

26th Annual Joseph R. Royce Research Conference

Department of Psychology
University of Alberta

March 2, 2012

Keynote Address by

Björn Brembs, Freie Universität Berlin

Invited Presentations by

Marcia Spetch, University of Alberta

and

Anthony Singhal, University of Alberta

Program in Brief

9:00-10:20 Session 1 (BioSci P226)

Moderator: Sawa Senzaki

- 9:00 Tracing theme transformations in dreams: An exploration in style
Ben Zalkind & D. Kuiken (University of Alberta)
- 9:20 Heightened accessibility of personal relationships under pathogen threats
Liman Man Wai Li (University of Alberta) & Takeshi Hamamura (Chinese University of Hong Kong)
- 9:40 Comparison of electronic textbooks with printed textbooks: Learning outcomes and implications
Karsten A. Loepelmann (University of Alberta)
- 10:00 Extended surfaces or not? Discrete object arrays can also help forming a boundary-like representation
R. Zhou & W. Mou (University of Alberta)
- 10:20 Break

10:40-11:05 Invited Presentation (BioSci P226)

Extreme memory and risky choice
Marcia Spetch, Christopher Madan, & Elliot Ludvig (University of Alberta)

11:05-12:05 Session 2 (BioSci P226)

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- 11:05 Response strategies for musical stimuli: Parsing the properties of sound
Lee M. Vilinsky, Marisa Hoeschele, Ann-Marie Przyslupski, & Christopher B. Sturdy (University of Alberta)
- 11:25 Discrimination of fee-bee songs based on geography in black-capped chickadees
Allison H. Hahn, Marisa Hoeschele, Lauren M. Guillette (University of Alberta), Daniel Mennill (University of Windsor), Ken Otter, Thibault Grava (University of Northern British Columbia), & Christopher B. Sturdy (University of Alberta)
- 11:45 To (chick-a-) dee, or not to dee? That is the question
Christopher B. Sturdy, Marc T. Avey (University of Alberta), Laurie L. Bloomfield (Algoma University), Julie E. Elie (University of California Berkeley), Todd M. Freeberg (University of Tennessee Knoxville), Lauren M. Guillette, Marisa Hoeschele, Homan Lee, Michele Moscicki (University of Alberta), & Jessica L. Owens (University of Tennessee Knoxville)

12:05-13:45 Lunch and Posters (PCL Lounge)

13:45-14:10 Invited Presentation (BioSci P226)

Neural correlates of attention-emotion interactions in adolescents with and without mental health concerns

Anthony Singhal (University of Alberta)

14:10-15:10 Session 3 (BioSci P226)

Moderator: Michelle Yeung

14:10 Hippocampal slow oscillations and memory consolidation in human intracranial recording.

Kyle E. Mathewson (University of Alberta), Richard J. Staba (University of California Los Angeles), & Clayton T. Dickson (University of Alberta)

14:30 Does socialization play a role in the laterality of male convict cichlids?

Cheryl M. Sedlak Seaver, M. Moscicki, & P. Hurd (University of Alberta)

14:50 Shrexploration: Investigating the influence of personality on stress coping in a cichlid fish

M. K. Moscicki, V. M. Lepp, & P. L. Hurd (University of Alberta)

15:10 Break

15:30-17:00 Keynote Address (CCIS 1-160)

World- and self-learning, two learning systems that determine who we are

Björn Brembs (Freie Universität Berlin)

Conference Organizing Committee

Peter Dixon (chair)

Clayton Dickson

Sandra Wiebe

Donald Atkin

Michelle Yeung

Kerrie Johnston

Acknowledgement

The Royce Conference thanks the Faculty of Arts, the Faculty of Science, the Office of the Vice President, Research, and the Centre for Neuroscience for their generous support.

Session 1 (BioSci P226)

9:00 **Tracing Theme Transformations in Dreams: An Exploration in Style**

Ben Zalkind & D. Kuiken (University of Alberta)

This study is designed to identify several distinct theme transformation profiles in dreams. Each separate profile will comprise a transformative “style” that may be differentially associated with different types of impactful dreams (existential dreams, transcendent dreams, nightmares; Busink & Kuiken, 1996; Kuiken et al., 2006). In a set of 10 mundane and 30 impactful dreams, we have identified an array of different theme transformations, i.e., ways in which a theme (e.g., avoidance of threat) is repeated and yet transformed across successive dream episodes (e.g., an active form of response becomes an ineffectual form of response). Using numerically aided phenomenological methods (Kuiken & Miall, 2001), these arrays will be subjected to cluster analysis, which will allow us to identify polythetic theme transformation profiles (or “styles”) that we can then assess across dream types. This phenomenologically oriented classificatory effort is an important step in developing an understanding of how dreams process and reprocess emotional, imagistic, and linguistic material.

9:20 **Heightened Accessibility of Personal Relationships under Pathogen Threats**

Liman Man Wai Li (University of Alberta) & Takeshi Hamamura (Chinese University of Hong Kong)

Group affiliations and personal relationships provide non-overlapping benefits in overcoming survival threats. Whereas group affiliations afford coordinated reactions to survival threat, personal relationships help maintain physical and mental health via provisions of social support. In the past research, the role of group affiliations in aiding survival has been extensively researched whereas the role of personal relationship has received less attention. The present examined whether one particular survival threat, pathogen threat, causes heightened accessibility of personal relationships in a lexical decision task. Participants following the pathogen priming responded faster to words related to group affiliation and personal relationship relative to participants under accident prime. These findings suggest that heightened accessibility of personal relationships under pathogen threat evolved as a conducive reaction to survival threats.

9:40 **Comparison of electronic textbooks with printed textbooks: Learning outcomes and implications**

Karsten A. Loepelmann (University of Alberta)

Sales of mass-market ebooks have been growing rapidly in recent years, and academic publishers are increasingly offering textbooks in ebook format. Due in part to concerns about the costs of educational materials, students are adopting lower-cost ebook textbooks in greater numbers. However, some evidence has shown that reading is performed differently when text is presented on a screen than when it is printed on paper. The eBook-Textbook Examination Trial (eTExT) study was designed to compare usage of an ebook textbook with a traditional printed textbook in a second-year undergraduate course in psychology. Some students were randomly chosen to receive a free copy of the required textbook for the course in ebook format, and their final grades were compared to those of students who used a printed paper textbook. Although opinions about the ebook were mixed, no differences were found in student outcomes. Implications for the use of ebook textbooks in the future are discussed.

