little is known about the development of episodic memory systems and their brain substrates. The use of neuroimaging methodologies including magnetic resonance imaging (MRI) in the study of episodic memory development is providing new insights into the neural underpinnings that support improvements in episodic memory. I will present data on these neural mechanisms and highlight evidence that demonstrates how functional and structural brain development underlies changes in memory functioning throughout childhood and adolescence. We find age-related increase in memory-related activation in prefrontal cortex (PFC), a region that also shows protracted structural development. Age-related increase in the functional contribution of the PFC to memory may be directly related to improvement in the use of mnemonic strategies with age. The hippocampus, known to be critical for the integrity of episodic memory, shows a more complex pattern of functional development that may be dependent on its involvement in binding and associating among an increasingly large knowledge-base through development. Characterizing normative development of brain systems that support episodic memory has direct implications for the understanding of memory systems in adults and aging, as well as in atypical development.

February 26 CANCELLED--Melissa Duff, Assistant Professor, Interdisciplinary Graduate Program in Neuroscience, the University of Iowa Graduate College

February 19

**Amitai Shenhav**, Princeton Neuroscience Institute

TITLE: The Costs of Choice and the Value of Control

ABSTRACT: Two largely separate bodies of research offer different insight into the process by which we engage decisions. Research on goal-directed, value-based decision-making describes how we weigh the costs and benefits of our options, whereas research on cognitive control describes how we exert the necessary cognitive effort to overcome prepotent biases that interfere with the execution our choice (e.g., flankers directing us toward the incorrect response). I will discuss recent and ongoing studies aimed at examining questions that arise at the intersection of these two fields. I will focus in particular on two sets of studies that explore the cognitive effort costs we associate with the act of making a choice: one set of studies examines the neural circuits that drive simultaneously positive and aversive experiences of being offered multiple good options (e.g., great graduate schools to attend); the other set of studies explores the costs of considering alternatives to our default option (i.e., the choice we are prepotently biased to make in a given situation). I will then describe a recent theoretical framework and ongoing modeling work that seeks to address how we weigh the costs and benefits of control itself (i.e., how much cognitive effort is worth exerting?).

February 5

**Yuhong Jiang**, Professor, Department of Psychology, University of Minnesota

TITLE: Attention in Space and Time

ABSTRACT: The visual world is complex; it is not possible to process all incoming sensory information at once. Selective attention allows us to prioritize processing of behaviorally relevant information. Selectivity often applies to specific spatial locations and occurs in certain moments of time. In the first part of this talk on “attention in space”, I present evidence that implicit learning affects spatial attention. Borrowing terminologies from memory research, I divide attention into a declarative component - the “where” of attention, and a procedural component - the “how” of attention. I show that implicit learning affects how people deploy attention in a viewer-centered (egocentric) reference frame. I argue that successful target detection serves as a reinforcement signal for learning. In the second part of the talk on “attention in time”, I present behavioral and fMRI evidence that detecting behaviorally relevant events in time facilitates global perceptual and brain function. Such facilitation overcomes dual-task interference and counters the traditional push-pull effects of spatial attention.

January 29

**Andrew Yonelinas**, Professor, Psychology Department; Associate Director, Center for Mind and Brain, University of California, Davis

TITLE: The Role of the Medial Temporal Lobe in Memory, Perception and Emotion: The Promiscuous Hippocampus

ABSTRACT: (Tentative ABSTRACT) The ability to remember the important events that make up our lives is critically dependent on the medial temporal lobe (MTL). Today, I will start by briefly reviewing some work indicating that different regions within the MTL play distinct roles in long term episodic memory. More specifically, I will describe work suggesting that the hippocampus plays a central role in binding together and subsequently recollecting the different aspects that make up an episode or event, whereas other regions such as the perirhinal cortex can support familiarity-based memory discriminations even when recollection fails. Second, I will then discuss some more recent work that has suggested that the MTL may not be limited to supporting long term episodic memory, but that it may also be involved in supporting short-term memory and even visual perception, and will present data that suggests that in general the primary function of the hippocampus is to support processing of high-resolution complex bindings, that can play a critical role in making long term memory, short term memory and perception judgments. Third, I will examine how emotion impacts remembering and show emotional memories are particularly resistant to the effects of forgetting. I will argue that this arises because the amygdala supports recollection of emotional bindings that exhibit relatively slow forgetting compared to hippocampal bindings. Forth, I will present data showing that when acute stress occurs immediately after an event has been encoded into memory that this can rescue memory from the effects of forgetting. I will then present some data suggesting that this occurs because stress acts as a mnemonic filter biasing us toward remembering items that were strongly encoded by the MTL.

January 22

**Jonathan Weinberg**, Associate Professor, Department of Philosophy, University of Arizona  
TITLE: Cognitive science can help burn an armchair, but can it help separate wheat from chaff? On the 'experimental philosophy' challenge to traditional philosophical methodology.

ABSTRACT: An important methodology in philosophy, in recent decades but also going back to Socrates, has been the armchair method of cases: we consult our armchair judgments about what hypothetical cases are or are not instances of philosophically interesting categories. If you want to know about the nature of knowledge, consider what pre-theoretically seem to count as excellent cases of knowledge, and excellent cases of non-knowledge, and try to systematize. Likewise for, say, moral goodness, or human agency, and so on. This methodology has come under fire in recent years from 'experimental philosophers', deploying both existing results and empirical research tools from the social sciences to argue that armchair judgments about these cases may be susceptible to all sorts of noise: order effects, framing effects, demographic variation, and so on. More recent results indicate that philosophical training and experience does little to dampen the influence of such noise. I will discuss this body of work, and then ask the audience for help with what seems to me one of the most pressing questions: if we cannot trust the armchair to help us determine the nature of philosophical categories, can we find ways for scientific tools and methods to help us do better?

***COGNITIVE SCIENCE COLLOQUIUM***  
***Fall 2015***

December 4

**Elissa Newport**, Professor, Georgetown University Medical Center; Director, Center for Brain Plasticity and Recovery

TITLE: Statistical Language Learning: Computational, Maturational, and Linguistic Constraints

ABSTRACT: In recent years a number of problems in the brain and cognitive sciences have been addressed through statistical approaches, hypothesizing that humans and animals learn or adapt to their perceptual environments by tuning themselves to the statistics of incoming stimulation. Our own work on statistical language learning shows that infants, young children, and adults can compute, online and with remarkable speed, how consistently sounds co-occur, how frequently words occur in similar contexts, and the like, and can utilize these statistics to find candidate words in a speech stream, discover grammatical categories, and acquire simple syntactic structure in miniature languages. However, statistical learning is not merely learning the patterns that are presented in the input. Our research also shows that there are maturational changes in statistical learning, with children sharpening the statistics and producing a more systematic language than the one to which they are exposed. Our most recent work examines variation in relation to linguistic universals, suggesting that, when inconsistencies occur on dimensions on which languages tend strongly to align in one direction, learners also shift the languages they

learn in this direction. These processes potentially explain why children acquire language (and other patterns) more effectively than adults, and also how systematic language structures emerge in communities where usages are varied and inconsistent.

