

ABSTRACTS

The Tower of London: Different Scoring Methods Lead to Different Developmental Hypotheses. Karen Baker,* Sidney J. Segalowitz,† and Mary-Claire Ferlisi,† *University of Waterloo; and †Brock University.

The Tower of London is frequently used to assess executive functioning in both adults and children. However, differing scoring procedures make interpretation of results across studies problematic: A comparison of two methods of scoring the Tower of London resulted in support for two different developmental hypotheses. Results of the first method (Krikorian, Bartok, & Gay, 1994) show a developmental trend in performance from middle childhood to adulthood. The second method (Anderson, Anderson, & Lajoie, 1996) showed a developmental progression from age 7 to age 13, but no significant difference in performance between 13-year-olds and young adults. Correlations between scoring methods were high for 7-year-olds (.86), and fell across development to a low of .39 for adults. These results demonstrate difficulties in determining the developmental trajectory of executive functions.

Speculations about Systemic and Modular Approaches to the Development of Cognition in Autism. Jake Burack,* Philip David Zelazo,† and Grace Iarocci,* *McGill University; and †University of Toronto.

Whereas modular approaches to the study of developmental disorders such as autism involve the search for a single defining core deficit, a systemic developmental approach encourages a comprehensive view of an individual's abilities across age and domain of functioning. Performance is examined within the contexts of general and specific developmental levels, comparison groups, types of experimental task, and task difficulty. These considerations entail more conservative questions and conclusions for each individual study but engender more collaborative and systematic work among researchers. The combination of precision within study but interconnectedness among studies facilitates a better understanding of the developmental organization of persons with autism, and thereby promotes a shift in emphasis from small modular questions of deficit to bigger questions of the relation between typicality and atypicality. In this presentation, we review several systemic developmental research initiatives, especially with regard to research in attention and cognition as a framework for providing a more precise and integrated understanding of persons with autism.

Neurochemical Modulation of Judgment and Response Bias. June Corwin, New York University School of Medicine.

Many, if not most, neuropsychiatric disorders are marked by abnormalities in judgment. Patients often fail to appreciate the costs and rewards of the choices they make when uncertain, and/or they fail to conform their behavior to these contingencies. Disorders in which judgment abnormalities are obvious and debilitating include affective disease, drug dependence, and the dementias. It has been difficult to model abnormal decision processes in the laboratory and to assess the effects of potential treatments on judgment.

One operational characterization of these decision processes under conditions of uncertainty

is response bias, which can be measured unambiguously only when the set of possible response choices is limited. Under the simplest conditions, possible responses are limited to yes/no or go/no-go choices. Paradigms using these response options are ubiquitous in the laboratory and include such tasks as the Continuous Performance Test, the Sternberg Short Term Memory Scanning task, the Peterson–Brown task, yes/no recognition memory and identification tasks, and go/no-go discrimination tasks. Bias is characterized as neutral, yea-saying (liberal) and nay-saying (conservative).

In these paradigms response bias can be measured independently of accuracy using two theoretical approaches: Two-High Threshold Theory with the accuracy measure P_r and the bias measure B_r , or Signal Detection Theory with the accuracy measure d' and the bias measure C . Bias can be manipulated reliably by two paradigm modifications: changing the ratio of targets (correct response items) to distractors (incorrect response options), and/or explicitly changing the costs of the two possible error types: false alarms (incorrect acceptance of distractors) and misses (incorrect rejection of targets).

Empirical results from a set of ongoing studies in which bias was characterized and manipulated neurochemically and behaviorally will be presented. A variety of tasks was used, including assessments of attention, learning and memory, and olfactory identification. These results may be summarized as follows:

Bias is LIBERAL in hypomania, Alzheimer's disease, Huntington's disease, Down's syndrome, anticholinergic treatment, HIV Dementia, opiate intoxication, and sober cocaine/crack abusers.

Bias is NORMAL in amnesia.

Bias is CONSERVATIVE in depression and THC (marijuana) intoxication.

Bias NORMALIZES in successful treatment of depression with tricyclic antidepressants, serotonin specific reuptake inhibitors, and hypomania with lithium carbonate.

Bias is INCONSISTENT in malingered memory deficit.

Bias RESPONDS ABNORMALLY to behavioral manipulations in depression and opiate intoxication. These results will be discussed in terms of their possible neurochemical modulators, including cholinergic (both muscarinic and nicotinic), adrenergic, dopaminergic, and opiate systems.

