Fall Meeting of the Comparative Cognition Society 2018

November 2, 2018
8:00 AM-5:00 PM
Grand Hyatt Hotel (Promenade AB)
San Diego, CA

www.comparativecognition.org

Fall Meeting of the Comparative Cognition Society 2018

Grand Hyatt Hotel, Promenade AB

8:00-9:00	Registration (Coffee provided)
9:00 – 9:50	Choice and Timing
10:05-10:55	Serial Learning and Decision Making
11:05-11:30	Social Behavior
11:30-1:30	Lunch Break
1:30-2:00	Memory and Cognitive Control
2:14—3:00	Visual and Auditory Perception
3:00—3:30	Cognition
3:45—4:45	Keynote Presentation – Douglas Nitz

Important Note to Presenters: Talks should be no longer than twelve minutes (three additional minutes scheduled for discussion and transition)

Comparative Cognition Society

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Please consider joining us in April for the Annual *International Conference on Comparative Cognition*

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Choice and Timing

Session Chair: Olga Lazareva

9:00 **Welcome and Introduction (Olga Lazareva)**

9:10 Kenneth Leising, Cheyenne Elliot, Sydney Wilson, Cassidy Willie, & Lauren Cleland (Texas Christian University)

The effects of differential outcomes and environmental enrichment on discrimination performance with rats

An instrumental differential outcomes procedure involves presenting unique outcomes following different operant responses (e.g., R1-O1; R2-O2). Differential outcomes have been used to facilitate acquisition in various discrimination tasks with several species. We examined differential outcomes in a traditional discrimination, as well as in a same/different relational task with rats. We included an enrichment condition in the traditional discrimination task. In the traditional discrimination, four different shapes were displayed on separate trials before two response options appeared (i.e., left and right). A correct left or right response was assigned to each stimulus. In the relational task, a sample stimulus was displayed and then followed by the same or a different stimulus. A touch to the second stimulus revealed two response options ("same" on the left and "different" on the right). The experimental groups were reinforced with a different outcome for each kind of correct response. The control group of rats was reinforced with only one outcome for both correct responses. No differential outcomes effect was found in either experiment, but interestingly, both groups performed better with longer delays. Discussion will include the role of differential outcomes in discrimination learning and the effects of environmental enrichment.

9:25 Alejandro Macías, Valeria V. González, Armando Machado (University of Minho) & Marco Vasconcelos (Univesity of Aveiro)

Suboptimal choice and temporal information

In a suboptimal choice procedure, pigeons choose between two alternatives that deliver food intermittently after a 10-s delay. In one alternative, two stimuli signal whether or not food follows the delay (Red light-> food; Green light->no food); in the other alternative, the two stimuli do not signal the outcome reliably (Blue light or Yellow light->food or no food). Pigeons prefer the former even when it yields significantly less food overall. This preference suggests they trade off information for food. In the present study, we examined how preference changes when the information value of the Red or Green stimuli decreases. In Experiment 1 the suboptimal alternative always led to the Red stimulus; after T seconds into the delay, Red either remained and was followed by food, or changed to Green and was followed by no food. That is, information was delayed for T seconds. In Experiment 2, the suboptimal alternative always led to Green; after T seconds, Green either remained and ended without food, or changed to Red and ended with food. Across phases, we manipulated T. In both experiments, preference for the suboptimal alternative decreased as a function of T. Moreover, suboptimal preference decreased more rapidly in Experiment 1.

9:40	Andrew Delamater & Norman Tu (Brooklyn College – CUNY) **Integration of Outcome Identity and Time Information in a Temporal Averaging Task** Rats were trained on a variant of the peak procedure in which two discriminative stimuli signaled that qualitatively different rewards (differing mostly in their taste) could be earned in their presence. An 80-sec auditory stimulus signaled that one type of pellet could be earned by the first lever press occurring after 5 s from stimulus onset, and an 80-s visual stimulus signaled that the other type of pellet could be earned for the first press occurring on the same lever after 30 s. Non-reinforced probe tests in which the two stimuli were presented simultaneously revealed that responding showed a peak distribution that was centered near the average of the two previously reinforced intervals. However, additional tests were conducted after either the early outcome, in one sub-group, or the late outcome, in another sub-group, was devalued through their separate pairings with LiCl. In these tests, the peak distribution on compound test trials was biased short or long depending upon whether the late or early outcome, respectively, had been devalued. These data suggest that temporal expectancies are averaged in a way that depends upon a current representation of the outcome's identity and its value associated with the individual stimuli contributing to the computation.
9:55	**10 Minute Break**