November 20

**Matthew D. Grilli**, Assistant Professor, Department of Psychology, University of Arizona

TITLE: Mechanisms and Functions of Personal Semantic Memory: Insights from Amnesia

ABSTRACT: Personal semantic memory can be defined as knowledge that is specific and unique to each individual. It consists of autobiographical facts, knowledge of self-referential traits and roles, and personal thoughts and beliefs. Recently, there has been much interest in understanding the cognitive and neural bases of personal semantic memory, as well as the contributions of this type of memory to other cognitive constructs. In regards to mechanisms, current research is focused on elucidating the extent to which personal semantic memory relies on two other types of human memory: episodic memory, which is memory for unique events, and semantic memory, which is general world knowledge. In addition to the cognitive and neural mechanisms of personal semantic memory, there is considerable theoretical and clinical interest in shedding light on how this type of memory can be used to support the self-concept: the cognitive construct that enables us to experience an identity. To provide insight into the mechanisms and functions of personal semantic memory, I have conducted a series of studies investigating personal memory and self-concept in individuals with medial temporal lobe (MTL) amnesia. Based on the findings of this work, I will present a conceptual model that separates personal semantic memory into “experience near” semantics, which contain information linked to personal experience and depend on the MTL for retrieval, and “experience-far” semantics, which are ABSTRACT memories that rely on neocortical brain regions involved in retrieval of general semantic memory. I also will discuss findings demonstrating that personal semantic memory supports the ability to construct a self-concept in the present moment and to create a continuous sense of identity across mental time.

November 13

**Nina Dronkers**, Ph.D., VA Research Career Scientist, Director, Center for Aphasia & Related Disorders, University of California, Davis

TITLE: Lesion and Connectivity Analysis of a Network Supporting Language Comprehension

ABSTRACT: Classic models of language comprehension have focused on the left posterior superior temporal gyrus as the key region involved in language comprehension. However, recent lesion and functional imaging studies have suggested the involvement of numerous cortical regions that could assist in supporting the complexities of language. This presentation will review some of the major findings from our laboratory concerning the neural correlates of auditory comprehension disorders in stroke patients with aphasia. Voxel-based lesion-symptom mapping analyses of behavioral and neuroimaging data from aphasic patients will be presented that associate several brain regions with the language disorders of our patients. In addition, the structural and functional connectivity of these regions will be described, based on our recent work using diffusion tensor and resting-state functional magnetic resonance imaging (MRI). This comprehensive approach has

allowed us to evaluate both the cortical regions and the underlying fiber pathways that are affected after brain injury and to examine the ramifications of these disconnections for patients with language comprehension disorders.

November 6

**Teenie-Matlock**, McClatchy-Chair-of Communications, Associate Professor of Cognitive Science, University of California, Merced

TITLE: A Look at Linguistic Framing in Everyday Language

ABSTRACT: Framing is important in everyday communication and reasoning. People constantly frame events, states, and situations with the intention of encouraging others to adopt a particular point of view or take particular actions in the world. Social scientists and linguists know a good deal about framing, but relatively little about how some of the finer linguistic details effect reasoning. This presentation will discuss recent experimental findings on aspectual and metaphorical framing across various domains, including political messages, reckless driving reports, and risk alerts.

October 30

STUDENT SHOWCASE

Natalie Dailey, Graduate Student, Speech, Language and Hearing Sciences

TITLE: Neurological Models of Dyslexia and White Matter Integrity

ABSTRACT: Dyslexia is a neuropsychological developmental disorder, affecting roughly 5 - 12% of the population, and persisting into adulthood. Previous research has identified neurological differences in individuals with dyslexia. However, little is known about the white matter integrity of the cerebellar-cerebral pathways within the reading network for adults. The current proposal outlines neurological models of dyslexia and how cerebellar-cerebral-pathways-relate to reading. Building upon previous findings from function MRI, the present study proposes differences in white matter integrity within in the reading network, between individuals with and without dyslexia. Bilateral Iterative Parcellation (BIP) will be introduced and discussed as a novel method to identify the location and size of connected cortical regions involved in reading. Results from preliminary analyses will be presented, demonstrating successful implementation of the BIP procedure and the identification of cortically connected regions important for reading.

Noah Nelson, Graduate Student, Linguistics

TITLE: Hyperarticulated Speech Correlates with Phonetically Specific Lexical Competition

ABSTRACT: Languages change over time in many ways, including the sounds that are used to form words. One possible way for this to happen is in gradual shifts in the pronunciation of words in response to similar-sounding competitors. True to this view, phonetic competition between words correlates with hyperarticulation, or the exaggeration of distinguishing phonetic cues (Baese-Berk & Goldrick, 2009). Experimental work to date has focused on either very broad measures of competition or very phonetically specific ones, leaving uncertain what intermediate types of competition may affect phonetic realizations of words (though see Kirov & Wilson 2012 and Schertz 2013). What is more, very little work

has attempted to find these effects in conversational speech outside the lab. To address these issues, the present study examined spontaneous, conversational speech from the Buckeye Corpus (Pitt et al. 2005, 2007) to see what measures of competition correlate with hyperarticulation. Only the most phonetically specific measure of competition was found to reliably predict hyperarticulation, suggesting that speakers may manipulate fine-grained phonetic detail to enhance intelligibility. This finding is consistent with previous research suggesting that phonetically specific competitor words may drive language change (Wedel et al. 2013).

October 23

**G. John Andersen**, Professor, Department of Psychology, University of California, Riverside

TITLE: Age-related Declines in Vision and Recovery of Function Using Perceptual Learning

ABSTRACT: A major problem for the rapidly growing population of older adults (age 65 and older) is age-related declines in vision, which have been associated with increased risk of falls and vehicle crashes. My talk will briefly review what is known about age-related declines in vision and review in detail behavioral and imaging research that examines how training using perceptual learning methods can be used to improve vision and sensory processing among older adults. This research has found that with a few days of training older adults can perform visual tasks as well as untrained college age adults, that the improvements are maintained for up to 3 months, are not the result of task practice and that the improved performance is not associated with changes in attention. The results of our imaging studies indicate activation changes for younger adults and structural changes for older adults due to training – providing evidence of multiple mechanisms of plasticity within the adult brain. These findings, considered together, indicate that behavioral interventions can greatly improve visual performance for older adults.

October 16

**Chad Woodruff**, Associate Professor, Psychological Sciences, Northern Arizona University

TITLE: EEG  $\mu$ -rhythm  $\beta$ -rhythm and Event-Related Potential Correlates of Perspective-Taking, Personal Distress and Self-Other Discrimination

ABSTRACT: Taking another's perspective requires not only the experiencing of another's intentions/feelings, but these experiences must be represented as belonging to the other and not to the self. Failures of self- other discrimination can lead to personal distress, which necessarily entails self-focus – the antithesis of empathy. This talk will feature a series of experiments demonstrating some of the neural correlates of processes related to empathy. Using  $\mu$ - and  $\beta$ -rhythms (possible correlates of mirror neuron activity) as well as ERP's, we will see that empathy-related processes correlate not only to neural responses to others, but also to self- other differences in neural responses. The data are consistent with claims that greater self-other discrimination relates to greater empathic abilities. The talk will also include comparisons of  $\mu$ -rhythms from omnivores and vegetarians as relates to perception of traditional food animals and, separately, from those who do and do not hold paranormal beliefs.

