The Behavioral Neuroscientist and Comparative Psychologist

Division 6 — American Psychological Association

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MESSAGE FROM THE PRESIDENT
by Skip Spear

The program for Division 6 at the APA meetings August 7-10 in Toronto is described in this issue of the newsletter. You will see that the Program Chair, Mark Stanton, has put together an exciting set of Symposia and Invited Addresses to complement the poster and paper sessions of Division 6. Several other parts of the APA program will be of interest to Division 6 members as well, in particular talks by Daniel Kahneman, Steven Ceci, Steven Hollon, David Buss, and Nora Newcomb on topics ranging from the use of drugs in psychotherapy, to evolution, to sociobiology and the transition from basic to applied research. You will notice also that Division 6 members have major roles in the Track 1 and Track 2 programs: Our President-Elect, Ed Wasserman, is giving one of the keynote addresses in the session “The Rational Mind” on Friday, and on Saturday’s session ("The Emotional Mind") Paul Rozin and Linda Spear are speaking on topics relevant to neuroscience and comparative psychology.

We urge you to attend this meeting. It will allow you to get

NORMAN E. “SKIP” SPEAR

captured up on APA’s important contributions toward strengthening the use of laboratory animals in research and in representing us before Congress on issues of government funding of basic research. And you can see old friends and enjoy Toronto. Surely one of the most pleasant and exciting cities in the world, Toronto has been assured by the World Health Organization and similar health-monitoring organizations that the frightening issues of the SARS epidemic of last spring are a thing of the past. We hope to see you there in August.
The Behavioral Neuroscientist and Comparative Psychologist is the official newsletter of APA Division 6 — Behavioral Neuroscience and Comparative Psychology — and is published 3 times a year. Mailing addresses used are those appearing on the official APA roster and a separate Division roster. Corrections and changes of address should be sent directly to the APA Directory Office, 1400 North Uhle St., Arlington, VA 22201, and to the newsletter editor (see below).

As the official newsletter of Division 6, BNCP publishes official business, committee reports, news items, job announcements, information on technical issues, topics of current interest, and information about the professional activities of Division 6 members. News items and articles should be submitted to the Editor at the address below (preferably by email). Paid advertisements are not officially endorsed by Division 6. The Editor welcomes comments and suggestions for ways in which BNCP can better serve the needs of the members. The preferred method of submission is by email. Send correspondence and submissions to Stephen B. Fountain via e-mail at sfountai@kent.edu. Postal mail should be sent to Stephen B. Fountain, Department of Psychology, Kent State University, Kent, OH 44242-0001. Other contact information: Phone: (330) 672-3826; FAX: (330) 672-3786

ANNOUNCEMENT

NEW EDITED BOOK WITH DIVISION 6 AUTHORS


This edited, interdisciplinary volume is an ambitious attempt to analyze violence from an evolutionary perspective and to explicitly articulate the implications of those analyses for prudent public policy. Phenomena examined include lead poisoning, rape, psychopathy, homicide, and intergroup and global conflict. Introductory and concluding chapters address basic tenets of evolutionary reasoning and challenges from within and outside of academe to adoption of this theoretical approach to public policy. While designed primarily to educate and persuade those active in the policy arena, the book also will provide researchers and teachers with useful models for bridging evolution and contemporary social problems. Chapters are by: Richard W. Bloom; Roger D. Masters; Stuart Kinner; Linda Mealey; David M. Buss & Joshua Duntley; Sheldon Solomon, Jeff Greenberg, & Tom Pyszczynski; Harold D. Fisbein & Nancy Dess; Christopher Boehm; and Nancy Dess.

(Submitted by Nancy K. Dess)
Inability of Tactile Reading in Late Schooled Subjects

Rita Simoes, M.D.; R. Fernandes, M.D., V.S. Nunes, M.A., M.A. Goncalves, M.A., A.L. Castro-Caldas, Ph.D., M.D.

BACKGROUND: Previous work has shown that learning to read and to write at the proper age in childhood modulates brain function. This modulation can be expressed as a focal effect or as diffuse effects. The focal effect is related to the specificity of the operations of reading and writing. Diffuse effects are related to attending school and learning the general program. Comparisons of performance were made between illiterate adult subjects and subjects that attended school in childhood. Results revealed functional and structural differences in the brain, some of which could be related to the focal effect and others that were probably the result of the diffuse effects (Castro-Caldas & Reis, 2000). Among the focal effects we can identify the activity of the left side posterior Parietal Cortex. This region was more prominently active in literate than in illiterate subjects, when they were scanned during word repetition tasks (Castro-Caldas et al., 1998a). On the other hand literate changes the inter-hemispheric parietal "cross-talking". The balance between homologous parietal areas is different in the two educational groups while repeating both words and pseudowords (Castro-Caldas et al., 1998b). Therefore, posterior Parietal Cortex seems to be a very important area of interest to understand the difference between literate and illiterate subjects. Cases of tactile alexia have also been reported as a result of lesions in this area suggesting an independence of the structures responsible for graphesthesia and visual reading in both of the Japanese writing systems (Fukatsu et al., 1998). Animal research showed that the posterior Parietal Cortex is responsible for the convergence of both visual and somesthetic information into the same frame of reference. This convergence is crucial for motor programming of intentional actions. These are the type of motor actions that constitute the operations of writing (for a general reference see Cohen & Anderson, 2002). It is known that adults can learn orthography. However, if there is a handicap as the result of a long period of being illiterate, they will probably use different strategies to perform the same operations. Our goal is to test the visual-tactile connection related to orthography.