Serial Learning and Decision Making

Session Chair: Kenneth Leising

10:05	Jerome Cohen & Siyaram Pandey (University of Windsor) **What do rats learn when they track signals within incidentally structured sequences?** Ever since Nissen and Bullemer (1987) demonstrated that humans can learn a repeated sequence pattern in a serial reaction time task without explicit knowledge of the pattern, researchers have used serial reaction time tasks to examine the neuro-cognitive nature of incidental sequence learning in non-human animals. Most notably, Domenger and Schwarting (2005, 2007, 2008) considered that rats' faster reactions to successive signals presented under repeated rather than random sequence patterns reflect a "higher-order motor plan". We consider their findings, however, demonstrate their rats' use of "lower-order" associative processes in their 6 or 12 item serial reaction time tasks within their 4-choice operant chamber. To examine this possibility, we trained rats on less complex 5- or 3-item sequences within 5- and 9-choice operant chambers to uncover associative processes that could eventually involve 'higher-order" representations. We also discuss how we are currently using such tasks in rodent models of age-related neuro-degenerative disorders.

10:20	Jessica L. Sharp & Stephen B. Fountain (Kent State University) **Evidence for Parallel Processing in Rats: Retention of Serial Pattern Elements** These experiments examined long-term retention of elements in a serial pattern. Adult rats were trained in a serial multiple choice task to perform a pattern of nosepoke responses in receptacles mounted on the 8 walls of an octagonal chamber for water reward. Rats learned to nosepoke the pattern, 123-234-345-456-567-678-781-818, where digits represent the clockwise positions of successive correct receptacles and dashes indicate brief pauses. The pattern consisted of three types of elements. Chunk-boundary elements, the first element in each 3-element chunk, are learned via stimulus-response learning. Within-chunk elements, the second and third elements in all but the last chunk, are learned via abstract rule learning. The final element in the pattern was the violation element, an element that violates pattern structure. Rats were trained to asymptotic levels of performance on these elements in separate experiments. They were tested at 24-hour, 2-week, and 4-week retention intervals. No forgetting was observed at the 24-hour retention interval, but successively more forgetting of each element was observed at 2- and 4-week retention intervals but the degree of forgetting differed for each element type. The current studies suggest that forgetting of information learned via different cognitive mechanisms are forgotten at different rates.
10:35	Amanda Robin & Peter Nonacs (University of California, Los Angeles) **Saving for a Rainy Day: How Context and State-dependent Factors Impact the Decision to Eat or Cache in Wild Food-Storing Rodents** A deceptively simple task in nature – finding food – still requires an animal to make a series of complex decisions in a variety of differing circumstances. The challenge for a food-hoarding species of whether to immediately consume an item or cache it for the future is an ideal experimental system to test predictions of how trade-off decisions in foraging are impacted by state-dependent factors. We are studying this in two wild food-storing rodent species- Western grey squirrels (Sciurus griseus) and Merriam's chipmunks (Tamias merriami). Their survival depends upon making thousands of efficient economic decisions during seasons of food abundance. Participants are implanted with passive integrated transponders (PIT-tags) and trained to come to an apparatus that presents a choice between two items: a cacheable item and an item that must be eaten immediately. In the context of this simple binary choice, we are able to measure preferences and behaviors of each individual relative to their body condition, time of day, competition level, and level of predation risk.
10:50	**10 Minute Break**

Social Behavior

Session Chair: Olga Lazareva

11:00 Benjamin M. Basile, Jamie L. Schafroth, Daniel R. Lucas, and Elisabeth A. Murray (National Institute of Mental Health, NIH)

Viewing patterns of social, food, and predator videos in monkeys with and without amygdala or anterior cingulate cortex damage

It is widely assumed that social species, including most monkey species, possess a distributed set of brain regions dedicated to processing social signals. However, social viewing preferences in monkeys are not well characterized, stimuli are sometimes poorly controlled, and evidence implicating social brain regions is mostly correlational. Here, we characterized the viewing patterns of rhesus monkeys (Macaca mulatta) watching videos of conspecifics, food, or predators, compared to control videos of similar backgrounds and scrambled versions of all videos. We also investigated the role of two parts of the 'social brain' by comparing viewing patterns of intact monkeys (n=10) to those of monkeys with selective amygdala (n=8) or anterior cingulate cortex (n=3) lesions. Monkeys showed robust viewing preferences for all biologically-relevant stimuli, primarily characterized by long-duration attentional fixations. Surprisingly, we observed no robust effect of either lesion on viewing social videos, despite known face-viewing deficits in some of these same monkeys. Compared to controls, monkeys with amygdala damage viewed food videos more and both lesion groups viewed predator videos more. These preliminary data provide the best characterization yet of how monkeys view biologically-relevant videos and suggest that putative 'social brain' areas may be broadly involved in regulating attention to biologically-relevant stimuli.