October 9

CANCELLED Evelina Fedorenko, Assistant Professor, Psychiatry Department, Massachusetts General Hospital; Department of Brain & Cognitive Sciences, Massachusetts Institute of Technology

October 2

**Tania Lombrozo**, Roger N. Shepard Distinguished Visiting Scholar, Associate Professor, Department of Psychology, University of California- Berkeley

TITLE: Explanation: The Good, The Bad, and the Beautiful

ABSTRACT: Like scientists, children and adults are often motivated to explain the world around them, including why people behave in particular ways, why objects have some properties rather than others, and why events unfold as they do. Moreover, people have strong and systematic intuitions about what makes something a good (or beautiful) explanation. Why are we so driven to explain? And what accounts for our explanatory preferences? In this talk I'll present evidence that both children and adults prefer explanations that are simple and have broad scope, consistent with many accounts of explanation from philosophy of science, and with ties to ideas about inference to the best explanation in epistemology. The good news is that a preference for simple and broad explanations can sometimes improve learning and support effective inferences. The bad news is that under some conditions, these preferences can systematically lead children and adults astray.

September 25

**Mark T. Wallace**, Director, Vanderbilt Brain Institute, Vanderbilt University

TITLE: Development and Plasticity of Multisensory Function: Single Neurons to the Clinic

ABSTRACT: We live in a world in which we are continually bombarded with stimuli from a number of different sensory modalities. As such, one of the important functions of our brains is to combine this rich sensory mélange into a coherent and unified perceptual representation. Although we now know a great deal about how multisensory interactions guide behavior and shape perception and cognition, and about the neural correlates of these interactions, our knowledge about the development and plasticity of multisensory representations has lagged behind. In this talk, I will begin with an overview of the benefits that can be gleaned from multisensory interactions, and review some of the neural bases for these effects. I will then describe work in animal models that has revealed some of the basic features of how multisensory representations develop, and the inherent plasticity contained within these representations. I will then transition to describe studies in humans that highlight the multisensory plasticity that takes place not only during the course of development, but also in the adult. I will end with a discussion of the clinical implications of alterations in multisensory function, with an emphasis on neurodevelopmental disabilities.

September 18

**Jonathan Tullis**, Assistant Professor, Educational Psychology, University of Arizona

TITLE: Reminders: The influence of prior episodes on present behavior

ABSTRACT: One aspect of successful cognition is the efficient use of prior relevant

knowledge when navigating novel situations. Reminders – stimulus-guided retrievals of prior episodes – allow us to link prior knowledge to current problems by prompting retrieval of relevant knowledge from events that are distant from the present. Here, I explore the causes and consequences of reminders for interpretation, memory, and generalization. I will present research showing that reminders bias the interpretation of ambiguous stimuli, that memory for the first item in a reminded pair is enhanced, that the benefits of reminders depend upon the association and lag between related presentations, and that reminders can produce better generalizations than comparison. Further, I will describe a mathematical model of reminders, which demonstrates that reminders provide a useful unifying theme for memory phenomena that otherwise lack theoretical coherence. Reminders are an important cognitive mechanism that enables our past experiences to influence our current behavior.

September 11

**Don T. Fallis**, Professor, School of Information, University of Arizona

TITLE: Shedding Light on Keeping People in the Dark

ABSTRACT: We want to keep hackers in the dark about our passwords and our credit card numbers. We want to keep potential eavesdroppers in the dark about our private communications with friends and business associates. And especially after Snowden's revelations, we probably want the government kept in the dark as well. But in order to know whether we are achieving these sorts of goals, we first need to understand exactly what it is to \*keep someone in the dark\* about something. Several philosophers (e.g., Bok 1983, Scheppele 1988, Mahon 2009, Carson 2010) have analyzed this concept in terms of concealing and/or withholding information. However, these analyses incorrectly exclude clear instances of keeping someone in the dark. And more importantly, they incorrectly focus on possible \*means\* of keeping someone in the dark rather than on what it \*is\* to keep someone in the dark. In this talk, I argue that you keep X in the dark about P if and only if you intentionally leave X without a true belief about P. I then show how my analysis of keeping someone in the dark can be generalized from a categorical belief model of epistemic states to a degree of belief model. I also show how my analysis connects to recent research in cryptography and game theory.

September 4

**Martin Reimann**, Assistant Professor, Marketing, Eller College of Management, University of Arizona

TITLE: Can a Happy Meal help you eat less? New behavioral and neurophysiological findings on motivating smaller portion choice

ABSTRACT: Four studies show that offering consumers the choice between a full-sized food portion alone and a half-sized food portion paired with a small non-food premium (e.g., a small Happy Meal toy or the mere possibility of winning frequent flyer miles) motivates smaller portion choice. Importantly, we investigate why this is the case and find that both food and the prospect of receiving a non-food premium activate a common area of the brain (the striatum), which is associated with reward, desire, and motivation. Finally, we show that the choice results are mediated by a psychological desire for, but not by liking of,

the premium. Notably, we find that choice of the smaller food portion is most pronounced when the probability of obtaining the premium is not disclosed compared to when the probability is disclosed or when the receipt of the same premium is stated as being certain.

## **COGNITIVE SCIENCE COLLOQUIUM**

**Spring 2015**

May 1

Graduate Student Showcase, Speakers: Goffredina Spano and Erica Wager

Goffredina Spano, Graduate Student, Psychology (Major) & Cognitive Science (Minor)

TITLE: Testing the Boundaries of Boundary Extension Across Development ABSTRACT: In adults, perceptions of the world are influenced by past experience and memory. Boundary extension (BE) is a phenomenon in which observers will extend the background details of a previously viewed scene, reflecting a rapid top-down influence on perceptual representations. Given recent evidence findings suggesting a role for the hippocampus in BE (Mullally, Intraub & Maguire, 2012), and findings evidence of BE in very young infants (Quinn & Intraub, 2007), we tested whether this phenomenon may change during rapid periods of hippocampal development or may be altered in populations with hippocampal dysfunction (i.e., Down syndrome, DS). The findings suggest that there are no clear links between the development of hippocampus and BE in school-age children or individuals with DS. These findings raise questions regarding the continuity of mechanisms underlying BE across development.

