

**Papers and Posters Presented at the 31st Annual Meeting of the Psychonomic Society
The Hyatt Regency New Orleans, New Orleans, Louisiana
November 16-18, 1990**

CATEGORIZATION

Regency Ballroom A, Friday Morning, 8:00-9:45

Chaired by Betty Tuller, Florida Atlantic University

8:00-8:20 (1)

System Topographies as Explanatory Constraints on Category Learning. LAWRENCE W. BARSALOU & CHRISTOPHER R. HALE, *Georgia Institute of Technology*—Whereas exemplar, prototype, and connectionist models assume that similarity underlies category learning, domain theories and explanation-based learning suggest that explanations are central. Subjects learned the topography of a physical system and then learned to troubleshoot faults. On each trial, subjects received symptoms (features) and identified the fault (a category). When subjects knew the system's topography, they used it extensively to learn fault categories; when subjects did not, they relied on similarity-based learning.

8:25-8:40 (2)

When Do Cues Compete in Causal Induction? MICHAEL R. WALDMANN, *University of Frankfurt*, & KEITH J. HOLYOAK, *University of California, Los Angeles* (sponsored by Keith J. Holyoak)—Some theorists have claimed that causal induction can be reduced to associative learning, a view supported by demonstrations of cue competition ("blocking") in human learning. Experiments will be presented in which cues corresponded either to causes or to effects. The results demonstrate that cue competition is sensitive to causal structure. These findings are at odds with associationistic learning theories, but can readily be accommodated by higher level theories of causal induction.

8:45-9:00 (3)

Factors Affecting Feature Weighting in Category Decision Making. THOMAS B. WARD & ANGELA H. BECKER, *Texas A&M University*—Objects can be partitioned into different subgroups based, in part, on the attributes that are heavily weighted in making category decisions. Three studies exploring the factors that influence feature weighting revealed that (1) variability along an attribute reduces reliance on that attribute, (2) lack of intent to learn reduces selective weighting of attributes, and (3) surprisingly, the weighting of attributes in incidental learning is unrelated to the subsequent use of those attributes in category decisions.

9:05-9:20 (4)

Systematic Versus Orthogonal Sets of Correlations Benefit Un-supervised Category Learning. DORRIT BILLMAN & JAMES KNUTSON, *Georgia Institute of Technology*—Natural categories mark systems of intercorrelated properties. Prior category learning experiments found that subjects were more likely to learn a given correlational rule (e.g., relating head type and habitat) when these attributes correlated with additional attributes than when the rule occurred in isolation. However, number as well as organization of correlations varied. Now we varied organization, while keeping number constant. Again, systematicity, not just numbers, of correlations benefited learning.

9:25-9:40 (5)

The Utility of Categories: A Comparison of "Rational" Analyses. JAMES E. CORTER, *Teachers College of Columbia University*, & MARK A. GLUCK, *Stanford University*—Gluck and Corter (1985) argued that categories are useful because they facilitate inferences about the features of instances, and derived a measure (category utility) of the "goodness" of a category for this purpose. We present some new applications, and discuss theoretical and mathematical relationships between the category utility model and other analyses of the normative value of categories, including several proposed measures for identifying

basic level categories and Anderson's (1990) "rational" analysis of categorization.

HUMAN LEARNING/MEMORY I

Regency Ballroom C, Friday Morning, 8:00-9:45

Chaired by Marcia Ozier, Dalhousie University

8:00-8:15 (6)

Motivational Factors in Using an Imagery Mnemonic. KENNETH L. HIGBEE, *Brigham Young University*—Mnemonics research has focused on cognitive aspects of mnemonics. This study investigated some motivational aspects—factors that can affect how much people might want to use mnemonics. College students recalled a list of 12 numbered sayings after hearing them once. In addition to recalling more sayings, students using the rhyming-pegword mnemonic generally rated the recall task as requiring less effort, and as being less difficult, more interesting, and more enjoyable, than did control students.

8:20-8:35 (7)

Factors Affecting Reliance on Analytic and Nonanalytic Knowledge. BRUCE W. A. WHITTLESEA, *Simon Fraser University*, & LEE R. BROOKS, *McMaster University* (read by Lee R. Brooks)—We developed a task in which subjects could successfully classify items by relying on either analytic knowledge (knowledge of stimulus elements predictive of category membership) or nonanalytic knowledge (similarity to previous items). Subjects were given training trials emphasizing analysis and other trials emphasizing whole-item processing. In a subsequent test, we investigated factors controlling differential reliance on analytic and nonanalytic knowledge. Critical control was exerted by factors often treated as noncontroversial aspects of experimental procedure.

8:40-8:55 (8)

Recall of Proverbs: Roles of Imagery and Interpretation. ALEXANDER VON EYE, LAUREN P. JACOBSON, & SUZANNE D. WILLS, *Pennsylvania State University*—This research investigates whether proverb recall can be predicted from concreteness of proverb wording and the subjects' gender, age, and proverb interpretation. A sample of 182 subjects interpreted five concretely and five abstractly worded proverbs. Interpretation was followed by free written recall. Interpretations were coded according to five categories: concreteness, optimistic perspective, correctness, use of examples, and conciseness. Recall was coded at the gist level. Results from nonstandard, log-linear modeling suggest that recall rates are associated with age, proverb concreteness, and optimistic perspective. Interpretation was based on dual code theory.

9:00-9:20 (9)

Compound Cue Versus Spreading Activation Theories of Priming. GAIL MCKOON & ROGER RATCLIFF, *Northwestern University*—Words that can be linked through chains of strong associations (box to beach through sand) prime each other in lexical decision. McNamara and Altarriba argued that this mediated priming contradicted our compound cue retrieval explanation of priming (Ratcliff & McKoon; also Doshier) and supported a spreading activation account. In turn, we present data that cannot be explained by spreading activation and we show how McNamara and Altarriba's data is consistent with compound cue theory.

9:25-9:40 (10)

The Bizarre Metamemory Effect. NEAL E. A. KROLL, *University of California, Davis*—When word pairs are learned with visual imagery (18 pairs with bizarre, 18 with common imagery), more common images are remembered; but in posttest interviews, subjects report remembering more bizarre images. This metamemory illusion is in-

created with careful estimations of numbers of pairs presented and numbers of pairs remembered. In ratings during learning, subjects predict better recall of bizarre pairs, but in ratings during the retention interval, subjects more correctly predict better recall of common pairs.

LANGUAGE/DISOURSE I

Regency Ballroom D, Friday Morning, 8:00-10:20

Chaired by Ruth H. Maki, North Dakota State University

8:00-8:15 (11)

Word Selection in Reading Sentences: Preceding Versus Following Context. MARY C. POTTER, MIT—Subjects read RSVP sentences (133 msec/word) which included a critical pair of words presented simultaneously and briefly (67 msec). Biasing context appeared before or within three words after the pair. In immediate recall of the sentence, subjects included the appropriate word on 75% of the before and 65% of the after trials, the inappropriate word on 11% and 15%, respectively. On few trials could both words be reported. This and further experiments indicate that sentence context can have substantial backward as well as forward effects on word perception and selection.

8:20-8:35 (12)

Shaped Mental Representations of Original Versus Principled Revisions of Texts. BRUCE K. BRITTON, University of Georgia, SAMI GULGOZ, Auburn University of Montgomery, & PAM TIDWELL, University of Georgia—Kintsch's computer model of reading was used to analyze and revise a long text. Cognitive maps of Air Force recruits' mental representations after reading were obtained using Schvaneveldt's network model; also mapped were the text's author, and 7 domain experts. Results showed that maps of recruits reading the revised text correlated with the author's and experts' maps about +.60 ($p < .05$), but recruits reading the original text correlated only +.10. So the Kintsch-based revision implemented the author's intentions better than the author.

8:40-8:55 (13)

Reinstatements and Elaborative Inferences During the Reading of Narratives. PAUL VAN DEN BROEK & RICHARD THURLOW, University of Minnesota—Subjects read stories that varied in the causal explanations provided for target events. In one version, the immediately preceding events were sufficient for explaining the targets, in others sufficiency required reinstatements or elaborative inferences. Reading times and answers suggest that reinstatements and elaborations are made when needed for sufficient explanation, that reinstatements are made as the target is read whereas elaborations often are postponed, and that systematic differences exist between high- and low-span readers.

9:00-9:15 (14)

Reminders of Autobiographical Memories While Reading Literature. STEEN F. LARSEN, University of Aarhus, Denmark, & JANOS LASZLO, Academy of Sciences, Budapest (sponsored by John M. Kennedy)—Black and Seifert (1985) proposed reminders of previously experienced episodes are an important component in text comprehension—in particular that the literary quality of a text is proportional to the number of reminders it elicits. Two studies are presented showing that the type or content of such reminders is more important than the sheer number. Authentic texts (6-8 pages) were used; reminders were registered while reading and, after reading, described and rated retrospectively.

9:20-9:35 (15)

Paragraphing and Task Effects on Reading Strategies. SUSAN R. GOLDMAN & ELIZABETH U. SAUL, Vanderbilt University—Predictions of the Strategy Competition Model for Text Processing (Goldman & Saul, in press) were examined. Students' reading behavior for informational passages was traced and analyzed for processing time and sentence-inspection patterns. Passages either were appropriately or inappropriately paragraphed; this manipulation affected reading behavior as predicted. Following reading, students completed either a recall or a summarization task. Task affected processing time and sentence inspection patterns as predicted by the model. Further model developments are discussed.

9:40-9:55 (16)

Paragraph Breaks and Continuity of Subjective Point of View in Narrative. GAIL A. BRUDER, SUNY at Buffalo, & JANYCE M.

WIEBE, University of Toronto—Events in objective sentences are objectively presented; events in subjective sentences are presented from the point of view (POV) of a story character. Analysis of narrative (Wiebe, 1990) suggests that private-state sentences initiate a character's POV, but not without a paragraph break. In an experiment using natural narrative, we found removal of a break before private-state sentences decreased the readers' tendency to initiate a character's POV; insertion decreased the tendency to continue a character's POV.

10:00-10:15 (17)

Outlines Versus Trees: Same Structure, Different Function. RUTH S. DAY, Duke University—Material from academic disciplines is often difficult to comprehend and remember. One way to make such tasks easier is to use brief notes to represent the basic meaning in a given text passage. Although outlines and tree diagrams can represent the same hierarchical structure for a given passage, they have quite different effects on cognitive processes, including scanning strategies, transition of notes into text, memory, and comprehension. These results support the alternative representations viewpoint.

VISION I

Regency Ballroom H, Friday Morning, 8:00-10:20

Chaired by John M. Kennedy, University of Toronto

8:00-8:15 (18)

Similarity Grouping Occurs After Lightness Constancy. STEPHEN PALMER, ROMI NIJHAWAN, & IRVIN ROCK, University of California, Berkeley—Similarity grouping was investigated by requiring subjects to indicate whether a central column of light-gray elements seen behind a neutral filter was grouped with light, reflectance-matched elements on one side or with dark, luminance-matched elements on the other. The central column was grouped with the light, reflectance-matched elements. Control conditions ruled out explanations in terms of grouping by luminance ratios. These and other results suggest that similarity grouping occurs relatively late in visual processing.

8:20-8:40 (19)

Responses to Optical Looming in the Retinal Center and Periphery. THOMAS A. STOFFEGEN, University of Cincinnati, & GARY E. RICCIO, University of Illinois at Urbana-Champaign—We assessed sensitivity of the retinal periphery to optical looming. Subjects dodged out of the path of simulated objects just before "impact." Time-to-contact strongly influenced responses for both peripheral and central approaches. This shows that the retinal periphery is sensitive to information for the affordances of optical looming despite the fact that such information is carried in radially structured optic flow, to which the periphery is insensitive in the context of postural sway.

8:45-9:00 (20)

Ethanol-Induced Diplopia. R. J. MILLER, Washington State University—To assess ethanol-induced diplopia, 8 males with excellent vision participated in two sessions, one preceded by consumption of an alcoholic drink, the other by a placebo. Fusion near and far points and fusion speed were assessed every 15 min for 6 h. Even relatively low levels of intoxication produced far point decreases and increases in far-target fusion speed. There was a small increase in near-target fusion speed. Intermediate-target fusion was unaffected by ethanol.

9:05-9:20 (21)

How the Brain Knows Where the Eye Is: The Gauthier Effect. BRUCE BRIDGEMAN, University of California, Santa Cruz, & LAWRENCE W. STARK, University of California, Berkeley—Viewing a target monocularly and pressing on the side of the open eye to change efference copy, or on the closed eye to change proprioception, we measured these two extraretinal influences on perceived position. The gain of proprioception is lower than that of efference copy, and there is a threshold below which changes in proprioception have no effect. Both influences together total less than the objective eye deviation; this accounts precisely for illusions associated with eccentric gaze.

9:25-9:40 (22)

Stereoacuity and Interocular Transfer of Tilt Aftereffects. H. H. MIKAELIAN, MARY LOU LAJOIE, & GISELE LANDRY, University of New Brunswick—The role of stereoacuity in interocular transfer

was investigated in a series of studies using adaptation to prism induced visual tilt. Rearrangement entailed walking around in a hallway while viewing through 25° tilting prisms. Viewing was monocular, using the dominant eye. Differences between pre- and postmeasures of subjective vertical were used to assess aftereffect magnitude. The results showed that approximately 50% of the aftereffect evident in the ipsilateral eye transfers interocularly. When measured binocularly, the magnitude of the aftereffect is further reduced by another factor of two. No relationship between magnitude of interocular transfer and stereoacuity could be determined, although there appeared to be a tenuous relationship between aftereffect magnitude and stereoacuity.

9:45-10:00 (23)

The Role of Stereopsis in Prehension. PHILIP SERVOS & MELVYN GOODALE, *University of Western Ontario* (read by Melvyn Goodale)—Stereopsis plays an important role in the computation of depth in grasping space. A kinematic study was undertaken to investigate the effects of monocular viewing on a task requiring subjects to reach towards and grasp rectangular objects placed at various distances. When compared with binocular viewing, monocular viewing produced systematic changes in the movement kinematics that were consistent with poor estimates of distance and object size. In many respects, the performance of these subjects was similar to that observed in visual open loop testing. The effect of practice upon several kinematic variables is discussed.

10:05-10:15 (24)

Effects of Binocular Rivalry on Spatiotemporal Sensitivity. DAVID H. WESTENDORF, JOAN B. EICHLER, & JOHN BUSHKUH, *University of Arkansas*—We measured monocular contrast sensitivity for gratings (1.3 to 10.6 cpd) presented with or without counterphase modulation during suppressed and dominant phases of binocular rivalry. Thresholds for unmodulated gratings were elevated during rivalry suppression by about a half log unit. Thresholds were elevated least for gratings of the highest spatial frequency tested. When grating contrast was counterphase modulated (8 or 12 Hz), threshold elevation was less than one quarter log unit regardless of spatial frequency.

ASSOCIATIVE LEARNING I

Regency Ballroom F, Friday Morning, 8:00-9:50

Chaired by H. D. Kimmel, *University of South Florida*

8:00-8:20 (25)

A Multilayer Circuit Model of the Cerebellum and Eyelid Conditioning. MARK A. GLUCK, *Stanford University*, GABOR T. BARTHA, & RICHARD F. THOMPSON, *University of Southern California*—We describe a real-time multilayer circuit model of the neural bases of classical conditioning of the mammalian eye-blink response. The model proposes functional roles for the deep nuclei (interpositus) and overlying cerebellar cortical structures (Purkinje cells). The model is constrained by known circuit anatomy, by the physiological characteristics of parallel-fiber/Purkinje cell plasticity, and by a wide range of Pavlovian behavioral phenomena.

8:25-8:35 (26)

Effects of Varying the Interreinforcement Interval on Appetitive Contextual Conditioning. ALBA E. MUSTACA, FABIAN GABELLI, *University of Buenos Aires*, MAURICIO R. PAPINI, *Texas Christian University*, & PETER D. BALSAM, *Barnard College of Columbia University* (read by Mauricio R. Papini) (sponsored by Peter D. Balsam)—Rats exhibited more anticipatory activity in a context associated with closely spaced food presentations than in one associated with more widely spaced food presentations. This was observed in both within- and between-subjects experiments. The same direct relationship between anticipatory activity and rate of food delivery was also found in ring doves. Thus, a different relation between US rate and contextual conditioning was obtained in these studies than that obtained in studies employing aversive USs.

8:40-9:00 (27)

Learning in Honeybees as a Function of Amount of Reward. M. E. BITTERMAN & YOUNGLIM LEE, *University of Hawaii*—

Comparative experiments on learning in honeybees and vertebrates have given only one indication of uniqueness in the learning of honeybees: The results of recent work on amount of reward provide no basis for rejecting the parsimonious hypothesis that it affects the slope rather than the asymptote of the acquisition function (the equal-asymptote hypothesis). The results of further work to be described here do, however, now point clearly to an asymptotic effect.

9:05-9:20 (28)

Rehearsal Processes and Orientation-Contingent Color Aftereffects. SHEPARD SIEGEL & LORRAINE G. ALLAN, *McMaster University*—According to a conditioning analysis of orientation-contingent color aftereffects, orientation stimuli (grids) become associated with chromatic stimuli. On the basis of this account, interfering with rehearsal of the grid-color association should decrease the illusion. To evaluate this prediction, chromatic grid presentations were followed by posttrial episodes (PTEs) that either were congruent or incongruent with prior experience. Incongruent PTEs interfered with induction of the illusion more than did congruent PTEs.

9:25-9:45 (29)

Induction and Selection of Barpress Topography. PETER D. BALSAM, *Barnard College of Columbia University*, & PATRICIA STOKES, *Columbia University*—In a series of experiments with rats, it was found that water-deprived subjects emitted all of the component acts of a barpress prior to explicit training. Pavlovian pairings of a bar with a water US increase the frequency of these components. Specific shaping (instrumental) contingencies selectively alter the frequency of components and may change their sequential organization.

ATTENTION I

Burgundy Room, Friday Morning, 8:00-9:55

Chaired by M. Pavel, *New York University*

8:00-8:20 (30)

Modeling Illusory Conjunctions: Distance and Feature Similarity Constraints. F. GREGORY ASHBY, RICHARD B. IVRY, W. TODD MADDOX, & WILLIAM PRINZMETAL, *University of California, Santa Barbara* (read by Richard B. Ivry)—A formal model of illusory conjunctions is developed by (1) assuming perceptual variability in localizing features and (2) applying a simple nearest neighbor binding rule. Experiment 1 demonstrates that the model can account for distance effects observed with illusory conjunctions. In addition, the model is able to predict correct identifications and feature errors. In Experiment 2, we first obtained similarity matrices for color and shape stimuli. From the matrices, we test predictions of the model concerning similarity effects in the occurrence of illusory conjunctions.

8:25-8:45 (31)

Frustration as a Consequence of Inconsistent Reward in Children with ADHD. ABRAM AMSEL, *University of Texas at Austin*, TIM WIGAL, JAMES M. SWANSON, KIMBERLEY K. FULBRIGHT, *University of California at Irvine*, & VIRGINIA I. DOUGLAS, *McGill University*—A hypothesis for the basis of Attention Deficit-Hyperactivity Disorder (ADHD) is that these children do not learn to persist but remain in conflict when the same response is followed inconsistently by rewards and nonrewards. A recent investigation using a variant of the partial reinforcement experiment with ADHD and normal children indicates that prolonged partial as compared with continuous reinforcement affects display of frustration in extinction such that ADHD children decrease bodily activity but increase facial responsiveness.

8:50-9:10 (32)

Negative Priming and Other Attention Measures as Indices of Individual Differences. JOHN H. FLOWERS, CLYDE C. HEPPNER, & TOM J. MURAOKA, *University of Nebraska-Lincoln*—Using a flanker task, we obtained a significant "negative priming" effect. It was not negatively correlated with response competition to the previous stimulus, related to individual differences in response competition across subjects, nor significantly related to any of several personality indices for which other attention measures obtained from the flanker

task showed strong relationships. The utility of negative priming as an individual difference measure (e.g., aging, psychopathological vulnerability, etc.) is questioned.

9:15-9:25 (33)

Attentional Facilitation and Task Difficulty in Visual Discrimination. MARYLOU CHEAL & DON LYON, *University of Dayton Research Institute, Arizona*—Using a location-precuing task, we found that the extent to which visual discrimination is facilitated by attention (manipulated by varying the time between a precue and the target) depends on the kind of discrimination (such as color, line orientation, or line arrangement), but is not consistently associated with the difficulty of the task within a particular kind of discrimination (different hues, orientations, durations, number of line endings, or size of a gap in a circle).

9:30-9:50 (34)

Episodic Theory of Visual Attention. GEORGE SPERLING, *New York University*, & ERICH WEICHELGARTNER, *Universität Regensburg*—Previous measurements of visual attention in go/no-go reaction-time, choice reaction-time, complex discrimination, attentional gating, and iconic memory experiments are reanalyzed and quantitatively predicted by assuming (1) visual attention consists of a sequence of discrete attentional acts (episodes); (2) each episode is defined by its spatial facilitation function $f(x, y)$; (3) the transition at time t_0 between episodes is described by a temporal switching function $G(t - t_0)$; (4) f and G are space-time separable.

LANGUAGE DEVELOPMENT

Regency Ballroom A, Friday Morning, 9:55-11:50

Chaired by Sam Glucksberg, Princeton University

9:55-10:05 (35)

Transfer in an Artificial Language Paradigm. JANET L. McDONALD & MICHELLE PLAUCHÉ, *Louisiana State University*—An artificial language paradigm was used to examine the learnability of a grammar marked by a semantic reference field, high salience syntax markers, low salience syntax markers, or no markers. After initial training and test, subjects received another condition in a language with new vocabulary but the same underlying grammatical structure. Transfer effects among the various conditions relate to the feasibility of child language learners using semantics as a stepping-stone to syntax.

10:10-10:20 (36)

Collaborative Explanation and the Development of Children's Theories. MAUREN CALLANAN, *University of California, Santa Cruz*, & JEFF SHRAGER, *Xerox Palo Alto Research Center*—In order to understand the development of children's theories, we studied explanations in parent-child discourse. Parents and children in three age groups (about 2;9, 3;9, and 4;9) read *The Snowman* (R. Briggs, 1978). Explanations about melting were categorized in terms of the theory expressed, and analyzed according to which participant provided the information (parent, child, or both). We discuss the developing relationship between collaboratively constructed explanations and theories about the physical world.

10:25-10:35 (37)

Developmental Differences in Processing Capacity Expended While Reading. THOMAS V. PETROS, BARB K. BENTZ, BRENDA FOLSTROM, & RHANDA CLOW, *University of North Dakota*—Processing capacity expended while reading narrative texts was examined in students from the fourth, fifth, and sixth grades, and college students. Subjects read 10 narrative texts from a computer screen, one idea unit at a time. Periodically, a secondary tone was presented while students were reading some of the texts. The results indicated that secondary tone latencies varied as a function of both age and importance level of the idea units.

10:40-11:00 (38)

Children's Knowledge of Syntactic Constituents: Effects of Age and Schooling. FERNANDA FERREIRA, *University of Alberta*, & FRED MORRISON, *University of North Carolina at Greensboro* (read by Fred Morrison)—Using the "school cutoff" methodology, we examined how children's knowledge of syntactic constituents changes with

schooling. We found that preliterate 5-year-olds could accurately report the subject of a sentence, as long as the subject was a noun or determiner-noun sequence. Children performed poorly with pronouns and determiner-adjective-noun sequences. After six months of reading instruction, the children were no better with pronouns, but improved in the determiner + adjective + noun condition.

11:05-11:20 (39)

Syntactic Context Affects the Shape Bias in Learning New Words. BARBARA LANDAU, *Columbia University*, SUSAN JONES, & LINDA B. SMITH, *Indiana University*—Adults and young children preserve object shape over texture or size when learning a novel count noun (Landau, Smith, & Jones, 1988). However, this shape bias changes when the word's syntactic context is altered. Five-year-olds and adults, but not 3-year-olds, showed a weakened shape bias when the word was introduced in the context "This is a kind of _____," and a reversal of the bias toward texture in the context "This is a daxy one."

11:25-11:45 (40)

Toddlers' Disambiguation of the Reference of Unfamiliar Nouns. WILLIAM E. MERRIMAN, *Kent State University*—Young children's word learning may be guided by a mutual exclusivity bias, which is an expectation that words will not share referents. One manifestation of this bias is what Merriman and Bowman (1989) have called the disambiguation effect—a tendency to select unfamiliar over familiar objects as the referents of new names. Twenty-four-month-olds showed this effect when tested with a procedure that controlled for the differential attractiveness of the two kinds of objects.

REPETITION/PRIMING EFFECTS I

Regency Ballroom C, Friday Morning, 9:55-12:25

Chaired by David B. Mitchell, Southern Methodist University

9:55-10:10 (41)

Implicit Memory: A Data-Driven Concept, or Conceptually Driven Data? W. TRAMMELL NEILL, LESLIE A. VALDES, & JEAN L. BECK, *Adelphi University*—Subjects judged spelling correctness or meaningfulness of words and nonwords (misspelled words), and then received an unexpected word-fragment or recognition memory test. For spelling-oriented subjects, misspelled words primed correct fragment completion as well as correctly spelled words, despite inferior recognition memory. Misspelled words misjudged as correct (with error feedback) produced more priming than correctly spelled words misjudged as incorrect. The results indicate that a "conceptually driven" correction effectively primes a "data-driven" test.

10:15-10:30 (42)

Priming in Perceptual Identification Relies on a Context-Sensitive Interpretation. COLIN M. MACLEOD, *University of Toronto, Scarborough Campus*, & MICHAEL E. J. MASSON, *University of Victoria*—Currently, indirect tests are viewed as sensitive either to conceptually driven processing or to data-driven processing. We argue that priming in such tests results from recapitulation of whatever operations produced a context-sensitive interpretation during initial encoding. We report several experiments that demonstrate consistent enhancement of perceptual identification by generated as well as by read words. Moreover, generated words can actually display more priming than read words.