11:15 Gabriel D. Medley, Raymond D. Lundy, Nicholas A. Stelly, Logan M. Pack, Hannah M. Parrish, Deanna L. Cashel, & Pamela A. Jackson (Radford University)

Sociability Following Adolescent Cannabinoid Exposure

Changes in adult behavior have been inconsistent following chronic adolescent cannabinoid use. Although cannabinoid-exposed rats generally display decreased sociability compared to controls (e.g., O'Shea et al., 2004; Schneider et al., 2008), Trezza and Vanderschuren (2008) reported that the specific receptors stimulated predicted inhibition or enhancement of social interaction. Variability in behavior may be due to the reduction in food consumption and lack of comparable weight gain seen in young cannabinoid-exposed animals (see Biscaia et al., 2003; Schneider, 2009). The current study supplemented half of the cannabinoid animals with Ensure, and yoked each control to a drug animal in terms of food and supplement during the injection period. Daily injections began at puberty and lasted for two weeks (CP 55,940 or vehicle). Body weight and food consumption were measured throughout. Four weeks following the last injection, animals were subjected to a battery of behavioral tests. Early results suggest that food-reduced animals were more likely to initiate social interaction than rats that maintained normal weight gain, regardless of drug condition.

11:30 **Lunch Break**

Memory and Cognitive Control

Session Chair: Martin Acerbo

1:30

Emily Kathryn Brown (Emory University), David F. Sherry (Western University), Robert R. Hampton (Emory University)

Cognitive control in a caching and a non-caching bird species

Scatter hoarding black-capped chickadees use memory to relocate hidden food, often after delays of hours or days. The ability of these birds to maintain accurate memories of the location and current status of food caches suggests that their memory may be especially resistant to competing cognitive load. We measured resistance to competing cognitive load during memory tests in black-capped chickadees (Poecile atricapillus) and a non-caching species, dark-eyed juncos (Junco hyemalis). Birds were presented with 4 intermixed tasks. On stand-alone matching trials, birds pecked a sample, which they selected from among 2 distractors at test. On stand-alone discrimination trials, birds learned by trial-and-error to select a target from among 2 distractors. On embedded matching+discrimination trials, the embedded discrimination was presented in the interval between the sample and test phase of a matching trial. Juncos were significantly more impaired than chickadees in both embedded tasks, especially the embedded matching task, indicating greater vulnerability to competing cognitive load in this species. The need to encode and retain the locations of multiple food caches may have led to the evolution of enhanced cognitive control in black-capped chickadees.

1:45

Danielle Panoz-Brown, Vishakh Iyer, Lawrence M. Carey, Christina M. Sluka, Gabriela Rajic, Jesse Kestenman, Meredith Gentry, Sydney Brotheridge, Isaac Somekh, Hannah E. Corbin, Kjersten G. Tucker, Bianca Goncalves De Almeida, Severine B. Hex, Krysten D. Garcia, Andrea G. Hohmann, Jonathon D. Crystal (Indiana University)

Replay of Episodic Memories in the Rat

Vivid episodic memories in people have been characterized as the replay of multiple unique events in sequential order. The hippocampus plays a critical role in episodic memories in both people and rodents. Although rats remember multiple episodes, it is currently unknown if animals ‘‘replay’’ episodic memories. We developed an animal model of episodic memory replay. Here, we show that rats remember a trial-unique stream of multiple episodes and the order in which these events occurred by engaging hippocampal-dependent episodic memory replay. Rats rely on episodic memory replay to remember the order of events rather than relying on non-episodic memories. Replay of episodic memories survives a long retention-interval challenge and interference from memories of other events, which documents that replay is part of long-term episodic memory. The chemogenetic activating drug clozapine N-oxide (CNO), but not vehicle, reversibly impairs replay in rats previously injected bilaterally in the hippocampus with a recombinant viral vector containing an inhibitory designer receptor exclusively activated by a designer drug (DREADD; AAV8-hSyn-hM4Di-mCherry). By contrast, two non-episodic memory assessments are unaffected by CNO, showing selectivity of this hippocampal-dependent impairment. Our findings suggest that the ability to replay a stream of episodic memories is quite old in the evolutionary timescale.