METHODS: Twenty four right handed, middle/old aged women, without central or peripheral nervous system diseases were included in the study. All of them were able to recognize letters and read simple words, visually. They were divided into three groups: ex-illiterates (9 women who learned in adult life), literates with 1-4 years of schooling (8 women) and literates with more than 4 years of schooling (7 women who attended school at the proper age). Four tasks have been studied: 1) Stereognosis, 2) Size Discrimination, 4) Letter Graphesthesia and 4) Tactile Reading of plastic block letters and words. RESULTS: Results showed that the first two tasks were easily and equally performed by the three groups (respectively p=.513 and p=.272, ANOVA). Graphesthesia seemed to be better performed by literate than ex-illiterates subjects, but the difference did not reach statistical significance due to great interindividual differences (p=.227, ANOVA). Literate women performed better than ex-illiterate ones in the Tactile Reading task with either hands. Statistical differences were significant for the comparison of higher educated women vs ex-illiterate (p<.001, Bonferroni). The comparison between less literate and ex-illiterate women did not reach statistical significance due to the presence of an outlier in the group of ex-illiterates. CONCLUSION: Results suggest that the ability for Tactile Reading is naturally acquired in childhood while the grapheme-phoneme matching operation is learned. Tactile images of the letters do not form spontaneously in adult learning, which may suggest that adults recruit different bio functional networks from those used in young life. This might be important for the development of programs to teach adults. REFERENCES Castro-Caldas, A. and Reis, A. Neurobiological substrates of illiteracy. The Neuro-
The Neuropsychology of Second Language Acquisition

Darleana McHenry, Ed.D.

This presentation will explore the neuropsychology of second language acquisition. Details of the neural mechanisms of language have been the most difficult of the brain's functions to study. Language is a dynamic element which drives the integrated function of the whole brain. The more complex a task like language the greater number of regions and structures in the brain must be involved. Language functions are distributed throughout the brain and the locations can vary significantly from one person to the next. Language acquisition skills are present before birth and environmental stimulus activate this genetic ability in order to learn words and grammar. Language acquisition is a biological process. Infants enter the world with the propensity for handling the basic rules of grammar. Normal language relies on a complex interaction among sensory integration and symbolic associations, motor skills learned, syntactic patterns and verbal memory. The language acquisition process tends to be a universal part of everyone’s brain structure applying equally to babies all over the world. There is an amazing consistency in the timeline by which babies acquire language and learn words and grammar in their native language. Children bilingual from birth, store their native and second language in the same area. The universal ability of humans to communicate links the human race throughout the world. This process of acquiring language begins in utero as the fetus becomes attuned to the sounds of the mother’s voice. There are 44 distinct basic sounds (phonemes) that can be arranged into an indefinite number of connections. The fetal brain’s language areas can accept all phonemes. By 6 months gestation the fetus is already beginning to grasp together sounds due to the phonemes it hears in its mother’s speech. Infants under age 6 months can distinguish all the sounds of all language in the world. They learn to select from the ones that they hear and the others are lost without reinforcement through repetition. Infants can hear subtle differences between sounds that adults hear as identical. Human brain development starts right after conception. By 8 months gestation there are twice as many neurons in the fetus’ brain as the adult brain. As the brain ages, neurons that are weak or unused are pruned away to leave more efficient connections for those that are being used. Extensive memory is required for success in using symbolic communication such as language. It seems likely that as language evolved, the brain adapted to improve short and long term memory. As time progresses brain adaptability decreases and the connections become more durable and permanent. Humans lose flexibility in forming new language connections by age 7. This has tremendous implications for education programs. Research indicates that a second language learned after 7 years of age is stored within neural systems that are distinct from that of the native language. Brain development is a continuous unending process. The brain has a tremendous ability to compensate and rewire with practice. It is possible for adults to learn to speak a new language with little or no accent. It is clear that adults do not learn language as efficiently as infants. There are a lot of individual differences among people that may be relevant to second language learning: attitude, intelligence, personality, cognitive style, attitude and motivation. Acquisition of academic skill functions such as learning takes place over a lifetime unconstrained by windows of development. Although the brain’s flexibility may decrease with age, it remains plastic throughout life, restructuring itself according to what it learns. We have the ability to develop our brains. To increase our skill in one area, one engages in some activity that is familiar and novel to the individual, because simply repeating the same activity only maintains established conceptions. Activities that challenge your thinking, expand the number and strength of neural connections devoted to the skill. The more that higher skills are practiced the more automatic the skills become. WE can alter the ongoing development of our brains and our capabilities. People are not slav
genes or environment. Free will may be the strongest force directing the development of our brains and our lives. Although it may be easier for young children to learn a second language, it does not mean that adults can’t learn another language. It means that this process occurs in a different way from the way it occurs in young children with a different learning system.

Possible Improvement of Visual Recall Through Chinese Character Learning

Morihiro Sugishita, Dr.P.H.

From elementary through high school, Japanese children are required to memorize a large number of distinct visual forms, i.e., roughly 2000 Chinese characters, and tremendous effort is expended in learning to read and write them. We hypothesized that early training in memorizing Chinese characters and the use of these characters in daily life shapes brain development and facilitates recall of visual forms in general, including geometrical figures in visual recall tests. To demonstrate whether the leaning of Chinese character is correlated with specific aspects of memory, we administered the Wechsler Memory Scale-Revised (WMS-R) to a representative sample of the normal Japanese population (316 persons, 100% Japanese), and compared these results with data previously obtained with a representative sample of the normal US population (316 persons, 82.5% Caucasian). The WMS-R is comprised of 12 memory subtests, each measuring a different aspect of memory, and includes two visual recall subtests (Visual Reproduction I and II). Compared to the Americans, the Japanese group obtained significantly higher scores on these two visual recall subtests in each of the six age groups tested (16 to 74 years old). If the learning of Chinese characters improves visual recall of geometrical figures, these two psychological processes may activate the same site of the brain. To test this hypothesis, we conducted a fMRI study for 14 right-handed Japanese subjects. The results showed that both the recalling of newly-learned Chinese characters and the recalling of newly-learned geometrical figures activated the same site of the brain, which is the bilateral parietal lobe. A contrast of learning Chinese characters minus visual recall was tested so that no significant activated area was shown, which means that the both psychological processes activate the same area of the brain.