Evolution Proposes and Ontogeny Disposes. Victor Denenberg, University of Connecticut, Storrs.

Genes, the basic building blocks of evolution, are highly conserved. For example, the mouse and human have approximately the same number of genes, and around 94% are identical in the two species. Since species differ in multiple dimensions (e.g., anatomy, physiology, behavior), it follows that identical genes may subserve different functions in different species. Two reasons for this is because of gene–gene interaction and gene–environment interaction (and it is the presence of these interactions which prevents one from making deterministic statements about genetics, thus rendering obsolete the Nature–Nurture controversy). Behavioral examples of both types of interaction will be presented. These include studies showing that (1) the uterine environment enhances later cognitive competence, (2) early postnatal experiences affect learning and emotionality, (3) maternal behavior changes alter aggressiveness, and (4) knocking out one gene results in an animal less competent in spatial learning but more competent in S–R associative learning.

A Case Study of an Autistic Man with a Severe Symptomatology of Repetitive Behaviors: Relation with Executive Functions Hypothesis in Autism. Fanny De Reuck,* Louise Gagnon,† Edith Ménard,‡ and Laurent Mottron,† *Département de psychologie, Université catholique de Louvain-la-Neuve, Belgium; †Département de psychologie, Université de Montréal; and ‡Hôpital Rivière-des-Prairies, Montréal, Canada.

An executive function deficit hypothesis has been proposed to account for the restricted interests and stereotyped behaviors (RISB) of individuals with autism (Turner, 1997). Executive functions (EF) encompass cognitive processes involved in problem-solving, or goal-directed behaviors such as problem representation, strategic planning of actions, inhibition, flexible execution of a plan, and evaluation of actions. Evidence for deficits on tasks assessing EF have brought further support for the executive dysfunction hypothesis in autism. This study presents the case of H.E., a man with autism and mild mental deficiency who presented a high frequency of RISB, in conjunction with an unexpectedly high performance on the Tower of London task (TOL), a planning task. The goal of this case study was (1) assess the stability of H.E.'s performance on the TOL, (2) investigate H.E.'s impaired/preserved EF, and (3) discuss H.E.'s level of executive functioning in relation to his RISB. This case has theoretical relevance considering the relation between EF deficits and ritualized behaviors.

The Relationship between Trait Anxiety and Level of Alcohol Consumption in Social Drinkers: Effects on ERP Indices of Memory. Allison M. Fox, Robert J. Barry, Alistair Lethbridge, Sue Bresnahan, and Jason Bruggemann, University of Wollongong, Australia.

Previous research has suggested that frequent, heavy, social drinking may have long-term effects on the ability to process cognitively complex information. However, others have argued that the results reflect confounding by variables such as IQ and psychological distress. The present study examined the effects of level of alcohol consumption and trait anxiety on event-related potential indices of memory in light ($n = 12$) and heavy ($n = 12$) social drinkers. ERP results indicated that the processes which predicted subsequent memory performance differed for the light and heavy social drinkers, and that the differences were not related to trait anxiety status. The results provide support for the application of ERP techniques to enhance understanding of the nature of memory processing differences between light and heavy social drinkers.

Validity of a Computerized Administration of the Warrington Recognition Memory Test and the Detection of Simulated Memory Deficits. Allison M. Fox,* E. Arthur Shores,† and Hilarie Tardif,* *University of Wollongong, Australia; and †Macquarie University, Australia.

The detection of incomplete effort on neuropsychological test performance is an increasing problem for clinical neuropsychologists. Procedures have typically employed comparison of the profile of neuropsychological test results with the expected neuropsychological deficits in brain damaged individuals. The present study reports preliminary data examining the validity of a computerized administration of the Recognition Memory Test (Warrington, 1984) in both a normative control sample ($n = 16$) and in a sample of subjects instructed to feign a believable head injury related memory deficit ($n = 8$). Results supported the equivalence of the standardized and computerized versions in both groups and provided evidence for the utility of recommended cut-off scores in the detection of incomplete effort. Potential problems with the cut-off scores identified in studies using university students are discussed.

Inferring What Speakers Say and Implicate. Raymond W. Gibbs, Jr., University of California, Santa Cruz.