10:35-10:50 (43)

Cumulative Influences on Implicit and Explicit Memory. P. GRAF, *University of British Columbia*—Memory performance is facilitated by multiple presentations of study list items. In previous investigations, items were presented in the same manner across study trials. The present experiments examined how different presentations of the same items (e.g., written vs. spoken words) influence performance of implicit and explicit memory tests. The results showed that multiple presentations have a cumulative effect, but only on some tests.

10:55-11:10 (44)

Localizing Prime Task Effects in Semantic Priming. FRANCES J. FRIEDRICH, *University of Utah*, AVISHAI HENIK, & JOSEPH TZELGOV, *Ben Gurion University of the Negev*—Previous research investigating semantic priming effects has shown that priming does not occur when nonlexical tasks, such as letter search, are performed on

the prime word. These experiments were conducted to determine if the letter search task disrupted the lexical activation of the prime word or the activation of semantic associates. The results suggest that under letter search conditions, the lexical entry of the prime word is activated but semantic associates are not.

11:15-11:35 (45)

ERP Evidence for Selective Attention and Task Effects on Semantic Priming in Auditory Word Processing. SHLOMO BENTIN, *Hebrew University*, MARTA KUTAS, & STEVEN A. HILLYARD, *University of California, San Diego*—Event-related potentials were recorded while subjects listened to words. With unilateral presentation, subjects either studied words in anticipation of a memory test ("memorize") or counted nonwords interspersed in the list ("count"). Semantic priming was bigger in the memorize than in the count test. With dichotic presentation, subjects attended to only one ear. Semantic priming was reliable only in the attended channel. Words presented to the right ear were more difficult to ignore than words presented to the left.

11:40-11:55 (46)

Semantic Priming in Alzheimer's Disease and Normal Aging: Single- and Dual-Choice Lexical Decision. BETH A. OBER, *VAMC, Martinez, and University of California, Davis*, & GREGORY K. SHENAUT, *VAMC, Martinez*—For dual-choice lexical decision, we found the expected increase in RTs with normal aging and with Alzheimer's disease (AD). However, with single-choice lexical decision, the RTs for the AD patients were equivalent to those of the older controls, suggesting normal speed of lexical access in AD. With both lexical decision tasks, AD patients showed equivalent semantic priming to age-matched controls, and older controls showed equivalent semantic priming to younger controls. The breakdown of priming effects into facilitative and inhibitory components showed differences, however, for the younger controls versus the two older subject groups.

12:00-12:20 (47)

Do Words That Are First Syllables of Other Words Access Their Semantic Codes? JAMES H. NEELY, EDWARD J. CRAWLEY, & FRANK R. VELLUTINO, *SUNY at Albany*—In a lexical decision task using 250-650 msec prime-target SOAs, words that produced priming when in isolation (e.g., *cat* priming *kitten*) did not produce priming when they were the first syllables of an unrelated priming word (e.g., *catalyst* priming *kitten*). However, *catalyst* did produce priming of *cat*, presumably through nonsemantic codes. These findings have implications for the role of syllabic decomposition in word recognition and for the mechanisms involved in priming.

PATTERN PERCEPTION I

Regency Ballroom D, Friday Morning, 10:30-12:20

Chaired by Donald L. King, Howard University

10:30-10:50 (48)

Perceptual Processing of Pattern Goodness by Left and Right Hemispheres. LLOYD L. AVANT, MICHAEL W. O'BOYLE, ALICE A. THIEMAN, MICHAEL TEPIN, & MICHAEL MARCH, *Iowa State University*—Subjects made same-different judgments for lateralized 200 msec paired presentations (separated by 1,000 msec) of Garner and Clement (1963) good and poor five-dot patterns. For both LVF and RVF presentations, responses to good patterns were more accurate, but not faster or slower, than to poor patterns when inputs were pre- and post-marked. When inputs were not masked, RVF presentations produced faster responses, good patterns produced faster and more accurate responses than poor patterns, and hemisphere of registration interacted with pattern type and matched versus mismatched pattern pairs.

10:55-11:15 (49)

Lightness Differences and the Perceived Segregation of Regions and Populations. JACOB BECK, *University of Oregon*, NORMA GRAHAM, *Columbia University*, & ANNE SUTTER, *New York University*—Experiments compared the segregation of striped and checked patterns of light and dark squares into regions and the segregation of a pattern composed of two interspersed populations of light

and dark squares into subpopulations. Perceived lightnesses are the same for a given set of squares whether they are in texture regions or in intermixed populations. Perceived population segregation is approximately a single-valued function of the lightness differences of the squares but perceived region segregation is not. The reasons for the difference between population segregation and region segregation will be discussed.

11:20-11:35 (50)

Reference Frames and Geometric Primitives in Object Recognition. MARTHA J. FARAH & ROBIN ROCHLIN, *Carnegie-Mellon University*—Evidence for a viewer-centered reference frame in shape recognition comes from experiments in which the stimuli are made of contours (e.g., Rock et al.). We constructed abstract shapes of either wire (contour) or flat clay (surface interpolated within the same contours). In three experiments, perception of contour shapes appeared extremely viewer-centered, whereas surface shapes showed relatively good or perfect orientation invariance, consistent with an object-centered reference frame.

11:40-11:55 (51)

Priming of Structural Representations of Three-Dimensional Objects. LYNN A. COOPER, *Columbia University*, DANIEL L. SCHACHTER, *University of Arizona*, SOLEDAD BALLESTEROS, *Universidad Nacional de Educacion a Distancia*, & CASSANDRA MOORE, *Columbia University*—Previous research has demonstrated differential effects on implicit memory (priming) and explicit recognition, depending on whether drawings of unfamiliar 3-D objects were studied under conditions of structural or elaborative encoding. We extend this experimental situation to investigate the nature of the information incorporated in structural description representations of objects. In particular, effects of introducing study-to-test changes in object size or orientation on object decision judgments and recognition are described.

12:00-12:15 (52)

Extraction of Facial Information by Prosopagnosic and Normal Subjects. JUSTINE SERGENT, *Montreal Neurological Institute*—The human face conveys a variety of information about an individual. Some of this information can be directly derived independent of the face's identity, whereas other information is contained in the invariant characteristics unique to a given face. Extraction of each type of information can be selectively impaired by brain damage, and findings from 3 prosopagnosics and from normal subjects will be presented that illustrate the decomposition of face processing and that help identify the nature of the underlying operations.

ANIMAL LEARNING I

Regency Ballroom H, Friday Morning, 10:30-12:35

Chaired by Frances K. McSweeney, Washington State University

10:30-10:45 (53)

Timing Versus Responsiveness in the Reinforcement Omission Effect. ROBERT C. MELLON & JOHN GIBBON, *New York Psychiatric Institute and Columbia University* (read by John Gibbon)—Previous investigations of enhanced responding after reinforcement omission (omission effect) in pigeons have employed fixed-interval schedules with brief blackouts in lieu of reinforcements. In the present study, subsequent omissions after a signaled omission were unsignaled in an analogue of the peak procedure. This provided an assessment of whether the omission effect is a timing-based or a responsiveness-based phenomenon. The results implicated responsiveness, as indexed by a threshold change in a scalar timing model.

10:50-11:05 (54)

Generalization of Operant and Respondent Keypecks. STANLEY J. WEISS & RICHARD D. WEISSMAN, *American University*—Pigeons acquired discriminated keypecking between 528 and 540 nm by either operant (R-S') or respondent (S-S') contingencies. Independent assays of the contingency actually controlling each pigeon's pecking included omission tests, peck location comparisons, and manipulation of CS informativeness. During stimulus generalization tests, both groups pecked most at a stimulus removed from their reinforced training stimulus,

whether S^D or CS, in the direction away from their nonreinforced stimulus. Respondent peakshift has rarely been reported heretofore.

11:10-11:30 (55)

Peak Shift Revisited: A Test of Alternative Interpretations. DAVID R. THOMAS, *University of Colorado at Boulder*—Human subjects and a voluntary response were used to test the application of Spence's theory to postdiscrimination peak shift. In Experiment 1, a peak shift opposite to the predicted direction was produced by the use of asymmetrically spaced test stimuli. In Experiment 2, more widely spaced S+ and S- values led to greater, not less, peak shift. In Experiments 2 and 3, increasing the range of test stimuli increased the amount of peak shift. All these results favor a relational learning interpretation based on the concept of adaptation level.

11:35-12:05 (56)

Progressive Work Schedules: Examining Patch-Leaving in Rats. JASPER BRENER & ANDREW B. SLIFKIN, *SUNY at Stony Brook*—Patch depletion was simulated by doubling the work costs of successive food rewards. This progressive-work schedule could be reset to its minimum value by completion of a substantial fixed-work requirement. Resetting occurred at the point coinciding with the calculated long-term maximization of food per work. However, the suggestion that resetting is controlled by a molar maximization process is questioned by detailed analyses of behavior, which revealed that local work performance also predicted resetting.

12:10-12:30 (57)

Generalizing the Partial Reinforcement Extinction Effect. ROBERT EISENBERGER, FRED A. MASTERTSON, & FRANCES WEIER, *University of Delaware*—The partial reinforcement extinction effect may be a special case of effort learning. Three of the principal elements defining the effect—the intermittency of reward during training, the use of extinction in test, and the employment of the same task for training and test—are unnecessary for the learning and evocation of increased effort. Findings with rats and humans suggest that the sensation of high effort, when paired with a reinforcer, develops secondary reward value.

SPATIAL ABILITY

Regency Ballroom F, Friday Morning, 10:00-12:25

Chaired by T. G. Bever, *University of Rochester*

10:00-10:15 (58)

Navigation Without Vision by Blind and Sighted. ROBERTA L. KLATZKY, JACK LOOMIS, REGINALD GOLLEDGE, *University of California, Santa Barbara*, NAOFUMI FUJITA, *Kochi University*, & JAMES W. PELLEGRINO, *Vanderbilt University*—The navigation abilities of blind and blindfolded, sighted individuals were assessed in locomotion tasks, including replicating linear segments and turns and retracing or completing multisegment paths. No consistent differences were found among sighted, adventitiously blind, and congenitally blind subjects. Errors from the completion tasks are accounted for by an encoding-error model, which assumes that linear segments and turns in the initial pathway are compressed in the encoding process, and that the return trajectory is computed accurately.

10:20-10:35 (59)

Spatial Descriptions and Depictions. HOLLY A. TAYLOR & BARBARA TVERSKY, *Stanford University* (read by Barbara Tversky)—Students studied maps of fictitious environments and wrote descriptions of the environments and drew maps from memory. The order of mentioning and drawing landmarks was correlated within and across subjects, indicating similar organization in memory. About half the descriptions took either a route or survey perspective, but the other half mixed perspectives, indicating that perspective is not inherent in the representation but is instead imposed at the time of description.

10:40-11:00 (60)

Measurement of Orientation Skill in Blind Travelers. LYN R. HABER & RALPH NORMAN HABER, *University of Illinois at Chicago*—A quantitative measure of orientation skill in the blind was developed and correlated with a measure of travel ability. Orientation was defined as "compass" knowledge: being able to walk fixed distances, make fixed turns in the absence of external cues, with interfer-

ences sometimes interposed, and being able to point back to the start. Travel ability manipulated distance walked, and the presence or absence of orientation cues, a barrier, and an interference task (counting backwards while walking).

11:05-11:25 (61)

Individual Differences in Orientation Ability. SUSAN E. INFELD, EARL HUNT, & PENNY L. YEE, *University of Washington* (read by Earl Hunt)—How do people find their way in the world? We have considered this problem by examining expert and novice navigator populations. We have studied the performance of subject populations ranging from world-class navigators to psychology undergraduates. These groups have been contrasted in terms of their performance on a variety of spatial and general information processing tasks. Results will be compared to a model of the processes proposed as key to orientation in the real world.

11:30-11:50 (62)

The Concurrent Acquisition of Familiar and Rearranged Sensorimotor Maps. HELEN A. CUNNINGHAM & ROBERT B. WELCH, *NASA-Ames Research Center* (read by Robert B. Welch)—Subjects practiced two mutually interfering visual-motor tracking tasks. Task 1 employed a familiar spatial relationship between movement of a hand-held stylus and a visually displayed cursor, while Task 2 entailed a 108° rotation between hand space and visual space. Tracking error on the initially difficult Task 2 eventually dropped to a level close to that of Task 1, and interference between the two tasks largely disappeared. The roles of discriminative cues and intermanual transfer were also examined.

11:55-12:05 (63)

Spatial Complexity and Manual Aiming Asymmetries. DIGBY ELLIOTT, *McMaster University*, ERIC A. ROY, *University of Waterloo*, RICHARD G. CARSON, DAVID GOODMAN, *Simon Fraser University*, & BRIAN K. V. MARAJ, *McMaster University*—Right-hand aiming advantages are often reduced when subjects must make rapid, complex decisions about the spatial location of a target. This study was conducted to examine the influence of spatial complexity on manual aiming asymmetry when no time pressure was placed on spatial processing. In this situation, right-hand advantages actually increased when subjects were required to make a more difficult decision about the spatial location of the target.

12:10-12:20 (64)

The Role of Attention in the Acquisition of Spatial Knowledge. M. JEANNE SHOLL, *Boston College*—Counting backwards while traversing a path results in route but not survey knowledge of its layout. This experiment tests the hypothesis that backward counting has the effect of restricting attention to the center of the visual field and that failure to establish survey knowledge is a consequence of reduced processing of information in the visual periphery. The results do not support the hypothesis, suggesting instead that attentional resources are necessary to establish survey knowledge.

HUMAN LEARNING/MEMORY II

Burgundy Room, Friday Morning, 10:05-12:25

Chaired by Marc Marschark, *University of North Carolina at Greensboro*

10:05-10:25 (65)

The Nonlinear Dynamics of Learning. P. G. ZANONE & J. A. SCOTT KELSO, *Florida Atlantic University* (sponsored by J. A. S. Kelso)—Our window into learning is a perceptual-motor skill, bimanual coordination to a visually required phase relation. Prior to learning, only a limited set of stable patterns, or attractors, exist. We show how this attractor layout evolves in time as a new pattern is learned: Loss of stability occurs, and a new attractor emerges close to the required phasing pattern (a nonequilibrium phase transition). The newly learned pattern dynamics persist beyond a week.

10:30-10:45 (66)

Improving Recall by Retrieval Clues That Segregate Interfering Material. GORDON H. BOWER, *Stanford University*—When subjects reorganize interpolated material, it interferes less with other recall. Will similar effects arise if the reorganization occurs long after interpolated learning? In free recall and serial-learning experiments, sub-

jects learned two lists (L1, L2), then recalled L1, some after receiving information enabling them to reorganize the L2 materials. This reorganizing clue greatly reduced the interference of L2 with L1 recall. Apparently, segregating L2 into a smaller, distinct package made L1 easier to discriminate and recall.

10:50-11:05 (67)

Nonassociative Foundations of Associative Thought. ASGHAR IRAN-NEJAD & WILLIAM SLATER, *University of Alabama*—A common assumption in the literature on learning and cognition is that the subsymbolic processes underlying symbolic associative thought are also associative in nature. However, a growing literature in both neuroscience and cognitive psychology points to nonassociative biofunctional foundations of associative thinking and learning. This paper reviews this literature and discusses its implications for theories of cognition and learning.

11:10-11:25 (68)

Implicit Learning and Concept Learning. ROBERT W. FRICK, *SUNY at Stony Brook*—Are implicit learning and concept learning different parts of the same elephant? In Experiment 1, a standard implicit learning paradigm involving artificial letter strings was modified to allow measurement of both implicit learning and concept learning. By conventional tests, both occurred. In Experiment 2, using naturally learned concepts, subjects showed strong indications of implicit learning in distinguishing cats from dogs. Perhaps the same learning process underlies both implicit learning and concept learning.

11:30-11:40 (69)

What Do We Know About Unknown Words? FRANCIS T. DURSO & WENDELYN J. SHORE, *University of Oklahoma*—Subjects made decisions about words they previously denied were part of the language (unknown) and about words that were vaguely familiar (frontier). In several tasks, but not all, performance for even unknown words was above chance. Subjects could choose between a synonym and an unrelated word, and between a legal context and an illegal one. Without a contrast at test, however, subjects guessed on unknown words, but performance on frontier words remained above chance.

11:45-12:00 (70)

Crosstalk Between Memory and Perception. JAMES S. NAIRNE & ROBERT D. MELARA, *Purdue University*—A Garner speeded classification paradigm was used to investigate the interaction between memory and perception. When subjects were required to make decisions about the past history of a stimulus, they were unable to ignore variation in its current perceptual status. When the decision was perceptual, however, subjects could selectively attend to the relevant perceptual dimension, ignoring past history. We will discuss the rationale behind treating memory, methodologically and theoretically, as if it was a perceptual dimension.

12:05-12:20 (71)

Individual Differences in Procedural and Declarative Learning. BETH KERR, JULIE J. FELDMAN, EARL HUNT, HEATHER CARMICHAEL OLSON, & ANN P. STREISSGUTH, *University of Washington*—Subjects performed a visual serial reaction-time task with an embedded repeating sequence (Nissen & Bullemer, 1987) and were later asked to generate the sequence. Subjects also completed a number of other cognitive and motor tasks. There was a strong correlation between the procedural and declarative learning measures for the serial reaction-time task. However, only the declarative learning score was related to performance on other tasks.

ANIMAL COGNITION I

Regency Ballroom A, Friday Afternoon, 1:00-3:15

Chaired by Sarah T. Boysen, *Ohio State University*

1:00-1:20 (72)

Immediate Transfer of Same-Different Response to Photographic Stimuli by Rhesus Monkeys. H. S. TERRACE, *Columbia University*, KARYL B. SWARTZ, *Lehman College of CUNY*, & JOHN GIBBON, *New York State Psychiatric Institute*—Rhesus monkeys ($N = 4$) were trained to make same-different judgments of color photographs of natural objects. Each subject was trained on a set of 1,080 stimuli until it responded correctly on at least 80% of each kind of trial. The transfer

test consisted of one-third novel and two-thirds familiar stimuli. A small decrement was observed on novel-same trials; none on novel-different trials. Implications for the study of stimulus similarity will be discussed.

1:25-1:45 (73)

Multiple List Acquisition by Rhesus Monkeys. KARYL B. SWARTZ, *Lehman College of CUNY*, SHAOFU CHEN, & H. S. TERRACE, *Columbia University*—Separate groups of monkeys were trained on successive 4- or 6-item lists, each consisting of different photographs. Overall, list_n was learned more rapidly than list_{n-1}, sometimes with virtually no errors. Relatively long latencies to item₁ of each list suggest that the subject devises a plan for executing the list before responding to that item. In contrast to pigeons (Terrace, 1990), latencies to items_{1&2} of 2-item subsets provide evidence that monkeys form linear representations of each list.

1:50-2:05 (74)

Hierarchical Organization and Rat Serial Pattern Learning. STEPHEN B. FOUNTAIN & JAMES D. ROWAN, *Kent State University*—Rats learned to anticipate the elements of hierarchically organized patterns. Pattern structure was characterized by a lower order rule that related pattern elements within "chunks" and higher order rules relating successively larger groups of chunks (in a hierarchically nested arrangement). Rats' choice and latency data will be presented to assess whether rats, like humans, find higher order pattern structure more difficult to learn than lower order structure.

2:10-2:25 (75)

The Element Superiority Effect: Input or Memory Limitation? MARVIN R. LAMB, *VAMC, Martinez*—The information overload hypothesis, which holds that pigeons have an input channel of limited capacity, is based on converging evidence from matching-to-sample experiments. Similar experiments with humans produced effects similar to those found with pigeons. However, further experiments showed that findings taken as evidence for an input limitation in pigeons reflect a postinput process (possibly a serial search of working memory) in humans. Implications for pigeon information processing theories will be discussed.

2:30-2:45 (76)

Choice Behavior in the Radial-Arm Maze. MICHAEL F. BROWN & MARIA C. ZIRBEL, *Villanova University*—Typical analyses of performance in the radial-arm maze are limited to measurement of the sequence of visited arms. However, rats often orient toward arms without visiting them, in a manner reminiscent of "vicarious trial-and-error" behavior in T-mazes. The usefulness of this VTE behavior for testing theories concerned with working memory and spatial representation and for developing models of choice in the radial-arm maze will be examined.

2:50-3:10 (77)

Arbitrary Matching by Exclusion: California Sea Lions Learn Paired Relations Errorlessly. RONALD J. SCHUSTERMAN, BRIGIT GRIMM, EVELYN HANGGI, *University of California, Santa Cruz*, & ROBERT C. GISINER, *Naval Oceans Systems Center*—Like most animals, sea lions have difficulty learning paired relations consisting of two sets of four novel shapes in MTS paradigms. However, by opposing novel and well-trained pairs, new conditional relations are acquired immediately. Following choices of appropriate nonreinforced novel comparisons, probes pitting two novel pairs against one another showed that it took about 300 trials for exclusion effects to emerge as a novel conditional performance when control by exclusion was unavailable.

NEURAL NETWORK MODELING

Regency Ballroom C, Friday Afternoon, 1:00-3:40

Chaired by Cynthia H. Null, *The College of William & Mary*

1:00-1:20 (78)

A Neural Network Model for Attentional Enhancement of Visual Locations. DAVID L. BERGE, MARC CARTER, & VINCENT BROWN, *University of California, Irvine*—The selection aspect of attention is modeled by a neural network based on known circuitry of the thalamus. When a target is presented with flankers, the network enhances cortical activity in the target location relative to surrounding lo-

cations. The expectation aspect of attention is modeled by a peaked activity distribution generated by a prime acting through the same circuit. The network is applied to data from experiments that varied expectation and target/flanker similarity.

1:25-1:40 (79)

Word Recognition and Connectionism: More Words, Definitely a Lexicon. DEREK BESNER, *University of Waterloo*—I analyze Seidenberg and McClelland's latest defense of their connectionist model of word recognition published in *Psychological Review* (1990). I conclude that the currently implemented version of the model is fatally flawed.

1:45-2:05 (80)

Connectionist Exploration of a Theory of Generalization and Classification. ROGER N. SHEPARD, *Stanford University*, & SHEILA KANNAPPAN, *Harvard University*—Testable implications of a cognitive theory of generalization (Shepard, 1987) were originally derived mathematically and covered the effects of a single learning trial only. The theory has, however, a natural connectionist implementation as a hierarchical network. Tests of this network with various sequences of discrimination and classification learning trials confirm that the theory accounts for major phenomena of discrimination and classification, as well as for the initially exponential form of the gradient of generalization.

2:10-2:30 (81)

Binding Invariant Shape Descriptors for Object Recognition: A Neural Net Implementation. JOHN E. HUMMEL & IRVING BIEDERMAN, *University of Minnesota* (read by Irving Biederman)—We describe a neural network that achieves a translational, scale, and viewpoint invariant representation of an object from a line drawing of the orientation and depth discontinuities. The model offers a solution to the binding problem—determining what groups with what. Binding is achieved through “fast enabling links” that phase lock the oscillatory activity of cells that are tuned to oriented image edges. The phase locking allows binding of invariant shape descriptors with their relations without positing additional units for “anding.”

2:35-2:50 (82)

Knowledge Representation in Connectionist Models of Human Learning. DAVID JEFFREY GRAHAM, *University of Otago* (sponsored by K. Geoffrey White)—Connectionist models of arithmetic learning have adopted representational schemes that yield poor fits to human norms of problem difficulty. We demonstrate a means to predetermine problem difficulty for any representational domain, based on the principle that a problem will have delayed mastery if its input is very correlated with other inputs whose output patterns are relatively orthogonal. We argue that coding schemes must be based on analyses of item difficulty and featural similarity.

2:55-3:10 (83)

Learning and Unlearning in Distributed Memory Models. STEPHAN LEWANDOWSKY, *University of Oklahoma*, R. PATRICK GOEBEL, *Center for Advanced Study in the Behavioral Sciences*, & BENNET B. MURDOCK, *University of Toronto*—Connectionist networks provide an elegant account of many basic learning processes. However, it has been shown that it is difficult for these networks to retain existing information when new material is presented for study. We show that Murdock's TODAM, unlike the connectionist networks with whom it shares some properties and basic assumptions, provides an accurate account of various learning and unlearning paradigms. Possible reasons for the differences in performance between these two related approaches are discussed.

3:15-3:35 (84)

Modeling Dolphin Echolocation with an Integrator Gateway Network. HERBERT L. ROITBLAT, *University of Hawaii*, PATRICK W. B. MOORE, RALPH H. PENNER, & PAUL E. NACHTIGALL, *Naval Ocean Systems Center*—An integrator gateway artificial network was developed to classify multiple successive dolphin target echoes. The inputs to the network were frequency spectra. Outputs were object classes. The network was trained on a small subset (4%) of the total set of available echoes (1,335). Depending on the measure used to assess it, the network correctly classified between 90% and 93% of all echo trains. In contrast, a comparable back-propagation network performed with only about 63% accuracy in classifying echo trains.

SYMPOSIUM I: VARIETIES OF AUTOMATICITY Regency Ballroom D, Friday Afternoon, 1:00-3:30

Chaired by Gordon D. Logan, *University of Illinois*

1:00-1:05 (85)

Introductory Remarks. GORDON D. LOGAN, *University of Illinois*—Everyone knows what automaticity is. It is the immediate, obligatory way we apprehend the world around us. It is the fluent, effortless manner in which we perform skilled behaviors. It is the “popping into mind” of familiar knowledge at the moment we need it. Do these intuitions reflect different manifestations of a single underlying phenomenon, or do they reflect different phenomena, different varieties of automaticity? That is the question addressed in this symposium. The papers address different empirical paradigms in which automaticity has been investigated—search tasks, training studies, dual tasks, and priming studies—with an eye toward finding commonalities or revealing fundamental differences.