Paper Session II
1:00 PM – 1:50 PM, Metro Toronto Convention Centre, Meeting Room 101

Intragenomic Conflicts and ‘Adapted’ Minds

William M. Brown, Ph.D.

Conflicts of interest may occur between mother’s and father’s genes within offspring (Haig, 2000; 2002). Genomic imprinting is the differential expression of genes depending upon the parent of origin in which the gene was inherited. Specifically it appears that father’s genes are predominantly expressed in the hypothalamus (involved in homeostasis, for example hunger) while mother’s genes are predominantly expressed in the neocortex (involved in flexible decision making). Haig (2000), Trivers (2000) and Brown (2001) have suggested that genomic imprinting could mediate conflicts over information transmission and reception within the brain. Keverne (2001) has further hypothesized that maternal genes may have been selected for the ‘emancipation’ from endocrinological determinism mediated by paternal gene expression. It is a tantalizingly (albeit speculative) idea that the occurrence of genomic imprinting approximately 135 million years ago (MYA) in mammals may have indirectly facilitated coevolutionary conflicts between genes and cultural transmission (Haig, 2000; Trivers, 2000; Brown, 2001). This theoretical presentation will outline what we know about imprinted genes (including the brain areas and behaviours influenced by such genes). Finally research methods generated from cognitive neuroscience and experimental psychology will be presented as possible ways of testing the kinship theory of genomic imprinting. ADAPTED MINDS? While commonly evoked, traditional inclusive fitness calculations may not be sufficient for explaining behaviour due to relatedness asymmetries. For example, Takahasi (1998) wrote: “Genetic determination of the preference seems to preclude the emergence of a cultural runaway [of a maladaptive variant], and only preferences that favor adaptive variants may eventually evolve” (p. 154). The problem with Takahasi’s
logic in the above passage is that an adaptive variant for paternal genes may be disadvantageous to maternal genes (and vice versa). More recently, Henrich & Boyd (2001) assume in a cultural evolutionary model that humans may have a psychological bias for copying the majority and/or the most successful individual. However the ‘most successful’ individual in terms of maternal genes or memes may not be the most successful in terms of paternal genes or memes. In kin groups, the information transmitted between siblings could have different levels of reliability and adaptiveness because of differing maternal and paternal coefficients of relatedness. The widespread use of language appears to correlate with the rapid evolutionary increase in brain size. Language permits individuals to share information and includes both signal and receptor mechanisms. It appears from the study of animal behaviour that signal-receptor systems are susceptible to hyper-stimulation (Ryan 1990). Language’s signal-receptor mechanisms provide an extraordinary opportunity for sensory exploitation. Conflict may arise over information exchange in an analogous manner to genetic conflicts. Because humans need to receive information from others receivers make themselves vulnerable to persuasion that cause deviations from their optimum behavior. In this coevolutionary struggle, “offense is the construction and sending of signals that persuade others to do what is best for the signal-coding genes, and defense is reception and processing of information sent from others in a way that is best for the reception coding genes.” (Rice & Holland, 1997). Neuroscientists have reported that different areas of the brain contribute to the production of speech (frontal lobe) and speech comprehension (temporal lobe). This is consistent with the hypothesis that the genes mediating offense and defense are partially different and may create opportunities for genomic conflict. Genes involved in the reception of information could respond by changing cognitive algorithms so that the over-stimulation is reduced or by using complex reasoning to suppress impulsive emotions. The phenomena referred to as intelligence may be a byproduct of extended evolutionary conflicts between genes mediating offense and genes mediating defense in the linguistic realm (Rice & Holland, 1997).

Women’s Mating Strategies and Preferences of Dads versus Cads

Maryanne L. Fisher, M.S., D.J. Druger, Ph.D. & I. Jobling, Ph.D.

Introduction

Evolutionary psychology uses the principles of evolutionary biology as a guide to the study of human cognition and behavior. The types of psychological adaptations that will succeed evolutionarily are those that maximize an organism’s ability to transmit its genes to the next generation, or what evolutionary psychologists call its “fitness,” by successfully reproducing and helping kin who share its genes to reproduce. The areas of sexual relationships and romantic partnerships are of great interest to researchers with an evolutionary perspective because of the strong connection with reproductive behaviors. Historically, research on romantic relationships indicated that men and women differ in their preference of either short-term or long-term relationships, such that men tend to pursue short-term relationships, and women tend to pursue long-term relationships. For women, this preference was thought to reflect the necessity of locating a mate to assist with child rearing and to provide any necessary protection. However, contemporary research suggests that there are advantages to both sexes for either form of relationship. For example, women may seek a short-term mate who demonstrates ‘good genes’ that may be transmitted to a potential offspring, but is not likely to provide any paternal care (i.e., Cads). In contrast, women may seek a long-term mate who demonstrates high levels of paternal care but who is not the most attractive or dominant (i.e., Dads). Furthermore, recent research has demonstrated that this preference may be moderated by women’s menstrual cycles. Theory predicts that Cads are preferable as providers of ‘good genes’ and hence, will be most preferred when maximally fertile. Alternatively, Dads provide paternal care and not necessarily genes, and hence, will be most preferred when minimally fertile. Method

Using this framework, we examined women’s preferences for long-term and short-term mates using archetypal Cad and Dad characters from early 19th century British literature. Female undergraduates from an American and a Canadian university were asked to read two pairs of descriptive passages of archetypal Cads and Dads. Then participants were asked to rate the character in terms of the likelihood of accepting them as a short-term or long-term mate and to indicate a preference for one of the characters in other types of social relationships. Expected Results

We hypothesized that Cad characters would be more preferred by women in the fertile phase whereas Dad characters would be more preferred by women in the non-fertile phases of the menstrual cycle. Discussion

This project unites the social sciences and humanities through the integrative framework of evolutionary theory. Literature is a vast
source of data for understanding psychological phenomenon, however empirical studies are currently scarce.