10:00 Extended surfaces or not? Discrete object arrays can also help forming a boundary-like representation

R. Zhou & W. Mou (University of Alberta)

This project investigated how people use extended surfaces and landmark arrays to localize target objects. Studies of Neuroscience and cognitive psychology studies indicated that human and non-human animals use extended surface rather than discrete landmarks as primary localization cues (e.g. Burgess, 2008). Previous experiments in our lab demonstrated that when the number of landmarks was increased and the landmarks formed a regular shape (i.e. a circle), participants used the landmark array as well as an enclosed circular wall to locate targets. The current study was designed to determine the factors that might make the landmark array comparable to the enclosed circular wall. Participants learned locations of four objects with the presence of both a circular wall and an array of traffic cones forming a circle. During test, participants indicated the locations of the objects with the presence of either the wall or the traffic cones. Three experiments examined the number of landmark or the shape formed by the landmarks. The preliminary data indicated that grouping the landmark as a circle might be critical for participants to select the landmarks as important cues in localization.

Invited Presentation (BioSci P226)

10:40 Extreme memory and risky choice

Marcia Spetch, Christopher Madan, & Elliot Ludvig (University of Alberta)

When presented with a risky choice (e.g., \$10 for sure or a 50% chance of \$20), people tend to be risk averse if the outcomes are gains and risk seeking if the outcomes are losses. This difference in risk preference for gains and losses has been shown repeatedly and is a cornerstone of prospect theory, a prominent economic theory of decision making under uncertainty. Studies of risky choice, however, typically present people with hypothetical scenarios that explicitly describe the outcomes and odds for each choice. If people are not told what will happen and instead learn about the outcomes and odds from their own choice experience, they develop the opposite preferences, with greater risk seeking for gains than for losses. One possible reason for this difference is that experience-based choices are biased by a stronger memory for the more extreme outcomes experienced. We provide evidence that people are more likely to remember stimuli associated with extreme values, and we test the hypothesis that changes in risk sensitivity with experience are due to a memory-induced overweighting of the locally extreme outcomes (largest gains and largest losses). In support of this hypothesis, we find that people show greater risk seeking for gains than for losses only when the experience-based choices involve locally extreme outcomes.

Session 2 (BioSci P226)

11:05 Response strategies for musical stimuli: Parsing the properties of sound

Lee M. Vilinsky, Marisa Hoeschele, Ann-Marie Przysluski, & Christopher B. Sturdy (University of Alberta)

Consonance/dissonance is a musical attribute of sound that typically provides listeners a sense of stability/instability, respectively. Pitch is a subjective attribute of sound that is related to frequency. Here, we examine the extent to which humans use either consonance/dissonance or pitch height (perceived frequency differences) as a cue to discriminate and generalize musical intervals (i.e. two notes played simultaneously) in a

go/no-go operant task. After reinforcement contingencies to consonant and dissonant intervals were established with response feedback, subjects successfully generalized to the same intervals composed of different notes. For example, subjects that were reinforced for octaves on notes C, E, and G-sharp during training generalized their discrimination to octaves on notes D, F, and A. During a subsequent test phase without feedback, subjects were presented with novel intervals along with training stimuli. The novel intervals that were more similar in pitch height to training intervals were less similar in consonance/dissonance. Stimulus control for novel intervals was governed by consonance/dissonance for subjects initially reinforced for consonance but not for subjects initially reinforced for dissonance. Our findings reveal individual differences in solving the task: subjects either rely on consonance/dissonance or pitch height as a cue for discrimination and categorization.

11:25 Discrimination of fee-bee songs based on geography in black-capped chickadees

Allison H. Hahn, Marisa Hoeschele, Lauren M. Guillette (University of Alberta), Daniel Mennill (University of Windsor), Ken Otter, Thibault Grava (University of Northern British Columbia), & Christopher B. Sturdy (University of Alberta)

In contrast to the complex songs of many songbird species, the fee-bee song of the black-capped chickadee appears to be a relatively simple acoustic signal, containing only two whistled notes. This two-note structure of the fee-bee song has been considered highly stereotypic across the species' range, with some exceptions in isolated populations. Previous discriminant function analyses using acoustic features of songs produced by birds in Ontario and British Columbia suggest that songs can be accurately classified based on the geographic origin of the singer. In the current experiment, we used an operant discrimination task to examine if black-capped chickadees perceive differences in fee-bee songs produced by birds from these two locations. Using a true category/pseudo category paradigm, we found that birds in the true category had an easier time discriminating songs based on the geographic location compared to birds discriminating the same songs based on random assignment (pseudo category). When presented with novel songs not heard during initial acquisition, birds in the true category group continued to accurately discriminate songs based on geographic location. These results suggest that black-capped chickadees perceive differences among songs produced by birds from different locations, which supports the previous statistical classification by discriminant function analysis.

11:45 To (Chick-a-) Dee, or not to Dee? That is the question.

Christopher B. Sturdy, Marc T. Avey (University of Alberta), Laurie L. Bloomfield (Algoma University), Julie E. Elie (University of California Berkeley), Todd M. Freeberg (University of Tennessee Knoxville), Lauren M. Guillette, Marisa Hoeschele, Homan Lee, Michele Moscicki (University of Alberta), & Jessica L. Owens (University of Tennessee Knoxville)

We quantified immediate early gene (IEG; ZENK) expression in black-capped chickadee brain to understand the perception of conspecific and heterospecific vocalizations. In Experiment 1 we used whole "chick-a-dee" calls from black-capped and mountain chickadees (sister species) as playback stimuli, along with "chick-a-dee" calls produced by closely-related boreal chickadees and calls from the more distantly-related gray-crowned rosy-finch. We found no significant differences in IEG expression among the three chickadee species' calls, but significantly greater IEG expression to all chickadee species compared to gray-crowned rosy-finch calls and silence controls. In Experiment 2, we tested whether acoustic structure, not phylogenetic relatedness, drove the IEG response. We compared IEG response to D notes from "chick-a-dee" calls to IEG response elicited by acoustically-similar stimuli from species of varying phylogenetic relatedness. All vocalizations led to significant IEG expression, with the exception of reversed black-capped chickadee D notes. These results, along with previous studies of ours, suggest that IEG expression in the chickadee brain cannot be characterized as a simple conspecific/

heterospecific dichotomy, but rather, is best described as an interaction between representation/function and perception/acoustics.