The traditional view in pragmatic theory is that a distinction exists between what speakers say and what they mean, communicate, or implicate in context. For example, when uttering "Jane has three children," a speaker might only say that "Jane has three children but may have more than three," but the speaker implicates that "Jane has exactly three children." Under this view, pragmatics plays only a small role in determining what speakers say and has a primary part in interpreting speaker's intended messages. I describe empirical work

showing that pragmatics has a fundamental role in determining both what speakers say and what they implicate. I will discuss the importance of these findings for contemporary pragmatic theory.

Theory and Research on the Evolution of Cerebral Specialization before and after Darwin: The Question of Handedness. Lauren J. Harris, Michigan State University, East Lansing.

Scientists today who seek clues into the evolutionary origins of human handedness make extensive use of comparative data, that is, from studies that ask whether handedness occurs in other species, especially apes and monkeys, as the Darwinian principle of continuity would seem to imply, or whether, to the contrary, it is uniquely human. In this paper, I review early research on animal handedness in the period before publication of Darwin's *On the Origin of Species* in 1859 and, following that, through the first decade of the 20th century. Inasmuch as an examination of Darwin's writings reveals hardly any statements about handedness and none at all about its evolution and continuity across species, I also speculate about what Darwin *might* have said based on his statements on related matters, such as the morphology of the hand and the transition from a quadrupedal to bipedal stance, and from others' reports and opinions about handedness with which he is likely to have been familiar. I conclude by asking how and to what extent early investigators, lacking direct statements by Darwin himself on the evolution of handedness, drew on his theory of evolution and his statements on related matters in the interpretation of their findings.

Studying Cholinergic Mechanisms in Normal Aging and Pathological States: Which Experimental Tasks to Choose? Helen J. Kahn, Northern Michigan University.

What information have we gained as a scientific community concerning the cholinergic influences on everyday cognition? Research in which pharmacologic agents have been administered to individuals in an effort to study neurotransmitter mechanisms has utilized tasks that are reliable, have internal validity, but lack considerably in external validity. For instance, the Stroop task, the Paired Associate Learning Task, or mental rotation tasks are experimental tasks that have been widely used in research, and they measure discrete mechanisms concerned with attention and memory. However, in the everyday world, one does not need to differentiate the color of the word from the word itself, although clearly we do need to inhibit some information in favor of other information. In other words, how do these tasks translate into externally valid, real-world aspects of cognition? If we wish to study attention and memory via the cholinergic system, we need to construct and use tasks that bear direct relationship to cognitive functioning in the everyday world. This presentation will focus on well-validated tasks that are highly reliable, have internal validity, and may effectively be generalized to the real world.

Associative Priming between Spoken Texts and between Hummed Melodies of Familiar Songs: Event-Related Brain Potentials Measures. Marc E. Lavoie and Isabelle Peretz, Groupe de Recherche en Neuropsychologie Expérimentale, Université de Montréal, Québec, Canada.

Recognition of the text of a familiar song (e.g., *Frère Jacques*) is facilitated by the previous presentation of a different excerpt from the same song (e.g., *Dormez-vous*) compared to when the prime is coming from a different but equally familiar song. These associative priming effects can also be obtained when prime and target are both hummed instead of spoken. Evidence for priming effects was obtained here on response times in both the spoken and the hummed condition. However, event-related brain potentials only revealed priming effects in

the spoken condition. Texts preceded by related texts elicited larger N400 components than those preceded by unrelated texts. This priming effect was larger at left frontal recording sites. There were no such priming effects in the hummed condition. The results are consistent with the notion that the N400 component is language-specific. Unlike previous studies, the amplitude of the N400 component was found here to reveal lexico-semantic congruity, not semantic incongruity, and could be explained by the inhibition theory.

Comparison of Two MRS Protocols for Neuropsychology: Short (STEAM) and Long Echo Time (PRESS). C. Mailloux,* M. Dumont,* C. M. J. Braun,* and Y. Boulanger,† *Université du Québec à Montréal; and †Centre Hospitalier de l'Université de Montréal.