References

**Poster Session**

2:00 PM – 3:50 PM, Metro Toronto Convention Centre, Exhibit Hall

**Serial Order Learning in Associative Formation**

Murray J. Goddard, Ph.D.

Typically, researchers in Pavlovian conditioning have investigated the conditions that affect associative formation between a conditioned stimulus (CS), such as a light or tone, and an unconditioned stimulus (US), such as food or electric shock. More recently, however, there is evidence that a US can also serve as a signal, or cue, for the delivery of another US (for a review, see Goddard, 1999). In the present experiment, serial order learning was investigated in rats by delivering food pellets to two spatially distinct feeders. All rats received three food pellets in feeder A followed by three food pellets in feeder B. For Group Paired (P), there was a 20 second delay between A and B whereas, for Group Unpaired (U), there was a 150 second delay between A and B. The rats in Group P better learned the A-B association than the rats in Group U, as evidenced by greater anticipatory responding to B in the 20 second interval following A. Of more interest, however, was that the rats in Group P (but not U) showed a significantly greater percentage of responding to feeder A at the beginning of the session. Since food was always delivered first to feeder A and second to feeder B (for Groups P and U), the results suggest that serial order learning was facilitated during associative formation.

The above results imply that during Pavlovian conditioning, organisms may not only learn the CS-US association but may also learn that the CS is presented first and the US is presented second. However, this serial order learning may not be expressed because subjects may show little anticipatory responding to a CS and the US delivery site may elicit greater intertrial responding because the US is biologically more salient than the CS. The above experiment overcomes these two obstacles by allowing for the study of associative formation between two events of equal salience that elicit two distinct and easily measurable responses.

**The Effects of Emotional and Neutral Stimuli on Interhemispheric Interaction**

Michael I Bloch, Ph.D.

For more than one hundred years psychologists and neurologists have investigated the brain areas involved with emotional experience. In the area of hemispheric asymmetry, the vast majority of research has investigated left hemisphere/right hemisphere differences in the processing of emotional stimuli. Until very recently, there has been little investigation of interhemispheric interaction in the processing of emotional vs. neutral stimuli. In the present experiment positive words, negative words, neutral words and nonwords were presented unilaterally (left visual field or right visual field) and bilaterally (to both visual fields simultaneously). Performance in the bilateral condition in particular was analyzed to determine the degree of interhemispheric interaction. The results indicated shorter reaction times, reflecting greater interhemispheric interaction, to the emotionally charged words than to the neutral words. The results also showed no performance differences in responding to the positive and negative words. The findings suggest greater interhemispheric interaction for emotional stimuli, presumably due to the greater cortical and subcortical activity required for processing, relative to that required for the processing of the neutral stimuli. The results are discussed in the context of cognitive/developmental models of processing emotional stimuli.
Caregiving AD and ALS Patients: What’s the Difference?
Sonia S. Silva, BS, LCSW; Manuela MG Guerreiro, Ph.D., RN

Objectives: The purpose of this study is to assess the satisfaction with life and the dementia burden among caregivers of Alzheimer’s disease (AD) patients, compared with those who care for dependent but cognitively intact patients with other progressive neurodegenerative diseases.

Method: The group of caregivers of AD patients (n=24) was compared with other two groups: a control group (n=31) and a group of Amyotrophic Lateral Sclerosis (ALS) patients caregivers (N=11). All subjects were submitted to a questionnaire of demographic data; the Mini Mental State Examination (MMSE) for the evaluation of the mental state; the Blessed Dementia Scale (BDS) to assess the patient’s dementia severity; the Satisfaction With life Scale (SWLS), which measures the subject’s satisfaction with life, and a scale assessing depression, anxiety and stress levels (Depression Anxiety Stress Scale – DASS). Results: The burden in caregivers of AD and ALS patients was found in several measures. When compared with the control group the two caregivers groups showed increased levels of depression, anxiety and stress, and lower levels of satisfaction with life. There were no significant differences between the two caregivers groups on those domains. Cognitive impairment did not seem to increase the burden in any of the measures considered. The degenerative nature of these diseases may justify this pattern of results.

Metamemory and Objective Memory
Sandra SG Gino, BS, LCSW; Manuela MG Guerreiro, Ph.D., RN; Carlos CG Garcia, Ph.D., RN

Introduction: The relationship between metamemory and the performance in memory tests is controversial.

Method: The authors compare the impression of adult subjects about the efficacy of their own memory expressed on a dichotomic scale (good/not good) with the score on a scale of subjective memory complaints. The performance in memory tests and the loss of the information for intervals of thirty minutes was also compared. Results: A sample of 54 healthy subjects without neurological or psychiatric disorders, aged 40 to 86 years and educational level from 0 to 17 years, recruited outside the context of a memory clinic was evaluated. The subjects classified their memory as good or not good. Thereafter they filled the scale of Subjective Memory Complaints (SMC) and their memory was evaluated with two tests (Logical Memory and Associated Learning of the Wechsler Memory Scale) on immediate recall and thirty minutes delayed recall. The subjects were also evaluated with the Geriatric Depression Scale (GDS). A Subjects referring bad memory and with a high score on SMC (presence of memory complaints) were older and had a lower educational level. Our results show that some objective measures of forgetfulness can be influenced by the age, education, and for GDS and they don’t reveal important correlations with most of the items of SMC.

Associations and Dissociations Between Implicit and Explicit Memory Tasks
Peter J Bruss, MA; David B. Mitchell, Ph.D.