Posters (PCL Lounge)

1 Bioacoustic analysis of North American and Swedish raven vocalizations
Conor Enns, Marisa Hoeschele, Mathias Osvath, Ann-Marie Przyszlupski, & Christopher B. Sturdy (University of Alberta)

The *Corvus* genus of songbirds has been shown to possess intelligence exceeding that of even the great apes (Heinrich & Bugnyar, 2007). Observations by Conner (1985) have shown different vocalizations associated with behaviors such as horseplay, aggression, defense and courtship. To fully comprehend acoustic communication of a species, the acoustic structure and note composition of vocalizations needs to first be known (Hoeschele, Gammon, Moscicki, & Sturdy, 2009). We recorded the common raven (*Corvus corax*) in North America and Sweden. Spectrograms of separated individual calls were produced to carry out quantitative measurements of notes. Call types were sorted by 3 independent sorters qualitatively based on spectrogram images. Statistical comparisons between the North American and Sweden populations were then carried out using the quantitative measurements. These results will lead to insights into what aspects of their calls ravens use to communicate meaning and distinguish individuals, and ultimately a more complete understanding of raven behavior.

3 Contextual versus sequential-search models of judgements of relative order
Yang S. Liu, Michelle Chan, & Jeremy B. Caplan (University of Alberta)

People often need to judge the relative order of a pair of experiences known as "judgements of relative recency" (JOR) or order. We previously found that both error rates and response times to "which item came earlier" favour earlier serial positions whereas responses to "which item came later" favour later serial positions, both subspan (Chan et al., 2009) and supraspan. We refer to this as a target-instruction congruity effect. The Backward self-terminating search model (Hacker, 1980) and SIMPLE (Brown et al., 2007) were fit to data from supraspan JORs to test possible accounts of the data, including the novel effect of instructed target (earlier versus later). We found that SIMPLE, with an additional gradient modulating temporal discriminability outperforms Hacker's model, even when both forward and backward self-terminating search were considered. The results suggest that the instruction congruity effect cannot be fully accounted by directional search strategies in supraspan lists, and something additional, such as a discriminability bias, is needed for SIMPLE to adequately account the instruction congruity effect.

4 No evidence for a respiratory component in neocortical and hippocampal slow oscillations.

Jeremy M. Viczko, Sylvia Pagliardini, & C. T. Dickson (University of Alberta)

Previous research has suggested that the respiratory cycle may be a generator of slow oscillations during sleep. Such work correlated nasal inspiration to the slow oscillations of the olfactory (paleo-) cortex during ketamine-xylazine anaesthesia. Their results have been interpreted to imply that respiratory oscillations may be an entraining mechanism for neo- and archi-cortical activity during sleep. Using multisite local field potential recordings from the neocortex and hippocampus as well as EMG activity from respiratory muscles in rats during natural sleep, we demonstrate that these claims are not substantiated. Rhythmic respiratory activity does not yield any strong or reliable coherence to forebrain slow wave activity during either ketamine, urethane, or natural

sleep. Thus, respiratory-related oscillatory neural activity is not coupled nor entrains slow oscillatory activity in neo- or even archicortical structures.

5 The influence of parenting style on children's daily executive function

Courtney Wilkes, Mahsa Khoei, Kelly West, & Sandra A. Wiebe (University of Alberta)

Early childhood is an important time for the development of the ability to regulate behaviour, and there is evidence that interactions with parents play an important role in the children's development of these skills (Bernier, Carlson, & Whipple, 2010; Schroeder & Kelley, 2009). The present study analyzes the relationship between different parenting styles and executive functioning in preschoolers. Participants included 77 children between the ages of 3;2 and 7;0 years. During a lab visit, the child's parent or guardian completed the Robinson Parenting Style questionnaire and the Behavior Rating Inventory of Executive Function Preschool Version (BRIEF-P) questionnaire. These questionnaires assess the specific parenting style employed by the parent (Robinson, Mandlco, Olsen & Hart, 1995), and the child's executive function problems in the home (Gioia, Espy & Isquith, 2003), respectively. In general, negative correlations were observed between authoritative parenting style and executive dysfunctions, whereas positive correlations were observed between both authoritarian and permissive parenting styles, and executive dysfunctions. These observations suggest that authoritative parenting may promote executive functioning skills in children, whereas authoritarian and permissive parenting appears to negatively influence children's everyday executive functioning. Williams et al. (2009) found that higher executive functioning is a strong predictor of better school performance and behavioural control; therefore, parents should carefully consider which parenting style they decide to employ towards their children.

6 Is what goes in what comes out? Encoding and retrieval ERP components in recognition memory are related

Yvonne Y. Chen, Kirstie Lithgow, Junjy A. Hemmerich, & Jeremy B. Caplan (University of Alberta)

The study of memory is about tracking an item from encoding to retrieval. Previous research has identified event-related potential (ERP) components at study ("subsequent memory effect," SME, comparing subsequent hits with misses) and at test ("old/new effect", comparing hits with correct rejections). The late positive component (LPC) of the SME and the FN400 old/new effect have each been linked to shallow processing (rote rehearsal and familiarity-based recognition). Similarly, the slow-wave SME and the late parietal positivity (LPP) old/new effect have each been linked to deep processing (semantic study and recollection-based recognition). We tested the hypothesis that the variability in encoding tapped by the LPC-SME materializes as variability in the FN400 and likewise for the slow-wave-SME and LPP. We correlated difference measures for SME components with both old/new effect and retrieval success (RS; hits vs. misses) components across 64 participants. In line with our predictions, significant ($p < 0.05$) correlations were found between the LPC and the FN400 (RS) [$r(63) = 0.35$], and between the slow wave and the LPP (old/new) [$r(63) = 0.26$]. Partial correlations suggested that these correlations mediated two additional correlations. Unexpectedly, the slow-wave-LPP association was non-significant when using retrieval success, consistent with recent suggestions that the parietal contribution to recognition may not be necessary for accurate recognition. Our findings largely confirm the emerging interpretation of these four commonly reported memory ERPs, but suggest that this kind of large-sample, individual-difference approach could be extended to sharpen our understanding of the broader range of memory ERPs.