Magnetic resonance spectroscopy (MRS) is a noninvasive *in vivo* technique which provides chemical characterization of small brain areas. The two most commonly used acquisition protocols, in proton MRS, are stimulated echo acquisition mode (STEAM) and point resolved spectroscopy sequence (PRESS). This study investigated 32 normal adults with STEAM and 35 age- and sex-matched normals with PRESS. We analyzed four metabolites and three brain sites, compared internal correlations of these metabolites by brain site, and determined relative sensitivity of each protocol to normal aging. Mean metabolite values were significantly and consistently higher with STEAM, though the readings from the two protocols were significantly correlated. STEAM yielded markedly more variable measures. However, both protocols were equally and significantly sensitive to normal aging. The two protocols are sensitive and relatively coherent, thus the shorter acquisition time of PRESS presents an outstanding advantage.

Which Comes First, Memory or Language? Rachel I. Mayberry, McGill University.

The language backgrounds of deaf individuals whose primary language is signed is highly heterogeneous. Deaf school-aged children, for example, receive highly variable kinds and amounts of signed input ranging from a few hours daily to full immersion. Deaf adults, moreover, have experienced highly variable ages of first sign acquisition ranging from infancy to late adolescence. We have used this heterogeneity in linguistic experience to investigate the relationship between memory and language. Specifically, we have examined the possible causal nature and direction of the language/memory relationship. This paper summarizes a series of experiments with deaf children (ages 7 to 15) and adults (ages 20 to 70) that compared and contrasted memory for signed digits, words, and sentences in association with measures of signed language comprehension. Together the results shed much light the nature and direction of the relation of memory to language in linguistic knowledge.

Deficits in Pragmatic Understanding after Brain Injury: Do These Reflect a Failure to Attribute Speaker Intention? Skye McDonald, University of New South Wales, Sydney, Australia.

Clinical research has indicated that different forms of acquired brain injury such as focal damage to the right hemisphere or diffuse injury following traumatic brain injury can interfere with the ability to comprehend pragmatic inferences in conversation. This paper considers whether it is possible to delineate, more specifically, the aspect of pragmatic processing that is impaired in these instances using sarcasm as an example. When a sarcastic comment is made the speaker usually infers that (a) the state of affairs is the opposite to that stated and (b) that he (the speaker) is ridiculing the listener in some way. There has been little systematic study of these separate aspects of pragmatic processing. However, pilot research with traumatically brain-injured adults suggests that the counterfactual inference may be less opaque for them to detect than inferences regarding the intentions of the speaker. The implications of this in terms of brain processes are considered.

Cognitive Deficit in Autism: Specific or Distributed? Laurent Mottron, Université de Montréal.

Pervasive developmental disorders are characterized (1) by an uneven profile of performance consisting of peaks and dips and (2) by deficits among apparently heterogeneous cognitive domains. Cognitive accounts of autism propose that deficits in a small number of cognitive operations may have detrimental consequences for several behaviors. The rational basis of cognitive models is that some elementary operations are mandatory for the normal accomplishment of a large number of behaviors. More recent complexity accounts postulate that any cognitive operation surpassing a certain level of complexity is impaired in autism. These models are based on the absence of localized anatomical or functional deficit in autism. Cognitive accounts succeed in explaining restricted portions of autistic deficits and symptoms, but they fail to explain the link between impaired domains. On the other hand, complexity accounts succeed in explaining the heterogeneity of defective operations and abnormal behaviors, but are highly dependent on post hoc measures of complexity. Respective interest of these two theoretical trends will be discussed here.

Nicotinic Cholinergic Systems and Cognitive and Motor Performance in Aging and Disease. Paul Newhouse, Department of Psychiatry, University of Vermont College of Medicine.