Erica Wager, Graduate Student, Psychology (Major) & Cognitive Science (Minor)

TITLE: Exploring the Effects of Long vs. Average Sleep on Cognition in Healthy Older Adults ABSTRACT: Previous research suggests that too little or too much sleep time in adults can have negative consequences on mortality, health, mood and various cognitive outcomes. Most of these studies, however, have measured sleep subjectively by using sleep diaries and self-report measures. I'll be discussing results from a Multi Site Sleep Study where we explored how average or long sleep measured objectively in older adults is associated with cognitive function. In this study, as part of a larger longitudinal study, we hypothesized that long sleepers would have worse cognitive performance than average sleepers. Among other measures, we calculated total sleep time in 72 healthy older adults by using actigraphy (a device similar to "fitbit") and sleep diaries. The older adults were then classified as average or long sleepers. At baseline, after participants had monitored their time in bed and sleep for two weeks, we gave them various cognitive and health measures. We found that longer sleep among older adults was associated with slower completion time on a task that requires inhibition of an automatic response – the Stroop Task, but that there were no significant differences on a task that requires set shifting and visual attention – the Trail Making Test. I'll discuss these findings and the broader impact of these results in aging populations in my talk.

April 24

**Edward F. Chang**, MD, Associate Professor, Departments of Neurosurgery and Physiology, University of California-San Francisco

TITLE: Feature Organization in Human Speech Cortex

ABSTRACT: Communication systems generally rely on upon defined organizational schemes for signal generation and sensing. In humans, the production and perception of speech is processed by highly specialized neuroanatomical areas and processes. We have recently identified important phonetic-level features for vocal tract control during articulation in the speech motor cortex, and for speech sounds in the higher order non primary auditory cortex. I will discuss important similarities and differences in these representational systems with respect to feature organization and dynamics. I will also present related work on auditory-vocal (sensorimotor) integration and transformation in speech.

April 17

**Sarah Shomstein**, Associate Professor of Cognitive Neuroscience, Department of Psychology; Affiliated Faculty, Neuroscience Institute and Mind-Brain Institute, George Washington University

TITLE: Structuring Visual Input: Evaluating Representations Influencing Attentional Selection

ABSTRACT: Behavioral goals and motivations play a critical role in shaping and refining information processing so that only the most relevant sensory stimuli are used to guide attention and ultimately influence perception and decision making. Traditional accounts hold that multiple representations (spatial, object-based, features, etc.) guide attentional selection automatically. Using visual system as a model, I will present evidence drawn from behavioral, neuroimaging, and eye-tracking experiments challenging the traditional automaticity assumptions. Focusing on the influence of spatial and object-based representations, I will demonstrate that while spatial contribution is automatic, the influence of object representations to attentional selection is not. I will further argue that the degree to which object representations are used for attentional guidance is determined by the amount of uncertainty in the scene.

April 10

**Dan Bartels**, Assistant Professor of Marketing, University of Chicago

TITLE: Psychological Connectedness to the Future Self and Forward- Looking Decisions

ABSTRACT: In this talk, I'll build on a philosophical account of personal identity (Parfit, 1984) which argues that the degree of concern one has for one's future self may be scaled by the degree of "psychological connectedness"—overlap in properties such as beliefs, values, and ideals— held between one's current and future self. Our studies pose participants with tradeoffs between consuming a benefit in the near future versus consuming more of that benefit in the distant future. When people's sense of connectedness with their future self is reduced, they make impatient choices. When their sense of connectedness with the future self is bolstered, they make more prudent-seeming, forward-looking choices. I'll then discuss some studies that examine people's

preferences about whether to engage in discretionary spending vs. save their money and find that reduced spending in the present requires the combination of both being motivated to provide for one's future self (valuing the future) and actively considering long-term implications of one's choices (awareness of the future). Finally, I'll talk about some studies that explore goal setting and striving. The exercise of self-control involves setting priorities and adhering to plans, even in the face of immediate temptations. Many decisions requiring self-control involve trading off consumption or happiness in the present or immediate future with consumption or happiness in the distant future. We posit that a crucial variable in such decisions is how a person views her distant future self (i.e., as a somewhat different person from her current self or as fundamentally the same person). We find, in several studies, that how people view their future selves influences the plans they make and how successfully they adhere to those plans.

April 3

**Robert C. Wilson**, Assistant Professor, Department of Psychology and the Cognitive Science Program, University of Arizona

TITLE: The Explore-Exploit Dilemma in Human Reinforcement Learning

ABSTRACT: When you go to your favorite restaurant, do you always get the same thing, or do you try something new? Sticking with an old favorite ensures a good meal, but exploring other options might yield something better - or something worse. This simple conundrum, choosing between what you know and what you don't, is called the exploration-exploitation dilemma. Whether it's deciding on a meal, a vacation destination or a life partner, this is an important problem for humans and animals to solve. In this talk I will discuss how humans solve the explore-exploit dilemma. Theory suggests two distinct strategies: a directed strategy, in which choices are biased toward information, and a random strategy, in which exploration is driven by noise. Here I will show that humans use both approaches, and that furthermore, the mixture of random and directed exploration is optimal in that it maximizes reward in the long run. These results have implications for our understanding of how decisions impact learning, the role of exploration in development and mental disorders, and even for choosing what to eat for dinner.

March 26 & 27

Open Forum & Workshop on Neural Systems and Memory Special Event—No Cognitive Science Colloquium scheduled for Friday, March 27, 2015

March 13

**Tyler Peterson**, Assistant Professor, Department of Linguistics, University of Arizona

TITLE: Structural Complexity and the Acquisition of Recursive Locative PPs

ABSTRACT: Phase-based models of grammar hold that the role of syntax is to build formal objects that are interpretable at the interface between semantics and syntax. Derivations are believed to be cyclic, such that a structure is built until it constitutes a category of the right type, which can then be mapped into one of the two basic semantic primitives: referential expressions or propositions. At such point in the syntactic derivation, a cycle or phase is complete, and the syntactic object is 'shipped off' to the semantic interface. In the

syntax, only certain components of it remain accessible for further syntactic manipulations. According to Arsejinovic & Hinzen (2011), the syntactic consequence of this model is that recursion – the basis of the generative capacity of language – does not occur within a single phase. The semantic consequence is that at each point in a derivation of a complex structure, only a single element is interpretable, so that the extension or semantic value can be calculated. Such cyclic accounts of referential opacity predict asymmetries in the interpretation of matrix and embedded constituents but are silent on whether embedding itself introduces complexity. The overarching goal of this paper is to examine how structural complexity arising from embedding can be represented in this model, and whether grammatical complexity should be defined in terms of compositional semantics, or phrase structure. More specifically, we shed light on the complexity that recursion introduces in grammar and meaning by comparing child and adult patterns of production of recursive noun phrases. The results of this study provide evidence for the limitations of syntax-only or semantics-only approaches to complexity in certain kinds of complex NPs – despite the fact that these NPs are made up of the same syntactic and semantic ingredients.