1:05-1:30 (86)

Automaticity and Preattentive Processing. ANNE TREISMAN & ALFRED VIERRA, *University of California, Berkeley*—Preattentive processing, as evidenced by rapid texture segregation and the “pop-out” effect in visual search, has many of the properties of automaticity. It seems to depend on the discriminability of targets and distractors. Easy discriminations lead to pop-out and fast texture segregation. Difficult discriminations and the need to conjoin separate features require serial focusing of attention. Many cases of preattentive processing seem to be “hard wired” into the early visual system. Some cases appear to be learned. Can learning produce “true” preattentive processing?

1:35-2:00 (87)

Automaticity and Memory. GORDON D. LOGAN, *University of Illinois*—Several theories claim that automaticity is a memory phenomenon, governed by the theoretical and empirical principles that govern memory. These theories focus primarily on the acquisition of automaticity, accounting for the power-function speed-up and the development of various properties of automaticity with practice in consistent task environments. Can these memory theories provide a complete account of automaticity?

2:05-2:30 (88)

Automaticity and Cognitive Anatomy. THOMAS H. CARR, *Michigan State University*—Automaticity has been studied in several different theoretical paradigms. In the 1950s, automaticity was an input-output relation crucial to understanding how practice increased channel capacity. In the 1970s, automaticity was a characteristic of mental operations crucial to understanding how knowledge and expectations improve the efficiency of processing. Currently, theoretical emphasis has shifted to interactions among anatomically separated data-processing and attentional structures that divide cognitive labor in the nervous system. Is there a place for automaticity in cognitive neuroscience?

2:35-3:00 (89)

Conditional Automaticity. JOHN A. BARGH, *New York University*—In many cases, the various properties of automaticity do not co-occur as they should. Instead, there appear to be three major varieties of automaticity, distinguished by the conditions under which they occur: *preconscious* automatic processing is independent of attention and intention; *postconscious* automatic processing is independent of intention but requires “priming” of the relevant mental structure in order to occur; *goal-dependent* automatic processing occurs only if it is enabled by an overarching goal. Subtypes of these varieties can also be distinguished.

3:05-3:30 (90)

Discussion. RICHARD M. SHIFFRIN, *Indiana University*.

LETTER/WORD PROCESSING I Regency Ballroom H, Friday Afternoon, 1:00-3:20

Chaired by Peter Dixon, *University of Alberta*

1:00-1:15 (91)

Fast Priming During Eye Fixations in Reading. SARA SERENO & KEITH RAYNER, *University of Massachusetts* (read by Keith

Rayner)—Near-threshold primes were flashed in a target location prior to the onset of a target word while subjects read. The type of prime (related, unrelated) and the duration of the prime (20–60 msec) were manipulated. Fixation times on the target revealed significant priming from 30-msec prime exposures. Ways in which the fast priming paradigm can be used to investigate lexical and phonological ambiguity will be discussed.

1:20-1:40 (92)

The Neighborhood Density Constraint on Masked Form Priming. KENNETH I. FORSTER, EMMANUEL DUPOUX, & RICK HAAN, *University of Arizona*—Form-priming between orthographic neighbors in lexical decision is obtained when the prime is masked, and the target has few neighbors. But when the neighborhood density is high, no facilitation is observed. However, it is unclear whether an inhibitory effect is generated, which would imply the existence of competitive processes. An attempt is made to resolve this issue, taking into account the relative frequency of prime and target, and the lexical status of the prime.

1:45-2:00 (93)

Motivation and Phonemic Priming Effects on Parafoveal Information Processing. EVA DREIKURS FERGUSON, *Southern Illinois University-Edwardsville*—Hunger facilitation of high-speed word recognition under foveal, but not parafoveal, viewing was found in previous research not due to cortical magnification (CM). Additional data, when words matched for CM were processed semantically, showed subjective hunger ratings consistently positively correlated with trials to recognition for parafoveal, and consistently negative for foveal, viewing. In contrast, under shallow processing, with phonemic priming, parafoveal data resembled foveal viewing. Encoding demands appear to moderate the effect of motivation on information processing.

2:05-2:25 (94)

The Role of Phonetic Processes in Letter Detection: A Reevaluation. VIVIAN I. SCHNEIDER, ALICE F. HEALY, *University of Colorado at Boulder*, & ANTOINETTE T. GESI, *University of California, Santa Cruz* (read by Alice F. Healy)—Subjects often fail to detect the letter *f* in *of*. We found this effect even when subjects searched for *v* as well as *f* and even with an auditory presentation. The effect was reduced, however, when subjects searched for *o*, asterisks were inserted between all letters, or *of* was interpreted as *off* misspelled. The results suggest that both unitization processes and prelexical phonetic processes (rather than postlexical phonological recoding) are largely responsible for the effect.

2:30-2:50 (95)

Phonetic Recoding of Printed Words and Its Effect on the Detection of Speech. RAM FROST, *Hebrew University of Jerusalem*—Subjects were presented auditorily with amplitude envelopes of Hebrew words and nonwords, simultaneously with their vowelized or vowelized printed forms. Subjects detected correspondences between amplitude envelopes and printed stimuli only for words. Such visual-auditory correspondence was not detected for nonwords even when their printed forms were vowelized. These results suggest that amplitude envelopes are lexically stored and addressed directly by the printed word, rather than generated through spelling-to-sound conversion rules.

2:55-3:15 (96)

Strategic Dissociation of Lexical and Sublexical Translation of Spelling to Sound. S. MONSELL, *University of Cambridge*, & K. E. PATTERSON, *MRC Applied Psychology Unit, Cambridge*—We show, first, that skilled readers of English pronounce exception words (like *pint*) and nonwords (like *rint*) less efficiently in mixed than in pure blocks, and, second, that some can set themselves to pronounce exception words “by rule” (e.g., *pint* pronounced like *mint*) as efficiently as matched nonwords. These strategic shifts of balance between lexical and sublexical levels of spelling-sound correspondence imply a functional dissociation between them which must be recognized in models of transcoding.

PSYCHOPHYSICS

Regency Ballroom F, Friday Afternoon, 1:00-3:20

Chaired by Brian Lyman, Trinity University

1:00-1:10 (97)

Combination Rules in Psychophysical Measurement of the Judged Seriousness of Crimes. DANIEL ALGOM, *Bar-Ilan University*—

Common to all psychological ratio scaling techniques used to determine the judged seriousness of crimes is the necessary (yet usually implicit) assumption that the derived scale values are additive. The present study tested the additivity assumption explicitly by having subjects judge the seriousness of pairs of offenses produced by a factorial combination of eight offenses with the same offenses. Results established an underlying additive metric for the psychological representation of the gravity of crimes.

1:15-1:30 (98)

The Contextual Dependence of Unidimensional Similarity Structures. DOUGLAS H. WEDELL, *University of South Carolina*—Subjects made absolute and pairwise ratings of numerosity of dots. Stimulus spacing was manipulated to create positively and negatively skewed distributions. Contextual effects on absolute judgments conformed to range-frequency theory. Contextual effects were absent for pairwise ratings when these occurred first and members of each pair were presented simultaneously. However, when pairwise ratings followed absolute ratings or when there was a 3-sec delay between members of each pair, significant contextual effects were observed.

1:35-1:55 (99)

Judgments of Numerical Equality and Inequality. STEPHEN W. LINK, *McMaster University*—New psychophysical studies of mental comparisons reveal how judgments of the equality or inequality of distances depend upon a new form of comparative judgment. Judgments such as same-different, or equal-unequal, produce distinctive chronometric and psychometric functions that are quite unlike those obtained from judgments of greater-lesser, or larger-smaller. Experimental results from comparisons of single- or two-digit numbers illustrate that the comparison mechanism for equal-unequal judgments operates across diverse stimuli.

2:00-2:10 (100)

Space Errors in the Method of Pair Comparisons. SERGIO CESARE MASIN & ANNA AGOSTINI, *University of Udine*—Using the method of pair comparisons, pairs of simultaneous lines differing in length were presented tachistoscopically on the left and right of a fixation point. Spatial asymmetry and presentation-order effects were detected. The comparison task seems to activate a left-to-right scanning of lines which gives the left line a greater weight in controlling the comparative response. In fact, space-error effects reversed when the direction of scanning was changed toward right to left.

2:15-2:25 (101)

The Method of Transitions: An Adaptive Procedure. GIULIO VIDOTTO, *University of Padova*—An adaptive psychophysical procedure based on the method of transitions as presented in Masin and Vidotto (1984) to calculate individual thresholds or points of subjective equality is described. The adaptive procedure does not require reasonably precise advance knowledge of the psychometric function to select optimal stimulus levels. Practical solutions to a number of computational problems in order to increase the accuracy of the estimates obtained are considered.

2:30-2:50 (102)

Information Theory Goes A-Roving. LAWRENCE M. WARD & SHUJI MORI, *University of British Columbia*—Absolute identification of unidimensional stimuli measured by information transmission was once the rage. It was supplanted by two-interval paradigms when signal detection theory and “information processing theory” came into vogue. We present data on information transmission in absolute identification, and fixed- and roving-standard two-interval discrimination, of frequency and intensity of pure tones presented in white noise or alone. These data have implications for theories of intensity resolution and the “magical number seven.”

2:55-3:15 (103)

Modeling Detection and Localization in Medical Images. RICHARD G. SWENSSON & PHILIP F. JUDY, *Harvard Medical School*—A simplified “maximum-value” model for detecting and locating target signals randomly embedded in image-noise backgrounds predicts a nonparametric linear relation between detection and localization accuracies: $A = (1 + P)/2$, where P is the probability of correctly locating the target when present and A is the area below the (detection) ROC curve for differentiating target and nontarget cases. When applied to data from radiologists who searched medical images for simulated

lesions, estimates of A fell below predictions as P decreased ($A = .5$ about $P = .2$).

PICTURE PROCESSING

Burgundy Room, Friday Afternoon, 1:00-3:35

Chaired by Michael P. Toglia, SUNY at Cortland

1:00-1:20 (104)

Looking at Pictures, but Remembering Scenes. HELEN INTRAUB, RACHEL BENDER, & JENNIFER MANGELS, *University of Delaware*—Subjects remember close-up photographs as being less close-up (*boundary extension*; Intraub & Richardson, 1989). To test two alternate explanations, subjects studied close-up, prototypic, or wide-angle scenes. Immediately or 48 h later, they viewed the same pictures and rated each as being same, closer, or further. Immediate conditions yielded boundary extension supporting a perceptual schema hypothesis. Delay conditions yielded different results, but did not support regression-to-prototype in memory. Demonstration will be attempted.

1:25-1:40 (105)

Comparing the Rate of Semantic Access of Pictures and Words. JOAN GAY SNODGRASS & KELLY FEENAN, *New York University*—Sixteen-item lists of pictures and words were presented in rapid succession and subjects identified a target cued with an extrinsic cue (an outline square) or an intrinsic cue (target in boldface). Across a range of ISIs (50-134 msec), pictures and words were identified equally well. This equivalence was approximately independent of cue. We present evidence that successful identification was accompanied by semantic access, and thus conclude that pictures and their names are understood equally quickly.

1:45-2:05 (106)

Behavioral and Simulation Explorations of the Other-Race Effect. ALICE O'TOOLE, *University of Texas at Dallas*, KENNETH DEFFENBACHER, *University of Nebraska at Omaha*, HERVÉ ABDI, & JAMES C. BARTLETT, *University of Texas at Dallas* (read by Kenneth Deffenbacher)—Our data replicate the other-race effect for Caucasian observers viewing Japanese and Caucasian faces and show a negative correlation between typicality and recognizability of individual faces. The correlation was mediated by increased false alarms for typical Japanese faces but by decreased hits for typical Caucasian faces. Simulations examined similarity relationships among unfamiliar faces of each race recalled by an autoassociative memory trained either on a majority of Japanese or a majority of Caucasian faces.

2:10-2:25 (107)

Generalization of Implicit Memory to Same-Name Pictures. LINDA J. ANOOSHIAN, *Boise State University*—Initial exposure to pictures varied in the specificity of names provided for depicted objects (e.g., tulip or flower). For later assessments of implicit memory, college students identified and named pictures hidden within random dot patterns. Independent of exposure condition, old pictures as well as new pictures with the same specific and/or general names (e.g., tulip, sunflower) were identified with less clarification than was required for new unrelated pictures.

2:30-2:45 (108)

Adaptive Changes in Exocentric Direction Estimates Associated with Error Feedback. GREGORY K. THARP, *University of California, Berkeley*, & STEPHEN R. ELLIS, *NASA-Ames Research Center and University of California, Berkeley* (read by Stephen R. Ellis)—An experiment was conducted to determine the effects of training on characteristic errors observed when subjects judge exocentric directions on perspective displays. Five subjects' errors were measured during a procedure providing feedback of the sign and direction of their errors. Errors decreased but were not eliminated. A lookup-table model was developed which attributes the judgment error to errors in estimating the display's viewing direction. Fitted to the data, this model matched the characteristics of the data well.

2:50-3:05 (109)

Experiments in Memory for Visual Area. SIMON KEMP & CLARE LANGE, *University of Canterbury*—When two (or more) areas are seen in a figure, the ratio of the larger to the smaller area is usually underes-

timated. The estimated ratio decreases further when the figure is remembered. Our experiments showed underestimation where recognition of the figure was attempted. Experiments in which background hatching was varied or distances were recalled suggested that underestimation cannot be attributed to some kind of zooming. The perceived importance of area judgments was also investigated.

3:10-3:30 (110)

How Degrading a Picture Slows Processing and Alters Memory. LEAH KAUFMAN & GEOFFREY R. LOFTUS, *University of Washington* (read by Geoffrey R. Loftus)—How does visually degrading a stimulus affect perception of and memory for that stimulus? In a recognition paradigm, we presented naturalistic pictures for varying study durations. The pictures were either "clean" (normal contrast) or "degraded" (reduced contrast) both during original study and during the subsequent recognition test. We found (1) that degradation reduces information-acquisition rate at study by a constant factor and (2) that some information about the original degradational state is stored as part of the memory representation.

REPETITION/PRIMING EFFECTS II

Regency Ballroom A, Friday Afternoon, 3:25-5:30

Chaired by Colin M. MacLeod, University of Toronto

3:25-3:45 (111)

Evidence for Long-Lasting Perceptual Information in the Transformed Text Paradigm. FERGUS I. M. CRAIK & MICHAEL C. GEMAR, *University of Toronto*—Subjects read some paragraphs in one transformed typography and other paragraphs in a second transformed typography. After one week, they reread the paragraphs either in the original or the alternative typography. A small but reliable advantage was found for paragraphs reread in the same typography, and this advantage was at least as great for words read relatively fluently in the first session. A second study showed that the rereading advantage was largely restricted to words occurring only once in the experiment.

3:50-4:05 (112)

Does Attention Control the Context Specificity of Repetition Benefits in Oral Reading? LAURA CARLSON, BRUCE MCCANDLISS, ANNJANETTE ALEJANO, & THOMAS H. CARR, *Michigan State University* (read by Thomas H. Carr)—Extant data are mixed concerning context specificity of repetition benefits in reading, an issue that bears on how practice improves performance. We explore the possibility that focusing attention on lexical versus propositional processing is an important but previously uncontrolled determinant of context specificity. Results show attentional focus influences context specificity when the target that is to benefit from past reading experience is a coherent text, but not when the target is a random word list.

4:10-4:30 (113)

Looking Through the Kiger and Glass: Adventures in Backward Priming. KENNETH R. PAAP, LINDA S. JOHANSEN, RONALD W. NOEL, & JERRY T. BALL, *New Mexico State University*—In a series of experiments, we demonstrate that backward priming is different from forward priming in three important ways: (1) backward priming yields relative degrees of interference relative to a neutral prime, (2) backward priming induces a response bias that is clearly evident when related nonwords (e.g., boat-cunoe) are tested, and (3) backward priming occurs for associative primes, but not categorical primes. Finally, we show that when the response bias is eliminated, backward priming disappears.

4:35-4:50 (114)

Repetition Blindness Depends on Spatial Proximity. LARRY HOCHHAUS, *Oklahoma State University*—Repetition blindness, the failure to perceive immediately repeated target words, can be explained at least two ways, namely, by perceptual capture (failure to perceive prime and target as distinct events) and by token individuation (failure to identify the second particular instance of a generic word type). To decide between these views, the spatial distance between prime and target was manipulated. Reduced repetition blindness with increasing spatial separation favors explanation of repetition blindness by perceptual capture.

4:55-5:10 (115)

Inhibitory Effects in Form Priming: An Evaluation of Phonological Contributions. STEPHEN J. LUPKER, *University of Western Ontario*, & LUCIA COLOMBO, *University of Padova*—In 1985, Colombo reported that, contrary to popular belief, formally similar primes often inhibit processing of high-frequency targets. In the present studies, we used rhyming pairs to evaluate an explanation of this effect based on the notion of simultaneous phonological inhibition and orthographic facilitation processes (O'Seaghdha et al., 1990). Although lexical decision task results provide good support for this explanation, naming task results do not. Implications for other explanations of form priming are also considered.

5:15-5:25 (116)

The Time Course of Early Activation in Primed Picture Naming. NANCY L. BOWLES, *Veterans Administration, Boston*—Carr, McCauley, Sperber, and Parmelee (1982) have shown facilitation of picture naming by masked, semantically related primes presented at sub-threshold through suprathreshold durations. The present experiments indicate that such priming of picture naming is somewhat elusive and is critically dependent on the intention to name the prime, the nature of the prime masking, and the type of prime. These results will be considered in the context of interactive activation models of word retrieval.

MUSIC

Regency Ballroom C, Friday Afternoon, 3:50-5:35

Chaired by Stewart Hulse, *Johns Hopkins University*

3:50-4:00 (117)

The Influence of Pitch on Time Perception in Short Melodies. IAN NEATH & ROBERT G. CROWDER, *Yale University* (read by Robert G. Crowder)—Three experiments indicated that the pitches of two notes defining a silent interval affected the perceived duration of that interval. When subjects compared the duration of the two silent intervals defined by a three-note melody, the notes were perceived as having a greater temporal separation if a wide, rather than narrow, gap in pitch separated two tones, even if the objective timing is identical. The effect was weaker at octaves than at other wide intervals.

4:05-4:20 (118)

Learned Pitch Recognition in Songbirds. RON WEISMAN & DAN WEARY, *Queen's University at Kingston*—We report a discrimination experiment in which 3 notes served as positive standards at 4100, 3300, and 2500 Hz, and 24 notes served as negative comparison notes at 400 Hz to only 1 Hz lower than each standard note. Four black-capped chickadees worked separately to obtain food by flying to the feeder on widely spaced positive trials. Chickadees maintained excellent performance, over 90% correct response, at pitch differences of no more than 100 Hz.

4:25-4:35 (119)

Abrupt Onsets and Offsets Clarify the Order of Overlapped Tones. ALBERT S. BREGMAN & JEAN KIM, *McGill University*—Listeners compared two four-tone sequences whose order was the same or different. Tones were 1 sec in duration but were greatly sequentially overlapped (94%, 92%, or 90%). Onsets and offsets had linear amplitude ramps whose duration was varied. Same-different judgments were facilitated by more abrupt (shorter) onsets/offsets in the range between 640 msec and 40 msec. Onsets exerted a much more powerful effect than offsets. These transitions seemed to trigger rapid pitch analyses.

4:40-4:50 (120)

Tempo Range for Recognition of Interleaved Melodies. W. JAY DOWLING & MELINDA WILSON ANDREWS, *University of Texas at Dallas*—Warren (*Music Perception*, in press) found a tempo range of about 0.6 to 6 notes/sec within which familiar melodies are easily recognized. We replicated Warren's result, and also found temporally interleaved distractor notes in pitch ranges neighboring the targets did not affect target tempo range for recognition. Thus, in cognition, the recognition process (that depends on tempo) appeared to follow the attentional process (that separates target elements from distractors). We discuss listeners' various recognition strategies.

4:55-5:15 (121)

Testing the Implication-Realization Theory of Melody. CAROL L. KRUMHANSL & E. GLENN SCHELLENBERG, *Cornell University*—The implication-realization theory of melodic structure (Narmour, *Contemporary Music Review*, 1989) proposes Gestalt-based principles operating on local levels. This aspect of the theory is strongly supported by perceptual studies with both isolated intervals and intervals embedded in folk melodies. Listeners with different levels of musical training produce similar results, suggesting these principles may be universal as claimed by the theory. Top-down influence of tonality was also evident, especially for the folk melodies.

5:20-5:30 (122)

Speech Accompanied by a Tone with Aligned or Misaligned Stress. TRACY GLEASON & JAMSHED J. BHARUCHA, *Dartmouth College* (read by Jamshed J. Bharucha)—A repeating tone of alternating strong and weak stress accompanied the production or perception of English sentences spoken isochronously but with normal linguistic stress. More errors were made when the linguistic and tone stresses were aligned than when they were misaligned. The results support Palmer and Kelly's (1989) prediction that alignment of musical and linguistic stress aids comprehension and provides further evidence of rhythmic attention as reported by Jones (1981).

LANGUAGE/DISOURSE II

Regency Ballroom D, Friday Afternoon, 3:40-5:35

Chaired by Barbara Landau, *Columbia University*

3:40-3:50 (123)

Pause Reports for Spontaneous Dialogic Speech. LORI ANN FRIEDMAN & DANIEL C. O'CONNELL, *Georgetown University* (read by Daniel C. O'Connell)—Native speakers of English ($N = 40$) reported occurrence and estimated duration of pauses for English and German spontaneous dialogue. Occurrence was underestimated, more so for German than for English. Duration was underestimated by men, overestimated by women. Women were more accurate and efficient than men for German, though both groups performed equivalently for English. Reports for English were significantly more accurate and efficient than for German.

3:55-4:10 (124)

Discourse Processing as a Function of Content and Feedback. PHILIP LANGER, VERNE C. KEENAN, & SUSAN M. NELSON, *University of Colorado*—Subjects reconstructed scrambled descriptions of the layout of a mythical town, which were either geographical (spatial) or sequential (route). Assistance was provided either by access to a map or by tokens which could be used to directly aid sequencing sentence order. Using numbers of propositions recalled, discrimination of old from new sentences, and verification of inferences as dependent variables, the results suggest differential processing strategies as a function of strong version and/or assistance provided.

4:15-4:30 (125)

Speech Segmentation During the First Minutes of Second-Language Acquisition. PIENIE ZWITSERLOOD, *Max-Planck-Institute for Psycholinguistics* (sponsored by K. I. Forster)—What kind of information can adult listeners extract from as little as 15 min of exposure to a language that is completely unknown to them? How do they segment the continuous spoken input? Native speakers of Dutch were presented with two videotaped Chinese stories, illustrated in a cartoon-like fashion. The Chinese speaker was always visible on the screen. The frequency of occurrence of certain critical words was varied in the input. After seeing the video, subjects were tested on a number of on-line tasks normally used to assess comprehension processes in adult native speakers. Error and reaction time data from a word-recognition task and from tasks on the syllabic structure and segmental makeup of Chinese show that minimal contact with a foreign language can lead to knowledge about its structural properties.

4:35-4:50 (126)

Context Effects in Comprehending Familiar and Unfamiliar Proverbs. NIGEL E. TURNER & ALBERT N. KATZ, *University of*

Western Ontario (read by Albert Katz)—Conventional wisdom holds that figurative language (such as metaphor or proverbs) is not processed differently than literal language. In three studies employing proverb stimuli, we show that this conclusion is limited to familiar proverbs. Our conclusion that novel figurative language is processed differently than literal language is based on: (1) the latency to comprehend proverbs when placed in various contexts, (2) normative rating data, and (3) memory data. An explanation based on the default processing of customary meaning will be discussed.

4:55-5:10 (127)

Understanding Idioms: The Psychology of Allusion. SAM GLUCKSBERG, MATTHEW S. MCGLONE, *Princeton University*, & CRISTINA CACCIARI, *Universita' di Bologna*—Standard pragmatic models of figurative language paradoxically assign initial priority to literal meanings, but then assign no roles for literal meanings once a figurative meaning has been generated. We describe a framework for idiom comprehension that integrates literal and idiomatic meanings in discourse contexts. We then show how this framework can apply to people's use and understanding of familiar word sequences in general, including allusions to familiar texts, poetry, songs, and other culturally shared referents.

5:15-5:30 (128)

A Knowledge-Usage Theory of Writing. RONALD T. KELLOGG, *University of Missouri-Rolla*—A theory of writing is proposed relating the availability and accessibility of knowledge to writing performance and the demands of the writing process. The availability of domain-specific topic knowledge is contrasted with domain-free verbal knowledge in its effects. The degree of accessibility is hypothesized to vary with the prewriting strategy used by the writer to retrieve and maintain knowledge. Three experiments testing predictions of the theory are presented.

PERCEPTION I

Regency Ballroom H, Friday Afternoon, 3:30-5:40

Chaired by Lynn C. Robertson,
University of California, Davis Medical School

3:30-3:40 (129)

The Effect of Size on the Perception of Ambiguous Figures. PAULA GOOLKASIAN, *University of North Carolina at Charlotte*—The present study looked at the effect of size on the interpretation of ambiguous figures. Small (less than 10° of visual angle) and large (greater than 15° of visual angle) figures were preceded by a fixation point, a biased version of a figure, or a feature of a figure. While the interpretation of a large ambiguous figure was found to be influenced by a critical feature or a biased version of a figure, the interpretation of a small ambiguous figure was not affected by the information that preceded it. Large figures were processed in a flexible manner that showed evidence of top-down and bottom-up processing.

3:45-4:05 (130)

Spontaneous Pattern Changes for Bistable Stimuli: Evidence Against Neural Satiation. HOWARD S. HOCK & AUDREY VOSS, *Florida Atlantic University*—Experiments with reversible (bistable) apparent motion stimuli argue against prolonged inspection time causing spontaneous pattern change because of satiation (fatigue) of the neural units associated with the initially perceived pattern. Bistable stimuli can be subject to spontaneous change from the moment a pattern is organized; prolonged inspection merely provides the opportunity for low-probability changes to occur. Although it can remain constant for long durations, immediate increases in the probability of change can also be observed.