The loss of central nicotinic receptors is a neurochemical hallmark of several degenerative brain disorders, notably Alzheimer's disease (AD) and Parkinson's disease (PD). Further, alterations in nicotinic receptor structure and/or function may be important in a number of other neuropsychiatric disorders including schizophrenia, and its attention deficit hyperactivity disorder. Investigation of the effects of nicotinic agents in both normal and diseased individuals has produced significant evidence of the importance of the integrity of these systems for normal cognitive functioning. Studies in our laboratory utilizing the nicotinic antagonist mecamylamine have shown that blockade of nicotinic receptors produces measurable and significant cognitive impairment similar in nature to deficits seen in dementing illnesses. This work suggests that symptoms of impaired acquisition of information and short-term storage, impaired memory consolidation, attention, visual perception, and speed may reflect nicotinic lesions. These studies and others have suggested that nicotinic systems may be involved in the modulation, partitioning, and maintenance of attention, especially for tasks involving working memory; e.g., nicotinic systems may help constrain the focus of attention. Recent studies with nicotine and novel nicotinic agonists such as ABT-418 by our group in AD patients suggest that nicotinic stimulation can improve the acquisition and retention of verbal information and decrease errors. We have also recently embarked on a series of studies examining the acute and subchronic quantitative effects of nicotine on cognitive and motor functioning in Parkinson's disease. Preliminary results suggest that acute nicotine administration speeds some aspects of cognitive and motor performance and may improve the processing speed of more complex tasks involving as opposed to simple tasks. Studies are ongoing. Further work will attempt to examine how nicotinic stimulation effects attentional systems, mnemonic systems, and motor systems in patients with degenerative and nondegenerative neuropsychiatric disorders as well as whether chronic stimulation with nicotine or novel agonists will produce clinical benefit.

Reduced Perception of Similarity in Autism. Michelle O'Riordan, University of Cambridge.

Children with autism and typically developing children were compared on a series of visual search tasks. In visual search tasks subjects are required to indicate the presence or absence of a prespecified target which is hidden among simultaneously presented distractors. In a feature task the target is defined by a single feature but in a conjunctive search task the target is only uniquely defined by the combination of its component parts. It was found that the children with autism were superior to matched controls at both feature and conjunctive visual

search. Discriminability of display items is the critical factor influencing the ease of target detection. This suggests that superior visual search in autism may result from an enhanced discrimination ability. In support of this notion the performance of children with autism was less affected than controls by manipulations of the similarity of display items. Further empirical work suggests that differential low-level perceptual mechanisms underlie the enhanced discrimination ability in autism. More specifically, individuals with autism have a reduced perception of similarity. This work challenges the weak central coherence theory at the lowest level and may relate to other examples of visuo-perceptual disturbance in autism.

The Relationship between Inhibition and Impulsivity: A Replication and Extension of Visser's Work. Patricia Pailing,* Sidney J. Segalowitz,† and Jane Dywan,† *University of Waterloo; and †Brock University.

Using seventh-grade school children, Visser, Das-Smaal, and Kwakman (1996) found group differences in inhibitory control for social impulsivity ratings (hyperactivity) but not for cognitive impulsivity ratings (impulsive working attitude). The current study set out to replicate these findings in an adolescent sample with a variety of learning and attentional problems. Negative priming (NP) scores were gathered from 36 high school students (Mean age = 15.69), while homeroom teachers rated students on the Visser Impulsivity Scales (VIS). The current study also found a relationship between NP and social impulsivity, but learning ability influenced the magnitude of this relationship. In contrast, only a spurious NP–cognitive impulsivity relationship was found as this relationship was confounded by gender differences. Thus, this investigation replicates Visser and colleagues' main finding, but also suggests that gender and learning ability may be important covariates in the inhibition–impulsivity relationship.

The Cerebral Division of Labor in Verbal Communication. Michel Paradis, McGill University.

Because utterances are never used in the absence of a context from which they necessarily derive at least part of their meaning, generative grammars have been criticized for dealing only with context-independent sentence grammar. Yet, attempts to integrate pragmatics into a formal grammar have not been very successful. It seems that the brain has adopted a division of labor strategy in subserving the two systems independently: (1) Lesions in areas of the left hemisphere have long been known to cause sentence-grammar deficits while lesions in areas of the right hemisphere have more recently been reported to cause pragmatic deficits. (2) Neuroimaging studies (rCBF, PET, fMRI) show activation of both hemispheres during story comprehension tasks, even though the right hemisphere has not been demonstrably implicated in the routine processing of grammar. (3) A cognitive ERP study conducted last year in collaboration with Riccardo Budai and Franco Fabbro on professional conference simultaneous interpreters shows a strongly significant separation between grammatical and pragmatic cerebral processing and actually suggests that the literal meaning is processed before pragmatics is activated. These findings provide theory-external justification for considering grammar and pragmatics as separate neurofunctional modules, the latter having as input the former's output. Both modules are necessary but neither is sufficient for normal verbal communication.

Language Acquisition and Cognition Development in Autistic Children. Christophe Parisee, Laboratoire de Neuropsychologie de l'Enfant, INSERM, France.