March 6

**David Raichlen**, Associate Professor, Department of Anthropology, University of Arizona  
TITLE: Evolutionary Links between Exercise and the Brain

ABSTRACT: Recent work suggests exercise can have profound impacts on the brain. From altering psychological state and improving mood, to enhancing brain structure and improving cognitive function in older adults, aerobic exercise generates surprising links between the brain and body. Here, I explore these effects from an evolutionary perspective. Human evolution was marked by a shift from relatively sedentary, ape-like lifestyles, to more aerobically active lifestyles beginning with the origins of hunting and gathering nearly two million years ago. I suggest that this shift helps us understand how and why exercise alters the brain today. First, humans and other distance running mammals seem to share exercise-induced upregulation of neurotransmitters associated with rewards and analgesia. This convergence may be a product of selection and suggests that the positive change in psychological state associated with exercise has deep evolutionary origins. Second, humans have a long lifespan compared to other primates and mammals which many suggest evolved so that older adults could help care for, and provide knowledge to, younger generations. Exercise-related improvements in cognitive function and brain structure in older adults may help explain how and why the long human lifespan evolved. Combined, these studies show how we can use our evolutionary history to better understand the links between the brain and body today.

February 27

**Anastasia Flevaris**, Postdoctoral Fellow, Department of Psychology, University of Washington

TITLE: Contextual Processing in the Primary Visual Cortex and Variations with Autistic Tendency

ABSTRACT: Neurons in the primary visual cortex (V1) respond to basic image features (e.g.,

orientation, spatial frequency) in small, restricted areas of the visual field (“receptive field”). However, visual information beyond the receptive field can significantly alter neural responses. For example, the neural response to a stimulus can be suppressed by similar stimuli (e.g., same orientation/spatial frequency) outside the receptive field, in the “surround,” even though the neuron would not otherwise respond to the surround stimulus. This form of contextual processing - termed “surround suppression” - is thought to arise from both lateral connections within V1 itself as well as feedback from higher-level regions. Given the potential high-level influence on surround suppression, an important question is whether and how attention modulates the suppression. In this talk I will discuss attentional influences on surround suppression as well as how surround suppression varies with autistic tendency. In the first part of the talk, I will present evidence that surround suppression is modulated by attention to features. Next, I will examine how attentional enhancement interacts with surround suppression. Prior studies have shown that enhanced processing of an attended stimulus automatically spreads to items in an image that are perceptually grouped with and/or share features with the attended stimulus. I will provide a unified account for surround suppression and surround enhancement by showing that suppression and enhancement in V1 of the same stimulus depends on the focus of attention. Finally, in the last part of the talk I will examine how surround suppression in V1 differs as a function of autistic tendency. Prior work has suggested that individuals with autism exhibit differences in perceptual phenomena thought to be associated with surround suppression. I will present data suggesting that surround suppression in V1 of neurotypical individuals varies as a function of the degree to which they have autistic tendencies, as measured by the “Autism Quotient” scale (AQ). Individuals with more autistic tendencies exhibit less surround suppression, which could contribute to the perceptual differences exhibited by individuals with autism. For a copy of Dr. Flevaris’ CV, please contact Nova Hinrichs @ [nhinrich@email.arizona.edu](mailto:nhinrich@email.arizona.edu).

February 20

**Tamar Kushnir**, Associate Professor, Department of Human Development, Cornell University

TITLE: Seeing the Road not Taken: The Origin of Our Beliefs about Choice in Childhood

ABSTRACT: Our adult concept of choice is not a simple idea, but rather a complex set of beliefs about the causes of actions. These beliefs are situation-, individual- and culture-dependent, and are thus likely constructed through social learning. Initially, infants and young children evaluate actions as choices by two criteria: they are intentional, and there are possible (or likely) alternatives. By preschool, these same considerations guide children’s inferences about their own choices as well. Moreover, preschoolers can talk explicitly about how physical, biological, and psychological constraints can limit choice by constraining the possibility to “act otherwise.” Developments beyond the preschool years suggest that more complex aspects of our beliefs about choice - In particular about how actions can or cannot be freely chosen in the face of strong desires or against social and moral norms – take time to emerge and are subject to significant cultural variation.

February 6

**Jill Lany**, Assistant Professor, Department of Psychology, University of Notre Dame

TITLE: Discovering the Underpinnings of Statistical Language Learning in Infants

ABSTRACT: A longstanding question in the developmental and cognitive sciences concerns how we learn our native language. Very young infants are adept at learning statistical regularities, such as sequential structure and correlations between stimulus dimensions in novel artificial languages. These data suggest that statistical learning plays an important role in language acquisition. They also have implications for children's real-world language development, as variation in statistical learning ability may help explain divergent learning trajectories. However, few studies have tested whether there is a connection between statistical learning and native language competence, and little is known about sources of variation in statistical learning. Moreover, statistical learning is itself poorly specified. In this talk I will discuss several studies designed to bridge these gaps in our knowledge. Specifically, these studies test the hypothesis that statistical learning is related to native language development, and that infants' ability to encode and identify fluent speech supports statistical learning.

January 30

**Noah Snavely**, Assistant Professor, Department of Computer Science, Cornell University

TITLE: Planet-Scale Visual Understanding from Online Photos

ABSTRACT: We live in a world of ubiquitous imagery, in which the number of images at our fingertips is growing at a seemingly exponential rate. These images come from a wide variety of sources, including mapping sites, webcams, and millions of photographers uploading billions upon billions of images to social media and photo-sharing websites such as Flickr, Facebook, and Instagram. Taken together, this imagery can be thought of as constituting a distributed camera capturing the world at unprecedented scale, and continually documenting its cities, events, and the natural environment. This talk will outline how we might use this distributed camera as a fundamental new tool for science, engineering, and environmental monitoring, and how a key problem is deriving \*structure\* from these unstructured and uncalibrated image collections -- making sense of the soup of pixels that is being captured all around the globe. I will talk about my group's work on new computer vision methods for extracting meaning from these massive photo collections.

January 23

**Rebecca Gomez**, Associate Professor, Department of Psychology, University of Arizona

TITLE: Sleep and Time Dependent Learning in Infants and Young Children

ABSTRACT: It seems as if sleep has taken the world by storm. Not a week goes by that a new finding is not reported in the media regarding the health or cognitive consequences of good or poor sleep. Here I present studies investigating the role of sleep in newly formed memories in infants, toddlers, and preschool children. Sleep and wake, both, contribute to generalization but for very different reasons in different periods of brain development. Our work has implications for understanding the impact of sleep on infant and child learning in language acquisition, as well as for mechanisms of memory formation at these ages, but more generally is the first to ask how learning unfolds over time as a function of sleep

across changing neural structures in such young children. Our research also speaks to questions of practical importance such as whether learning time is more important than nap time in preschool and whether and when preschool children can safely transition out of naps.