4:10-4:20 (131)

Emmert's Law of Apparent Distance. MAURICE HERSHENSON, *Brandeis University*—Emmert's Law predicts the size of afterimages from the retinal size of the stimulus (visual angle) and the distance of the projection surface. It rests on the assumption that the distance of the surface is perceived accurately. If the assumption is false, Emmert's Law could be used to calculate perceived distance from afterimage size. Empirical outcomes using Emmert's Law in this fashion provide a new picture of the scale of perceived distance.

4:25-4:40 (132)

Evidence for Extrastriate Mechanisms in Two-Dimensional Orientation Illusions. PETER WENDEROTH, *University of Sydney*—In one-

dimensional orientation illusions, repulsion (direct) effects are reduced by spatial differences between test and inducing stimuli; attraction (indirect) effects are unaffected. With 2-D (plaid induced) illusions, direct effects also decrease but indirect effects increase. This suggests competitive interactions between low-level real contour and high-level virtual axis mechanisms. The hypothesis makes precise predictions about the effects of a surrounding frame on 2-D orientation illusions and experiments confirm these predictions.

4:45-4:55 (133)

Contribution of Lateral Neural Interactions to Five Visual-Geometric Illusions. STANLEY COREN & DEBORAH J. AKS, *University of British Columbia*—Five experiments employed the intermittent light stimulation technique that Coren, Porac, Aks, and Morikawa (1988) used to demonstrate the relative contribution of lateral neural interactions to the Müller-Lyer illusion on various illusions. For intersecting line illusions (Wundt-Hering, Zöllner, and Poggendorff), the illusion increased under the intermittent illumination, suggesting contributions from lateral neural interactions. For configurations lacking these elements (Delboef and Ebbinghaus), there were no significant changes suggesting an absence of lateral inhibitory contributions.

5:00-5:15 (134)

The Separate Components of the Müller-Lyer Illusion. CLARE PORAC, *University of Victoria*—Three experiments explored the hypothesis that the component parts of the Müller-Lyer illusion are different distortions. Results confirmed that the wings-in and wings-out segments are separate but not independent illusions. Also, the Brentano form is a third illusion related in mechanism to the wings-in rather than the wings-out component. Novel findings emerged that led to a new theory of illusion magnitude formation and change in the Müller-Lyer figure.

5:20-5:35 (135)

Relative Salience of Axes in an Object Perception Frame of Reference. DARRELL L. BUTLER, *Ball State University*—The perception of object shape can be influenced by reorientation. Three experiments investigated Rock's hypothesis that these orientation effects occur because perceivers use an internal perceptual reference frame whose major axis determines the top and bottom of an object.

ANIMAL LEARNING II

Regency Ballroom F, Friday Afternoon, 3:30-5:35

Chaired by Helen M. Murphy, *John Carroll University*

3:30-3:45 (136)

Delay Versus Rate of Reinforcement as Determinants of Behavioral Contrast. FRANCES K. McSWEENEY & CAM L. MELVILLE, *Washington State University*—Changes in the delay to reinforcement produced behavioral contrast even when rate of reinforcement was held constant. That is, responding during a constant component of a multiple schedule increased with increases in the delay to reinforcement in the other component. Past experiments on this topic may have inadvertently confounded changes in delay with changes in rate by canceling uncollected reinforcers when the components of the multiple schedule changed.

3:50-4:10 (137)

Fine Structure and Dynamics of Behavior. WILLIAM L. PALYA, *Jacksonville State University*—IRT distributions of keypecks as a function of time in the interreinforcement interval are presented for simple schedules in a format analogous to Blough (1963). The results indicated a constant basic frequency with a proportion of missed responses. These findings indicated that it is unlikely that the molar effects of schedules are necessarily the result of direct changes in the basic response frequency. A sequential analysis of the IRTs provided no evidence of an underlying chaotic dynamic process.

4:15-4:30 (138)

Stimulus Value and Behavioral Contrast. BEN A. WILLIAMS, *University of California, San Diego*—Stimuli correlated with either positive or negative contrast were paired in probe choice trials. Contrary to the prevailing view that positive contrast effects reflect an increase in relative value, preference was in favor of the stimulus correlated with negative contrast. Thus, response rate was negatively correlated with stimulus value.

4:35-4:50 (139)

Feeding and Thermoregulatory Strategies of Pigeons Living in Harsh Environments. MICHAEL E. RASHOTTE, DORI HENDERSON, M. MERCEDES FORT, & ROSS P. HENDERSON, *Florida State University*—Pigeons living at an ambient temperature (T_a) of 21°C and a low food cost (FR12 → 10 sec food) in a closed economy were exposed to either $T_a \approx 1^\circ\text{C}$ or to rising food cost. Daily food consumption increased when T_a fell, but decreased when food cost rose; nocturnal body temperature decreased when food cost was high, an energy-saving response. An additional experiment determined the combined effects of low T_a and rising food costs on feeding and nocturnal body temperature.

4:55-5:10 (140)

Range Effects During Generalization Testing. JOHN M. HINSON & LINDA R. TENNISON, *Washington State University*—Stimulus range effects during visual discrimination by pigeons were assessed with either transient or maintained generalization testing methods. In both testing paradigms, the range of negative (S^-) stimuli was varied to determine its impact on generalization phenomena. Peak shift effects during transient testing, and dimensional contrast effects during maintained testing, were both diminished by increases in S^- range. The results obtained in both settings may be attributable to variations in attention that occur with changes in stimulus range.

5:15-5:30 (141)

Searching Image in Pigeons: A Test of Two Hypotheses. CYNTHIA LANGLEY, *University of California, Berkeley*, ALAN B. BOND, *University of Nebraska-Lincoln*, & DONALD A. RILEY, *University of California, Berkeley* (read by Alan B. Bond)—Searching image theory states that animals hunting for a cryptic item focus on visual features particular to that item, thus facilitating its detection. An alternative search-rate model (Guilford & Dawkins, 1987) proposes that improved detection of cryptic items, regardless of their visual features, only reflects the adoption of a longer "look time" than is used when searching for easily detected items. Our data on pigeon grain search support searching image and contradict the search rate model.

INFORMATION PROCESSING I

Burgundy Room, Friday Afternoon, 3:45-5:30

Chaired by Sylvan Kornblum, *University of Michigan*

3:45-4:05 (142)

Interactive Activation, FLMP, and the Effect of Context on Perception. JAMES L. McCLELLAND & JAVIER MOVELLAN, *Carnegie-Mellon University*—Massaro has argued that the Fuzzy Logical Model of Perception (FLMP), and not interactive activation, provides a correct and parsimonious account of context effects in perception. We will show that interactive activation offers the superior account. In some cases, interactive activation mimics FLMP: Both models can account for classical effects of context in perception. In others, interactive activation makes clear predictions that FLMP does not make. Experiments testing these predictions are in progress.

4:10-4:25 (143)

Interpreting Additive Factors in Processing Networks: Application to Psychological Refractoriness. RICHARD SCHWEICKERT, *Purdue University*, DONALD L. FISHER, *University of Massachusetts*, & W. GOLDSTEIN, *University of Chicago*—Experiments by Smith (1969), Becker (1976), and Pashler and Johnston (1989) suggest that processes in double stimulation tasks are arranged in PERT networks. An OP diagram analysis suggests exponential process durations. Two factors prolonging processes in a PERT network are additive if and only if the factors prolong processes on either side of a vertex whose removal would disconnect the network. A stage (cf. Sternberg) consists of the set of processes between two such cut vertices.

4:30-4:40 (144)

Cognitive Flexibility in Three Domains. RONNA F. DILLON, *Southern Illinois University at Carbondale*—An important dimension of cognitive flexibility involves generating multiple strategies during solution of complex cognitive items that can be solved in more than one way. A second dimension of flexibility centers on maintaining information-processing efficiency when item demands change following solution of items that are similar in underlying transformational rules. Data were collected on three samples: graduate students in medical school preparation courses, undergraduate students, and third-year medical school students. Data indicate that both dimensions of flexibility contribute significantly to school grades and other measures of academic performance and medical competence, with R^2 's in the .32-.53 range.

4:45-5:00 (145)

Network Interference Processes in Mental Multiplication and Division Skills. TIMOTHY C. RICKARD & LYLE E. BOURNE, JR., *University of Colorado* (read by Lyle E. Bourne, Jr.)—Subjects were trained on simple multiplication and division problems. Transfer was then evaluated across a change in the operand-order and across a change in position of the unknown. Reaction time data showed good transfer across operand-order, but poor transfer across unknown position. Table-related errors for transfer problems were traceable to operand-based links acquired during learning. These results support a network model of multiplication/division skill which specifies both operand-based and problem-based retrieval components.

5:05-5:25 (146)

Stimulus Complexity Effects in Visual Comparisons: Effects of Practice and Learning Context. JAMES W. PELLEGRINO, *Vanderbilt University*, STEPHANIE M. DOANE, *University of Colorado*, SUSAN C. FISCHER, *Anacapa Science Inc.*, & DAVID ALDERTON, *Navy Personnel Research and Development Center*—Two experiments examined effects of stimulus complexity, practice, and task context on performance in a visual comparison task. In Experiment 1, stimulus complexity effects were initially present but decreased with practice. In Experiment 2, the initial context for stimulus discrimination was varied. A difficult discrimination context led to more stimulus-specific learning, diminished complexity effects, and less disruption from a subsequent change in task context. The results will be discussed relative to skill-acquisition theories.

POSTER SESSION I

Regency Ballroom E, Friday Evening, 5:30-7:00

(147)

Mental Spatial Frameworks for Different Perspectives. NANCY FRANKLIN, *SUNY at Stony Brook*, & BARBARA TVERSKY, *Stanford University* (sponsored by Barbara Tversky)—In three experiments, subjects read narratives describing two characters surrounded by objects in scenes. The narratives reoriented the characters periodically, and subjects identified objects in probed directions. Response times indicated that when characters were in different scenes, subjects took the perspective of each character in turn, but when characters had different perspectives on the same scene, subjects took an overview perspective.

(148)

Spatial Reference Frames and Mental Imagery of Rotational Motion. JOHN R. PANI & DAVIDO DUPREE, *Emory University* (sponsored by Ulric Neisser)—Previously, direction of the axis of rotation had strongly influenced success of mental imagery for a class of rotational motions. Two experiments asked what reference frames define effective direction of the axis. Orientation of the axis in the environment strongly influenced mental imagery of rotation; orientation in the visual field was irrelevant. Additionally, orientation in a local physical reference frame was influential for some subjects. These results extend those found with form recognition (Rock).

(149)

Pseudoword Priming in Amnesic Patients. GAIL MUSEN & LARRY R. SQUIRE, *VAMC, San Diego, and University of California, San Diego* (sponsored by Larry R. Squire)—We examined whether amnesic patients could acquire new information by adopting a reading speed paradigm in which amnesic patients and age-matched control subjects read lists of repeated pseudowords, unique pseudowords, repeated words, and unique words. Both groups read the repeated lists faster than the unique lists and improved at the same rate within each list. We suggest that facilitated reading speed may reflect early-stage perceptual priming that does not depend on access to meaning.

(150)

Memory Dissociations in Normal and Memory-Impaired Subjects. TERESA A. BLAXTON, *National Institutes of Health* (sponsored by Henry L. Roediger III)—Dissociations among memory measures were examined in memory-impaired temporal lobe epileptics and matched controls. After either generating or reading items during study, only the controls showed standard generation effects on conceptually driven tests of explicit semantic cued recall and implicit general knowledge. However, both groups showed more priming from reading than generating words on data-driven tests of explicit graphemic cued recall and implicit fragment completion. Implications for processing and systems theories will be discussed.

(151)

Reducing Interference in Distributed Memories Through Episodic Gating. STEVEN A. SLOMAN & DAVID E. RUMELHART, *Stanford University* (presented by David E. Rumelhart) (sponsored by Cynthia H. Null)—Distributed models of memory sometimes show catastrophic interference when sequential learning is simulated. We eliminate the problem using both a representational and an architectural constraint. Interference is reduced by assuming the space of possible representations to be sparsely populated. Interference between contexts is minimized by using "episodic" units to gate "general knowledge" units. Storage is effectively compartmentalized such that learning in one episode has limited effect on memories acquired in other episodes without losing generalization properties.

(152)

Encoding Stable Memory Traces in Neural Network Models. WILLIAM L. OLIVER, *Florida State University* (sponsored by Richard Wagner)—Learning in neural network models of memory is notoriously unstable. New memories tend to displace old memories in these models so that only recently encountered material can be accurately recalled

or recognized. A multilayer neural network model of human recognition and recall is described. The model uses a mean field theory learning algorithm. Results indicate that the memory traces encoded by the model are sufficiently stable to simulate human learning in laboratory tasks.

(153)

Using a Symbolic/Connectionist Model to Simulate Action Planning. STEPHANIE M. DOANE & WALTER KINTSCH, *University of Colorado* (sponsored by Walter Kintsch)—A system called UNICOM uses Kintsch's (1988) construction-integration theory to model UNIX knowledge. In the construction phase, the model forms an associative network according to production rules. In the integration phase, activation propagates throughout the network such that items related to each other and to the current context becomes strengthened, and items with few, weak, or inhibitory connections become deactivated. UNICOM simulates group and individual differences in planning complex UNIX command production tasks.

(154)

Effects of Tonal Context on Octave Discrimination Thresholds. NANCY E. KELLEY, *Indiana University-Purdue University at Fort Wayne* (sponsored by W. Jeffrey Wilson)—Octave-discrimination thresholds were obtained for a single tone from 24 musically trained and 24 musically naive subjects using the method of constant stimuli. Thresholds were obtained under two context conditions for each subject: the standard formed either (1) a tritone interval or (2) a perfect-fifth interval with the tone preceding it. Thresholds were narrower for the perfect fifth context than for the tritone context for both trained and naive subjects.

(155)

Effects of Referent Signal Intensity on Monaural Loudness Adaptation. ANJALI DANGE, ERNEST M. WEILSER, JOEL S. WARM, & WILLIAM N. DEMBER, *University of Cincinnati* (presented by Joel S. Warm)—Recent studies of monaural loudness adaptation can be indicated on the basis of contrast effects stemming from reference tones which are more intense than the adapting tone. To test that possibility, listeners made magnitude estimates of adapting tones (45 and 75 dB) as well as of reference tones whose intensities were ± 10 dB of the adapting tones. All loudness estimates declined over a 5-min, 20-sec listening period, indicating adaptation without a contrast artifact.

(156)

Units of Knowledge in Skilled Music Performance. CAROLINE PALMER & CARLA VAN DE SANDE, *Ohio State University* (sponsored by Richard Jagacinski)—We tested the hypothesis that conceptual units of musical knowledge (notes/chords) change with learning. Skilled pianists' successive performances of unfamiliar music revealed systematic differences in performance errors. Chord errors were more common in homophonic (chordal) music, and single note errors were more common in polyphonic music. Perceived similarity, relative importance, and selective attention to particular musical features also affected the content and size of representational units. Associative processes are suggested, similar to other performance domains.

(157)

Source Misattributions in Eyewitness Memory. MARIA S. ZARAGOZA & KATHLEEN MOORE, *Kent State University*—Subjects who are exposed to misleading suggestions about an event they have witnessed sometimes come to believe they remember *seeing* items that were merely suggested to them, an error we refer to as *source misattribution errors*. An experiment was conducted to assess how the prevalence of source misattribution errors varies as a function of how the misinformation is processed. The results provide evidence for the role of elaborative and imaginal processes in source misattribution errors.

(158)

Memory for Humorous Sentences: A Preliminary Analysis. STEPHEN R. SCHMIDT, *Middle Tennessee State University*—Humorous sentences were rewritten to produce nonhumorous sentences of similar meaning, length, and complexity. Memory for humorous and

nonhumorous sentences was then tested in both mixed- and between-list manipulations of sentence type. A greater number of humorous sentences was recalled than nonhumorous sentences, but only in mixed-list designs. Humor did not influence memory for sentence detail. These results have important implications for the role of affect in memory.

(159)

Early Versus Late Inhibitory Mechanisms and Aging. JAMES KIELEY, *Pitzer College*, & ALAN HARTLEY, *Scripps College* (presented by Alan Hartley)—Recent reports suggest that reduced inhibitory efficiency among older adults may account for age differences in cognitive functioning. The generality of this finding was tested with tasks that primarily made either "early" (i.e., locating a repositioned nonverbal target stimulus) or "late" (i.e., discriminating a letter target from a competing distractor) demands on inhibitory processes. Results indicate that age differences may be more pronounced for late tasks that are hypothesized to primarily involve response competition.

(160)

Aging and Memory for Objects in Real-World Settings. TIMO MÄNTYLÄ, *University of Stockholm*, LARS BÄCKMAN, & CHRISTER CREUTZ, *Karolinska Institute, Stockholm*—Adult age differences in memory for objects in real-world settings were examined. Older and younger adults walked into an office containing objects that varied in terms of consistency with expectation. Learning instructions and retention interval were manipulated, and memory for objects was assessed with tests of free recall, verbal recognition, and visual recognition. For both age groups, the consistency effect was affirmed: objects inconsistent with expectation were better recalled and recognized than objects consistent with expectation.

(161)

Aging and the Allocation of Visual Spatial Attention. CHARLES L. FOLK, *Villanova University*, & WILLIAM J. HOYER, *Syracuse University* (sponsored by Dana J. Plude)—The timecourse and magnitude of costs and benefits associated with symbolic versus peripheral spatial cues were measured for younger and older adults in a letter discrimination task. Older adults showed significant cuing effects with peripheral cues only. Moreover, with peripheral cues, the magnitude of costs and benefits, as well as the speed of their development, was greater for older than for younger adults. The results support the existence of separable mechanisms in spatial attention allocation.

(162)

Age Differences in Indirect Memory for Distracting Information. MARILYN HARTMAN, *University of North Carolina at Chapel Hill* (sponsored by Lynn Hasher)—Older and younger adults studied sentences that had likely and unlikely endings. Subjects were instructed to learn the unlikely (Experiments 1 and 2), or likely endings (Experiment 3). Memory was tested indirectly with a sentence completion test. The results suggest that older adults retain more than younger adults about distracting information only if it conforms to general knowledge and expectations. These findings are interpreted as age-related failures of inhibitory mechanisms (Hasher & Zacks, 1988).

(163)

The Interfering Effects of Generation. DANIEL J. BURNS, *Lafayette College* (sponsored by Todd R. Schactman)—Recent evidence suggests that the generation effect (better memory for internally generated items than for externally presented items) is due to enhanced stimulus-response and response-specific processing. A series of experiments show that generation also can interfere with some types of processing that are not induced by the generation task. Two competing explanations of this interference effect are examined.

(164)

Does Expertise Help to Mediate the Verbal Overshadowing Effect? JONATHAN W. SCHOOLER & MARTE FALLSHORE, *University of Pittsburgh* (sponsored by Charles Perfetti)—Schooler and Engstler-Schooler (1990) demonstrated that verbalizing the appearance of previously seen nonverbal stimuli, such as faces or colors, can impair subsequent recognition. The present study suggests that this impairment, termed verbal overshadowing, may be associated with expertise. Specifically, verbalization impaired the recognition of same-race faces but not different-race faces. These findings are consistent with the hypothesis

that perceptual expertise enhances holistic/configural processing (Diamond & Carey, 1986) and verbalization impairs such processing.

(165)

Sensitivity to Frequency in Probabilistic Category Learning. ALBERT F. SMITH, *SUNY at Binghamton* (sponsored by Jared B. Jobe)—Subjects classified five-letter stimulus strings sampled from two categories, each of which was defined by a distinct probability distribution over the set of letters. For strings that had a nonzero probability of having been generated from either category, classification performance was well predicted by the relative likelihood that the stimulus string had been sampled from one, as opposed to the other, category. Data concerning subjects' knowledge of the structure of the categories will be presented.

(166)

Effects of Task Characteristics on Memory Strategy and Performance in College Students. MARGARET D. ANDERSON & PETER A. HORNBY, *SUNY at Plattsburgh* (presented by Peter A. Hornby) (sponsored by Henry Morlock)—Differential use and rated effectiveness of six memory strategies were measured as a function of stimulus materials, task characteristics, and testing method. While subjects report using different memory strategies depending on stimulus content and task characteristics, this pattern of use differs substantially from their rated effectiveness of the same six memory strategies. Test performance was also found to vary as a function of memory strategy employed with elaboration being most effective independent of task characteristics.

(167)

Direct and Indirect Measures of Serial Pattern Learning by Event Observation. JAMES H. HOWARD, JR., *Catholic University of America*, DARLENE V. HOWARD, *Georgetown University*, & SHARON A. MUTTER, *Catholic University of America*—Serial pattern learning was investigated using a variation of the serial reaction time task introduced by Nissen and Bullemer (1987). Subjects responded to an asterisk presented at one of four spatial locations by pressing a key (response condition) or by observing the event (observation condition). Direct and indirect measures revealed equivalent pattern learning for the two conditions. The findings support theories of pattern learning which assume that overt responding is not necessary for learning to occur.

(168)

Serial Position Effects in an Implicit Memory Task. FELICIA B. GERSHBERG & ARTHUR P. SHIMAMURA, *University of California, Berkeley* (presented by Arthur P. Shimamura)—The effects of serial position on word-stem completion priming were investigated. Recency and primacy effects were observed for the first half of the stems completed, but these effects disappeared for the second half of the stems. The recency effect suggests a relationship between time of activation and strength of priming. Although the primacy effect could be attributed to explicit memory, it may be mediated by an implicit mechanism based on distinctiveness of initial list items.

(169)

Replication and Comments on the Jacoby/Whitehouse Experiment. IRA H. BERNSTEIN, KENNETH R. WELCH, & VICTOR L. BISSONNETTE, *University of Texas at Arlington*—Jacoby and Whitehouse presented priming stimuli prior to recognition memory test stimuli. Primes that were identical to the tests *increased* the tendency to label the tests "old" if flashed "subliminally" but *decreased* this tendency when presented for longer durations. We replicate their recognition memory data but further illustrate the perceptual aspects of their study are subject to fundamentally the same criticisms that Eriksen (1960) raised about an early generation of subliminal stimulation studies.

(170)

Processing Effects on a Context-Sensitive Fragment Completion Test. KEITH D. HORTON & BRENDA D. NASH, *Wilfrid Laurier University* (sponsored by William Hockley)—Subjects generated sentences or counted vowels for pairs of study words. On a fragment completion test, E-generated sentences contained both members of the studied pair, including one in fragment form. The fragment could be completed with the studied word or an equally reasonable alternative. The data showed a large depth of processing effect. A processing account is offered

which emphasizes processing overlap between study and test rather than the implicit/explicit nature of the test.

(171)

An Orthographic Basis for Masked Repetition Priming. MICHAEL E. J. MASSON & MATTHEW I. ISAAK, *University of Victoria*—Word identification is enhanced by an immediately preceding masked presentation of the identical word. We demonstrate that this masked repetition effect is not altered by a disruptive intervening event, or by memory for a prior unmasked presentation of the target. In a pronunciation task, words and nonwords show equal masked repetition effects. We argue on these bases that masked repetition priming is orthographically based and related to repetition blindness and, more generally, informational persistence.

(172)

Categorization Using Direct and Indirect Similarity. EVAN HEIT, *Stanford University* (sponsored by Dorrit Billman)—When we categorize some stimulus, A, we are influenced by memory for stimuli, B, that are directly similar to A. It is proposed that categorization is also affected by memory for other stimuli, C, that are indirectly similar to A, by way of direct similarity to B. This reasoning may take the form of a chain, where A reminds us of B, and B remind us of C. Two experiments supported a mathematical model incorporating indirect similarity.

(173)

A Hidden Pattern-Unit Network Model of Category Learning. JOSHUA BEN HURWITZ, *Harvard University* (sponsored by William K. Estes)—A network model of category learning is introduced that employs hidden units representing stimulus patterns. These units are activated using a multiplicative similarity function. The model is fit to data from a rule-based serial category learning task, separately for subjects who discovered the correct rule and for those who did not. The predictions are more accurate for both groups when the model acquires differential feature weights than when it does not.

(174)

Reading and Mathematical Problem Solving as Interactive Processes. DORIS AARONSON & PETER SO, *New York University*—Subjects read mathematical text using a self-paced word-by-word computer presentation. A mathematical or semantic question occurred before or after each sentence. The data implicate different reading and memory strategies for these four groups. Math subjects, especially the least accurate ones, start computing while they are reading, stressing their working memory buffers. These poor problem solvers apportion their reading time nonoptimally, spending too much on numbers and too little integrating information at clause and sentence boundaries.

(175)

Mathematical Problem Solving by Analogy. LAURA R. NOVICK, *Vanderbilt University*, & KEITH J. HOLYOAK, *University of California, Los Angeles* (sponsored by John Rieser)—Two experiments involving undergraduates provided evidence on several key issues concerning mathematical problem solving by analogy: (1) a distinction between the processes of analogical mapping and procedure adaptation, (2) the relation between analogical transfer and schema induction, (3) the role of time pressure in mediating the relation between analogical transfer and solution accuracy, and (4) the contributions of domain-specific expertise and general ability to predicting analogical transfer with math word problems.

(176)

Japanese and American Children's On-line Comprehension of a Mathematics Lesson. CLEA FERNANDEZ, MAKOTO YOSHIDA, & JAMES W. STIGLER, *University of Chicago* (presented by James W. Stigler)—Using video, we explored effects of age and culture on comprehension of a mathematics lesson. Japanese children judged relative importance of lesson events better than did American children, sixth graders better than fourth graders. Americans rated teacher actions as more important than results of actions, whereas the Japanese judged actions and results equally important. A recognition memory task showed Japanese to be better than Americans at focusing selectively on teacher statements that were essential for learning.