Classification schemes proposing functionally distinct memory systems, processes, or components run myriad. Although these perspectives often share many similarities, several theoretical differences exist. Further, there is considerable debate in how to classify the current arsenal of memory tasks utilized in theory development. The aim of the present investigation was to explore the multiple memory distinctions/systems debate using factor analytic techniques. Implications of these findings are discussed in terms of multiple memory systems (Tulving, 1985), transfer appropriate processing (Roediger, Buckner, & McDermott, 1999), and component processes accounts (Moscovitch, 1994). To investigate this issue, 11 measures of memory thought to differentiate between the various memory models were administered. These tasks ranged from explicit memory measures including both episodic and semantic tasks, to implicit memory tasks spanning the perceptual-conceptual continuum. Partici-
A total of 84 adults participated. Young adults (ages 18-32, N = 48) were undergraduates at Loyola University (Chicago) and received course credit for participation. Older adults (ages 45-88, N = 36) were comprised of university staff, faculty, and alumni enlisted in the Loyola University Chicago Center for Aging Studies volunteer register. Procedure After providing consent and relevant background information, participants were exposed to 108 pictures and words for 2.0 sec each. After 20 minutes of distractor activities (including a verbal fluency task (FAS) and the WAIS-III vocabulary subtest), participants performed 5 implicit memory tasks in the following order: word fragment completion (WFC), word stem completion (WSC), category exemplar generation (CEG), picture fragment identification (PFI), and picture naming (PFI). Priming was assessed for both pictures and words for each of the 5 implicit tasks, producing 10 measures of implicit memory. Additionally, the time it took for participants to generate the category words in the CEG task was recorded. After completing the implicit tasks, episodic memory was assessed using category-cued recall (CCR), recall of the words defined in the WAIS-III vocabulary subtest (WM), and recall of the various tasks performed in the experiment (TM). The semantic measures included scores on the WAIS vocabulary subtest (VS), average category completion time for CEG (CCT), and the total words generated in the verbal fluency task (FAS). Each session took about 90 min to complete. Results Priming was reliable for 8 of the 10 priming measures (no cross-format priming was found for pictures in the WFC task, or for words on the PFI task). Five of these measures were used in the factor analysis (W and P refer to word and picture primes, respectively): WFC-W, WSC-P, CEG-W + P, PFI-P, and PN-W. These tasks were selected because they provided the best match to conceptualizations of perceptual and conceptual implicit memory. Using a principal components analysis with a Varimax rotation, four factors were identified with eigenvalues greater than 1, this coincided with the scree plot which also indicated a four-factor solution. The four factors accounted for 19.9%, 16.8%, 13.5%, and 10.5% of the variance, respectively (total = 60.7%). The factors clearly delineate by pre-described test type with episodic tasks, semantic tasks, conceptual implicit tasks, and perceptual implicit tasks loading on separate factors. The first factor, which included WM, CCR, and TM, clearly represents episodic memory. The semantic tasks, including VS, CCT, FAS, loaded on a second factor, thus differentiating episodic and semantic measures. Factor 3 comprised the conceptual implicit memory tasks (CEG-W + P, PN-W, WSC-P), and both perceptual implicit tasks (WFC-W, PFI-P) loaded on a fourth factor. Conclusions The results from the present investigation provide unequivocal support to the notion that memory is multi-dimensional. A wide-variety of prototypical memory tasks were administered and subjected to factor analysis. Four distinct factors emerged, with the explicit and implicit tasks both loading uniquely on separate factors. The two explicit loadings could unambiguously be defined in terms of their task type: episodic and semantic. The novel finding that the perceptual and conceptual tasks loaded on distinct factors provides strong evidence that different underlying processes mediate priming among these task types. It also confirms that perceptual/conceptual distinction will continue to be a useful heuristic in the study of implicit memory. These data fit quite nicely with conceptualizations of both the multiple memory systems (Tulving, 1985) and components process (Moscovitch, 1994) frameworks, but only the implicit tasks conformed to the transfer appropriate processing model (Roediger et al., 1999). References Moscovitch, M. (1994). Memory and working with memory: Evaluation of a component process model and comparisons with other models. In, Schacter, D. L. and E. Tulving (Eds.), Memory systems 1994 (pp. 269-310). London: MIT Press. Roediger, H. L., III, Buckner, R. L., & McDermott, K. B. (1999). Components of processing. In, J. K. Foster, & M. Jelicic (Eds.), Memory: Systems, process, or function (pp. 31-64). Oxford University Press. Tulving, E. (1985). How many memory systems are there? American Psychologist, 4, 385-398.

FRIDAY, AUGUST 8, 2003

Invited Address
9:00 AM – 9:50 AM, Metro Toronto Convention Centre, Meeting Room 701A
Mark E. Stanton, Ph.D., Chair
Ontogeny of Conditioned Fear: Acquisition vs. Expression?
Pamela S. Hunt, Ph.D.
Historically, studies of fear conditioning in adult rats revealed that different response measures may be used to infer fear and that these response measures covary (e.g. freezing, changes in cardiovascular function, potentiation of motor reflexes). The notion of response equivalence based on that covariation remains consistent with a neurobiological perspective in which different behavioral measures of fear are subserved by a common neural circuitry involving the amygdala. Our work with the developing rat has implications for this perspective. We have shown that various measures of fear emerge at different times during ontogeny. For example, conditioned freezing can be seen quite early in development but conditioned changes in heart rate and fear-potentiated startle can not be observed until the animal is several days or even weeks older. We argue this is not simply the result of developmental changes in afferent or effector pathways, and suggest these different response measures may not be functionally equivalent indices of learned fear. Instead, developmental differences in the expression of fear, and, in some cases the failure to express fear, may be mediated by the interaction of different neural systems responsible for associative learning. Our research also suggests plasticity within response pathways themselves may be necessary to enable expression. The developmental approach is allowing researchers to more clearly identify acquisition and performance factors regulating expression of different components of learned fear, and has been useful for suggesting novel approaches to studying the interplay among fear’s underlying neural circuits.

**Hebb Award Address**

2:00 PM – 2:50 PM, Metro Toronto Convention Centre, Meeting Room 701B

Mark E. Stanton, Ph.D., Chair

**Ghost in the Addict: Drug Anticipation and Drug Addiction**

Shepard Siegel, Ph.D.