2:00	**15 Minute Break**

Visual and Auditory Perception

Session Chair: Jonathan Crystal

2:15	Martin Acerbo (Iowa State University) & Olga Lazareva (Drake University) **Figure-ground discrimination in pigeons** Figure-ground segregation is a fundamental visual ability that allows an organism to separate an object from its background. In primates, figure-ground segregation occurs relatively early in a course of visual processing, but little is known about figure-ground segregation in avian brain. Our earlier research has shown that nucleus rotundus (Rt), a thalamic nucleus processing visual information in pigeons, together with its inhibitory complex, nucleus subpretectalis/interstitiopretecto-subpretectalis (SP/IPS), had significantly higher metabolic activity than control after figure-ground discrimination. Next, we investigated the role of SP/IPS in figure-ground discrimination by conducting its bilateral lesion in birds trained to perform three simultaneous discrimination tasks: color, shape and figure-ground. We found that lesions of SP/IPS impaired figure-ground discrimination, but had no discernible effect on color or shape discrimination. Finally, we performed bilateral microinjections of GABAergic receptor antagonist and agonists (bicuculline and muscimol, respectively) and glutamatergic antagonist (CNQX) separately into the SP/IPS to further clarify their role in figure-ground discrimination. We found that a low dose of bicuculline produced a decrement on figure trials but not on background trials, whereas a high dose impaired performance on background trials but not on figure trials. Muscimol produced an equivalent, dose-dependent impairment on both trials. Finally, CNQX had no consistent effect at either dose. Together, these results further confirm our earlier hypothesis that inhibitory projections from SP to Rt modulate figure-ground discrimination, and suggest that the Rt and the SP/IPS provide a plausible substrate that could perform figure-ground segregation in avian brain.
2:30	Mischler, S.K., Campbell, K.A., Congdon, J.V., Montenegro, C., Scully, E.N., Service, W.D. (University of Alberta), Hahn, A.H. (St. Norbert College), Mennill, D.J. (University of Windsor), Otter, K.A. (University of Northern British Columbia), & Sturdy, C.B. (University of Alberta) **Anthropogenic noise affects discrimination of conspecific fee-bee songs by black-capped chickadees** Black-capped chickadees (Poecile atricapillus) produce several vocalizations, including the fee-bee song, which is used to attract potential mates and defend territories. Fee-bee songs also encode information about the dominance hierarchy and, importantly for the current study, native geographic location. Previously, our lab demonstrated that chickadees from different regions of North America have distinctive fee-bee songs that birds are able to discriminate. Anthropogenic noise, though, can mask acoustic signals and compromise discrimination of fine details in songs. For this study we aimed to investigate whether chickadees' ability to discriminate between geographically-distinct fee-bee songs (Ontario vs. British Columbia) would be impacted by differing levels of anthropogenic noise. We used a true/pseudo category go/no-go operant discrimination

	paradigm. Once the birds acquired the initial discrimination, we added different levels of anthropogenic noise (low: 35-40 dB; high: 70-75 dB) to the stimuli to examine how anthropogenic noise would affect the discrimination abilities of the chickadees. Preliminary results suggest that chickadees that were exposed to high noise required more trials to regain previous performance levels than those that were exposed to low or zero noise. Therefore, our results provide laboratory evidence that high levels of anthropogenic noise affects perception in songbirds, and may also have an effect on communication by songbirds.
2:45	**15 Minute Break**