(177)

Expert Problem Solving: Empirical Dimensions and Theoretical Foundations. JAMES J. STASZEWSKI, *University of South Carolina*

(sponsored by Robert S. Siegler)—Rubik's cube challenges human subjects and also GPS (Newell & Simon, 1972) as a comprehensive theory of human problem solving. The exceptional performance a college undergraduate exhibited in solving the cube is described along with findings from a detailed cognitive analysis that identify mechanisms supporting his remarkable skill. Experimental evidence is reported for the psychological reality of macro-operators, mechanisms predicted by AI studies, and an abstract hierarchical goal structure that governs their application.

(178)

Manipulating Subgoal Depth Via Examples. RICHARD CATRAMBONE, *Georgia Institute of Technology* (sponsored by Timothy A. Salt-house)—Learners can acquire subgoals and methods for solving problems in domains such as algebra, physics, and probability by studying worked-out examples. Depending on the examples studied, the acquired subgoals and methods will represent an understanding ranging from superficial to deep. Data are presented that support this claim and suggest ways of constructing examples that influence the depth of the subgoals and methods acquired by learners.

(179)

The Attention Demands of Memory Retrieval. MARK CARRIER & HAROLD PASHLER, *University of California, San Diego* (presented by Harold Pashler)—The attentional demands of memory retrieval were studied using three dual-task methods. One method involved chronometric analyses of refractory-period experiments with episodic memory retrieval as the second task. The second method combined a difficult semantic memory retrieval with easy repeated auditory-manual choice reactions. In the third method, subjects saw one or two difficult retrieval cues; we analyzed whether both retrievals were working simultaneously. Results provided converging evidence that memory retrieval is subject to the same single-channel bottleneck as response selection.

(180)

When Two Jobs Are Easier Than One: Facilitating Effects of Speeded Secondary Tasks. DAVID BURROWS, *Skidmore College*—Subjects simultaneously engaged in a primary letter-identification task and a secondary tapping task. In fast-tap conditions, minimum tapping rates were specified. In controlled-tap conditions, tapping rates had to fall within specified boundaries. For both types of condition, faster tapping requirements led to reductions in reaction times on the primary task. Overall, primary task reaction times were shorter in the fast-tap conditions. Secondary tasks apparently can have both energizing and distracting effects.

(181)

Collaboration in Communication Between Pilots and Air Traffic Controllers. DANIEL G. MORROW, *Stanford University and Decision Systems*, HERBERT H. CLARK, *Stanford University*, ALFRED T. LEE, *Decision Systems*, & MICHELLE RODVOLD, *Stanford University*—In conversation, people use collaborative techniques to establish the mutual belief that they have been understood. We examine the techniques used in communication between pilots and air traffic controllers. We identify common problems that disrupt routine communication and the techniques (e.g., repeating, paraphrasing, questioning) that are used to indicate and repair these problems. We find that some techniques are more efficient than others.

(182)

Speaking Versus Writing About Complex Knowledge. KIRSTEN NIELSEN & DAVID C. RUBIN, *Duke University* (presented by David C. Rubin)—Undergraduates described what a foreign visitor would need to know to understand the game of basketball, thereby translating a complex set of ideas into a linear structure. The procedure controlled for planning time, production time, purpose, audience, and formality. The differences in lexical characteristics and syntax between speech and writing that are noted in naturalistic studies were confirmed. Differences in content were noted. Implications for the study of memory and language are discussed.

(183)

Similarity Judgments of Spoken Words and Their Components. PAUL A. LUCE, JAN CHARLES-LUCE, *SUNY at Buffalo*, & DAVID B. PISONI, *Indiana University* (sponsored by David B. Pisoni)—We presented spoken words and syllables to subjects for similarity scaling judgments. We examined the degree to which similarity judg-

ments of consonant-vowel-consonant (CVC) words correlated with judgments based on subunits of the CVC words (e.g., consonant-vowel and vowel-consonant syllables). One result demonstrated that similarity judgments of vowels in CVC syllables correlate most highly with overall judgments of the CVC words, suggesting a perceptual hierarchy of the components of CVC words on which similarity judgments are based.

(184)

Mental Models in Narrative Comprehension: Now You See Them, Now You Don't. DIANA L. MILLER & TIMOTHY P. McNAMARA, *Vanderbilt University* (sponsored by Timothy P. McNamara)—In a series of experiments, we investigated whether or not mental models created from narratives shared critical properties with images constructed from viewed scenes. In particular, we looked at the existence of time-distance constraints on comprehension time and retrieval time for story information. Experiments focused on described distances between static objects and on distances crossed by moving characters. Individual differences were explored by comparing data from subjects classified as high or low imagers.

(185)

Prosodic Cues to Syntax: Interactive Processing and Cue Trading Relations. CHERYL M. BEACH, *University of California, San Diego* (sponsored by Gregg Oden)—Two experiments explore listeners' use of sentence prosody to identify syntactic structure. Duration and pitch patterns were assigned to synthesized sentence beginnings having a direct object-sentence complement ambiguity. Prosody influenced listeners' judgments about which type of complete sentence an item was from. The relationship between prosodic patterns and syntactic structure is continuous; the mechanism by which prosody functions as a cue to syntactic structure is shown to be interactive and characterized by cue trading relations.

(186)

The Role of Pronominal Reference in Discourse Segment Coherence. PETER C. GORDON, BARBARA J. GROSZ, *Harvard University*, ABIGAIL GERTNER, *University of Pennsylvania*, & KAREN RABIN, *Harvard University* (sponsored by J. Kathryn Bock)—According to centering theory (Grosz, Joshi, & Weinstein), coherence within discourse segments depends on the manner in which utterances make reference to common entities. The theory claims that each utterance has a center which links it to the previous utterance, and that this center should be realized as a pronoun. Self-paced reading time experiments show that references to centers, more than other references, are processed more quickly as pronouns than as repeated names.

(187)

The Role of Explanations and Plan Recognition in the Learning of Theatrical Scripts. HELGA NOICE, *Augustana College* (sponsored by Charles F. Schmidt)—Twenty-eight professional actors and 28 novices, assigned to gist or rote conditions, studied a six-page theatrical scene. Recall protocols indicated that the elaborations of actors qualitatively and quantitatively differ from those of novices. Actors appear to approach script learning by adopting their assigned character's perspective and by actively asking questions in order to infer that character's plan. The gist condition appeared to facilitate literal recall and encourage the generation of elaborations.

(188)

Short-Wavelength (Blue) Text Improves Reading Comprehension in Reading-Disabled Children. MARY C. WILLIAMS, *University of New Orleans*, NAOMI WEISSTEIN, *SUNY at Buffalo*, ANITA ROCK-FAUCHEUX, & KATIE LECUYSE, *University of New Orleans*—Abnormally long visual persistence, which smears visual information from one fixation to the next, has been hypothesized to be the basis of some reading disabilities. If so, a stimulus manipulation which speeds up decay times might improve reading comprehension. Metacontrast functions obtained for short (blue) and long (red) wavelength isoluminant masks indicated that short wavelength stimuli do speed up visual processing time. Blue text was then found to restore reading comprehension, consistent with the initial hypothesis.

(189)

Coordinating Mutual Beliefs in Conversation. DEANNA WILKES-GIBBS, *Wesleyan University*, & HERBERT H. CLARK, *Stanford University* (sponsored by Herbert H. Clark)—We examined how refer-

ences in conversation are affected by different kinds of evidence for common ground, following predictions of the collaborative theory. "Directors" conversed with successive "matchers" to arrange unusual shapes. The directors' references assumed little more common ground with second matchers who had heard the first conversation as bystanders than with entirely new partners. Directors presumed somewhat more with bystanders who had also seen the shapes, but a great deal more with previous side-participants.

(190)

Writing as Process and Product: The Impact of Tool, Genre, and Audience Knowledge. SARAH RANSELL, *New College*, & C. MICHAEL LEVY, *University of Florida* (sponsored by Ira Fischer)—Two experiments investigated the impact of writing tool, genre, and audience on measures of quality, syntactic complexity, and number and type of revisions. Letters written to an unfamiliar audience were of higher quality and greater syntactic complexity than letters to a familiar audience. Total revisions were greater for word processed letters, but not when nonmeaningful revisions were removed from the count. In experiment two, overall quality was higher for handwritten letters within first drafts.

(191)

Keeping It All Together: Coherence in Text and Discourse. RICHARD M. ROBERTS & ROGER J. KREUZ, *Memphis State University* (presented by Roger J. Kreuz) (sponsored by Bill Prinzmetal)—Many theorists have assumed that the coherence relations of text and discourse are based upon similar pragmatic principles. However, this assumption may be simplistic, since text and discourse vary greatly on other dimensions. Subjects were asked to read and rate short dialogs for coherence. Different groups of subjects were told that the dialogs were taken either from text or from actual conversations. Differences in the subjects' ratings are discussed in terms of general coherence relations.

(192)

Signaling Effects on Text Recall. ROBERT F. LORCH, JR. & ELIZABETH PUGZLES LORCH, *University of Kentucky*—Recall of expository text was examined in two experiments. Texts varied in organizational complexity and in whether they contained organizational signals (e.g., headings). Signals did not influence recall when the text organization was simple, but both topic recall and overall recall were facilitated by the presence of signals when the text organization was complex. Previous failures to find signaling effects on overall recall may have been due to the use of organizationally simple texts.

(193)

Individual Differences in Breadth of Facilitation for High-Constraint Sentence Completions. ELLEN R. STOLTZFUS & LYNN HASHER, *Duke University* (presented by Lynn Hasher)—Duke undergraduates read high-constraint incomplete sentences at their own pace and subsequently performed lexical decisions on potential sentence completions. Completions were either expected or related to the expected ending. Facilitation on the lexical decision task was found for both expected and related completions, but the pattern of facilitation was different for two subgroups of subjects. While slow readers showed equal facilitation for both expected and related completions, fast readers showed facilitation for only expected completions.

(194)

The Effect of Typographical Inversion of Inferencing During Reading. SUSAN A. DUFFY & ANDREW F. HUNDLEY, *Amherst College*—We investigated readers' ability to generate elaborative linking inferences while reading sentences in inverted (compared with normal) typography. Sentences varied in the degree to which they invited elaborative inferences. Both reading time and cued recall were collected. Results indicated that readers are able to draw elaborative inferences while reading inverted typography. These results have implications for models of reading in which difficult perceptual processes and inference-generating processes compete for scarce resources.

(195)

Time Estimation and Modes of Attending. MARILYN G. BOLTZ, *Haverford College* (sponsored by Mari Riess Jones)—Duration judgments and the impact of selective attending toward different structural aspects of an event were examined. Subjects were asked to compare the duration of paired melodies that varied in both lower order infor-

mation (i.e., the relative number of pitch contour changes) and higher order information involving the relative timing of melodic phrase endings. Results indicated that a given pair of melodies could produce over- or underestimations depending on which level of information was selectively tracked.

(196)

Factors Producing a Temporary "Blink" in Attention in an RSVP Task. JANE E. RAYMOND, *University of Calgary*—When given a visual cue to begin recall in an RSVP task, subjects report stimuli near the time of the cue, miss stimuli 200 msec later, but recall stimuli presented after 300 msec. Using a modified RSVP task involving stimulus detection, I investigated factors leading to the "attentional blink" by varying task and cue. I report that suppression of attention results from active attention to information in the cue and not from limitations of visual processing.

(197)

The Source of Inhibition in Static Objects: Identity Versus Location. CATHERINE A. LOUGHLIN & KIMRON L. SHAPIRO, *University of Calgary* (presented by Kimron L. Shapiro)—Research studying selective visual attention has reliably demonstrated two effects. The first effect is interference in subjects' ability to respond to target information in the presence of distracting information. The second effect is post-response inhibition, caused by either object-centered or location-centered inhibition of the appropriate response. Using a priming paradigm, this study attempts to explore the locus of the inhibition caused in the second effect. Findings from the experiment conditions support a location-centered explanation of the observed inhibition.

(198)

Interactions Between Negative Priming and Semantic Activation in Ambiguous Word Processing. PENNY L. YEE & ERIC RUTHRUFF, *University of Washington* (sponsored by Earl B. Hunt)—In a selective attention experiment, evidence of negative priming was observed when processing words that were semantically related to previously ignored words. In the prime displays, subjects focused on an ambiguous word and ignored a word that was related or unrelated to it. If the words in the prime displays were related to each other, negative priming was not observed. Effects also depended upon the relative location of the attended words in the prime and target displays, and upon the task performed by the subjects.

(199)

Assessment of Visual Context Mechanisms Using Baldwin Figures. JOHN E. CLAVADETSCHER, *Illinois Wesleyan University* (sponsored by John Palmer)—Spatial context effects (a.k.a. visual illusions) appear to be the result of unconscious, automatic perceptual mechanisms. A two-process model of these effects was examined by varying the size, location, and configuration of Baldwin context boxes. Results supported this model, but not alternative theories. In another study, the context effect pattern persisted with little change during 8-sec delays between viewing the test figures and response production.

(200)

Recognition of Facial Expression: Wholes Are Recognized Faster Than Parts. DEBORAH CHAMBERS & CAROL MARTENSON, *North Dakota State University* (sponsored by Daniel Reisberg)—Subjects were presented with whole and half faces (displaying either a happy, sad, or surprised expression), for durations varying between 20 and 60 msec. Subjects recognized the expression of whole faces at faster presentation times than half faces. The results indicate that the perception of facial expression is most likely achieved by forming a configuration of several facial features, rather than an analysis of a single feature (e.g., an upwardly turned mouth).

(201)

Induction of McCollough Color Aftereffects in Six Pavlovian Conditioning Paradigms. R. M. YAREMKO & ROGER DUNN, *San Diego State University* (presented by Roger Dunn) (sponsored by R. M. Yaremko)—To examine the Pavlovian CR account of McCollough effects (MEs), we attempted ME induction using several paradigms in a procedure in which only the temporal contiguity of putative CS and US events was manipulated. Thirty-two color-bar pairings were presented in simultaneous, delay, trace, or backward fashion, or were presented simultaneously on 50% or 0% of the trials. Results largely replicated condi-

tioning outcomes with other response systems. However, grid-color overlap was a necessary condition for nominal ME induction.

(202)

Multimodal Convergence and the Control of Saccadic Eye Movements. GEORGIE NOZAWA, *Dartmouth College*, PATRICIA A. REUTER-LORENZ, ROBERT FENDRICH, *Dartmouth Medical School*, & HOWARD C. HUGHES, *Dartmouth College* (presented by Howard C. Hughes)—Anatomical and electrophysiological evidence indicates that the superior colliculus is important for controlling saccades. It is also the site of converging visual and auditory inputs. Consistent with these findings, the reaction time advantage for saccades to spatially coincident bimodal stimuli exceeded predictions based on probability summation of independent processing of visual and auditory targets, suggesting neural summation. The summation effects for saccades, directed-manual responses, and simple manual responses are compared.

(203)

Uniform Field Flicker and Two Types of Visible Persistence. GERALD M. LONG & JOYCE HOMOLKA, *Villanova University*—The effect of uniform field flicker (UFF) on two estimates of visible persistence were determined for foveal and parafoveal letter arrays. Type 1 persistence (offset perception) generally exhibited an inverse relationship with target luminance; Type 2 persistence (end of trace perception) generally exhibited a positive relationship with target luminance. However, these effects were clearly moderated by UFF. Implications both for likely differences across studies in the persistence literature and for underlying mechanisms are discussed.

(204)

Change: A Preattentive Feature? ZENON W. PYLYSHYN & JACQUELYN A. BURKELL, *University of Western Ontario*—A set of experiments were conducted to investigate the perception of isoluminant color change. Results indicate that color change is not preattentively detected, since detection accuracy decreases with an increase in the number of display items. Further studies investigated the information available when a color change is detected, indicating that the location of the change is known, but the previous color of the object is not available. A final experiment compares the perception of luminance change and color change to determine if subjects can discriminate between these two types of changes.

(205)

Motion Integration Across Space. MAGGIE SHIFFRAR & JEAN LORENCEAU, *Université de Paris V, CNRS* (sponsored by Misha Pavel)—How does the visual system combine individually ambiguous motion measurements across space? To explore when accurate integration occurs, subjects determined directions of revolution for a diamond viewed through apertures. The diamond's motion could not be determined from any single contour. Performance was poor in central vision but excellent in periphery. Performance in central vision improved with isoluminant stimuli, outlined apertures, and jagged apertures. Thus, integration across space appears more likely under conditions of positional uncertainty.

(206)

The Visual Perception of Globally Coherent Motion. JAMES T. TODD, *Brandeis University*, & ENNIO MINGOLLA, *Boston University*—A formal analysis is presented for how human observers are able to perceive a coherent pattern of global motion from a disparate set of local velocity measures. Although the analysis can detect translation, rotation, expansion (contraction), and shear in most natural contexts, it produces erroneous descriptions for a moving pattern composed of a limited sample of contour orientations. Experiments are described that compare theoretical predictions with human perceptual performance.

(207)

Attentional Modulation of a Three-Dimensional Motion Aftereffect. GORDON L. SHULMAN, *Washington University School of Medicine*—During the adaptation phase, subjects were shown two squares, one large and one small, centered on fixation and rotating in opposite directions. Subjects were instructed on different blocks to detect occasional perturbations in the dots comprising either the large or small square. During the test phase, subjects judged the direction of rotation of a square in parallel projection. The test square was seen to rotate opposite the direction of the attended adapting square.

(208)

A Low-Contrast Subjective Test for Astigmatism. THOMAS R. CORWIN & NANCY B. CARLSON, *New England College of Optometry*—The "clock chart," a set of black radial lines, is a common subjective test for astigmatic refractive error. The observer's task is to identify the darkest appearing line. We measured how well observers identified the appropriate line as the amount of astigmatic error increased. Compared to the standard chart, smaller errors were measurable when the contrast of the chart was reduced to 25%, a manifestation of Weber's law.

(209)

A Correlational Study of Visual Evoked Potential Components. JAMES G. MAY, *University of New Orleans*, & WILLIAM P. DUNLAP, *Tulane University*—Visual evoked potentials elicited by the onset and offset of sine-wave grating stimuli were obtained from 20 subjects at two spatial frequencies (1.0 and 8.0 c/d). The amplitude and latencies of eight components were intercorrelated and the correlations for latency were quite high, indicating considerable redundancy. Factor analysis revealed what appeared to be two factors which might represent contributions of the sustained and transient mechanisms to the visual evoked potential.

(210)

Differential Taste Aversions Resulting from Varying Retention Intervals. W. ROBERT BATSELL, JR., & MICHAEL R. BEST, *Southern Methodist University* (sponsored by Alan Brown)—A series of experiments examined taste aversions at different retention intervals. Experiments investigating saccharin-denatonium compound conditioning demonstrated that both an overshadowed denatonium aversion and a potentiated saccharin aversion were stronger at a 21-day retention interval than a 1-day retention interval. Furthermore, single element saccharin aversion strength increased as the retention interval increased.

(211)

After Inescapable Shock: The Bitter and the Sweet. NANCY K. DESS & JAMES A. AUSTIN, *Occidental College* (sponsored by Thomas R. Minor)—Exposure to a series of inescapable shocks (i.e., the "helplessness" model of depression) produces a variety of ingestive deficits including weight loss, anorexia, and finickiness. Three experiments examined the effects of inescapable shock on consumption of two sweet solutions. Shock reduced the incentive value of saccharin; preexposure to saccharin did not alter this suppressive effect. Shock did not reduce the incentive value of sucrose. These results raise interesting questions about hedonic effects of stress and their assessment. The data also are discussed via *à-vis* related work in other models of depression.

(212)

Recognition of Spoken Words With Ambiguous Word Initial Phonemes. CYNTHIA M. CONNINE, *SUNY at Binghamton* (sponsored by Albrecht Werner Inhoff)—A cross-modal priming paradigm was used to investigate auditory word recognition under conditions of impoverished acoustic-phonetic information. Spoken words containing a word-initial ambiguous phoneme that resulted in a lexical ambiguity were embedded in sentence contexts. The results suggest that matching of acoustic-phonetic information to lexical representations in memory is based on goodness of fit and will be discussed in terms of current models of auditory word recognition.

(213)

Cross-modal Interactions: Sensory Versus Semantic Processes. LAWRENCE E. MARKS, *John B. Pierce Foundation Laboratory and Yale University*—Informationally irrelevant stimulation in one modality influences speed/accuracy of identifying stimuli in another, performance being better or worse when the intermodal combinations are synesthetically congruent (e.g., high pitch = white, low = black) or incongruent (high = black, low = white). Analogous interactions arise when one dimension is lexical (e.g., words "white," "black"). Do all such interactions involve semantic coding? When sensory dimensions were pitted directly against semantic ones, the major interaction turned out to be semantic.

(214)

The Influence of Segmental Sonority on Immediate Memory for Syllables. AIMÉE M. SURPRENANT, *Yale University*, & SHARI R.

SPEER, *Northeastern University* (presented by Shari R. Speer) (sponsored by Robert G. Crowder)—Two experiments demonstrate that the sonority of a syllable's component sounds predicts the presence and magnitude of recency effects in immediate memory. Sonority is determined by co-occurrence restrictions on vowel and consonant sounds within syllable-internal structure. Recency effects were most pronounced in memory for CV strings with different vowels (high sonority) and least apparent for CV strings with different stop consonants (low sonority). Strings with different nasal consonants and glides (moderate sonority) produced intermediate recency.

(215)

Is Phoneme Identification Facilitated by Feedback from a Word's Lexical Representation? MARK A. PITT & ARTHUR G. SAMUEL, *Yale University* (sponsored by Arthur G. Samuel)—Listeners tend to identify ambiguous utterances as words rather than nonwords (Ganong, 1980). We tested whether the use of lexical information varies with the difficulty of the listening situation; such knowledge might be employed more when bottom-up processing is more difficult. Listeners labeled tokens from four continua in the clear, in noise, and while performing a distractor task. Identification and reaction time analyses showed differing patterns for the signal quality and cognitive load manipulations.

(216)

Analogical Priming of Semantic Relations in a Lexical Decision Task. BARBARA A. SPELLMAN & KEITH J. HOLYOAK, *University of California, Los Angeles* (presented by Keith J. Holyoak)—We investigated priming between pairs of words sharing a semantic relation (e.g., prime WINDOW-GLASS; target CHIMNEY-BRICK). Control primes consisted of mismatched exemplars of the relation (e.g., WINDOW-STRAW). At 400 msec SOA, significant priming (24 msec) was observed when subjects were told that reading the primes might facilitate the lexical decision, although not when told to remember the primes or relations. Results suggest that an appropriate strategic set produces analogical priming beyond that attributable to direct semantic priming.

(217)

The Redundant Signals Effect: Towards a Two-Stage Model of Facilitation of Reaction Time. HANS COLONIUS & ADELE DIEDERICH, *Purdue University*—The speed-up of responses in a redundant signal condition compared to a single stimulus condition is a frequently observed result. Here, simple reaction times (RTs) to visual and/or auditory signals (vertical sinusoidal gratings and a sinus tone) were studied. The amount of facilitation (RT speed-up) as a function of the frequency and contrast of the grating, and the stimulus-onset-asynchrony (visual-auditory delay) were determined. A new, two-stage model of facilitation combining neural and probability summation mechanisms is proposed and tested against the data.

(218)

The Isolation Effect in Tachistoscopically Presented Arrays: Data and Theory. RICHARD S. CIMBALO, *Daemen College*—Isolation (red letter) effects occur in Sperling-type tachistoscopically presented arrays of letters with a mask. Isolates are recalled better than non-isolates. An isolate present in a cued-for-recall row improves overall performance on the row. Converging lines of evidence in the fields of memory, epistemology, and ethology point to a nontemporal, perceptually based explanation as opposed to either temporal, strategically based or interference/decay-based explanations of isolation.

(219)

Semantic Priming and Word Recognition. DAVID S. GORFEIN, ANDREA BUBKA, & STEPHANIE A. BERGER, *Adelphi University*—In an effort to evaluate the hypothesis that different senses of a word are multiply represented in the memory system, we tested words in lexical decision for which we had obtained a pair of equally related primes. Each of the target words was presented twice with either a related or an unrelated prime and with either the identical prime or its matched counterpart on the second occurrence. Results are discussed in terms of the episodic memory view of repetition effects.

(220)

The Influence of Studied Neighbors on Repetition Priming for Target Words. PATRICIA L. TENPENNY, *Loyola University of Chicago*, & EDWARD J. SHOBEN, *University of Illinois* (sponsored by Edward J. Shoben)—This experiment investigated the effect of studying a tar-

get word's neighbor on repetition priming for the target. The normative frequencies of the targets and neighbors were varied, as well as the font in which the neighbors were presented. A perceptual identification task was used. The effect of a studied neighbor on repetition priming for the target depended both on the frequencies of the words and on the font in which the neighbor was presented.

(221)

Error Priming in Cognitive Addition. JAMIE I. D. CAMPBELL, *University of Saskatchewan*—In simple multiplication, answers to immediately preceding problems are inhibited as error responses (negative error priming), but answers to earlier problems are promoted as error responses (positive error priming). To investigate error priming beyond multiplication, adults were tested on simple addition problems. The results demonstrate that the time course and magnitude of error priming are similar for addition and multiplication, and support an extension of the network-interference model to retrieval of addition facts.

(222)

Priming Words and Pictures: Some Surprising Similarities. DAVID B. MITCHELL, ALAN S. BROWN, & TODD C. JONES, *Southern Methodist University*—A series of experiments replicated and extended our previous findings of priming in two implicit memory tasks. Both words and pictures prime picture naming to a similar degree when the input stimuli are manipulated between subjects. Likewise, words and pictures can prime mirror-reversed word reading to similar levels. This holds true only for immediate test intervals, however; over longer retention intervals, cross-modal priming is not as robust as direct priming.