People who stop drinking or smoking or using other drugs, for weeks and even years, report that cravings reappear. As described by Cocteau, “the dead drug leaves a ghost behind. At certain hours it haunts the house.” The “ghost” is summoned when the former drug user is confronted by cues that had, in the past, been associated with the drug. The cues may be exteroceptive (e.g., places where the drug had been used, or people associated with drug use) or interoceptive (e.g., subjective effects produced by a small dose of the drug, or emotions that had been associated with the effects of the drug). The study of associations is the study of Pavlovian conditioning, and recent research concerning Pavlovian conditioning of drug-elicited responses reveals the relationship between drug anticipation and drug addiction.

**Symposium: Learning to Extinguish Fears and Phobias: Evidence from Behavioral, Neurobiological and Preclinical Experiments**

3:00 PM – 4:50 PM, Metro Toronto Convention Centre, Meeting Room 707

William Falls, Ph.D., Chair

**Importance of Context, New Learning, and Memory Retrieval in Understanding Extinction**

Mark E. Bouton, Ph.D.

Pavlov observed that if a well trained conditional stimulus was presented in the absence of the unconditional stimulus with which it was originally paired, the conditional stimulus would lose its ability to elicit the conditioned response. Pavlov used the term extinction to describe the loss of the conditioned response that occurred with non-reinforcement. The nature of extinction learning has been debated. Contemporary analysis of extinction suggests that the loss of the conditioned response with non-reinforcement is not the consequence of unlearning. Instead, extinction is the consequence of new learning that masks the original learning. The fact that the original learning is not erased is relevant for extinction based psychotherapies and has often been sited as the underlying cause of relapse. In this symposium we will review data indicating that extinction is the consequence of new learning. We will present data indicating that contextual stimuli play a large role in determining whether the original learning or
extinction learning is expressed. We will also review data describing the neural circuits responsible for extinction of conditioned fear. These emerging data suggest that the medial prefrontal cortex plays an important role in extinction memory. Finally, we will review recent data indicating that extinction of spider phobias is also the consequence of new learning. Here as well, contextual stimuli play a large role in determining whether or not the phobia is expressed following extinction.

Learning Not to Fear: The Role of the Medial Prefrontal Cortex in Fear Extinction
Gregory J. Quirk, Ph.D.

In extinction of auditory fear conditioning, rats learn that a conditioned tone no longer predicts footshock, and fear responses decline. Lesion studies suggest that the medial prefrontal cortex (mPFC) may consolidate extinction learning. Recent work has shown that mPFC neurons increase their activity following extinction, supporting Pavlov’s idea that extinction is inhibition, rather than erasure. Consistent with this, electrical stimulation of mPFC reduces fear. Extinction-induced safety-signaling in the mPFC may be deficient in people suffering from post-traumatic stress disorder.

Context Specificity of Extinction in Phobias
Michelle G. Craske, Ph.D.

I will present a series of studies on context specificity of extinction in participants who are fearful of spiders. Typically, we provided graded in vivo exposure and then test the generalizability of effects in the same versus different context, counterbalanced, with random assignment to same versus different context or by a within subjects design where we evaluate the effects of same versus different context in the same participant. Dependent measures include behavioral approach, subjective distress and heart rate. We have found mild context specificity effects when context is differentiated by room and experimenter. These effects were larger when we compared contexts that were more discriminable from each other - outside versus inside.

Social Hour
5:00 PM – 6:50 PM, Crowne Plaza Toronto Centre Hotel, Niagara Room

SATURDAY, AUGUST 9, 2003

Symposium: Memory and Conditioning: Neurobiological, Developmental & Comparative Approaches
9:00 AM – 10:50 AM, Metro Toronto Convention Centre, Meeting Room 717B
Mark E. Stanton, Ph.D., Chair

Encoding Classical Eyeblink Conditioning in the Mammalian Brain
Joseph E. Steinmetz, Ph.D.

An overview of the major regions of the brain that are critically involved in encoding classical eyeblink conditioning in mammals will be presented. A variety of studies have demonstrated that neurons within the cerebellum appear to be responsible for encoding the basic CS-US associations that underlie the acquisition and performance of conditioned eyeblink responses. Further, activities in the cerebellar cortex and the deep cerebellar nuclei appear
to be critical for eyeblink conditioning and populations of neurons in these discrete regions of the cerebellum may be involved in encoding different aspects of conditioning. A model will be presented to describe the involvement of the cerebellum in classical eyeblink conditioning. In addition, many other brain areas are known to become engaged during eyeblink conditioning (e.g., the hippocampus, the striatum, and the amygdala). An overview of what some of these regions may be encoding during conditioning will also be briefly presented.

**Ontogeny of Eyeblink Conditioning in Rodents and Humans**

Mark E. Stanton, Ph.D.

The dramatic progress of behavioral and neurobiological research on eyeblink conditioning over the past 25 years has created an extraordinary opportunity to use this paradigm to advance the developmental psychobiology of learning. It is now possible to relate the ontogenetic emergence of associative learning to developmental changes in a defined brainstem-cerebellar circuit that is necessary and sufficient for the eyeblink conditioned reflex (CR). There is also an opportunity to study ontogenetic dissociations and interactions between sensorimotor learning in this circuit with learning in brain regions that encode the affective (amygdala) and cognitive (hippocampus) aspects of the conditioning episode. This presentation reviews developmental research on eyeblink conditioning in infant rodents and humans that supports a componential view of brain and memory during mammalian ontogeny.

**What Functional Imaging of Eyelid Conditioning Can Tell Us About Learning and Memory**

Bernard G Schreurs, Ph.D.

The search for the biological basis of learning and memory has, until recently, been constrained by the limits of technology to classical anatomical and electrophysiological studies. With the advent of functional imaging we have begun to delve into what, for many, was a “black box”. A number of different types of imaging experiments will be presented including steady state animal experiments that image the functional labeling of fixed tissues and dynamic humans studies based on functional imaging of the intact brain during learning. The data suggest that learning and memory involve a surprising conservation of mechanisms and the integrated networking of a number of structures and processes.