7 Heritage language learners: Subtypes and motivational differences from foreign language learners.

Kathryn Chaffee, Kim Noels, & Amber Mellott (University of Alberta)

Research by Comanaru and Noels (2009) has shown that, compared to non-heritage language learners, students studying a heritage language are more motivated to learn the language because of feelings of obligation (i.e., introjected regulation), and also because the language is part of their self-concept (i.e., integrated regulation). This survey study extended this research by examining 239 heritage learners with four different degrees of ancestral relatedness to the heritage language, as well as 139 learners without ancestral connection to the language. ANOVA results showed that introjected and integrated motivational orientations varied as a function of ancestral relatedness, with the most proximal learners (i.e., those who spoke the language and/or whose parents spoke the language as a native language) reporting the highest integrated and introjected motivation. The motivational orientations of students more than 3 generations removed from the heritage language were indistinguishable from non-heritage learners. In all groups, intrinsic, integrated, and identified orientations were positively correlated with motivational intensity; amotivation was associated with lower motivational intensity; and extrinsic and introjected regulation were inconsistent predictors of intensity. The relations between motivational orientations and engagement with the heritage community, however, differed across groups. The implications of these results for heritage language education are discussed.

8 Electrophysiological evidence of multisensory integration in peripersonal space

Ian Surdhar & Anthony Singhal (University of Alberta)

Evidence from a variety of fields indicates that the brain represents space in a modular fashion, that is, peripersonal (near) space is coded separately from extrapersonal (far) space. Unlike distant stimuli, stimuli presented close to the body within peripersonal space are coded by a specialized network of multimodal neurons with overlapping visual, tactile and auditory receptive fields. Here we present an experiment which served to establish some electrophysiological correlates of peripersonal space processing in a healthy population. By recording event-related brain potentials (ERPs) during the performance of a modified auditory oddball paradigm, we have shown that the auditory N1 waveform is selectively enhanced to tones presented near to the hands and can be used as a marker for peripersonal space processing. Furthermore, we've garnered strong ERP evidence to support the notion that peripersonal space is preconsciously coded by automatic attention networks in the brain. Our results reveal proximity dependent early sensory and later cognitive interactions in the auditory attention system. By elucidating the nature of sensory interactions in peripersonal space, this work will be crucial for developing future models of the human attention system and will provide some methodological parameters for studying brain activity during peripersonal space processing in a healthy population.

9 An ERP study of the emerging ability of set-shifting in preschoolers using the Shape School task

Cecilia Mah & Sandra A. Wiebe (University of Alberta)

A defining characteristic of the preschool years is the emergence of flexibility in shifting between response modes depending on contextual demands. High-density event-related potentials (ERPs) were used to study the neural bases of set-shifting in 5-year-old children. A sample of 21 children completed a computerized Shape School task (Espy et al., 2006) and provided usable ERP data. In this task, cartoon shape characters appeared individually onscreen and children pressed different buttons corresponding to each character's shape (if the character was wearing a hat) or color (if the character was hatless). The rule shifted unpredictably after 1 or 3 non-switch trials, yielding 3 switching

conditions (Switch-1, Switch-3, Non-switch). ERPs were analyzed using spatiotemporal principal components analysis (Dien & Frishkoff, 2004). Three temporal-spatial factors were found to differ across the switching conditions. Switch-3, when compared with Switch-1 and Non-switch, was associated with increased activity at parietal/occipital leads 348 ms after stimulus onset and decreased activity at frontal leads 1136 ms after stimulus onset. In contrast, the Switch-1 condition was correlated with increased activity at frontal leads 636 ms after stimulus onset. These differences in ERP activity between the switching conditions suggest that the timing and topography of neural activation depend on the context of task demands.

10 Interactions between digit ratio, handedness, and personality traits in humans.

Nicole McEwen, Kathryn L. Vaillancourt, Natalie L. Dinsdale, & Peter L. Hurd (University of Alberta)

Digit ratio (2D:4D) is a putative indicator of prenatal testosterone exposure in a number of species and has been shown to correlate with personality traits including neuroticism, sensation seeking and aggression in humans. Men with smaller, more masculine digit ratios tend to score higher of self-report assays of direct aggression. In addition, depression has been associated with more feminine digit ratios in men. Cerebral lateralization, the partitioning of cognitive function to either hemisphere of the brain, is also associated with the strength of masculinization of the brain. Strength of cerebral lateralization has been shown to associate with personality-like traits including aggressiveness in a cichlid fish (*Amatitlania nigrofasciata*). In humans, strength of handedness can be used as an index of cerebral lateralization; strong hand preferences relate to a strongly lateralized brain. The degree of handedness has been associated with trait aggression in a non-clinical adult population. The current study examines digit ratio, strength of handedness and their co-relation to personality traits in a large sample of undergraduate psychology students.

11 Estrogen receptor 1 polymorphism and digit ratio in men

Kathryn L. Vaillancourt, Natalie L. Dinsdale, & Peter L. Hurd (University of Alberta)

The 2D:4D digit ratio, the relative lengths of the index and ring fingers in humans, is a widely used proxy measure for prenatal testosterone exposure. Varying distributions of androgen and estrogen receptors on the second and fourth digits, both of which regulate digit development, appears to be the basis for this effect. Polymorphism in a tandem repeat in the gene coding for the estrogen receptor α (ESR1) in zebra finches (*Taeniopygia guttata*) not only explains a significant amount of variation in digit ratio, but also seems to explain the significant correlation between digit ratio and sexual behavior in these birds. In humans, the number of TA repeats in the promoter region of the ESR1 gene has been associated with anxiety, neuroticism, psychoticism, antisocial behavior and conduct disorder in humans. We examine this polymorphism with respect to 2D:4D, aggressive and sexual behavior in men. Our results demonstrate that a significant amount of left hand 2D:4D variation is due to this variation in ESR1.