The development of cognition in autistic children is addressed through a study of their acquisition of language. An analysis of corpora from the CHILDES database was undertaken to determine whether autistic children follow more closely their parents' language than do other children. The linguistic behavior of autistic children was compared with that of Down's syndrome and SLI children, and three groups of normally developing children. Quantitative

analysis showed that normal autistic children do only imitate multi-word utterances to a greater extent than found in other children. Interestingly, imitation of single-word utterances is just as frequent in autistic as in other children. Also, the autistic child's distribution of lexical categories is closer to that of the adult's than is the case for other children. Finally, autistic children produce less pointers to objects and events than any group of children and also less than their parents, whereas other groups of children either match or exceed their parents' use of pointers. Autistic children do not seem to imitate more closely than other children the language of their parents, but in a different and thus more striking way, autistic children produce some features original to their cognitive development. Their abnormal characteristics in prosody, their idiosyncrasies in body movements, and the wide range of their symptomatology, suggest that their deficits should be looked at using a more global framework. A model that takes into account the synergy between various cognitive mechanisms is presented in order to explain how a single general distributed anomaly in these children's neuronal mechanisms can develop into the wide covering and nonsystematic patterns observed in autistic children. This framework constitutes an alternate view to localistic explanations.

Clinical Pragmatics: Theory into Practice. Claire Penn, University of the Witwatersrand, Johannesburg, South Africa.

This paper will review the clinical application of pragmatic theory over the past two decades in the field of adult language pathology. Pragmatic competence is conceptualized as a number of interrelated skills manifesting in real-time in a range of adaptive behaviors, driven by underlying cognitive processes and variably compromised in brain damage. Differential neurological profiles reflect different pragmatic outcomes, which in turn challenge the clinician in different ways. Using the neuropsychological and linguistic profiles of certain illustrative clinical cases, current approaches to pragmatic assessment, and therapy will be considered. Specifically, the importance of discourse will be explored as a window onto the pragmatic deficit of such patients and the link between discourse and cognitive processes will be highlighted. A distinction will be drawn between the notions of "pragmatic" and "functional" and between testing and assessment. Certain cornerstones of current therapy approaches will also be considered.

MRI Estimation of Brain Volume Compared to Autopsy-Derived Estimation of Brain Volume. M. Peters,* L. Jäncke,† and K. Zilles†, *University of Guelph, Guelph, Canada; and †Research Center, Jülich, Germany.

The volumes of the autopsy-derived brains of eight men and two women were measured by conventional displacement procedures, and subsequently scanned with two methods (Flash, MPR), at two thicknesses each (ca. 1 and 5 mm) in order to derive MRI-based volume estimates. Correlations between autopsy and MRI estimates ranged from .83 to .97. All MRI measures gave significantly higher volume estimates than displacement measures, and 5-mm slices gave significantly higher volume estimates than 1-mm slices. There were no significant differences between Flash and MPR estimates.

Evolution of Hemispheric Specialization for Exploration, Fear, and Aggression. Lesley J. Rogers, School of Biological Sciences, University of New England, Armidale, Australia.

Differential specialization of the cerebral hemispheres for exploration, fear, and attack responses has now been shown in a number of vertebrate species. Attack and fear responses appear to be controlled by the right hemisphere and exploration (or approach) by the left hemisphere. Baboons are more likely to direct agonistic responses to conspecifics detected initially in the extreme left visual field (right hemisphere) than in the right visual field (left hemisphere). Toads are more likely to deliver agonistic strikes at conspecifics located in the

left visual hemifield and to strike at prey in the right hemifield. Consistent with these results, chicks exhibit higher levels of aggression when tested monocularly using the left eye (right hemisphere) than when using the right eye (left hemisphere). Fear responses show a similar association with the right hemisphere. Hence, it seems that specialization of the right hemisphere for fear and agonistic responses evolved early and has been conserved over divergent lines of evolution. The left hemisphere appears to be specialized for exploration, as shown recently in the marmoset: right-handed marmosets explore a novel setting more than left-handed marmosets. Associations between hand preference, hemispheric dominance, and cerebral specialization will be discussed in an evolutionary framework.

Estrogen and Cognitive Functioning in Healthy Elderly Women. Barbara B. Sherwin, McGill University.