**Executive Committee Meeting**

6:00 PM – 8:50 PM, Fairmont Royal York Hotel, Banff Hospitality Suite (1-263)

**SUNDAY, AUGUST 10, 2003**

**Paper Session III**

9:00 AM – 9:50 PM, Metro Toronto Convention Centre, Meeting Room 718B

**An Investigation of Regular Expression-Based Pattern Matching and Creation**

Anthony M. Cox, Ph.D. & Maryanne L. Fisher, M.S.

Formal languages, as defined by the Chomsky hierarchy, provide a notation for expressing the syntax of a specific language, and therefore, provide a pattern for identifying valid language elements. Regular (Chomsky type 3) languages are particularly recognized for their pattern specification capabilities, as they form the basis of many software string search tools. In our research, we examine the cognitive skills underlying the use of patterns, when the patterns are expressed using regular expressions — a specification for a regular language. We hypothesize that there is a link between expression matching, the identification of language members within a string, and
expression creation, the generation of an expression for a language described by roster. As reading and writing are related in natural language, expression matching and creation are related in pattern systems based on formal languages. Creation, the formulation of new expressions according to a predefined set of rules, builds upon the interpretation and application skills needed to identify language elements. Using a paper-based survey, we asked undergraduate students at a Canadian university to perform expression matching and expression creation. The survey was counter-balanced with half of the participants performing matching before creation and half performing the tasks in the opposite order. Participants were screened to ensure that they had no previous experience with formal pattern and language systems. The results were coded using the information retrieval measures of precision and recall to assess the accuracy and completeness of the participant’s responses. Precision identifies the percentage correct of identified solutions while recall identifies the percentage found of total possible solutions. Our preliminary results indicate that expression creation is strongly related to expression matching, but that creation is a more difficult task. Participants’ recall values are significantly correlated for both creation and matching, as is their overall performance when determined by the sum of their mean precision and recall values. Furthermore, precision is significantly correlated to recall for both creation and matching tasks. Accuracy and completeness improve in concert, suggesting that they result from the application of the same skill set and are not independent skills that can be used to develop more complex strategies (e.g., improved accuracy by sacrificing completeness). Finally, we found that the use of alternation is more difficult than the use of repetition. Participants tended to have lower scores on items containing an ‘or’ operator, than they did on items containing the ‘one or more’ operator. To simplify solution coding, we removed epsilon from the set of grammar non-terminals, transforming the ‘zero or more’ operator (Kleene closure) into a ‘one or more’ operator.

A Comparative Study of Three Sources of Constraint on Attention

David A Washburn, Ph.D.

At any given moment, there is a myriad of stimulation to which we might attend. Sensory information is continually available in a variety of modalities. Additionally, mental stimuli (e.g., manipulating information, remembering, planning, daydreaming) provide opportunities for attention that are at least as potent, even if they are less frequently studied. So what are the factors that determine to what we will attend in each moment of time? Reviewing the literature on attention and its determinants, I have proposed a model in which attention is determined by the competition of three sources of constraint. First, environmental cues vie for the control of attention. Novelty, movement, suddenness, and similar changes in the intensity of stimulation can elicit an involuntary or exogenous shift of attention. Such instances of attention capture rest upon the mechanism of habituation, by which we are inclined to deselect the familiar and unchanging and to attend to changes. However, environmental cues do not control attention alone. Experiential constraints also exert influence on selection. Habitual responses, automaticity, and contention scheduling are three attention-relevant phenomena that reflect these environmental cues, likely through the mechanism of priming and conditioning. Finally, these two sources of constraint vie against a third determinant of attention: executive constraints (instructions, intentions, plans, motivations). That is, we also appear to control attention endogenously, to make voluntary shifts, and to resolve input or response conflict through effortful processing. Of course nonhuman animals pay attention too, and are equally beset by sources of information to which one might attend. The present study was designed to determine whether nonhuman primates too manifest evidence for three separate determinants of attention that exert differential control over selection and performance. Studies with nonhuman animals might be particularly interesting because, although they show many of the classic attentional phenomena of human cognitive research (e.g., Stroop effects, pop-out in visual search, negative priming), there are typically large and reliable quantitative differences in performance between humans and monkeys. For example, humans and monkeys both show Stroop effects, but the magnitude of Stroop-like interference is much larger for the nonhuman primates. An inhibition task was selected for this study. The monkeys had never been tested with an inhibition task, but it allows mechanisms for individually manipulating the environmental, experiential, and executive constraints on attention. The task required a series of speeded responses to pairs of stimuli. One stimulus in each pair was blue, and was the stimulus to which the human or monkey was trained to respond. The other stimulus was white and could be ignored. Each stimulus could be a plus sign, a circle, or a triangle. If the blue stimulus was a plus sign, the subject was to move the joystick to the
left. If the blue stimulus was a circle, the joystick was to be moved right. The triangle was a neutral stimulus. In this way, proactive interference could be produced by manipulating the number of consecutive “left” responses before a “right” response was required. Coactive interference could also be produced by putting a yellow circle on the screen with a blue plus sign, for example. The intensity of this coactive interference was varied by manipulating the size of the yellow stimulus (e.g., an unexpectedly large yellow circle—a manipulation of environmental constraints on attention—was expected to produce more coactive interference than would a yellow circle of the standard size). Executive constraints were manipulated by changing the reward/penalty conditions (the number of pellets for the monkeys, or the number of points for the humans) so as to engage motivation. Twenty undergraduate volunteers were tested on the inhibition task, as were four rhesus monkeys. Responses were made to computer-graphic stimuli by manipulating a joystick. The latency and accuracy of each response was recorded. The data were analyzed as a function of species, source of interference, and intensity of constraint (low versus high environmental constraint; low versus high experiential constraint; low versus high executive constraint). The complex pattern of results cannot be detailed in this summary, but the main findings were interesting. The three determinants of attention were found, as hypothesized, to have independent effects on performance (e.g., manipulating size of the to-be-ignored stimulus resulted in significantly slower response and, for monkeys, significantly reduced accuracy). However, the three sources of constraint were not uniformly potent, nor was the pattern of relative potency comparable across species. Humans showed larger effects than monkeys of the executive-constraint manipulation, whereas monkeys showed larger effects than humans of the environmental-constraint manipulation. The priming effect was comparable for the two species. The species difference in the control of attention revealed here provide a useful way for summarizing a variety of data, including species differences that have been reported in learning, memory, and categorization. It also has implications for the types of training that might be most effective in improving attention-control skills of monkeys, of human children, and of individuals with ADHD.