12 The effect of situations on identity negotiation processes in immigrant Canadians

Yang Fang, Kimberly Noels (University of Alberta), & Richard Clément (University of Ottawa)

Previous research shows that French Canadians' Anglophone and Francophone identities tend to converge with the ethnicity of the interlocutor. Moreover, situational norms have an independent effect on patterns of ethnic identity. The current study extended previous research by examining the ethnic identity of 162 first and second-generation Canadians of mixed ethnic backgrounds. Participants indicated how strongly they identified with their heritage group and with the Anglo-Canadian group across four situational domains. One third of the group responded with reference to interactions with Anglo-Canadians, one third with reference to members of their heritage group, and for the remaining third

the interlocutor's ethnicity was not specified. Consistent with previous findings, ANOVA results showed that heritage identity is stronger than Canadian identity in interactions with members of the heritage group, but Canadian identity is marginally stronger than heritage identity in interactions with Anglo-Canadians. Independently of the effect of the interlocutor's ethnicity, the type of situation affected patterns of identification, such that heritage identity is equivalent to Canadian identity in more intimate settings, but the Canadian identity is stronger than heritage identity in less intimate settings. The implications of these results for understanding the acculturation of ethnic identity are discussed.

13 Black-capped chickadees fail to demonstrate octave generalization

Daniel Lee, Marisa Hoeschele (University of Alberta), Ronald G. Weisman (Queen's University), Lauren M. Guillette, Allison H. Hahn, & Christopher B. Sturdy (University of Alberta)

When the frequency of a note is doubled it is described as having changed by an octave. In humans, octave generalization describes a phenomenon in which one identifies notes separated by an octave as being the same note (e.g. "C" notes of different frequencies). Whether chickadees are also capable of octave generalization is largely unstudied. In this study, we addressed this possibility by applying an octave generalization task used by Hoeschele et al. (in prep), which demonstrated octave generalization in humans, to test black-capped chickadees. Stimuli were created by dividing an octave into three ranges of four notes. The chickadees were then taught to discriminate between these ranges by rewarding responses to the middle range and punishing responses to the outer two ranges. When tested with the same set of notes in a higher octave, the chickadees showed a negative transfer when the reward contingency pattern was the same but showed a positive transfer when the pattern was reversed. The results of this study suggest that, although chickadees are highly adept at discriminating between pitches, they are incapable of octave generalization.

14 Motor verbs and speech rate predict iconic gestures

Todd J. Pruner, Lisa Smithson, Laura Ritzen, & Sandra A. Wiebe (University of Alberta)

Among adults, verb use in speech is positively correlated with gesture production (Duncan, 2002), but this association has not been investigated in children. Understanding of iconic gesture production is thought to emerge during the preschool years, where adult-like understanding is reached by 4.5-5 years of age (Tolar et al., 2008). We hypothesized that verb use and iconic gesture production would be associated only among older preschoolers (> 4.5 years). We focused on motor verbs because they are most closely related to iconic gestures (Feyereisen and Havard, 1999). The sample included 21 young preschoolers (Mage 3;11 years) and 22 older preschoolers (Mage 5;5 years). Children watched cartoons and immediately retold the stories to an experimenter. Narratives were transcribed from video, and verbs, motor verbs and iconic gestures were coded. In a regression analysis, the proportion of motor verbs and speech rate were positive predictors of iconic gesture rate among older, but not younger, preschoolers. One possible explanation for these findings is that iconic gestures may facilitate lexical access, permitting faster speech. Alternative accounts, such as the development of motor imagery, will also be explored.

15 Long-term memory for an auditory discrimination in chickadees

Lauren M. Guillette, Marisa Hoeschele, Allison H. Hahn & Christopher Sturdy (University of Alberta)

Long-term memory retention (731 days) in visual discrimination tasks has been shown in pigeons (Vaughan & Greene 1984) and Clark's nutcrackers remember locations of cache sites for 285 days (Balda & Kamil 1992). While few studies have examined the extent of long-term memory retention in the vocal domain, two experiments have demonstrated that retention spans eight months; in a playback experiment, male hooded warblers discriminated between the songs of neighbours and strangers (Godard 1991) and

European starlings retained a species-based song discrimination in a go/no-go task (Braaten 2000). In the current study, we demonstrate memory for an auditory discrimination with retention intervals that range from one year to over three years. Previously, black-capped and mountain chickadees were trained to discriminate between their own, and the other species' vocalizations in a go/no-go operant discrimination task. One group of chickadees was trained on this species-based discrimination with entire chick-a-dee calls as stimuli; a second group of chickadees was trained with individual note-types isolated from the chick-a-dee call (Guillette et al. 2010). Recently, these same chickadees were re-trained on the discrimination they learned previously. Most chickadees performed significantly above chance during the first block of training, suggesting long-term memory retention for vocal discriminations.

16 Effects of COMT and BDNF polymorphisms on neurocognitive functioning in normal aging

Shraddha Sapkota, G. Peggy McFall, Bonnie P. Whitehead, David Vergote, David Westaway, Jack Jhamandas, & Roger A. Dixon (University of Alberta)

Genetic polymorphisms of Catechol-O-methyl transferase (COMT) and Brain-derived neurotrophic factor (BDNF) have shown promising linkages in recent studies that have examined selected aspects of executive functioning (EF) in normal aging (Nagel et al., 2008; Wishart et al., 2011). In the present study, we replicate and extend past findings with (a) a larger sample of older adults, (b) theoretically broader neurocognitive assessments, and (c) planned tests of independent and interactive gene-cognition associations. Older adult participants (n=608, age range=53-96) from the Victoria Longitudinal Study were genotyped and measured on 14 cognitive tasks from three relevant domains. Following established procedures, initial analyses (a) confirmed expected Met/Val distributions for BDNF and COMT, (b) tested point biserial correlations evaluating associations of genetic risk and cognitive performance and (c) computed two-way analyses of variance (ANOVAs) for four EF measures. For BDNF, the Genetic Risk(3) x Gender(2) ANOVA revealed a significant interaction on the Brixton Spatial Anticipation Test. Overall, older men benefited more from the protective BDNF allelic combination than did women. However, women performed better than men when they had one or more copy of the risk allele. Future directions involve exploring overall strength and extent of associations and interactions among BDNF, COMT, and cognitive changes with aging.