Findings from basic neuroscience have provided evidence that estrogen increases synaptogenesis in the CA1 region of the hippocampus and increases the production of choline acetyltransferase (ChAT), the rate-limiting enzyme for acetylcholine formation. Also, nerve growth factor (NGF) colocalizes with estrogen receptors in cholinergic neurons of the basal forebrain. Thus, several mechanisms of action of this sex steroid hormone affect specific brain structures and functions that are known to mediate aspects of cognition. Because the ovaries become atrophic by the average age of 52 years, postmenopausal women present a useful model for investigating the effects of estrogen on cognitive functioning. In several prospective studies of premenopausal women who had their uterus and ovaries surgically removed for benign conditions, those who randomly receive estrogen postoperatively maintained and/or improved their scores on tests of explicit memory, whereas scores of placebo-treated women on these same-tests decreased significantly compared to preoperative baseline. In cross-sectional studies of older postmenopausal women matched for age, education, and socioeconomic status, long-term estrogen users also had higher scores on tests of explicit memory compared to estrogen nonusers. Finally, when young women were given a gonadotropin-releasing hormone analog (GnRH-a), scores on tests of verbal memory decreased when ovarian function was suppressed and the deficit was reversed in the group that continued treatment with the GnRH-a plus "add-back" estrogen but remained in those given GnRH-a plus "add-back" placebo. Taken together, these findings support the conclusion that estrogen serves to maintain aspects of memory in women and that exogenous estrogen may protect memory in aging women.

Referential Communication in Conversation and Alzheimer's Disease: A Case Study. B. Ska and P. Malenfant, Université de Montréal.

In order to investigate pragmatic impairments of subjects with Alzheimer's disease (AD), a conversational task with formal constraints was used. Two female subjects (84 and 88 years old) with Alzheimer's disease took part in the study. Each of them was matched with three control subjects. The number of words, the number of turn-taking, and the time spent to the task by the AD subjects are the same as the control subjects. However, the use of definite references and lexical labels is normal for the subject AD1 and not normal for the subject AD2. Moreover, the two AD subjects use more new labels and they arouse more requests for clarification than the controls. The results suggest that AD patients encounter specific problems in conversation.

Memory with and without Language: Differential Performance on the Rey-O. Romy V. Spitz and Judy Kegl, University of Southern Maine.

Our studies in Nicaragua have offered us a unique opportunity to explore issues concerning the interrelationship between memory and language. This study examined the influence of

language on memory in subjects who are languageless, using a task which is typically assumed not to involve language. The Rey-O with a 3-minute delayed recall trial was given to 13 Nicaraguan deaf homesigners who had no exposure to signed language and who communicate via gestures. Homesigner's performance was compared to that of fluent Nicaraguan Signers. To equate testing conditions, all subjects were instructed using gesture, not sign. The results showed that homesigners recalled fewer details than fluent signers even when differences in copy accuracy were accounted for via a percent recall measure. Similar performance on the Beery VMI across groups indicated that the difference in Rey-O performance was not due to poorer spatial constructive abilities in homesigners. These results show that while performance on spatial tasks not requiring memory do not differ between subjects with or without language, tasks that require memory show substantial language effects, even for nonlanguage memory tasks.

On the Relationship between Language, Theory of Mind, and Executive Functions in High and Low Functioning Children with Autism. Helen Tager-Flusberg, University of Massachusetts and Eunice Kennedy Shriver Center.

In recent years there has been considerable debate concerning the specificity of the deficit in theory of mind in autism. Some have argued that deficits in theory of mind are domain specific, whereas others have claimed that they may be related to other domains of functioning including language and executive functions. In a recent study of 50 children with autism, aged between 4 and 12 years, we administered a battery of theory of mind tasks, standardized language measures, and measures of executive functions (divided into measures of inhibitory control, and working memory). Half the sample were high-functioning children with IQs in the normal range, and half the sample had IQs in the mild or moderate range of mental retardation. Our main findings were that overall, performance on the theory of mind tasks was significantly correlated with some of the language and executive functions measures in a subset of the sample, particularly within the low-functioning group. There was, however, a subset of the sample in whom the theory of mind measures were unrelated to either language or executive functions. These findings have important implications for theories of domain-specific impairments in autism.

Detecting Feigned Memory Impairment Using Event-Related Potentials. Hilarie Tardif, Allison M. Fox, and Robert J. Barry, Department of Psychology, University of Wollongong, Wollongong, New South Wales, Australia.