**COGNITIVE SCIENCE COLLOQUIUM**  
**Fall 2014**

December 5

Graduate Student Showcase, Christina Meyers and Zachary Brooks, presenters

Christina Meyers, Graduate Student, Speech, Language, and Hearing Sciences (major)  
Cognitive Science (minor)

TITLE: Effect of Schedule for Children Receiving Treatment Targeting Grammatical Morphology

ABSTRACT: This study examined the relative effects of massed and spaced treatment delivery schedules on learning outcomes for 16 preschool age children with specific language impairment involved in an intervention program targeting grammatical morphology. All children received equivalent individual Enhanced Conversational Recast treatment for 30 minutes each day for five weeks (25 days). Half of the children received treatment in the massed condition (30 consecutive minutes in one session) and half of the children received treatment in the spaced condition (three 10-minute sessions separated over a 2-hour period). Children's progress was assessed 3 times weekly by probing the use of the treatment morpheme using toys and a set of word stems not used during treatment. Children's use of an untreated morpheme was also tracked over the treatment period as a control for maturational effects. Treatment effect sizes (d) were calculated for each child's treatment morpheme and control morpheme. Overall treatment efficacy was confirmed by effect size (d) for treated morphemes significantly greater than the effect size (d) for untreated morphemes, which was true for both groups, massed and spaced. There were no group differences for treated morpheme effect size or any other outcome measure. The implications for Enhanced Conversational Recast treatment delivery schedule and treatment efficacy studies will be briefly discussed.

Zachary Brooks, Graduate Student, Second Language Acquisition and Teaching (major)  
Cognitive Science (minor)

TITLE: Bilingual Decision Making: A Verbal Probability Study

ABSTRACT: Probability can be expressed numerically ("75%") or verbally ("probable") and both numerical and verbal probability expressions have been studied extensively in medical, management, and political research contexts. However, verbal probability expressions are preferred more than numerical probability expressions despite their lack of precision because of their ease of use (Kuipers, Moskowitz, Kassirer, 1988), their ability to express a wider range of possibilities (Zwick, 1987), and the fact that using verbal probabilities rather than numerical probabilities costs decision-makers very little in terms

of accuracy (Hamm, 1991a; Wallsten, Budescu, & Erev, 1988). Using verbal probabilities to investigate possible differences in native vs. non-native numerical valuations is a step to explore if there are differences in decision-making between first-language (L1) and second-language (L2) speakers and if there are by how much in what direction. In this study, L1 and L2 speakers were provided the same verbal probability expressions (VPEs) in varying contexts and asked to assign numbers to ten VPEs – “rare,” “very unlikely,” “unlikely,” “likely,” “possible,” “probable,” “good chance,” “frequent,” “usually,” and “very probable” (Theil, 2002). Within subject and between subject tests were conducted and results show differences between native and non-native speakers’ numerical valuations in specific sentence contexts. This session reports findings of over 182 L1 and L2 subject responses, and it details the implications for SLA theory in terms of language use differences that translate into decision differences, such as decisions found in medical settings among care providers and patients who speak English as second language.

November 21

**Oisín-Deery**, Visiting Scholar, Department of Philosophy, University of Arizona

TITLE: Neuroscience, Causes, and Free Will

ABSTRACT: According to some, neuroscience reveals free will as illusory. This is because we typically judge choices as free only if they are caused by the agent’s mental states, whereas neuroscience claims that choices have sufficient neural causes. If events with sufficient neural causes cannot also have distinct mental causes, then free choice is illusory. Of course, one might deny that events with sufficient neural causes cannot also have mental causes. Still, the claim that choices are free only if they are caused by mental states is often presented as unassailable. I maintain that it is not true a priori. It is an empirical question whether the relevant causes are neural. If they are, then neuroscientific skepticism about free will is defused. This is because the term (or concept) ‘free’—when it is used to pick out paradigmatically free choices—functions as a natural-kind term (or concept) that refers to whatever properties underpin such choices. Thus, it is irrelevant whether choices have sufficient neural causes. We are free, unless the properties underpinning paradigmatically free choices do not constitute a kind that is useful for predicting and explaining actions. I conclude by pointing to work in neuroscience that suggests that neural kinds may already be better than psychological kinds at predicting and explaining behavior. If that is right, then not only does neuroscience fail to reveal free choice as illusory, it might tell us what free will is.

November 14

**David Raichlen**, Associate Professor, School of Anthropology, University of Arizona

TITLE: Evolutionary Links between Exercise and the Brain

ABSTRACT: Recent work suggests that exercise leads to improvements in cognition, changes in brain structure and function, and can reduce cognitive decline during aging. While researchers are beginning to understand how exercise affects the human brain, why the brain and body are linked in this way remains unclear. Here, I explore evidence that the effects of exercise on the brain are due, in part, to humans’ evolutionary history as aerobic athletes. In this talk, I review evidence that natural selection acting on endurance exercise

performance affects the evolution of the mammalian brain. These effects are apparent in experimental evolution experiments as well as in large comparative datasets. Based on comparative evidence, I explore the possibility that aerobic activity in our ancestors altered human brain evolution. The hunting and gathering lifestyle adopted by human ancestors approximately two million years ago required a large increase in aerobic activity. The links between exercise and the brain suggest that a significant portion of human neurobiology may have evolved due to selection on features unrelated to cognitive performance and maybe tied to the adoption of a novel lifestyle during human evolution.

November 7

**Jonathan Lifshitz**, Associate-Professor, -Child-Health, College of Medicine-Phoenix, University of Arizona

TITLE: Translational Studies into Circuit Reorganization as a Result of Traumatic Brain Injury

LEARNING OBJECTIVES: Describe the general process by which circuit disruption explains the chronic neurological consequences of traumatic brain injury (TBI). Since the CNS is composed of neurons and other components, recognize the neurovascular and neuroglial consequences of TBI. Translational studies generate new knowledge necessary to advance the diagnosis and prognosis of TBI.

ABSTRACT: To meet the learning objectives, a series of conceptual idea and experimental results will be presented to introduce and define traumatic brain injury (TBI). Conceptual ideas about neural circuitry will be presented as a concrete analogy to building and rebuilding Lego® structures. By understanding that Lego structures can be built and reorganized with the same basic building blocks, the consequences of TBI are understood as a reorganization of functional circuits. Thus, circuits that are dismantled and subsequently reorganized by TBI would manifest into neurological symptoms, depending on which circuits are reorganized. In the rodent, we primarily focus on the whisker-barrel circuit, because our diffuse TBI model impacts the somatosensory thalamus and cortex. However, brain injury does not occur with neurons in isolation; glia are active in clearing damaged tissue and contributing to repair. These glial contribution may be principal sites to direct recovery of function. To this end, experimental studies must meet strict translational standards in order to advance the diagnosis, prognosis and treatment of TBI patients. Ongoing experimental studies mirror clinical investigation in order to advance the field.

October 24

**Elizabeth Loftus**, Distinguished Professor of Social Ecology, Professor of Law, and Cognitive Science, University of California-Irvine

TITLE: The Memory Factory

ABSTRACT: In our studies of memory distortion, we can alter, in people's minds, the details of events that were actually experienced. We can also plant entire memories of events that never happened – “rich false memories.” False memories matter: they affect people's later thoughts, intentions, and behaviors. Moreover, false memories look very much like true memories – in terms of behavioral characteristics, emotionality and neural signatures.