(223)

Variations in Afterimage Duration: Influences of Hypnotizability in Waking and Hypnosis. RICHARD P. ATKINSON, *Fort Hays State University* (sponsored by Robert Markley)—The moderating influences of hypnotizability (high/low) and visuospatial ability (high/low) on visual afterimage duration were investigated. In counterbalanced conditions of waking and hypnosis, 80 subjects were dark adapted for 20 min, after which a highly codeable (cross) flash of light was presented. High hypnotizables reported significantly longer afterimages in waking and hypnosis than did low hypnotizables, as well as longer afterimage durations in hypnosis than in waking. Level of visuospatial ability did not significantly affect afterimage duration.

(224)

Mood Dependence in Implicit Memory. ERIC EICH & LEE RYAN, *University of British Columbia*—Though it has sometimes been shown that explicit memory for events is enhanced by reinstatement, at retrieval, of the affect or mood in which these events had been encoded, the possibility of demonstrating mood dependence in implicit memory has rarely been explored. This possibility was pursued in a series of studies, the results of which suggest that implicit memory for internally but not externally generated events may be susceptible to mood dependence.

(225)

African-American College Males Prefer Larger Female Body Silhouettes Than Whites. ELLEN F. ROSEN, *College of William and Mary*, & LINDA C. PETTY, *Hampton University*—The lower incidence of eating disorders among black women may result from their lower body dissatisfaction (Rosen & Petty, 1988). Cultural differences in what is considered a desirable body size may exist. Black and white male college students were asked to indicate their thinnest, largest acceptable, and ideal body silhouettes for a date, girlfriend, and mother. Differences were found in that black men indicated a significantly larger thinnest acceptable and ideal women's body silhouette.

(226)

Personality Type, Gender and Racial Differences, and Body Weight. B. MICHAEL THORNE, THOMAS J. KING, & THOMAS G. CARSKADON, *Mississippi State University*—2,633 students took the MBTI and were classified as underweight, normal weight, or overweight with the Body Mass Index. Black females were more likely to be OW than white females. On the MBTI, females were more likely than males to be Es, Ss, Fs, and Js. More blacks than whites preferred I, S, and J. The OW sample contained more Ts; the UW sample more Fs. Personality type, weight, gender, and race are discussed.

(227)

Objective Measurement of Morale. R. CHRIS MARTIN, *University of Missouri-Kansas City*, & KENNETH B. MELVIN, *University*

of Alabama—"Morale" has been a nebulous concept, typically defined in terms of feelings and needs based upon employee surveys. The objective methodology explained herein is based upon assumptions within Quality of Motivation Theory and utilizes answers to a multiple-choice management interview plus scores on motivation profiles (QMQ) gathered from a representative sample of employees at all levels of a company. Specific recommendations for two manufacturing firms ($n > 100$ each) are discussed.

(228)

The Effects of Gender Schemas and Priming on Self-Relevance Judgments. LLOYD K. KOMATSU, *Carleton College*, & RICHARD B. TYLER, *University of Wisconsin-Milwaukee* (sponsored by Kathleen M. Galotti)—Replicating previous research, we found that sex-typed subjects decide that gender-consistent traits apply to themselves more quickly than they decide that gender-inconsistent traits apply, while non-sex-typed subjects show no difference. However, we found priming between traits with the same gender connotation in both sex-typed and non-sex-typed subjects, suggesting that all individuals organize their knowledge of personality traits in terms of the gender connotations of those traits.

(229)

Memory for Evidence Used in Making Guilt/Innocence Judgments. LORI R. VAN WALLENDIAEL & AMY LINCOURT, *University of North Carolina at Charlotte* (sponsored by Paula Goolkasian)—Research on confidence and information use has shown asymmetry between guilty and innocent judgments in juror decision tasks. This study tested whether asymmetry would also be seen in subjects' recall of evidence. Subjects read brief accounts of six fictional crimes which varied in evidence diagnosticity and implication. There was a significant interaction of these two variables: subjects showed better recall of high-diagnosticity information implying guilt, but better recall of low-diagnosticity information implying innocence.

(230)

Similarities and Differences in the Dating Scripts of Males and Females. M. DIANE CLARK, MARTHA BORDIC, & ANGELA M. BARTOLI, *Shippensburg University* (sponsored by Debra Zellner)—Analyses of male and female generalized event representations (ger) for "a date" found that this situational script has at least four scenes: initiation, meeting, date activity, and conclusion. Observed differences between the males' and females' gers may be related to the two sexes having different personal scripts (sexual activity for males, securing another date for females) or to a subgoal within the date activity scene for the males. Further research is ongoing.

(231)

Effects of Structure and Motion on Perceptions of Social Causality. DIANE S. BERRY, *Southern Methodist University* (sponsored by Stan A. Kuczaj)—Free response descriptions of Heider and Simmel's (1944) animated film were obtained. Subjects viewed either the original film or versions altered via a special effects generator. These either (1) disrupted structural aspects of the film; (2) disrupted movement; or (3) disrupted both. Disruption of structural qualities did not significantly decrease the proportion of subjects who described the film in anthropomorphic terms, although the proportion who did so dropped sharply when motion was disrupted.

(232)

Gender, Amount and State of Liquid, and Water-Level Representation. MICHÈLE ROBERT & SYLVIE TREMBLAY, *Université de Montreal* (sponsored by Isabelle Peretz)—The contribution of amount and state of liquid in water-level task gender differences was assessed. After seeing an upright container either one-quarter, one-half, or three-quarters full, adults were instructed to draw the water line as it would look with the container tilted and the water either in motion or at rest. For control subjects, state of water was not specified. The results indicate that men consistently outperformed women; accuracy was poorest when the water was in motion and the container three-quarters full; and imagining water in motion predicted a poor performance among control women. Horizontality representation is discussed emphasizing the role of liquid state in gender accuracy differences.

(233)

Word Superiority in Detection of Letter Repetition: LVF Versus RVF. LESTER E. KRUEGER, LEANN M. STADTLANDER, &

ANTHONY J. BLUM, *Ohio State University*—Subjects judged whether a letter was repeated in a briefly exposed, vertically arrayed word or nonword, presented 1° to the left or right of fixation. Words were judged more slowly, but more accurately, than nonwords. The word advantage on accuracy did not depend on visual field when repetition was present, but was greater in the right visual field (left hemisphere) than left visual field (right hemisphere) when repetition was absent, indicating a primarily verbal locus.

(234)

Test of Interactive-Activation Versus Activation-Verification Models. ROBERT EGLY & DONALD HOMA, *Arizona State University* (presented by Donald Homa)—Confusability of response alternatives for letter, anagram, and word stimuli was varied to force different predictions for the interactive-activation and activation-verification models. The AV model predicts a WSE under low confusability but not under medium or high confusability. The IA model predicts an additive confusability effect. Confusability was additive with lexical class, supporting the IV model. Sensitivity for lexical class was above chance even when feature information was insufficient for a correct response in the WSE task.

(235)

Does Backward Masking Limit the Span of Apprehension? CURTIS W. MCINTYRE & CHRISTINE P. GANCARZ, *Southern Methodist University*—The predictions of an iconic and a noniconic model for processing information from brief visual displays were compared by combining a forced-choice span of apprehension task with backward masking. Semantic and nonsemantic displays were used as target stimuli followed at various intervals by a random line mask. The results were congruent with the noniconic model indicating that the processing of both semantic and nonsemantic information does not depend upon an afterimage.

(236)

Intra- and Interpattern Relations in Letter Recognition. THOMAS SANOCKI, *University of South Florida* (sponsored by Douglas L. Nelson)—Subjects identified strings of unrelated letters masked at five durations. There were three findings, the first being greater perceptibility for letters with normal relations than for letters with same elements but

in abnormal relations, supporting the idea of relational feature detectors. Second, relational information was extracted as early as feature presence/absence. Third, small letters became less perceptible (only) when mixed with larger letters, consistent with attentional priority explanations of global precedence.

(237)

Symmetry and Orientation Normalization in the Recognition of Naturalistic Stimuli. PATRICIA A. McMULLEN & MARTHA J. FARAH, *Carnegie-Mellon University* (sponsored by Martha J. Farah)—Tarr and Pinker (*Psychological Science*, 1990) showed that mental rotation is used in recognizing misoriented asymmetrical patterns, but not symmetrical patterns, using novel stimuli. They inferred that object-centered representations code spatial relations among features on one dimension only. We assessed the generality of this finding by retrospectively analyzing three experiments' worth of latencies to name misoriented drawings of common objects. Symmetrical and asymmetrical drawings showed equivalent effects of orientation between upright and 120°.

(238)

Seeing Beyond the Obvious: Understanding Perception in Everyday and Novel Environments. MARY K. KAISER, *NASA-Ames Research Center*, DENNIS R. PROFFITT, & ELLEN A. MCAFEE, *University of Virginia*—This videotape provides an undergraduate-level introduction to human visual perception and relates fundamental concepts to aerospace human factors applications. Students are introduced to the topics of primary depth cues, secondary depth cues, and motion, and shown how these sources of depth information are utilized in virtual environments and avionic displays. Other aerospace applications include the impact of disrupting visual/vestibular and perception/action relationships, and the challenge of interpreting thermal imagery.

(239)

Research Support from the NIMH. DOROTHY T. CARLSON, *NIMH, Executive to the Psychobiology and Behavior Review Committee.*

(240)

Research Support from the National Science Foundation. JOSEPH YOUNG, *NSF Program Director for Human Cognition and Perception.*, & FRED STOLLNITZ, *NSF Program Director for Animal Behavior.*

PERCEPTION II

Regency Ballroom A, Saturday Morning, 8:00-10:10

Chaired by Paula Goolkasian, University of North Carolina at Charlotte

8:00-8:10 (241)

Chromatic and Shading Effects in Animated Illusory Contours. GLENN E. MEYER, *Lewis and Clark College*—Meyer and Dougherty report that rotating Kanizsa illusory contours appear nonrigid. This is eliminated under isoluminance. Also, their illusion of ambiguous fluidity (ooze) is much diminished by isoluminance. Rotating illusory contours can be generated with the neon illusion but do not produce nonrigidity which seems congruent with the aperture effect. Animated neon colors will support other phenomena (stereokinetic effect, ooze). It is also demonstrated that rotating shape-through-shading displays will produce an illusory slippage of shading.

8:15-8:25 (242)

Subjective Contours and Metacontrast Masking. SUSAN PETRY & STEVEN SIEGEL, *Adelphi University*—We investigated the role of subjective contours in a metacontrast masking paradigm in which subjective or real contour test and mask were contiguous and non-overlapping. Both subjective and real contours were effective masking stimuli. Subjective contour tests, however, showed no u-shaped masking; visibility increased monotonically with stimulus onset asynchrony. These results are consistent with the transient on sustained inhibition characterization of metacontrast by Breitmeyer and others and our (1989) transient and sustained characterization of subjective contours.

8:30-8:50 (243)

Results of a New Method for Investigating Inattention in Visual Perception. IRVIN ROCK, CHRIS LINNETT, *University of California, Berkeley*, ARIEN MACK, *New School for Social Research*, & PAUL GRANT, *University of California, Berkeley*—Current methods for studying perception without attention are inadequate because they entail divided attention or assume that parallel processing implies pre-attentive processing. In a new method, subjects were given only one critical trial in which they had a visual distraction task and no expectation of the briefly presented object. Results indicate that the presence of an object, its location, numerosity, and properties such as color and contour orientation are preattentively detected, but shape is not.

8:55-9:10 (244)

Perceptual Grouping and Attention. ARIEN MACK, REGINA TUMA, STEVEN KAHN, *New School for Social Research*, & IRVIN ROCK, *University of California, Berkeley*—Several techniques were used to determine whether perceptual grouping by similarity of lightness, size, and orientation, or by proximity requires attention. Regardless of whether we used a pop-out design or an attention-absorbing distracting task, these experiments involving over 300 subjects demonstrate, at least with the range of stimuli tested, that grouping by similarity and proximity requires attention. These data are at odds with the original and more recent accounts of grouping.

9:15-9:25 (245)

Color-Induced Odor Enhancement: Influence of Color Intensity and Appropriateness. DEBRA A. ZELLNER, LORI A. WHITTEN, & CHRISTINE E. GANZ, *Shippensburg University*—Subjects rated the odor intensity of solutions of methyl salicylate (colored brown or green) and benzaldehyde (colored brown or red) at several color intensities. Color generally increased odor intensity, but odor intensity was not always monotonic with color intensity. Color appropriateness (some subjects were told that methyl salicylate was root beer, others that it was wintergreen; benzaldehyde was called almond or cherry) had no influence on odor intensity.

9:30-9:45 (246)

Global and Local Analysis in Patients with Full Commissurotomy. LYNN C. ROBERTSON, MARVIN R. LAMB, *University of California, Davis Medical School*, & E. ZAIDEL, *University of California, Los Angeles*—Data from brain-damaged patients with right or left

temporal-parietal damage and from lateralized presentations in normals have converged on the idea that the left hemisphere favors local information of a Navon-type pattern over global, while the right hemisphere favors global information over local, all else being equal. Data from two patients with full commissurotomies (LB and NG) lend additional support to this idea. The data will also be discussed as they relate to Robertson and Lamb's previous hypothesis that the interaction between global and local levels (often called Stroop-interference) depends on inter-hemispheric transfer.

9:50-10:05 (247)

Sensitivity to Auditory Information for Vessel Fullness: Blind and Sighted Subjects. PATRICK A. CABE, *Pembroke State University*, & JOHN PITTENGER, *University of Arkansas at Little Rock*—Recent research has shown that human subjects can reliably estimate both visual and auditory "time to arrival" of approaching objects, as predicted by Lee's (1976) tau variable. We show that an auditory tau for "time to full" for containers filling with water also exists, and blind and sighted subjects are moderately accurate in judging fullness auditorily. Their estimates, however, may not depend entirely on tau. Alternative strategies that may explain performance are discussed.

ANIMAL COGNITION II

Regency Ballroom C, Saturday Morning, 8:00-10:15

Chaired by Ken Cheng, University of Toronto

8:00-8:10 (248)

Symbolically Facilitated Discrimination of Quantities by Chimpanzees. SARAH T. BOYSEN & LISABETH S. RASKIN, *Ohio State University*—A chimpanzee (Sarah) selected between two different quantities of food. The chosen quantity was given to another animal (Sheba), and Sarah received the nonselected amount. When social roles were reversed and Sheba selected the quantities, her performance remained at chance over multiple sessions. Arabic numerals were then substituted for foods, and Sheba's performance increased immediately. The pattern of results suggested that stimulus equivalence relationships between symbols and food arrays may have enhanced discriminative performance.

8:15-8:30 (249)

Numerousness Judgments by *Homo sapiens* in a Species-Comparative Context. ROGER K. THOMAS, JULIA A. PHILLIPS, & CHERYL D. YOUNG, *University of Georgia*—Squirrel monkeys discriminate as many as seven versus eight dots and seven- versus eight-sided randomly constructed polygons. Humans were given comparable discriminanda with 200 msec presentation times, poststimulus masking, instructions not to count, and instructions to respond quickly. It was hypothesized and confirmed that accurate discrimination with comparable response times would occur regardless of the numerosness of the discriminanda. We suggest that a prototype-matching (parallel) process as opposed to a counting process explains the monkeys' and humans' performances.

8:35-8:45 (250)

Counting in Rats and Reward-Induced Odors. H. WAYNE LUDVIGSON, MICHAEL D. MYERS, & MICHAEL E. PATTERSON, *Texas Christian University*—To explore the function of experience-induced odors in "counting" reward events, rats ran an alleyway in which air was either exhausted continuously or not exhausted. Though affecting performance, the treatment did not prevent a counting-like pattern in the response to the reward-nonreward sequence. However, the response pattern displayed significant deviation from that expected from strong control by a counting process.

8:50-9:05 (251)

Dot Texture Discrimination by Pigeons. ROBERT G. COOK & CRAIG B. SANDERS, *Tufts University*—Pigeons discriminated classes of computer-displayed texture stimuli composed of small dots in a two-alternative choice task. Subjects located and pecked at an embedded target dot texture that differed in either dot density or dot spacing from the

surrounding background dots. Pigeon and human psychophysical data for discrimination of dot density differences at various viewer/stimulus distances are reported. Comparative implications for grouping mechanisms in avian and human visual processing of textures are discussed.

9:10-9:25 (252)

Transfer of Stimulus Mixture Discriminations by Pigeons. W. K. HONIG, *Dalhousie University*—Can pigeons transfer a discrimination of stimulus mixture to new elements? Pigeons were trained to discriminate between uniform and mixed arrays of blue and green elements, and of red and orange elements. They were then tested with the novel combinations of blue and red elements, and green and orange elements. This minimized generalization decrement between training and transfer elements. Orderly transfer gradients were obtained, with least responding to the most mixed arrays.

9:30-9:50 (253)

Delayed FI Alternation in Rats. J. S. COHEN, M. NJEGOVAN, & D. ARMSTRONG, *University of Windsor*—Rats were trained on signaled single and delayed FI alternation tasks. Pairs of light (L-L), tone (T-T), and mixed stimuli (L-T; T-L) were presented. Rats experienced only FI-O/FI-IOs or FI-IOs/FI-O alternations during single alternation tasks. Both types of FI alternations occurred within each session during the delayed alternation task. Increasing interstimulus intervals or decreasing intertrial intervals disrupted FI tracking less for mixed stimulus pairs of when the lever retracted between pairs.

9:55-10:10 (254)

Retention of Briefly Trained Associative Memories. DONALD M. WILKIE & ROBERT J. WILLSON, *University of British Columbia*—Pigeons received 15-min sessions in a box containing a lit pecking key and grain feeder on each wall. Food was unavailable during the first 1 min; thereafter, food was available on a VI 30-sec schedule on one randomly selected key. During the initial 1 min, subjects responded most on the key that was rewarded on the previous day. This result will be discussed in relation to animal memory processes and optimal foraging theory.

IMAGERY

Regency Ballroom D, Saturday Morning, 8:00-9:55

Chaired by Jamshed J. Bharucha, Dartmouth College

8:00-8:10 (255)

The Effects of Arousal and Imagery in a von Restorff Task. KINTA M. PARKER & LINDA WARREN DUKE, *University of Alabama in Birmingham* (read by Linda Warren Duke)—Thirteen item lists of high- and low-imagery words were presented in a single-trial free recall von Restorff task, with arousal manipulated by amplifying the critical middle word in the list. Main effects were found for imagery, arousal, and position within the list. These variables interacted with each other and with individual difference scales pertaining to coping styles and anxiety. Possible relationship to effortful processing and dual coding models will be discussed.

8:15-8:30 (256)

Individual Differences in the Processing of Imagery-Laden Words. BENJAMIN WALLACE, *Cleveland State University*—Subjects judged to be vivid or poor imagers as well as high or low in hypnotic susceptibility were requested to learn a series of paired-associate nouns for subsequent recall. In testing for recall, subjects who were judged to be vivid imagers as well as high in hypnotic susceptibility showed superior performance compared to other factorial group combinations, but only for high-imagery value nouns. This was also the case for a task requiring recognition of nouns. Subjects judged vivid imagers as well as high in hypnotic susceptibility demonstrated faster reaction time in response to word recognition, but only for high-imagery nouns. These results are discussed in terms of cognitive strategies employed by subjects in the completion of recall and recognition tasks.

8:35-8:50 (257)

Role of Pitch in Auditory Imagery. MARGARET JEAN INTONS-PETERSON, *Indiana University*—We tested the effects of pitch ratings

of named but unheard sounds on auditory images of the sounds. The times to mentally equate the pitches of two images increased with the difference between the pitch ratings of the sounds, but the times to generate auditory images did not vary with pitch ratings. These and other results suggest that pitch may be optionally represented and utilized in auditory images.

8:55-9:10 (258)

Subvocalization and Auditory Imagery: Interactions Between the "Inner Voice" and the "Inner Ear." DANIEL REISBERG, *Reed College*, J. DAVID SMITH, *New School for Social Research*, & MEG WILSON, *University of California, Berkeley*—While much is known about visual imagery, little research has examined imagery in other modalities. We report a series of experiments exploring the role of subvocalization in auditory imagery. Data from selective interference designs indicate that subvocalization plays a surprisingly broad role, even when subjects are imagining sounds that they cannot overtly vocalize (e.g., instrument timbres). We will discuss the implications of this for theories of auditory imagery.

9:15-9:30 (259)

Role of Routes in Spatial Imagery. MONIKA WAGENER, KARL F. WENDER, & VOLKER WAGNER, *Universität Trier, West Germany* (read by Karl F. Wender)—The mental representation of spatial information is investigated by using an item recognition task and a verification technique. With the recognition task, reaction times increase with spatial distance between successive stimuli: the spatial priming effect. The amount of the effect was found to depend on the SOA. With the verification technique, an inverse relationship is observed resembling the symbolic distance effect. The amount of the effect is not the same in different directions of a configuration. An experiment using paraphrases indicates that the results do not depend on verbatim memory. Instead, it is found that the route through subjective space which a person traverses during learning determines the person's responses.

9:35-9:50 (260)

Creative Inventions in Mental Imagery. RONALD FINKE, TRACI RATLIFF, & DONNA McKEOWN, *Texas A&M University*—Three experiments reveal new techniques for discovering creative inventions in imagery. Subjects imagined combining three object parts selected at random, to try to invent a practical object or device within various object categories. The inventions were more creative when the object category was restricted, and when the category was specified only after the forms were conceived. The findings demonstrate the importance of visualizing "preinventive" forms in creative invention and design.

INFORMATION PROCESSING II

Regency Ballroom H, Saturday Morning, 8:00-10:20

Chaired by Richard Schweickert, Purdue University

8:00-8:20 (261)

Consciously Represented Rules from Explicit and Implicit Learning. DON E. DULANY & THOMAS WILSON, *University of Illinois*—In Hayes and Broadbent's (1989) "computer person" task, subjects communicate on a dimension of warmth with a computer person whose responses are governed by algorithms designed to promote either explicit or implicit learning. Although we found less use of a deliberative learning strategy in the implicit condition, we found no evidence of unconscious representation of what was learned. Consciously represented rules predicted final performance equally well in both conditions and without significant residual.

8:25-8:45 (262)

Mandatory Processes: Consider Your Options. ROBERT D. MELARA, *Purdue University*—Cognitive psychologists often confuse processes that subjects *must* engage in—mandatory processes—with processes subjects *choose* to engage in—optional processes. I examine instances of dimensional interaction which show that alleged mandatory effects of (1) Stroop interference, (2) Garner interference, and (3) the distance metrics in similarity scaling, contain large, if not overwhelming, optional components. Optionality plagues findings of both

perceptual crosstalk and semantic crosstalk. I argue that a central obstacle to further progress in the field is the ability to distinguish necessary cognitive acts from merely strategic ones.

8:50-9:05 (263)

Mental Chronometry: Beyond Reaction Time. DAVID A. BALOTA & RICHARD A. ABRAMS, *Washington University*—Details of response activation and execution were investigated in two classic human information processing paradigms: lexical decision and memory scanning. The results of both experiments indicate that conditions that lead to reduced latencies for a particular response also yield responses that are more forceful. The results suggest that the rate at which activation accumulates in favor of a particular response can have effects on processes that occur both before response initiation and during response execution.

9:10-9:30 (264)

The Electrophysiology of Semantic Memory. PHILIP J. HOLCOMB & JOHN KOUNIOS, *Tufts University*—We discuss the measurement of event-related brain potentials (ERPs) during sentence verification as a tool for studying semantic memory. In particular, structural aspects of semantic memory seem to be reflected by a specific negative ERP component that peaks at about 400 msec after stimulus onset (i.e., N400). The amplitude of this component (but not its latency) was sensitive to aspects of the semantic relation between the subject and predicate terms of stimulus sentences.

9:35-9:50 (265)

Theoretical Implications of the Variability of Speeded Information Processing. JOEL MYERSON, *Washington University*, KEITH WIDAMAN, *University of California, Riverside*, & SANDRA HALE, *Washington University*—The average latency on information-processing tasks may be used to predict both within-subject and between-subject variability. Across a broad latency range, the nature of the task and the age of the group are both largely irrelevant, suggesting that the speed/variability relationship is a fundamental characteristic of information processing. The form of this relationship suggests that the durations of sequential processing steps are correlated, both within trials and within subjects.

9:55-10:15 (266)

S-S and S-R Compatibility Effects as Processing Consequences of Overlap on Relevant and Irrelevant Dimensions. SYLVAN KORNBUM, *University of Michigan-Ann Arbor*—A recently proposed model (Kornblum, Hasbroucq, & Osman, *Psychological Review*, 97, 253-270) ascribes S-R compatibility effects to dimensional overlap in stimulus-response ensembles. Results are presented from experiments with irrelevant noise stimuli that overlap dimensionally with either the relevant stimuli in the task, the relevant responses, neither, or both. Irrelevant noise is shown to produce S-S and/or S-R compatibility effects depending on which of the task variables the noise overlaps with dimensionally.

PSYCHOLINGUISTICS

Regency Ballroom F, Saturday Morning, 8:00-10:40

Chaired by Charles Clifton, Jr., *University of Massachusetts*

8:00-8:15 (267)

Frequency Effects and Superpositional Memory. JOSEPH PAUL STEMBERGER, *University of Minnesota*—Mispronunciation errors in language production are influenced by the frequency of the target elements: errors are more common for less frequent segments and sound sequences. The effect is easily derived in connectionist models, where superpositional memory gives two possible loci: on the segments themselves, and in the mapping between words and segments. Symbolic models use nonsuperpositional memory and cannot account for the frequency effects without radical (and awkward) modifications in the direction of connectionist models.

8:20-8:35 (268)

Effects of Concurrent Language Production on the Verbal Transformation Effect. DONALD G. MACKAY, *University of California, Los Angeles*—This study examines the effects of concurrent language production on the verbal transformation effect (VTE), the perceptual changes that occur when an acoustically presented word is repeated via

tape loop for prolonged periods (minutes). Besides resolving an empirical conflict within the literature (Lackner, 1974, versus Reisberg, Smith, Baxter, & Sonenshine, 1989), results of the present experiment supported a new theory for explaining the VTE, its relation to concurrent language production, and relations between language perception and production in general.