17 Children's aggression – Victimization and school engagement

P. Hau & W. L. G. Hoglund (University of Alberta)

Peer aggression and victimization are well-established risks for children's adjustment in school (Park, 2006). While research suggests that children who are aggressive and children who are victimized by peers are disengaged in school (Buhs et al., 2006; Burk et al., 2007; Iyer et al., 2010), few studies have examined how children who are both aggressive and victimized engage emotionally and behaviorally in school during middle childhood. This study examines the associations between aggression-victimization status and school emotional and behavioral engagement with a sample of low-income, ethnically diverse children in Kindergarten to grade 3 who were assessed on three occasions over one school term. Gender differences in these associations are also examined. Participants included 461 low-income children in Kindergarten to grade 3. Data were collected in January, March, and June 2010. School engagement (Furrer & Skinner, 2003) and peer victimization and aggression (Crick & Grotpeter, 1996) were assessed from children's self-reports. ANOVAs were used to test differences in levels of school engagement by aggression-victimization status at each wave. As expected, aggressive-victimized children showed the lowest levels of emotional and behavioral school engagement relative to other children. Also, boys were more likely to be in the aggressive-victim and aggressive, non-victimized status groups relative to girls. This study contributes to understanding how

peer aggression and victimization relates to children's enjoyment of and participation in school.

18 Spatial characteristics of the environment used in the Method of Loci influences verbal memory

E. L. G. Legge, B. Cheng, C. R. Madan, & J. B. Caplan (University of Alberta)

The Method of Loci (MoL) is an ancient strategy for remembering sequences of verbal information. In the MoL, the rememberer imagines navigating a familiar space, listing items in locations as they go. Due to reliance on navigation, the spatial properties of the environment could influence recall efficacy. Alternatively, the navigation metaphor might not affect verbal memory in material ways, instead serving as a hook that helps individuals apply their study and retrieval processes. Participants were briefly familiarized with three topologically different environments: an apartment, a large, open room, and a radial-arm maze. After studying each environment, participants were asked to use it with the MoL to remember five 11-word lists. Following serial recall, participants were provided with a blueprint of the last explored environment and asked to recall its object locations. Serial recall was best for the apartment and worst for the radial-arm maze regardless if scoring considered item recall order. Mastery of the environment (blueprint task accuracy) could not explain an environment's effect on serial recall. These findings suggest that the MoL is not simply a metaphor that ensures effective engagement in serial-order memory, but that navigation is important, and the spatial characteristics of the environment may determine effectiveness.

19 Cortical dynamics in offline sleep-like brain activity

Anastasia Greenberg, Justin Barclay, & Clayton T. Dickson (University of Alberta)

The EEG during non-REM sleep is dominated by the slow oscillation (SO; <1Hz) which reflects synchronous alternations in depolarizing (UP/ON) and hyperpolarizing (DOWN/OFF) events at the cellular and local network level. The SO has been implicated in sleep-dependent declarative memory consolidation, however, a complete understanding of its generation and spatiotemporal dynamics is still lacking. By making recordings of activity using a cortical array of bipolar electrodes arranged in an anterior-posterior plane of urethane-anesthetized rats we were able to track the spatial dynamics of the SO on a cycle-by-cycle basis. We show that the spectrally coherent SO is phase coupled to local multiunit and gamma activity at its negative peak (ON period) and appears as a propagating wave (0.08 ± 0.02 m/sec) that is most likely to show an anterior-to-posterior pattern, intermixed with a posterior-to-anterior pattern. By using low amplitude field stimulation we were able to entrain the endogenous SO, as evidenced by the strong coupling between EEG signals and the stimulation itself. Stimulation also biased propagation patterns, depending upon the spatial arrangement of the field. Our results underscore the inherent dynamic nature of the SO during anesthesia and suggest that there are localized hubs that tend to give rise to entraining waves that sweep across the cortex. However, using electrical field stimulation allows us to manipulate the occurrence of certain propagation patterns. This manipulation would be useful to both enhance and disrupt SO coordination, and to alter memory consolidation during sleep.

20 Under pressure! Stress levels and coping styles among undergraduate students

Danielle P. Farrell, L. Le, & S. Ziolkowski (University of Alberta)

Stress has been shown to be widespread among the undergraduate population, and students may use very different styles and methods of coping to deal with their stress. Our purpose in this study was to determine levels of stress among a sample of psychology 104 students and determine what types of coping methods they employed. Ninety-one students took part in the study by completing two measures: the Perceived Stress Scale (PSS) and the Ways of Coping Questionnaire (WCQ). Results indicated that there were

no significant differences in stress scores between gender, domestic status, year of study or faculty. Coping styles varied considerably, although most students used styles such as “self-controlling” or “escape-avoidance”. Social support was also cited by students as an important coping method, but as a coping style it was seldom used. Results were interpreted as being healthy (self-controlling, seeking social support) or unhealthy (escape-avoidance).

21 Functional manipulability of objects interacts with subsequent memory: A between-subject EEG study

Yvonne Y. Chen, Christopher R. Madan, Vivian S. T. Chan, & Anthony Singhal (University of Alberta)

Previous research has found that an object’s motor-related properties can affect later memory of the object, especially when the motor aspects of the object were not intentionally attended-to. To better understand how motor-related processes modulate memory, we recorded electroencephalography (EEG) while participants incidentally studied objects that were either high or low in functional manipulability, as well as when participants performed a subsequent recognition memory task involving the objects. During the study phase, participants judged the images on whether they (a) can manipulate the object using their hand (manipulability group); or (b) have seen the object in the past three days (personal experience group). Participants were subsequently given a recognition memory task, where they were asked to judge whether they had been presented with an image during the study phase. We found that participants in the manipulability group remembered low-manipulability objects better than high-manipulability objects. In contrast, participants in the personal experience group remembered the high-manipulability objects better than low-manipulability objects. Further analyses using an event-related potential (ERP) approach will also be

22 Intracerebral iron causes neuronal atrophy, neuronal death and progressive tissue loss: implications for intracerebral hemorrhage

Jayalakshmi Caliaaperumal & Fred Colbourne (University of Alberta)

An intracerebral hemorrhage (ICH) is a devastating stroke causing considerable tissue destruction from mechanical trauma with later secondary degeneration. Free iron, released over days from degrading erythrocytes, is a likely mechanism for this delayed injury (via increasing free radicals) and a key therapeutic target. Indeed, an intracerebral injection of iron rapidly kills cells and causes cerebral edema. We expanded these observations by: determining a dose-response relationship of iron infusion, examining the structural appearance of surviving neurons, and evaluating injury over months. In experiment 1, we measured 24-hr edema in rats given 1, 5 or 10 mmol/L infusions of FeCl₂ (30µL). Second, rats were given iron (0.25–10 mmol/L) followed by behavioral assessment and histology at 7 days. Third, dendritic structure was measured in Golgi-Cox stained neurons at 7 days after a 0.25 mmol/L dose. In experiment 4, rats survived 7 or 60 days post-injection (1 mmol/L) for histological assessment. Larger doses of iron caused greater injury, but this was generally not reflected in behavior that indicated similar deficits among the 1 – 10 mmol/L groups. Similarly, edema occurred but was not linearly related to iron dose. Even after a low dose of iron the surviving neurons in the peri-injury zone were considerably atrophied (vs. contralateral side and controls). Finally, continuing tissue loss occurred over weeks with prominent neuronal death and iron-positive cells (e.g., macrophages) at 60 days. Iron alone may account for the chronic degeneration found after ICH in rodent models.