A number of studies have supported the use of forced-choice tests, such as the Warrington Recognition Memory Test (RMT), as indicators of simulated memory impairment. It has also been reported that event-related potentials (ERPs), recorded during recognition memory tasks differentiate "old" and "new" words, and that this difference depends on conscious awareness of whether the words have been previously seen. In the present study, a control group ($n = 9$) and a group instructed to feign an injury-related memory deficit ($n = 9$) completed a computerized version of the RMT while ERPs were recorded. The behavioral data alone gave moderate levels of detection of malingerers (44.4 and 77.8% at the frequently used cut-off scores of 25 and 33, respectively), however, addition of the electrophysiological measures allowed 100% accuracy, with no false positive results.

Comparative Neuropsychology: A Stroll through Animals' Left and Right Perceptual Worlds. Giorgio Vallortigara, Department of Psychology, University of Trieste, Trieste, Italy.

Perceptual asymmetries in humans typically manifest themselves under quite unnatural conditions (e.g., tachistoscopic viewing and dichotic listening) and this has led to questioning of

their real biological significance. In animals with laterally placed eyes, however, perceptual asymmetries are ubiquitous and reveal themselves in the differential use of the lateral visual field of the left and right eye in everyday behavior. Data are reported showing how preferential use of the left and right eye influences direction of turning in detour behavior in chicks; similarities with detour tests performed in fish and evidences for asymmetries in eye use in species with larger binocular overlap (e.g., toads) are discussed. Implications of these perceptual asymmetries on the formation and fate of memory traces are considered, with examples from unihemispheric sleep and lateralization of spatial memory in chicks. Finally, speculations about the evolutionary origins and possible adaptive advantages of perceptual asymmetries in vertebrates are presented.

Sensory Modality versus Linguistic Status: Shaping the Architecture of Working Memory. Margaret Wilson,* Alicia Iverson,* and Karen Emmorey,† *North Dakota State University; and †The Salk Institute for Biological Studies.

In previous comparisons between hearing and deaf subjects we have found a high degree of parallel structure in working memory for spoken language and signed language, despite the radical differences in how information is coded in the two modalities. This suggested an overriding role of abstract linguistic properties in organizing working memory. In contrast, we have recently shown that spatialized aspects of sign language do influence how information is stored and rehearsed in working memory. Is this a consequence of the linguistic nature of the spatialized information? Here we report comparisons between deaf signers and hearing nonsigners in immediate serial recall of sign language stimuli, revealing similarities and differences in how working memory makes use of space to encode spatialized linguistic information versus nonlinguistic (from the nonsigner's perspective) spatial and motoric information.

Hemispheric Contributions to Verbal Communication? Eran Zaidel,* Asa Kasher,† Gila Batori,† Nachum Soroker,† David Graves,§ and Rachel Giora,† *University of California at Los Angeles; †Tel Aviv University; ‡Bet Loewinwein Rehabilitation Hospital (Israel); and §Academic College of Tel Aviv–Jaffa.

Twenty-seven patients with right hemisphere damage (RBD) and twenty-one patients with left hemisphere damage (LBD) received a new pragmatics battery in Hebrew consisting of two parts: (1) comprehension and production of basic speech acts (BSAs), including tests of assertions, questions, requests, and commands, and (2) comprehension of implicatures, including implicatures of quantity, quality, relevance, and manner. Each test had a verbal and a nonverbal version. Patients also received a Hebrew version of the Western Aphasia Battery. Both LBD and RBD patients were impaired relative to controls but did not differ from each other in their overall scores on BSAs and on Implicatures. This result persisted when scores were corrected by aphasia or neglect scores. There was a systematic localization of BSAs in the left hemisphere (LH) but not in the right hemisphere (RH). There was poor localization of Implicatures in either hemisphere. BSAs were associated with language functions measured with the WAB, suggesting the radical possibility that the localization of language functions in aphasia is due to the localization of the BSAs required by aphasia language tests. The verbal and nonverbal BSAs do not measure the same underlying abilities: they localize differently, and they associate with different language functions. There was a greater association between verbal and nonverbal implicatures and between implicatures and BSAs in LBD than in RBD patients. Thus, only the LH may contain an unmodular domain-nonspecific set of central cognitive mechanisms for applying means–ends rationality principles to intentional activity.