8:40-8:55 (269)

Mediated and Convergent Lexical Priming in Language Production. GARY S. DELL, *University of Illinois at Urbana-Champaign*, & PADRAIG G. O'SEAGHDHA, *Lehigh University*—Levelt et al. (*Psychological Review*, in press) argue that modular semantic and phonological stage theories of lexical access in language production are to be preferred over interactive spreading-activation theories (Dell, 1986). As evidence, they show no mediated semantic-phonological priming during picture naming: Retrieval of "sheep" does not prime "goal" (phonologically related to "goat"). We show that interactive activation theories predict this result, but that they also correctly predict convergent semantic-phonological priming.

9:00-9:15 (270)

Production Units and Production Problems in Forming Long-Distance Dependencies. KATHRYN BOCK & J. COOPER CUTTING, *Michigan State University*—To investigate the demands of implementing discontinuous dependencies in language production, we examined the occurrence of verb-agreement errors in sentences varying in the types and amounts of material separating subjects from verbs. In three experiments, errors were more common when agreement spanned single phrases than when it spanned single clauses. Longer discontinuities promoted errors only after phrases. These results imply that agreement is specified within clauses regardless of the eventual order of the clausal constituents.

9:20-9:35 (271)

Phonological Retrieval and Word Class. RANDI C. MARTIN & LAURA S. YAFFEE, *Rice University*—A controversial topic in speech production is whether there are separate phonological retrieval processes for function words and content words (Garrett, 1975; Dell, in press). An aphasic patient showed a selective deficit for function words in speech production and oral reading, but a preservation of syntactic and semantic knowledge for these function words. The results suggest either that there are different phonological representations or separate phonological retrieval processes for function words.

9:40-9:55 (272)

Phonological Information for Grammatical Category Assignments. MICHAEL H. KELLY & KIMBERLY CASSIDY, *University of Pennsylvania*—Successful language acquisition and comprehension requires that words be classified into appropriate grammatical categories. Most theories of this task focus on syntactic and/or semantic information for grammatical category. However, phonological factors might also be correlated with grammatical class. Our first study demonstrates that English nouns tend to contain more syllables than English verbs. Two experiments demonstrate that adults and children are sensitive to this information and use it when classifying novel words into grammatical categories.

10:00-10:15 (273)

Morphemic and Syntactic Facilitation in Sequences. LAURIE B. FELDMAN, *Haskins Laboratories and SUNY at Albany*, & DARINKA ANDJELKOVIĆ, *University of Belgrade*—Syntactic and morphemic facilitation was investigated in a sentence verification task with Serbo-Croatian materials. Target sentences of two or three words were preceded by prime sentences that shared morphemic constituents (m) and/or syntactic structure (s) (with different closed-class elements). For example, a translation of the "the voters run" was preceded by "the voter runs" (ms), "they vote for the runners" (m), "the plate falls" (s), or "they close the box" (O). Both morphemic and structural facilitation was observed.

10:20-10:35 (274)

Expectation-Driven Syntactic Parsing: How Context Effects Obey the Principle of Representational Autonomy. DAVID J. TOWNSEND, *Montclair State College*—The principle of representational autonomy states that the subprocesses of comprehension operate on distinct representational forms—for example, syntactic processing operates

on syntactic information, semantic processing on semantic information. In three experiments using various measures, semantically biasing context effects on parsing were greater when conditions focused subjects' attention on superficial information. Thus, some context effects on parsing may occur via generated syntactic representations, consistent with the principle of representational autonomy.

DEVELOPMENTAL PROCESSES

Burgundy Room, Saturday Morning, 8:00-10:40

Chaired by Fred Morrison, University of North Carolina at Greensboro

8:00-8:15 (275)

Two-Year-Olds' Coding of Spatial Location. NORA S. NEWCOMBE, *Temple University*—Huttenlocher and Newcombe (1984) studied the ability of 2-year-olds to reconstruct arrays of objects by free placement and when possible locations are predesignated. Without movement, performance was high in both cases, but with movement, free placement declined markedly. This pattern suggests spatial coding using frames of reference including the self. However, in two studies mixing amounts of movement rather than blocking, and in a study giving continuous feedback, free placement performance was much better, even with movement. Under the proper conditions, 2-year-olds can alter spatial coding to preserve location information after movement.

8:20-8:40 (276)

Transfer—Expected and Unexpected—by Young Children. JUDY S. DELOACHE, *University of Illinois*—In a study of transfer from one scale model task to another, 3-year-old children showed successful transfer both when tested on (1) an easy-to-hard sequence in which they had performed well in the initial, easy task and (2) a hard-to-hard sequence in which they were unsuccessful in the initial, hard task. The results, especially the surprising transfer in the second condition, will be discussed in terms of the importance of general symbolic awareness in young children.

8:45-9:00 (277)

Young Children's Drawings of a Man Before and After Training. ALBERT GOSS, *Rutgers University*, & ROCHELLE LEVINE, *Gouverneur Hospital, New York City*—Young children's drawings of a man were obtained before and two times after directed or nondirected training to draw or to construct the figure of a man. Directed training to draw or to construct produced greater, but short-of-significant increases in drawing scores than did nondirected training or nonspecific drawing or construction control experiences. Diverse bivariate and multiple regression analyses related drawings to naming knowledge of the human figure and PPVT scores.

9:05-9:20 (278)

Age Differences in Components of Mental Rotation Performance. CHRISTOPHER HERTZOG & BERT RYPMA, *Georgia Institute of Technology*—We used a three-stage RT task to study age differences in mental rotation (MR) performance. Eighteen older adults (mean age = 64) and 19 young adults (1) encoded a geometric figure, (2) imagined its rotation to a specified orientation (0°, 90°, or 180° from origin), and (3) made a same-different orientation judgment comparing the rotated image and a new figure. MR latency increased with increasing rotation, with minimal age differences. Increasing rotation produced differential decrements in speed and accuracy of older subjects' judgments.

9:25-9:40 (279)

Aging and Familiarity of Faces. JAMES C. BARTLET & ANNETTE FULTON, *University of Texas at Dallas*—A complaint of the elderly is that strangers' faces seem familiar. Indeed, older adults make more false alarms in face-recognition tests. However, previous studies revealed no age differences in familiarity ratings made to nonfamous faces. A possible explanation is that familiarity based on recollection of a face was not distinguished from familiarity based on a feeling of knowing. An experiment which distinguished these two familiarity experiences showed a positive association between familiarity and age.

9:45-10:00 (280)

Mental Effort and Elaboration: A Developmental Analysis of Accessibility Effects. DANIEL W. KEE & LESLIE DAVIES, *California State University, Fullerton*—Third- and seventh-grade participants performed two simultaneous tasks—associative learning and finger tapping—so that the mental effort demands of elaborating noun pairs that varied in accessibility could be examined. Finger-tapping interference declined between grades. Inaccessible pairs interfered more with finger tapping than accessible pairs. A grade by accessibility interaction indicated that the accessibility difference was limited to the third grade. Results support the knowledge-base interpretation of developmental differences in elaboration effort.

10:05-10:15 (281)

Age Differences in Forgetting Rate over 24 Hours. LEONARD M. GIAMBRA & DAVID ARENBERG, *National Institute on Aging*—Experiments on delayed recognition of pictures found no age decrements in forgetting rates until 48 h. In two experiments, we examined forgetting rates over 24 h in recognition and recall of sentence objects and verbs in young and old adults. The first experiment equated initial levels of learning for both groups. No significant age difference in forgetting rates was observed. However, in the second experiment, the difference in recall was significant at 24 h.

10:20-10:35 (282)

Hand Preference and Life Span. DIANE F. HALPERN, *California State University, San Bernardino*, & STANLEY COREN, *University of British Columbia*—From a random sample of recent deaths, next of kin were contacted to provide information regarding the hand preference of the deceased individuals. From the resultant 987 usable responses, it was ascertained that the left-handers died an average of 8.97 years earlier than the right-handers and were more likely to die of accident-related injuries. Additional factors for reduced longevity of sinistrals may include the effects of neuropathology and reduced immune system functioning.

3-D/MOVEMENT PERCEPTION I

Regency Ballroom A, Saturday Morning, 10:20-12:30

Chaired by Glenn E. Meyer, Lewis & Clark College

10:20-10:40 (283)

Visual Guidance of Locomotion: Human and Robotic. RALPH NORMAN HABER, *University of Illinois at Chicago*—Human locomotion under visual guidance involves reference to spatial representations of the scene in view, beyond view, remembered, and expected. Autonomous robotic locomotion may require comparable representations, though some tasks appear to need little representation. This paper examines the nature of spatial representations; what is known about human travel that may improve the design of robots; and what is known about robotic travel that may help understand human visual guidance of locomotion.

10:45-11:00 (284)

Orientation Specificity in the Perception of Biomechanical Motions. BENNETT I. BERTENTHAL & JEANNINE PINTO, *University of Virginia*—Both human infants and adults show orientation specificity in the perception of biomechanical motions. Infants discriminate a point-light walker display from a perturbed version when the displays are upright, but not when they are inverted. Adults detect a point-light walker display embedded in an array of 88 scrambled motion vectors when the walker display is upright, but not when it is inverted. These findings suggest the operation of a global organizational process in the perception of biomechanical motions.

11:05-11:25 (285)

Alternative Movement Organizations: Findings and Premises for Modeling. JULIAN HOCHBERG & JEREMY BEER, *Columbia University*—Flat or tridimensional patterns of moving elements can appear as very different motion configurations. This cannot, as proposed, be simple vector extraction: (1) Stationary references and normal surroundings reduce, not eliminate, the basic phenomena, nor do concurrent differently oriented patterns (thus also rejecting eye-movement explanations); (2) perceived organizations fluctuate, influenced by knowledge and instructed intentions. Quantitative response strengths measured in five experiments suggest two stages: local relative-motion analyses, and alternative schematic transformations.

11:30-11:45 (286)

Is the Velocity Field Sufficient to Perceive Heading? WILLIAM H. WARREN, *Brown University*—All models of perceived self-motion from optical flow assume the instantaneous velocity field as input. To test its sufficiency for the visual system, we presented 3-sec random-dot optical flow displays and varied the lifetime of individual dots. Observers were highly accurate in judging translational heading with a two-frame lifetime, but required a three-frame lifetime to judge circular heading accurately. This suggests that successive independent velocity fields are insufficient for perceiving circular heading.

11:50-12:05 (287)

The Visibility of Surface Curvature from Motion. J. FARLEY NORMAN, *Brandeis University*, & JOSEPH S. LAPPIN, *Vanderbilt University* (read by Joseph S. Lappin)—We have evaluated observers' sensitivity to surface curvature in kinetic depth patterns. Observers discriminated between nearly spherical ellipsoidal surfaces in random-dot kinematograms. Small differences in the curvature of such surfaces can be discriminated with remarkable accuracy. Cube-like surfaces with the same differences in depth but without curvature could not be discriminated. Surface curvature seems to be a fundamental optical property involved in discriminations of solid shape, detectable at early stages of vision.

12:10-12:25 (288)

Scene Organization and Viewpoint Influence Visual Speech. JAMES T. ENNS & DEBORAH J. AKS, *University of British Columbia*—Recent studies show that preattentive vision is sensitive to some properties of 3-D objects (e.g., orientation, direction of lighting) in addition to well-known 2-D features (e.g., tilt, color). Visual search for shaded items in the present study revealed sensitivity to another 3-D property (i.e., curvature). More importantly, relations of object to background, object to viewer, and object to object also influenced search. This suggests that some preattentive representations are spatiotopic and organized.

PROBLEM SOLVING

Regency Ballroom C, Saturday Morning, 10:25-12:30

Chaired by Ronald Finke, *Texas A&M*

10:25-10:40 (289)

Spontaneous Analogical Transfer Is Common If Subjects Learn by Doing. DOUGLAS NEEDHAM & IAN BEGG, *McMaster University* (read by Ian Begg)—Surprisingly, much research finds that people rarely transfer information from old problems to new ones without an explicit hint from the experimenter. Many researchers have had people analyze training problems; few have had people try to solve them. Our subjects usually failed to solve training problems. Yet, after we explained the solutions, subjects spontaneously transferred those solutions, even if the new problems were 15 min later, with other problems being attempted in the meantime.

10:45-11:05 (290)

Measuring the Directionality of Reasoning in Explanation and Problem Solving. GUY J. GROEN & VIMLA L. PATEL, *McGill University*—This paper discusses the use of some novel statistical techniques based on graph theory and combinatorial data analysis in analyzing semantic network representations of diagnostic explanation protocols obtained in studies of medical problem solving. These techniques allow the comparison of a theoretically postulated graph with a graph obtained from an empirical protocol. This allows direct estimates of the probability that a semantic network is generated by a process of forward or backward reasoning.

11:10-11:25 (291)

Characterizing the Search Space on a Medical Problem-Solving Task. MITCHELL RABINOWITZ, *Fordham University*, JOSEPH COTTRELL, *University of Pittsburgh*, & ARTHUR ELSTEIN, *University of Illinois at Chicago*—This study investigates how experience level influences characteristics of the search space during a medical problem-solving task. Three groups of four physicians (interns, residents, attendings) worked up a medical case and verbal protocols were obtained. Analysis centered on the specific medical terms used and categories of information discussed (e.g., treatment, diagnosis, or some interaction

between categories). Results indicate differences in the search space depending on the experience level of the physician.

11:30-11:50 (292)

Introducing Backward Reasoning in Medical Problem Solving. VIMLA L. PATEL & GUY J. GROEN, *McGill University*—This paper is concerned with factors that disrupt the familiar pattern of forward reasoning found in expert problem solving. Our experiments identify two such factors in diagnostic explanations of clinical cases. The first is the existence of loose ends in the case. The second is specific instruction in hypothetico-deductive problem-solving strategies. Implications regarding the role of the shift in the directionality of reasoning in acquiring new knowledge is discussed.

11:55-12:05 (293)

Feedback and Understanding in Learning Problem Solutions. ROGER L. DOMINOWSKI, *University of Illinois at Chicago*—Two experiments concerned situations in which people attempt but fail to solve a problem, receive solution feedback, and later have a second chance to solve. It was found that, compared to basic solution feedback, adding an explanation and requiring subjects to paraphrase solutions produced much better second-try performance. Copying solutions was not as effective as paraphrasing. Results are discussed in relation to the role of understanding in problem solving.

12:10-12:25 (294)

Anagram Solution by Experts. ARTHUR I. SCHULMAN, *University of Virginia*, JOHN JONIDES, *University of Michigan*, & DALE COHEN, *University of Virginia*—An expert can find the word disguised by a permutation of its letters in less than one tenth the time that a novice requires. Experts need no more than 5 sec to solve 25% of eight-letter anagrams, and no more than 3 sec to solve 50% of five-letter anagrams. We present extensive data from several experts and suggest some of the ways in which an expert's attack on the anagram-solution problem may differ from that of the novice.

ANIMAL LEARNING III

Regency Ballroom D, Saturday Morning, 10:05-12:15

Chaired by Stanley J. Weiss, *The American University*

10:05-10:25 (295)

Cognitive Maps in Rats and Humans. T. G. BEVER, K. SHENKMAN, K. O'CONNOR, *University of Rochester*, & CURT BURGESS, *Syracuse University*—Male and female rats learned to run from one end of a figure-eight maze to the other. Male rats learned faster when started at different maze points, while females learned more slowly. The corresponding maze-learning sex difference occurs in humans. Unilateral cortical spreading depression showed greater disruption of performance in the right hemisphere than in the left hemisphere for rats trained from the same starting point and greater disruption in the males overall.

10:30-10:45 (296)

Landmark Learning by Honeybees. P. A. COUVILLON & M. E. BITTERMAN, *University of Hawaii*—The concept of adaptive specialization in the learning of honeybees rests on a variety of claims, one of which is that they learn about certain features of a feeding place (such as about a nearby landmark) only on arrival and about others only during the orientation flight that follows feeding and precedes return to the hive (programmed sequential memory retrieval). Here we provide evidence of learning about a nearby landmark both on arrival and on departure.

10:50-11:00 (297)

Name That Tune in 500 Milliseconds or Less. BYRON A. CAMPBELL & RICK RICHARDSON, *Princeton University*—Unfamiliar auditory stimuli produce cardiac decelerations of 30-60 beats per minute in adult rats. This deceleration typically commences within 500 msec of stimulus onset of an unfamiliar stimulus. After 10 habituation trials to a 10-sec, 1600-Hz tone, no detectable cardiac deceleration can be observed. Following a 1-week retention interval, presentation of the same stimulus produces no change in interbeat interval at any time during the first test trial, indicating that recognition of the tone as a familiar stimulus occurred during the first 500 msec.

11:05-11:20 (298)

Attack by a Dominant Conspecific, Alpha-Colony Odors, and Hypoalgesia. JON L. WILLIAMS, PAUL D. WORLAND, & MELINDA G. SMITH, *Kenyon College*—Rats, attacked and defeated as intruders by alpha colony male rats, showed hypoalgesia and freezing during a formalin test 24 h later, if the odors of the alpha colonies were present. This hypoalgesia was found to be significantly blocked, but not completely reversed, when naltraxone was given prior to testing. Giving naltraxone prior to defeat resulted in greater freezing. Finally, prolonged pretest exposure to the alpha-colony odors resulted in extinction of this conditioned hypoalgesic reaction.

11:25-11:40 (299)

Sexual Discrimination Learning: A Response Profile Approach. MICHAEL DOMJAN & RUSSELL RAVERT, *University of Texas at Austin*—In process approaches to the study of learning, measurements of a single action pattern are often sufficient. In contrast, a functional approach requires the observation of multiple responses. A response profile analysis of sexual discrimination learning identified the components of appetitive sexual behavior in male Japanese quail and showed how these components come to occur differentially in the presence of male versus female conspecifics.

11:45-11:55 (300)

What Is Learned in the Learning Class? ROBERT H. I. DALE, *Butler University*—To examine whether students are exposed to similar databases and concepts in different learning courses, five learning texts were evaluated. These texts, all published between 1985 and 1990, were intended for undergraduate courses focusing primarily on animal research. There was minimal overlap among the reference lists of the texts, but considerable agreement concerning the texts' conceptual content. These data are compared with the findings of a similar study of cognitive psychology texts.

12:00-12:10 (301)

Vasopressin and Salt Preference Under Nonstress and Stress Conditions. HELEN M. MURPHY & CYRILLA H. WIDEMAN, *John Carroll University*—Long-Evans (LE or vasopressin-containing) and Brattleboro (DI or vasopressin-deficient) rats were tested for a preference of 0.9% NaCl solution versus tap water under ad-libitum (nonstress) and 23 hours of food-restriction (stress) conditions. Results demonstrate that the presence of vasopressin does not determine a preference for either solution in nonstress or stress conditions, while its absence produces a preference for water in the nonstress condition, but does not bring about a preference during the stress condition.

ATTENTION II

Regency Ballroom H, Saturday Morning, 10:30-12:35

Chaired by John H. Flowers, University of Nebraska-Lincoln

10:30-10:45 (302)

A Statistical Model of Preattentive Visual Search. M. PAVEL, *New York University*—Effortless search for a target among distractors, independent of the number of distractors ("pop-out"), has been taken as evidence for the existence of separate dimensions or "features." A quantitative analysis of the search process reveals that postulating unique features is not necessary to obtain pop-out. Using a stochastic representation of the target and the distractors, pop-out phenomenon will be explained in terms of a statistical decision process specified in terms of unidimensional likelihood functions as in signal detection theory. The distinction between easy and difficult search tasks, asymmetries between target and distractors, and many conjunction phenomena will be explained in terms of the variability of the stimuli.

10:50-11:10 (303)

Novel Pop-out. WILLIAM A. JOHNSTON & KEVIN J. HAWLEY, *University of Utah*—Glimpses of four-word arrays were followed by probes to locate particular words. The ratio of new to old (previously seen) words in an array varied from 0:4 to 4:0. Accuracy of localization was higher for 0:4 arrays than for 4:0 arrays, indicating greater perceptual fluency for old words. However, in 1:3 arrays, localization accuracy was higher for new words than for old words, indicating novel pop-out. Several studies probed the basis of novel pop-out.

11:15-11:30 (304)

Attentional Facilitation and Inhibition in the Processing of Irrelevant Stimuli. ARTHUR F. KRAMER, ANTHONY ARETZ, & ARNO HUANG, *University of Illinois*—Several studies were conducted to examine the influence of training on the processing of irrelevant stimuli. Targets and distractors from extensively trained search tasks were used as irrelevant flankers in response compatibility tasks. The results obtained in the response compatibility tasks suggest that subjects learned to facilitate the processing of targets and inhibit the distractors in the search tasks and that these processing strategies continued to be exhibited in different contexts.

11:35-11:55 (305)

Temporal Pacing in Visual Selective Attending. JUNE J. SKELLY, *Armstrong Aerospace Medical Research Laboratory*, & MARI RIESS JONES, *Ohio State University* (read by Mari Riess Jones)—This research examined how dynamic visual context affects focusing attention in a letter classification task. Variables were temporal and spatial relations obtaining between a relevant (letters) and an irrelevant (shapes) stream of events. Response times were significantly affected by manipulations of both temporal and spatial relations with the nature of interactions depending upon: (1) event simultaneity; and (2) patterns of temporal integration between event streams. These data have implications for visual selective attention.

12:00-12:15 (306)

Control of Stroop Effect. JOSEPH TZELGOV & AVISHAI HENIK, *Ben-Gurion University of the Negev* (sponsored by Moshe Naveh-Benjamin)—Some theoreticians speak about automaticity and control as opposing concepts. We generalized expectations in the Stroop task by manipulating the proportion of the various kinds of trials. Inhibition was negatively correlated with the proportion of color-related stimuli, and that facilitation component was sensitive to the proportion of congruent stimuli. The effects of these two manipulations were additive. These results challenge the view that automatic processes are uncontrollable.

12:20-12:30 (307)

Attentional Orienting in the Expression of Procedural Knowledge. PETER BULLEMER, *Honeywell, Inc.*, & MARY JO NISSEN, *University of Minnesota* (read by Mary Jo Nissen)—Is the expression of procedural knowledge accompanied by attentional orienting to expected events? And does attentional orienting depend on an awareness of expectancy? In a cost-benefit study of responses to a repeating spatial sequence, we found that attentional orienting occurs later in training than the initial benefit of training, and attentional orienting can occur even in subjects unaware of the sequence. Implications for the relations among attention, awareness, and distinct memory systems are considered.

BEHAVIORAL PHARMACOLOGY

Regency Ballroom F, Saturday Morning, 10:50-12:30

Chaired by James R. Ison, University of Rochester

10:50-11:00 (308)

Delay of Reinforcement Reverses Cocaine's Enhancement of Vigilance Task Performance. DAVID M. GRILLY & CHRISTINE NOCJAR, *Cleveland State University*—Rats were food reinforced for pressing one of two levers in an operant chamber, with the correct lever being indicated by the position of a briefly illuminated light. They were tested after an injection (SC) of saline or 2.5 mg/kg cocaine and with delay of reinforcement (DOR) of either 0 sec or 8 sec. Cocaine enhanced accuracy under the 0-sec DOR condition but not under 8-sec DOR. These results indicate that cocaine may only enhance performance in vigilance tasks under conditions that require minimal levels of information processing.

11:05-11:15 (309)

Time-Dependent Codeine Analgesic and Hyperalgesic Effects in Domestic Fowl. RICHARD A. HUGHES & KENNETH J. SUFKA, *Iowa State University*—Codeine (30 mg/kg) increased jump latency (analgesic effect) in young cockerels on a test of thermal nociception 15 min after injection, was without effect at 30 min, and decreased jump latency (hyperalgesic effect) 60 and 120 min after injection. Naloxone (5 mg/kg) blocked hyperalgesia but potentiated analgesia. Since morphine can

produce hyperalgesia in chicks, this codeine hyperalgesia probably reflects demethylation to morphine and subsequent morphine effects at opioid receptors. The basis for codeine analgesia is unclear.

11:20-11:30 (310)

Apomorphine-Induced Place Conditioning in a Y-Maze. LINDA PARKER, *Wilfred Laurier University*—A three-compartment Y-maze apparatus was used to assess the reinforcing and/or aversive properties of various doses of apomorphine (.125, .5, 1, 5, 15, and 25 mg/kg, i.p.). The Y-maze provided the opportunity to compare preferences for an apomorphine-paired, a saline-paired, and a novel chamber during preference testing. Only a dose of 1 mg/kg produced a place preference and the higher doses of apomorphine produced neither a preference nor an aversion. In the group that showed a place preference (1 mg/kg), the rats demonstrated a lower level of activity in both the apomorphine-paired chamber and in the novel chamber than in the saline-paired chamber.

11:35-11:50 (311)

Effects of d-Amphetamine on Conditioned Reinforcement in Multiple and Mixed Schedules. STEVEN L. COHEN, *Bloomsburg University*—Pigeons' responses in Component 1 of a multiple or mixed schedule produced food or brief stimuli according to a random ratio 2 (VI 30-sec) second-order schedule. In Component 2, responses only produced (1) food-paired brief stimuli, (2) nonpaired brief stimuli, or (3) no stimuli. *d*-amphetamine increased responding more in Component 2 with brief stimuli than with no brief stimuli. Differences were found between paired and nonpaired stimuli in multiple but not mixed schedules.

11:55-12:05 (312)

Effects of CCK-8 on Intakes of Caffeine, Ethanol, and Water. PAUL J. KULKOSKY, W. ERIC HOLST, WENDY G. SMITH, & MAX A. DIETZE, *University of Southern Colorado*—Water-deprived female rats ($N_s = 10$) received access to solutions of caffeine (0.5 mg/ml), ethanol (5% w/v), or water, after i.p. injections of cholecystokinin octapeptide (CCK-8; 0.5–4.0 μ g/kg). Associated behavioral displays were quantified with an instantaneous time-sampling observational technique. CCK-8 dose-dependently reduced intake of ethanol solution, but not intakes of caffeine or water. Feeding behavior reliably decreased after caffeine consumption. Chemical anorexias are specific; CCK-8 reduced both ethanol intake and associated feeding, but influenced neither caffeine consumption nor caffeine's anorectic effect.