October 17

**Fei Xu**, Roger N. Shepard Distinguished Visiting Scholar, Professor, Department of Psychology, University of California, Berkeley

TITLE: Towards a Rational Constructivist Approach to Cognitive Development

ABSTRACT: The study of cognitive development has often been framed in terms of the nativist/empiricist debate. Here I present a new approach to cognitive development: rational constructivism. I will argue that 1) learners take into account both prior knowledge and biases (learned or unlearned) as well as statistical information in the input; 2) prior knowledge and statistical information are combined in a rational manner (captured by Bayesian probabilistic models); and 2) there exists a set of domain-general learning mechanisms that give rise to domain-specific knowledge. Furthermore, learners actively engage in gathering data from their environment. I will present evidence supporting the idea that early learning is rational, statistical, and inferential, and infants and young children are rational, constructivist learners.

October 10

**Elena Plante**, Professor, Department of Speech, Language, and Hearing Sciences, University of Arizona

TITLE: Learning from Inside the Brain

ABSTRACT: The typical fMRI study of auditory-verbal language functioning returns what is now so commonly found as to constitute “the usual suspects” of classic language cortex (Broca’s and Wernicke’s areas) plus fronto-parietal regions associated with attention and memory encoding. Far less is known about how this network emerges. One approach is to study children, who are in the process of acquiring or refining language skills. Large-scale study of children’s language processing has documented age-related changes in networks that already look remarkably adult-like as early as age five. A second approach is to look at language learning, unconfounded by maturational change. My lab has recently implemented natural language paradigms that capitalize of principles from the statistical learning literature to examine learning as it happens in the scanner to examine the emergence of this skill in adult learners. This work demonstrates differences between learners who are provided with consistent statistical regularities in the input and those who are presented nearly identical input that lacks these statistical regularities. We also demonstrate that learners who are given input that contains multiple statistical regularities (e.g., those governing identification of word units and others for word order) shift their processing strategy over time to reflect attention to different aspects of the input.

October 3

**Leah Fabiano-Smith**, Assistant-Professor, -Department of Speech, Language, and Hearing Sciences, University of Arizona

TITLE: Misdiagnosis of Speech Sound Disorders in Latino Children: Linking Theory with Practice

ABSTRACT: Bilingual children are often misdiagnosed as having a speech disorder when they truly exhibit normal development. In addition, speech- language pathologists (SLP) are avoiding the assessment of bilingual children due to the lack of knowledge and resources

necessary for best practice with this population (Kritikos, 2003). Misdiagnosis of speech sound disorders in this population has long-term emotional, financial, and educational costs. These clinical errors can be prevented if we acquire more information on what constitutes normal and disordered speech development in the bilingual population. A theoretical model that allows us to differentiate difference in speech production (i.e., a difference in how a bilingual child speaks due to the influence of one language on the other) from speech disorder (i.e., an underlying speech-learning disability) will provide SLPs with the knowledge they need to prevent misdiagnosis. Recent research has found evidence in bilingual children's speech productions that they may be using some sounds interchangeably in both languages. For example, Fabiano-Smith and Goldstein (2010b) found that bilingual children exhibit higher production accuracy on sounds shared between English and Spanish than on sounds specific to either language. Those findings suggest that perhaps bilingual children have speech sound representations that differ from those of monolingual children. This talk will present a series of studies examining the production patterns of bilingual Spanish English speaking children in order to (1) extend current theories on speech perception to speech production and (2) provide an evidence-based theoretical framework for assessment practices in bilingual Spanish-English speaking children that takes into consideration interaction between their two languages.

September 26

**Bruno Galantucci**, Research Affiliate, Haskins Labs; Associate Professor, Department of Psychology, Yeshiva University

TITLE: Studying Novel Forms of Human Communication in the Laboratory

ABSTRACT: When deaf people are not exposed to a pre-established sign language, they spontaneously develop a novel one. This phenomenon can be simulated in the laboratory with non-deaf people, and this is what my collaborators and I have been doing over the last decade in order to investigate the fundamentals of human communication. In this talk I will provide an overview of these investigations, presenting two lines of research.

The first of these concerns the emergence of basic linguistic structure in human communication systems. In particular, I will present research aimed at uncovering forces that push human communication systems toward a combinatorial design, that is, toward recombining a small set of basic meaningless forms to express an indefinite number of meanings. The second line of research concerns the foundations of human communication. People sometimes show severe communicative limitations in the laboratory, failing to develop even the simplest forms of communication. This raises the question of how sophisticated forms of human communication can come about. I will present three hypotheses to address this question and discuss some preliminary evidence relevant to them.

September 19

**Peter Ditto**, Professor of Psychology and Social Behavior, University of California, Irvine

TITLE: Motivated Moral Reasoning

ABSTRACT: Moral judgments are important, intuitive, and complex. These factors make them particularly fertile ground for motivated reasoning. After reviewing the general

concept of motivated reasoning, I will describe research examining several different pathways by which motivational forces affect moral reasoning including: 1) affecting perceptions of the actor's moral accountability for an act, 2) influencing the normative moral principles people rely on to evaluate an act, and 3) promoting the selective recruitment of factual beliefs related to the practical effectiveness of an act. Discussion will focus on motivated moral reasoning as both a contributor to political conflict and as an example of people's long recognized difficulty maintaining clear conceptual boundaries between descriptive and prescriptive judgment, that is, between what is and what ought to be.

September 12

**Mihai Surdeanu**, Associate Professor, School of Information: Science, Technology and Arts, University of Arizona

TITLE: Teaching Computers to Answer Non-Factoid Questions

ABSTRACT: In this talk, I will describe our work towards teaching computers to answer complex questions, i.e., where the answer is a longer piece of text that explains a complex phenomenon, using linguistic information that is automatically acquired from free text. I will present a robust question answer model for non-factoid questions that integrates multiple sources of information, such as lexical semantics and discourse information, driven by two representations of discourse: a shallow representation centered around discourse markers, and a deep one based on Rhetorical Structure Theory.

I will describe how to evaluate the proposed system on two corpora from different genres and domains: one from Yahoo! Answers and one from the biology domain, and two types of non-factoid questions: manner and reason. I will experimentally demonstrate that the discourse structure of non-factoid answers provides information that is complementary to lexical semantic similarity between question and answer, improving performance up to 24% (relative) over a state-of-the-art model that exploits lexical semantic similarity alone. I will further demonstrate excellent domain transfer of discourse information, suggesting these discourse features have general utility to non-factoid question answering.