Presidential Address
10:00 AM – 10:50 AM, Metro Toronto Convention Centre, Meeting Room 701A

Very Early Learning About Alcohol
Norman E. Spear, Ph.D.

Toward understanding why prenatal exposure to alcohol enhances consumption of ethanol later in life for both animals and humans, we have been guided in part by this simple hypothesis: The fetus learns that the odor and taste of alcohol predicts appetitive reinforcement from alcohol’s pharmacological effects, so later in life the animal seeks alcohol flavor. To model the fetal condition of the prenatal human, some of our experiments have asked how the rat fetus responds to alcohol. To model brain development of third-trimester human fetuses, which is more similar to that of infant than prenatal rats, other experiments have tested the infant rat’s response to alcohol. Although the adult rat is reluctant to consume alcohol and usually behaves as if alcohol has little value as an appetitive reinforcer, newborn (3-hr old) and older infant rats readily ingest alcohol. Alcohol also exerts substantial reinforcement in conditioning of the neonatal rat, despite evidence of dissociation between alcohol intake and alcohol reinforcement. The source of alcohol reinforcement in the neonate seems to be largely pharmacological rather than caloric or gustatory. The nature of alcohol’s reinforcing effects are less clear in fetuses and in infants consuming alcohol during nursing, but in each case we have seen suggestions later in life that the earlier alcohol exposure may have been positively reinforcing. The newborn rat’s special efficacy in acquiring robust memories about alcohol and other events associated with the first postnatal meal may be due to neurochemical or hormonal consequences of the birth process.

Business Meeting
11:00 AM- 12:00 PM, Metro Toronto Convention Centre, Meeting Room 701A
Cluster A Program for APA 2003
Divisions 1, 2, 3, 6, 7, & 15

TRACK 1: THE RATIONAL MIND
FRIDAY, AUGUST 8, 2003

Keynote Address - 10:00 AM – 10:50 AM
MaryLou Cheal, Ph.D., Chair
Mapping Bounded Rationality
Daniel Kahneman, Ph.D.

Expert Forum: Developing the Rational Mind - 11:00 – 12:50 AM
Virginia Andreoli Mathie, Ph.D., Moderator
Early Scientific Thought: Knowing, Guessing, and Experimenting
David Klahr, Ph.D.
How Students Change Over Time as Psychological Thinkers
Jane Halonen, Ph.D.
Social Capital and the Rational Habit of Mind
Daniel P. Keating, Ph.D.
The Role of Technology in Developing Good Thinking
Roxana Moreno, Ph.D., J.D.

Keynote Address - 1:00 – 1:50 PM
Thomas Zentall, Ph.D., Chair
The Rational Mind: “Thin Colonies of Reason Amid a Savage World”
Edward A. Wasserman, Ph.D.

The Rational Mind
Is there a rational mind? Sometimes it seems so, but there are other instances in which behavior does not seem to
be rational. These ideas will be discussed in the opening keynote address by Daniel Kahneman, PhD, entitled “Mapping
bounded rationality.” His address is an adaptation of the Nobel lecture given in Stockholm and will be followed by an
expert forum of eminent psychologists. David Klahr, PhD, Jane Halonen, PhD, Daniel P. Keating, PhD, and
Roxana Moreno, PhD, J.D., will each present one aspect of the development of the rational mind in both nonhuman
and human infants, followed by discussion among the panel and the audience. The track will be completed by a keynote
address by Edward A. Wasserman, PhD, entitled, “The rational mind: ‘Thin colonies of reason amid a savage world’.”

TRACK 2: THE EMOTIONAL MIND
SATURDAY, AUGUST 9, 2003

Keynote Address - 11:00 AM – 11:50 AM
Patricia L. Pliner, Ph.D., Chair
You Make Me Sick: Revulsion and Disgust
Paul Rozin, Ph.D.
Expert Forum: Origins of Passions and Humors: From Affective Functioning to Motivation - 12:00 – 1:50 PM

Martin Seligman, Ph.D., Moderator

The Inseparability of Emotion and Cognition: What Temperament Teaches Us About Behavior
Nathan Fox, Ph.D.

Emotions in Adolescence: A Neurobiological and Comparative Perspective
Linda Patia Spear, Ph.D.

Interpersonal Regulation and Expression of Emotion
Richard Michael Ryan, Ph.D.

Pleasure vs. Gratification
Martin Seligman, Ph.D.

Keynote Address - 2:00 – 2:50 PM

Roger Thompson, Ph.D., Chair

Reunification of the Rational Mind with the Emotional Mind
Daniel Robinson, Ph.D.

The Emotional Mind

What characteristics identify an emotional mind? What role does the emotional mind play in our lives? These issues will be introduced in a keynote address presented by Paul Rozin, PhD, speaking on revulsion and disgust. The expert forum that follows will explore origins of passions and humors, from affective functioning to motivation, and will be moderated by Martin Seligman, PhD. Nathan Fox, PhD, Linda Spear, PhD, Richard Ryan, PhD, and Martin Seligman, PhD will discuss these issues from a variety of perspectives. The two-day series will be concluded with a keynote address by Daniel Robinson, PhD, speaking on the reunification of the rational mind with the emotional mind.