Complex cognition

Session Chair: Ken Leising

3:00	Alexandra D. Twyman, Mark P. Holden (University of Calgary), & Nora S. Newcombe (Temple University) **First Direct Evidence of Cue Integration in Reorientation: A New Paradigm** There are several models of the use of geometric and feature cues in reorientation (Cheng, Huttenlocher & Newcombe, 2013). The adaptive combination approach posits that people integrate cues with weights that depend on cue salience and learning, or, when discrepancies are large, choose between cues based on these variables (Cheng, Shettleworth, Huttenlocher & Rieser, 2007; Newcombe & Huttenlocher, 2006). In a new paradigm designed to evaluate integration and choice, disoriented participants attempted to return to a heading direction, in a trapezoidal enclosure in which feature and geometric cues both unambiguously specified a heading, but later the feature was moved. With discrepancies greater than 90 degrees, participants choose geometry. With smaller discrepancies, integration appeared in 3 of 5 situations; otherwise, participants used geometry alone. Variation depended on the direction of feature movement and whether the nearest corner is acute or obtuse. The results have implications for theory and future research.
3:15	Olga Lazareva, Haley Dikkers, Nora Balboa, Courtney Kalender, Riddhi Soni, Laura Claydon, Abigail Nordman (Drake University) **Spatial representation in nonverbal transitive inference: An individual differences approach** Transitive inference (TI) is a form of deductive reasoning which allows one to derive a relation between items. Spatial models suggest that TI is based on mental representation of spatial order among the training stimuli. We therefore hypothesized that the individual differences in TI performance may positively correlate with measures of spatial ability. In two experiments, the participants received a standard 6-item TI task, a postexperimental awareness questionnaire, three tests of spatial ability, a deductive reasoning test, or a general intelligence test. We found modest correlations between training TI performance and some of the measures of spatial ability. However, the ability to perform transitive inference during the test was correlated only with general intelligence test. Our results suggest that both spatial representation and general intelligence are involved in performing nonverbal transitive inference.
3:30	**15 min break**

Keynote Address

Douglas Nitz

Department of Cognitive Science
University of California-San Diego
Introduced by Olga Lazareva

4:00-4:45 **Component Mapping of Path Network Structure in Neural Activity**

Recent years have seen a number of discoveries of new forms by which spatial information is mapped through activity patterns of neuron ensembles. Most such forms are found within ensembles of neurons of the hippocampus, subicular complex, entorhinal cortex, and retrosplenial and parietal cortices. Most studies examine spatial tuning in the context of simple random search foraging tasks in environments bearing simple, very well-defined boundaries. The relevance of such work to navigation is most often taken as contributory to the processes of path integration and/or localization versus distal boundary cues. Yet, one can argue that navigation in humans and many other animal species very often utilizes knowledge of the intersections and orientations of environmental pathways constraining locomotion. As path networks invoke a multitude of additional spatial relationships between organism and environment, the forms these take in neural activity and the brain regions in which they occur are highly relevant to understanding complex forms of cognition. This lecture will seek to define the components of path network structure primarily as they are found in three brain regions, subiculum, retrosplenial cortex, and posterior parietal cortex, that form an extension of the hippocampal/entorhinal cortex tri-synaptic pathway. The data will evidence the encoding of routes, route sub-spaces, axis of travel, structural analogy, and distances and consider mechanisms by which spatial cognition can be transformed into action.

Please Consider Joining the Comparative Cognition Society

Founded in 1999, the Comparative Cognition Society (CCS) is a scientific society dedicated to gaining a broad scientific understanding of the nature and evolution of cognition in human and nonhuman animals. The Comparative Cognition Society is a nonprofit scientific society with no doctrine or philosophy, except the scientific method as it is commonly understood in all natural sciences. Anyone who studies perception, learning, memory, or any other cognitive or representational process in animals is welcome. Our members include faculty members, animal behavior professionals, and students in psychology, biology, anthropology, applied animal behavior science, and related fields.

Membership in the society supports the following activities:

- A primary activity of CCS is sponsorship of the annual International Conference on Comparative Cognition (CO3), which has been held annually each March in Melbourne, Florida since 1994. Both Faculty/Professional Scientist members and Student members of CCS receive a discount on CO3 conference fees. To promote student interest in comparative cognition, student conference fees are kept at a minimum. CCS sponsored a second conference in 2008 and 2009 (Fall conference held in coordination with the annual meeting of the Psychonomic Society.
- CCS has been a leader in electronic publishing and in an effort to provide the products of our science to scientists, students, and the general public at no cost and in a format that allows dynamic illustrations of animal behavior and analyses of that behavior. The current portfolio of electronic publications supported by members of the society includes:
  - *Comparative Cognition and Behavior Reviews* - The first four volumes of this annual online journal of are available.
  - Two cyberbooks have been published in cooperation with the society
    - *Avian Visual Cognition*
    - *Animal Spatial Cognition: Comparative, Neural, and Computational Approaches*
  - *Proceedings of the Annual Conference on Comparative Cognition* - conference proceedings include some full-text PowerPoint™ presentations

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