September 5

**Mary-Frances O'Connor**, Assistant Professor, Department of Psychology, University of Arizona

TITLE: Conflict Resolution in Bereavement and Complicated Grief: An fMRI Investigation

ABSTRACT: Complicated Grief, marked by a persistent and intrusive grief lasting beyond the normal grief process, is associated with a relative inability to disengage from idiographic loss-relevant stimuli. Functional magnetic resonance imaging (fMRI) studies investigating the neural networks associated with this bias consistently implicate the anterior cingulate cortex (ACC) in tasks of emotion regulation. To date, no such investigation of the neural mechanisms of Complicated Grief exists. Twenty-eight older adults were categorized into three groups based on grief severity: Complicated Grief (n=8), Non-Complicated Grief (n=9), and Nonbereaved controls (n=11). Using a block design, all participants completed the emotional-counting Stroop task during fMRI data acquisition. Differences in regional activation to grief-related (as opposed to neutral) stimuli across

groups were examined. Those with Complicated Grief showed an absence of rACC and fronto-cortical recruitment. Post hoc analysis evidenced activity in the dorsal ACC in the Complicated Grief and Nonbereaved groups late in the task. These results indicate a group-specific deficit in recruitment of fronto-cortical regions often associated with emotion regulation. This deficit was not observed in recruitment of the orbitofrontal cortex and the rACC during processing of idiographic semantic stimuli in Noncomplicated Grief. These findings suggest a relative inability to recruit the regions necessary for successful grief-related emotion regulation in those with Complicated Grief.

**COGNITIVE SCIENCE COLLOQUIUM**  
**Spring 2014**

May 2

Graduate Student Showcase

Jae-Hyun Sung, Graduate Student, Linguistics (major) and Cognitive Science (minor)

TITLE: What Does the Tongue Tell Us about Scottish Gaelic? A Case of Lexical Palatalization.

Jinyan Guan, Graduate Student, Computer Science (major) and Cognitive Science (minor)

TITLE: Bayesian Statistical Modeling of Temporal Interpersonal Emotion System (TIES)

Rachel Kraut, Graduate Student, Second Language Acquisition and Teaching (major) and Cognitive Science (minor)

TITLE: L2 Word Recognition and Storage: Evidence from Masked Priming

April 18

**Amanda Woodward**, William S. Gray Professor and Chair, Department of Psychology, University of Chicago

TITLE: Infants' Grasp of Others' Intentions

April 11

**Gene Alexander**, Ph. D., Professor and Director, Brain Imaging, Behavior, & Aging Lab, Department of Psychology, Neuroscience and Physiological Sciences Inter-disciplinary Graduate Programs and Evelyn F. McKnight Brain Institute, School of Mind, Brain, and Behavior, College of Science, University of Arizona

TITLE: Neuroimaging of the Aging Brain: Implications for Successful Aging and the Risk for Alzheimer's disease

April 4

**Yaoda Xu**, Assistant Professor, Vision Sciences Laboratory, Psychology Department, Harvard University

TITLE: Multi-Level and Dynamic Visual Object Representation in the Human Brain

March 28

**Heidi Harley**, Professor, Department of Linguistics, University of Arizona

TITLE: Forces Instead of Events in Verb Meaning

March 7

**Wally Boot**, Assistant Professor, Cognitive Psychology, The Florida State University

TITLE: Video Games as a Means to Improve Perceptual and Cognitive Abilities? The Promise and Challenges of Video Game Research.

February 28

**Noah Goodman**, Roger N. Shepard Distinguished Visiting Scholar,

Assistant Professor, Department of Psychology, Stanford University

TITLE: Language, Reasoning, and Commonsense Knowledge

February 21

**Barbara Mellers**, Heyman University Professor, Department of Psychology, University of Pennsylvania

TITLE: Improving the Accuracy of Intuitive Predictions of Geopolitical Events by Putting Psychology to Work

February 14

**Jessica Payne**, Assistant Professor, Department of Psychology, University of Notre Dame

TITLE: Stress, Sleep, and Memory Consolidation: Independent and Interactive Effects

January 31

**Stuart Hameroff**, MD, Anesthesiology, Psychology, Center for Consciousness Studies, The University of Arizona

TITLE: 'A finer scale' – Intra-neuronal origins of EEG, memory, language and consciousness

January 24

**Nicholas Turk-Browne**, Assistant Professor, Department of Psychology, Princeton University

TITLE: Statistical Learning in the Mind and Brain

January 17

**Tony P. Chemero**, Professor, Departments of Philosophy and Psychology, University of Cincinnati

TITLE: The End of the Debate over Extended Cognition

**COGNITIVE SCIENCE COLLOQUIUM**

**Fall 2013**

December 6

Cognitive Science Graduate Student Showcase, three speakers:

J. L. Sanguinetti, Psychology Department

TITLE—The Ground Side of an Object: Perceived as Shapeless yet Processed for Semantics

Will Leonard, Philosophy Department

TITLE: Elusive cognitive experience

Bryan Chambliss, Philosophy Department

TITLE: Social Cognition and Social Interaction

November 22

**Suzanne Curtin**, Associate Professor, Department of Psychology, University of Calgary

TITLE: How Forms Become Labels: Phonological Knowledge Guides Infants' Word-Object Mappings

November 8

**Eric Reiman**, M.D., Banner Alzheimer's Institute and Banner Research, Department of Psychiatry, University of Arizona; Neurogenomics Division, Translational Genomics Research Institute, Arizona Alzheimer's Consortium, Phoenix, AZ

TITLE: Launching the Era of Alzheimer's Prevention Research

November 1

**John Serences**, Associate Professor, Department of Psychology, Neuroscience Graduate Program, University of California, San Diego

TITLE: The Role of Attentional Priority Maps in Supporting Selective Attention and Working Memory

October 25

**Sharon Thompson-Schill**, Christopher H. Browne Distinguished Professor of Psychology; Director, Center for Cognitive Neuroscience, University of Pennsylvania

TITLE: Costs and Benefits of Cognitive Control for Language Processing

October 18

**Leah Kapa**, Ph.D., Research Associate, Department of Speech, Language, and Hearing Sciences, University of Arizona

TITLE: Considering a Bidirectional Relationship between Executive Function and Language-Learning

October 11

**Rick Dale**, Associate Professor, Cognitive and Information Sciences, School of Social Sciences, Humanities and Arts, University of California, Merced

TITLE: A "Centipede's" Dilemma" in Human Linguistic Interaction

October 4

**Eve Edelstein**, Associate Professor, College of Architecture, Planning and Landscape Architecture (CAPLA), The Institute for Place and Well-Being, University of Arizona  
TITLE: The Neuroscience of Design: The Human Response to the Built Environment

September 27

**Raymond M. Klein**, Professor, Department of Psychology and Neuroscience, Dalhousie University; Presently on sabbatical in the Department of Cognitive Science, UCSD  
TITLE: On the Flavors of Inhibition of Return: Two Ways to Enhance Orienting to Novelty

September 20

**Jack Gallant**, Professor, Department of Psychology, University of California, Berkeley  
TITLE: Detailed Maps of Semantic Information across the Human Brain

September 13

**Terence Horgan**, Professor, Department of Philosophy, University of Arizona  
TITLE: Reasons-Responsive Moral Judgment and the Phenomenology of Moral Experience

September 6

**Huanping Dai**, Associate Professor, Department of Speech, Language, and Hearing Sciences, University of Arizona  
TITLE: Seeing the Forest for the Trees: Delineating Global and Local Processing in the Perception of Sound Patterns