23 Octave generalization and operant reinforcement contingencies in humans

Ann-Marie T. Przystalski, Marisa Hoeschele (University of Alberta), Ronald G. Weisman (Queen's University), & Christopher B. Sturdy (University of Alberta)

Octave generalization occurs when two pitches are perceived as the same pitch-type because one is either half or double the frequency of the other. Hoeschele et al. (in prep)

employed an operant paradigm to train participants to differentially respond to three ranges of 4 notes each of alternating reinforcement within one octave, and then tested them for generalization in a novel octave (i.e., with notes that were double in frequency). Using this protocol we successfully demonstrated the octave generalization phenomenon in humans. The present study strived to determine why discriminating three equal sized ranges of notes results in generalization, when discriminating two ranges of six notes each fails. Here we sought to determine whether changing the balance between rewarded and unrewarded notes was the cause of the difference. We presented three ranges but the balance was 3 unrewarded notes, 6 rewarded notes, and 3 unrewarded notes. Our comparison group learned a discrimination that split the octave in two ranges of 6 rewarded and 6 unrewarded notes. We have preliminary results and they do not conclusively show octave generalization for either the two- or revised three-range training. This is in contrast to our previous demonstration of successful generalization patterns across two octaves by individuals initially trained with three ranges of four notes each. Small sample sizes and difficulty in obtaining learning of the discriminations in our current work make interpreting the data problematic.

24 Species-based vocal preference in black-capped and mountain chickadees
Amanda S. Richie, Lauren M. Guillette, & Christopher B. Sturdy (University of Alberta)

Previous research in our lab (Guillette et al. 2010) showed that chickadees are able to discriminate between mountain and black-capped chickadee chick-a-dee calls in a go/no-go operant paradigm. Other laboratories that study songbirds have successfully used multiperch apparatuses, using social reinforcement, rather than food reinforcement as in the go/no-go operant paradigm, to show preference for one sound stimulus class over another, among different species of birds (e.g., Gentner & Hulse. 1999). In the current study we used a multiperch task, one perch associated with vocalizations produced by mountain chickadees, a second perch associated with vocalizations produced by black-capped chickadees, and a third perch that is silent. We are testing black-capped and mountain chickadees to see which species vocalizations they preferred to hear. The preference is determined by observing number of perch landings as well as length of time spent on each perch. The end goal is to test hand reared black capped chickadees raised in different auditory environments and determine if they prefer to hear the vocalizations of their own species (nature) or the vocalizations of the species of chickadee that they were raised with (nurture).

25 Self-concept inconsistency: The case of biculturals
Rui Zhang & Kimberly A. Noels (University of Alberta)

Previous research has shown cultural differences in cross-role consistency in personality. While self-concept inconsistency has been attributed to dialectical thinking rooted in East Asian philosophical traditions, we conducted a study among people with dual cultural backgrounds (“biculturals”) to test whether inconsistency relates more to cultural frame switching (CFS), that is, the tendency of biculturals to shift their cultural identities to accommodate to distinct cultural audiences. In a survey of East-Asian and non-East-Asian biculturals (N = 128), participants rated themselves on the Big Five traits in two relationships, reported their situated cultural identities for each relationship, and completed measures of their general tendency to shift cultural identities and their dialectical beliefs. Results supported the idea that biculturals’ inconsistency is more reflective of CFS than dialectical thinking. Specifically, inconsistency was predicted by both general identity shifting and dialectical beliefs among East-Asian biculturals; inconsistency was predicted only by general identity shifting among non-East-Asian biculturals. Moreover, situated identities mediated 3 of the 5 Big Five traits that changed between relationships for East-Asian biculturals and 2 of the 3 traits that fluctuated for non-East-Asian biculturals.

26 Latent growth modeling of executive functioning in aging: Modifying roles for Type 2 diabetes and IDE polymorphism?

G. Peggy McFall, Sandra A. Weibe, & Roger A. Dixon (University of Alberta)

The insulin-degrading enzyme (IDE) contributes to Type 2 diabetes (T2D) and Alzheimer's disease susceptibility. We tested concurrent and longitudinal patterns of executive function (EF) performance in normal aging, as potentially modified by related health condition (T2D) and genetic polymorphism (IDE, rs6583817; designated by presence (C+) or absence (C-) of the C allele). Selected participants from the Victoria Longitudinal Study were measured: Wave 1 (n = 578, ages 53.2-95.2 years) and Wave 2 (n = 388, ages 57.3-94.5 years). A latent EF composite (based on 4 tests) was analysed using latent growth modeling (Mplus). First, adults with T2D (intercept= -.348) exhibited lower levels of initial EF than controls (intercept= .111). Second, rate of EF decline for adults with T2D (slope= -.031) was slightly but not significantly greater than for controls (slope= -.018). Third, C+ adults (intercept= .125) exhibited higher initial EF than C- adults (intercept= -.190). Fourth, C- adults had a steeper rate of decline (slope= -.037) than did C+ adults (slope= -.015). Fifth, no T2D-IDE relationship was observed. T2D may have an early or steady impact on EF level and decline in older adults. IDE C+ is known to increase hepatic insulin and A β degradation which may buffer cognitive outcomes and change.

27 An EEG measure of competition between parallel motor planning processes

D. E. Atkin, Peter Dixon, & A. Singhal (University of Alberta)

The affordance competition hypothesis states that the 'object' of attention is the neurocognitive process which is most activated at any given time, and that parallel processes must therefore 'compete' in order to be attended. Furthermore, the 'fairness' and outcome of this competition can be biased via sensory inputs that favour certain processes according to their properties. We tested this hypothesis in the motor domain via a pointing task, which allowed for right or left hand responses to targets in their respective ipsilateral and contralateral visual fields. Hand-specific movement planning processes are lateralized to the motor and premotor cortex of the contralateral cortical hemisphere, and the relative activity of each hemisphere can be detected via the lateralized readiness potential (LRP). Results demonstrated an LRP which was greater for hand movements to targets in the ipsilateral versus contralateral visual field, as well as preceding attention-related event-related potential (ERP) components which differed in scalp distribution according to the visual field of the eliciting target. Taken together, these results are consistent with the operation of spatially-biased competition between hand-specific movement planning processes.

Invited Presentation (BioSci P226)

13:45-14:10 Neural correlates of attention-emotion interactions in adolescents with and without mental health concerns

Anthony Singhal (University of Alberta)

The majority of mental disorders have a childhood onset and tend to be among the most resistant to change. Moreover, mental health problems are the leading cause of morbidity, mortality, and disability in youth worldwide. Thus, it is important to understand the nature of the neural mechanisms that underlie mental dysfunction in youth. In this talk I will present data from a large scale study with combined neuroimaging methods (fMRI & ERP) to examine neural dysfunction in attention and emotion processes in a population of high-risk adolescents with varied mental health concerns. In this study we employed a modified version of the emotional-oddball task where clinical and healthy participants

were presented with fearful and sad images interleaved with non-emotional targets. This task allowed for the analyses of neural activity in response to all stimulus types as well as interactions among them. Our main fMRI results showed differential activation in the emotion and attention circuits in the brain, including the amygdala, orbitofrontal and dorsolateral-prefrontal cortices, as well as parietal regions. Our main ERP results revealed differences in markers of attention (P100, P300) and attention-emotion interactions (late posterior positivity – LPP). I will discuss how these data provide a neural picture of cognitive and affective processing in adolescence along with markers of dysfunction, and some possible avenues for treatment.

Session 3 (BioSci P226)

14:10 Hippocampal slow oscillations and memory consolidation in human intracranial recording.

Kyle E. Mathewson (University of Alberta), Richard J. Staba (University of California Los Angeles), & Clayton T. Dickson (University of Alberta)

The functional relevance of sleep remains poorly understood. It is thought that sleep is involved in the consolidation of new learning from the previous day into long lasting memories. Deep sleep is characterized by large amplitude slow oscillatory activity slower than one cycle per second. These slow waves are often coordinated between many brain areas. Both deep sleep and slow oscillations are more prevalent early in the night, when disruption of sleep leads to decrements in memory consolidation. We propose that these coordinated slow oscillations serve to consolidate memories by coordinating activity between hippocampus and cortical areas. Here we measured these slow oscillations in brain activity in local field potentials recorded from intracranial electrodes surgically implanted in patients undergoing pre-surgical seizure focus localization for intractable epilepsy. Specifically, we focused on hippocampal slow oscillations, their coordination with cortical areas, and their relation to higher frequency local field potentials as a function of somnographic sleep state. We found increased hippocampal oscillations as a function of depth of sleep as predicted. Importantly, the phase of this slow oscillatory activity modulated the power of higher-frequency gamma activity (a measure of local circuit activation), and to a greater extent with deeper sleep. Further, these slow waves were most coordinated with cortical areas during the deepest sleep, providing a forum for the consolidation of memories from the previous day. In sum, we found in humans for the first time that the phase of slow oscillations in the local field potential during sleep modulates the higher-frequency gamma power, and that these slow oscillations are coherent between the hippocampus and many cortical areas during the deepest stages of sleep. This coordinated modulation of local circuit activity may serve as a mechanism by which memories are consolidated following prior waking experience.

14:30 Does socialization play a role in the laterality of male convict cichlids?

Cheryl M. Sedlak Seaver, M. Moscicki, & P. Hurd (University of Alberta)

Cerebral lateralization is the partitioning of cognitive function into a specific hemisphere of the brain and it is pervasive among vertebrates. There is evidence that eye preference (cerebral lateralization in fish) is stable for the same stimulus across different tasks in a variety of fish species. Previous research demonstrates that there is a distinct eye preference present in convict cichlids (*Amatitlania nigrofasciata*) and that there is a difference in the level of eye preference between the genders, with females expressing a population level and males expressing an individual level preference in a social context. These levels occur when an entire population uses the same eye to view a specific stimulus or when each individual expresses their own eye preference when viewing the same stimulus. Because it has been hypothesized that sociality within a species may have led to

the development and continuation of population level eye preferences, it is imperative that we discern what effects social versus isolated housing have on the direction and strength of lateralization. Here we have assessed the laterality of male convict cichlids in a perceived social environment following a period of social isolation or social housing. Results and applications for future research will be discussed.

14:50 Shrexploration: Investigating the influence of personality on stress coping in a cichlid fish

M. K. Moscicki, V. M. Lepp, & P. L. Hurd (University of Alberta)

Behavioural syndromes, defined as consistent behaviour across time and/or context (e.g., boldness while foraging and while inspecting predators or boldness while foraging in the presence or absence of a predator), pose an evolutionary puzzle. Why might some behaviours be stable in some organisms when consistent behaviour is not always adaptive? Some evidence suggests that a stressful environment can lead to more consistent behaviour. Here, we investigate whether the position of a fish along a well-studied personality dimension, the shy-bold axis, affects consistency of behaviour between two tasks designed to assess boldness. We investigate this relationship in the presence and absence of a stressor (i.e., damage-induced alarm signals). We found consistency in behaviour between the two tasks in the absence of a stressor. However, when a stressor was present in the second task, we found that males maintained the same behaviour between tasks while females, regardless of position on the shy-bold axis in the first task, all showed the same behaviour in the second task. We suggest these sex differences may be related to different sex roles in this species with respect to parental care behaviour and territory defense.

Keynote Address (CCIS 1-160)

15:30 World- and self-learning, two learning systems that determine who we are

Björn Brembs (Freie Universität Berlin)

Our internal construct of the world around us would be useless, if we lacked a concept of how to behave in it. Even before we are born, we explore the consequences of our actions by using trial and error. Recent research in several vertebrate and invertebrate species have begun to elucidate how the mechanisms by which we learn about the world and those that learn about how to behave in it interact to enable each individual to develop their own, personal solutions to their every day problems.