12:10-12:25 (313)

Consumption of Lake Ontario Salmon Increases Reactions to Aversive Events in Rats: Recent Results. HELEN B. DALY, *College at Oswego, SUNY*—Rats fed a 30% diet of Lake Ontario salmon for 20 days were tested in negative contrast, partial reinforcement extinction, and progressive ratio schedule experiments. All results were predicted by DMOD (a mathematical model), given the assumption that the toxic chemicals in Lake Ontario salmon increase reactivity to aversive, but not positive, events. Preliminary results indicate similar behavioral changes in pups whose mothers had been fed Lake Ontario salmon.

LETTER/WORD PROCESSING II

Burgundy Room, Saturday Morning, 10:50-12:40

Chaired by Judith F. Kroll, Mount Holyoke College

10:50-11:05 (314)

Word Superiority Effect Without a Brief Exposure. WILLIAM PRINZMETAL, *University of California, Santa Barbara*—With briefly presented stimuli followed by a visual mask, subjects are more accurate in identifying letters in words than in nonwords or even letters alone (WSE). Several theories of the WSE focus on the temporal properties of the stimulus display or the poststimulus mask. However, the present research demonstrates that the word superiority effect is more general than previously believed. It can be obtained with unlimited exposure duration simply by viewing the stimulus from afar.

11:10-11:20 (315)

Analysis of Word Superiority in Search for Repeated Letters. EDDIE C. MELTON, JAMES F. JUOLA, & C. BRUCE WARNER, *University of Kansas* (read by James F. Juola)—Subjects detected the

presence or absence of any repeated letter within strings of four, five, six, or seven letters. The strings were either common words, regular pseudowords, or irregular nonwords. Differences among all three types of strings were found in (1) detecting an adjacent pair of repeated letters, (2) detecting a nonadjacent repetition, and (3) detecting the absence of a repetition.

11:25-11:40 (316)

Recognizing Pseudowords With and Without Acquired Meaning. JOHAN HUETING, WIM RUTS, & ERIC SOETENS, *University of Brussels*—A list of pseudowords were integrated into the semantic framework of a modern fairy tale. The pseudowords were associated with objects out of the life of a population of goblins. Subjects studied these pseudowords and their ascribed meaning until they knew them by heart. Recognition times of the pseudowords with newly acquired meaning did not differ from pseudowords without meaning. Both took longer recognition times than words.

11:45-12:00 (317)

The Missing-Letter Effect in Hebrew: Word Frequency or Word Function. SETH GREENBERG, *Union College*, & ASHER KORAT, *Haifa University*—Some Hebrew letters appear as single letter function prefixes (e.g., meaning "to" or "for") appended to content words. Detection of initial letters in a word is more difficult where the letters are function prefixes than where they are simply the first letter in a non-prefixed content word. Prefixed words are no more familiar than the nonprefixed controls. Thus, in Hebrew text where function and familiarity can be naturally disentangled, evidence suggests that function affects letter detection.

12:05-12:20 (318)

Locus or Loci of Word-Frequency Effects? LUCIA COLOMBO & LISA CIPOLLOTTI, *University of Padua*—Is the locus of the word frequency effect (FE) in the access to the orthographic lexicon? Or is it in the transcoding between the orthographic and the phonological lexicon? In the latter case, words that have been mainly experienced as spoken, as opposed to words that are familiar both in the visual and in the auditory modality, should not show FEs. In the experiments to be reported, both types of words were presented in the visual and in the auditory modality for naming and repetition tasks.

12:25-12:35 (319)

Perhaps the Lexicon Is Coded as a Function of Word Frequency. PHILIP A. ALLEN, *Cleveland State University*—Two lexical decision task experiments were conducted where word frequency and stimulus onset asynchrony (SOA) between letter sequences and a mask were varied. For both experiments, there were word frequency advantages at all three SOA durations (100, 200, and 400 msec). Also, recognition sensitivity decreased as word frequency decreased, but decision criterion did not decrease with word frequency. These data indicate that the mental lexicon is coded as a function of word frequency.

JUDGMENT/DECISION MAKING I

Regency Ballroom A, Saturday Afternoon, 1:00-3:30

Chaired by Thomas S. Wallsten,

University of North Carolina at Chapel Hill

1:00-1:20 (320)

Categorical Versus Compensatory Reasoning and Inconsistent Choices. VALERIE F. REYNA, *University of Arizona*—A unified account of inconsistent choices is offered, covering framing, time discounting, and the Allais paradox. Fuzzy-trace theory identifies two critical factors: the qualitative pattern (gist) perceived in information, and knowledge differences determining perceived gist. Experiments manipulated perception of information as categorical (producing inconsistency) versus compensatory (producing consistency). Similarly, compensatory reasoners, in Piaget's sense, were consistent choosers. Thus, fuzzy-trace theory indicates how cognitive illusions can be induced or eliminated, depending on perceived gist.

1:25-1:45 (321)

The Gambler's Fallacy Type II. GIDEON KEREN, *University of Utrecht*, & CHARLES LEWIS, *Educational Testing Services*—Can people win fortunes by detecting biased numbers on the roulette wheel?

We discuss the proper analysis for answering this question, and show empirically that people notoriously underestimate the number of observations needed for a reliable detection of biased wheels. We label this bias as the "gambler's fallacy type II" and present potential explanations for the bias.

1:50-2:05 (322)

Is the Term "Significance" Misleading? MICHAEL E. DOHERTY, *Bowling Green State University*, BARBARA DOOLEY, *University College, Dublin*, & EUGENE STONE, *SUNY at Albany*—Do psychologists unwittingly con the public with the loaded term, "statistically significant"? Four hundred and three undergraduates read one of 18 versions of hypothetical newspaper articles produced by crossing two contents with three statements about significance with three levels of explanation. Factor scores from a 40-item semantic differential were subjected to ANOVA. "Statistically significant" led to lower evaluations than when "statistical" was not used, but "highly statistically significant" returned evaluations to a high level. Explanations of "significance" had a negative effect.

2:10-2:25 (323)

The Hot Human. DAVID L. GILDEN & STEPHANIE GRAY, *Vanderbilt University*—A common experience in the execution of demanding tasks is the perception that there are occasions when successes come in streaks; one is on a roll. Is this a cognitive illusion based on the Law of Small Numbers, or is it real? We have analyzed the clustering of successes and failures in an assortment of tasks ranging from putting golf balls and throwing darts to signal detection. Humans get hot—it is not an illusion.

2:30-2:50 (324)

Functional Value of Counterfactual Thought. KEITH MARKMAN, IGOR GAVANSKI, STEVEN J. SHERMAN, & MATT McMULLEN, *Indiana University* (read by Steven J. Sherman)—Spontaneous counterfactual generation was investigated using a computer-simulated blackjack game. Subjects whose counterfactuals improved upon reality (upward comparisons) expressed more dissatisfaction than those who tended to worsen reality (downward comparisons). In addition, subjects expecting to play only one hand made more downward comparisons (and were more satisfied) than those expecting to play additional hands, suggesting that counterfactual thought has some functional value: Downward comparisons provide comfort; upward comparisons prepare one for the future.

2:55-3:10 (325)

Modeling Individual Differences in Dynamic Decision Making. ALEXANDER J. WEARING & MARY OMODEI, *University of Melbourne*—Performance on a dynamic decision making (DDM) task may have multiple measures. Using two tasks, one relatively simple (DECOY), the other relatively complex (FIRECHIEF), participants were assessed with regard to person characteristics, attitudes, and expectations before, during, and after completing a DDM task. We found that different aspects of task performance were related to various individual difference measures, with gender playing a significant role. Models are proposed which may account for these findings.

3:15-3:25 (326)

Effects of Group Size and Inputs' Skewness on Nonlinearity in Equity. RICHARD J. HARRIS, *University of New Mexico*—For 5 versus 13 participants and nearly uniform versus negatively skewed distribution of inputs, the correlation between mean outcome (recommended salary) and input (deserved salary) varied from .99852 to .99986, with statistically significant nonlinearity only in the nearly uniform, 13-participant condition. Estimated weight given Mellers's (1982) preference for evenly spaced responses was statistically significant in this condition and the skewed, 5-participant condition. The conditions that yield significant nonlinearity are as yet poorly understood.

MOTOR CONTROL I

Regency Ballroom C, Saturday Afternoon, 1:00-3:35

Chaired by Jonathan Vaughan, *Hamilton College*

1:00-1:15 (327)

Broadcast Theory of Sequencing and Timing. DAVID A. ROSENBAUM, *University of Massachusetts at Amherst*—Controlling the tim-

ing and sequencing of behavior is one of the most remarkable achievements of the nervous system. Yet it has proven difficult to explain distinct aspects of timing and sequencing data with a single control mechanism. One is suggested whose key property is the use of space between control units. With minimal assumptions, the model predicts a wide range of observed effects, including the need for hierarchical control.

1:20-1:30 (328)

Goal and KR Bandwidth Effects in Motor Learning. TIMOTHY D. LEE & BRIAN K. V. MARAJ, *McMaster University*—We compared the effects on motor learning of having either a specific goal or a bandwidth as the movement timing goal, combined with receiving either specific error KR or bandwidth KR. Subjects practiced under one of these four conditions for 100 acquisition trials. Learning, as measured on retention tests (without KR), was facilitated by bandwidth KR, but not by the bandwidth goal. Results are discussed relative to recent concepts of KR effects in motor learning.

1:35-1:55 (329)

S-R Compatibility for Destination of Apparent Motion: Catching Affordances or Directional Coding? ROBERT W. PROCTOR, TRISHA VAN ZANDT, CHEN-HUI LU, *Purdue University*, & DANIEL J. WEEKS, *Lakehead University*—Michaels (1988) reported an S-R compatibility effect for destination of apparent motion. Motion toward a position yielded faster responses at that position than at other positions. This compatibility effect was attributed to "catching" affordances. Experiments are reported that contrast this affordance account with one based on coding of relative direction. Consistent with explanations of most spatial compatibility effects, the results support the coding account.

2:00-2:15 (330)

Spatially Induced Bifurcations, Hysteresis, and Pattern Selection in Discrete Reaching. J. A. SCOTT KELSO, *Florida Atlantic University*, T. MURATA, *University of Tokyo*, J. J. BUCHANAN, & J. D. DELCOLLE, *Florida Atlantic University*—In reaching for an object whose orientation is systematically changed (a bar rotating like the hands of a clock) kinematic analyses show: (1) a constrained phase relation between limb projection and forearm/wrist rotation, regardless of object orientation; (2) spontaneous switching from one phasing pattern to another at a critical orientation value; (3) hysteresis depending on the direction of bar rotation; and (4) the recruitment of new degrees of freedom which object orientation is perturbed across the hysteresis region.

2:20-2:30 (331)

Further Evidence for Implicit Learning in a Complex Tracking Skill. RICHARD A. MAGILL, BRITTA SCHOENFELDER-ZOHDI, & KELLIE G. HALL, *Louisiana State University*—We (Magill & Hall, 1989) previously reported an experiment replicating results of Pew (1974) where implicit learning was found for learning a complex tracking skill. A 60-sec pattern was tracked in which the middle 20-sec segment was repeated every trial while the first and last 20-sec segments were random every trial. In the present experiment, the repeated segment was the first 20-sec segment. Results replicated our previous work by showing a similar implicit learning effect.

2:35-2:55 (332)

The Reaction-Time Error as a Response to the Wrong Stimulus. ROBERT GOTTSANKER, *University of California, Santa Barbara*—Errors on both choice and simple reactions may be accounted for in terms of the evoking of a response, whose level of readiness for actualization is excessively high, by an inappropriate stimulus. Convergent evidence was obtained, using the method of brief precue-to-stimulus intervals, in the effects of relative stimulus-response frequency and difficulty of discriminations on the functions of reaction times, mismatches, and false alarms against length of interval.

3:00-3:10 (333)

Sequential Effects in a Serial Four-Choice Reaction Time Task. ERIC SOETENS & JOHAN HUETING, *University of Brussels* (sponsored by Johan Hueting)—An analysis is made of sequential effects in a serial four-choice reaction time task. Subjects used both middle and index fingers in a design with spatially compatible stimulus-response mapping. The analysis of sequential effects by means of the repetition-alternation function displays similar patterns as in two-choice tasks. Automatic facilitation prevails with short response-stimulus interval, and

subjective expectancy with long interval. Expectancy can be divided into a hand and finger component, whereas facilitation is indivisible.

3:15-3:30 (334)

How Speed and Perturbations Interact in Motor Control. ALF ZIMMER & HERMANN KÖRNDLE, *University of Regensburg, West Germany*—Human-factors analyses of motor performance suggest that external perturbations as well as speeding impair the quality of motor performance. The joint effect is assumed to be either additive or multiplicative. Learning and transfer experiments with a Pedalo show that there is a definite optimal speed range for motor control. If random external perturbations are added, this "window of stability" can be shifted downward to a speed, where no controlled performance is possible without perturbations. The results are in favor for a synergetic model of motor control.

SYMPOSIUM II: EXPERIMENTAL APPROACHES TO EATING AND ITS DISORDERS

Regency Ballroom D, Saturday Afternoon, 1:00-3:30

Chaired by Elizabeth D. Capaldi, *University of Florida*

1:00-1:05 (335)

Introductory Remarks. ELIZABETH D. CAPALDI, *University of Florida*—There has been a recent surge of experimental work on eating and its disorders. This development reflects several factors including behavioral work showing that learning and cognitive factors are major determinants of ingestive behavior, particularly of food preferences and aversions, progress in understanding the physiological basis of eating, as well as a practical concern with obesity and eating disorders. The purpose of the symposium is to provide a broad overview of the many experimental and theoretical approaches currently taken to the study of these topics. The first paper discusses biological influences on eating and implications of the current approach used in this area for understanding eating behavior and eating disorders; the second paper deals with sensory effects in eating behavior; the third paper reviews evidence for large conditioned flavor preferences based on the association of nutrients with the flavors; the fourth paper considers evidence for the role of cognitive biases in eating; and the fifth paper reviews the current evidence regarding the dramatic changes that occur in the control of food intake during the first few years of children's lives. Thus the symposium considers how some of the basic areas of experimental psychology (physiological, sensory, learning, cognitive, and developmental) approach the problem of understanding eating and its disorders. The symposium concludes with a commentary on the issues and approaches covered in the papers.

1:05-1:25 (336)

Biological Factors in Eating and its Disorders. NEIL E. ROWLAND, *University of Florida*—Factors that influence eating behavior basically fall into the familiar categories of organismic and environmental. Some of the organismic variables that influence feeding, including genetics, hormones, neurotransmitters, and modulators, will be discussed. Theoretical constructs and data interpretations in these areas mostly rely upon the concept of homeostasis. Problems associated with a narrow definition of this term and application to eating disorders will be described.

1:30-1:50 (337)

Taste, Smell and Eating Behavior. LINDA BARTOSHUK, *Yale University School of Medicine*—Before foods or fluids can affect behavior, they must be sensed. Several sensory modalities play roles in the perception of foods and fluids: taste, olfaction, touch, temperature, and pain (e.g., chili peppers). Taste appears to be tuned to nutrients. Sugars are sweet, NaCl is salty, and many poisons are bitter. Olfaction, on the other hand, appears to be organized to identify foods holistically (e.g., bacon, pizza, peanut butter, etc.) rather than to identify the nutrients within them. The roles of the other senses in food perception are less clear. Some differences in the ability to taste and smell are genetically mediated. In addition, age changes taste and smell differentially (age affects smell much more than taste). Of special importance when using animal models, there are species differences in taste and smell. Finally, pathology, disease, and treatments for disease may af-

fect taste and smell. For example, bulimia is known to damage some taste receptors. Sensory studies clearly have an important role in studies of eating behavior.

1:55-2:15 (338)

Conditioned Food Preferences and Appetite. ANTHONY SCLAFANI, *Brooklyn College of CUNY*—Food preferences and aversions are conditioned by the nutritive and toxic effects of foods. In contrast to conditioned aversions, however, the ability of animals to acquire strong and persistent preferences is not well established. Using a variety of conditioning paradigms, recent studies demonstrate that rats can acquire preferences for flavors associated with carbohydrates, fats, or proteins. For example, pairing flavors with intragastric infusions of Polycose condition robust (>95%) preferences that are resistant to extinction. Furthermore, conditioned preferences can be established for normally aversive flavors (e.g., bitter taste) and can lead to overeating. These few findings document the importance of nutrient-based conditioned preferences in food selection and intake. Much remains to be learned about the behavioral and physiological mechanisms that mediate flavor preference learning.

2:20-2:40 (339)

Obesity and Eating Disorders: Cognitive Aspects of Food Preference and Food Aversion. ADAM DREWNOWSKI, *University of Michigan*—Food choices in obesity and eating disorders are thought to be influenced by a variety of metabolic, psychological, and sociocultural events. While obese patients select and overconsume calorie-dense foods, anorectic women avoid meat dishes, sweet desserts, and particularly those foods that are rich in fat. Clinical studies suggest that some food cravings or aversions may involve alterations in brain peptide or neurotransmitter metabolism and may be linked to a prior history of "yo-yo" dieting. Sensory evaluation studies have demonstrated differences in taste responsiveness between overweight and underweight groups: while obese women preferred sweet, high-fat mixtures, anorectic and bulimic patients showed a dislike, if not aversion, to the oral sensation of dietary fats. Sensory responsiveness to sugar/fat mixtures may be further influenced by attitudes and beliefs regarding the health and nutritional value of some high-fat foods. An additional source of cognitive bias may be the patient's own perception of his or her health, diet habits, and body weight. Together with changing normative beliefs, attitudes toward calorie-dense foods can modulate the hedonic taste response and influence the pattern of food selection.

2:45-3:05 (340)

Obesity and Eating Disorders: A Developmental Perspective. LEANN L. BIRCH, *University of Illinois*—As mammals, milk is the initial source of nourishment for us all. During the first years of life, children must make the transition from suckling to consuming a varied diet appropriate to their cultural group. This transition involves increased autonomy and control regarding the variety and quantity of foods consumed. Children acquire preferences and aversions and learn to attend to a subset of the available physiological and environmental cues in regulating their food intake, and individual differences become increasingly apparent over time. Experimental evidence for the role of learning in the development of the controls of food intake will be presented. The contributions made by associative conditioning of food cues to the social contexts and physiological consequences of ingestion will be the focus of the presentation. The implications of these findings for the etiology of eating disorders and obesity will be discussed.

3:10-3:30 (341)

Commentary. STEPHEN C. WOODS, *University of Washington*.

COGNITION

Regency Ballroom H, Saturday Afternoon, 1:00-3:35

Chaired by George Wolford, *Dartmouth College*

1:00-1:15 (342)

Naive Physics, Representational Momentum, and a Spiral Tube. JENNIFER J. FREYD & KRISTINE TAYLOR, *University of Oregon*—Classic naive physics experiments demonstrate that subjects erroneously believe that a ball exiting a tube has curvilinear motion. Other findings suggest that humans may be perceptually more compe-

tent than they are conceptually competent. We used representational momentum to investigate perceptual-memory distortions for the position of a ball that suddenly disappears after exiting a spiral tube, with some surprising results. Might naive physics results reflect characteristics of perceptual representations and dynamic mental pathways?

1:20-1:35 (343)

Creating a Semantic Congruity Effect. BRIGETTE OLIVER & LINDA B. SMITH, *Indiana University* (read by Linda B. Smith)—People are faster at judging which of two big objects is bigger than they are at determining which is smaller. This semantic congruity effect characterizes all quantitative judgments. Developmental research suggests that the effect has its origins in how children learn dimensional terms. In this research, we taught new dimensional terms to adults and asked whether their learning proceeded through the same stages as children's learning and ended with the semantic congruity effect.

1:40-1:50 (344)

Language, Orthography, and Number: When Surface Structure Matters. KEVIN F. MILLER, *University of Illinois at Urbana-Champaign*—The Hindu-Arabic numbers represent a nearly universal rule-based symbol system. Names for these numbers, and orthographies for representing them, show greater complexity. Number manipulation tasks are thus ideal for looking at the representational role of surface structures. College students in the U.S. and China manipulated numbers represented as either words/characters or numerals. Tasks showed effects of orthography to the extent that they required subjects to manipulate number *names* in nonautomatic ways.

1:55-2:10 (345)

A Rational Analysis of Production System Architecture. JOHN R. ANDERSON & NICHOLAS KUSHMERICK, *Carnegie-Mellon University*—The psychological heart of a production system is its principles for conflict resolution. We propose conflict resolution principles based on a Bayesian decision analysis. The model combines a spreading activation for ordering production instantiations and an expected utility analysis for choosing among them. A production system model based on this analysis simulated two problem solving tasks—route finding and the Tower of Hanoi. The model successfully predicts choice behavior and latencies.

2:15-2:30 (346)

Reporting Information from Memory and Perception: Switching, Access, or Coordination? RICHARD A. CARLSON & JAY L. WENGER, *Pennsylvania State University*—People are slow and error prone when alternately reporting items from memory and perception. This has been interpreted as a cost of switching attention between modalities or of accessing items in memory. Analysis of individual responses in attention-switching tasks suggests that coordinating information from two sources may be a separable constraint on performance. Extensive practice speeds memory access but does not alter the characteristic serial response pattern (slow-fast-slow-fast) in this task.

2:35-2:50 (347)

Resistance to Interference: A Neglected Dimension of Cognition. FRANK N. DEMPSTER, *University of Nevada, Las Vegas*—I propose that resistance to interference is a fundamental, albeit underrated, factor in many cognitive performances. To support this claim, I review evidence suggesting that many tasks, including several developmental tasks, require the suppression of task-irrelevant, potentially interfering, information for effective performance. The possibility that resistance to interference is linked to the operation of the prefrontal cortex, a region of the brain that appears to play a major role in inhibitory control, is also discussed.

2:55-3:10 (348)

What Mediates Individual Differences in Working Memory? RANDALL W. ENGLE & JULIE J. CARULLO, *University of South Carolina*—What causes the correlation between tests of working memory and tests of reading comprehension? We used a subject-paced moving window procedure to present the elements of a working memory span task. Controlling for the time spent on the background task and on the span words did not reduce the correlation between working memory span and comprehension. Neither differences in a strategy of resource allocation common to the two tasks nor differences in rehearsal time explain the correlation.

3:15-3:30 (349)

The Role of Flexible Access to Information in Understanding. PATRICIA BAGGETT, *University of Michigan*, & ANDRZEJ EHRENFEUCHT, *University of Colorado*—In instructional movies, organization of material is important. When the material is presented interactively, organization and order do not matter. Flexible access to information seems to be the key difference. We will discuss the role of access to information in controlled environments, and attention in open environments, as a main factor in understanding.

ANIMAL SENSORY PROCESSES

Regency Ballroom F, Saturday Afternoon, 1:00-2:40

Chaired by Ron Weisman, *Queen's University at Kingston*

1:00-1:15 (350)

Recognition by Components: Comparative Evaluations of Visual Discriminations by Pigeons. EDWARD A. WASSERMAN, C. L. DEVOLDER, L. J. VAN HAMME, *University of Iowa*, & IRVING BIEDERMAN, *University of Minnesota*—The comparative applicability of a new theory of object discrimination—recognition by components—was tested on pigeon subjects. After being trained to discriminate line drawings of several different objects, pigeons were tested with specially prepared versions of those stimuli which either do or do not afford accurate recognition by humans. Research thus far has yielded some parallel and some divergent data. We expect further work to explicate this interesting pattern of results.

1:20-1:35 (351)

Early Experience, Spatial Competency, and Posterior Cortex of the Rat. RICHARD C. TEES, TRUDY ADAM, & KRISTIN BUHRMANN, *University of British Columbia*—Early experience is believed to differentially affect particular cortical areas and perceptual competences. The roles played by early somatosensory and visual experience on extrastriate, parietal, and temporal cortex and apparently related spatial and visual competences were the focus of this investigation. The abilities of complex-reared, dark-reared, and early dewhiskered rats were tested on water-based spatial navigation and visual discrimination tasks. Selective cortical lesions were maximally effective for rats with restricted stimulation histories.

1:40-1:55 (352)

The Influence of Relative Judgments on Subsequent Absolute Judgments. JOHN C. MALONE, *University of Tennessee at Knoxville*—Pigeons received occasional food for responding to vertical and horizontal lines projected on a response key, while five other orientations appeared in extinction. Average response rates depended on the presentation sequence of stimuli. Transient local sequential effects influenced overall response rates, causing lasting changes in the form of gradients of responding. These forms remained even when the stimulus sequence was altered. Such effects have not been examined in studies of human sequential judgments.

2:00-2:15 (353)

High-Frequency Noise Components and Detection of Acoustic Transients by Rodents. JAMES R. ISON, *University of Rochester*—Humans detect gaps in noise best when the carrier has components greater than 4-6 kHz. Here we show that gaps are better detected when the carrier includes frequencies above 16 kHz (rats) or 30 kHz (CBA mice), again octaves above the optimal audiometric sensitivity. Thus, across species, an acoustic transient is processed by auditory fibers close to the base of the cochlea, rather than by fibers sensitive to its particular Fourier transform.

2:20-2:35 (354)

Contextual Effects in the Chicken's Psychophysical Response. VIKTOR SARRIS, *J. W. Goethe-University, Frankfurt* (sponsored by Geoffrey Keppel)—In two experiments, the general assumption was tested that the chicken's psychophysical response undergoes context effects similar to those previously obtained in human subjects. In Experiment 1, three groups of two chickens each were tested with a series of cubes with volumes either below, surrounding, or above the training objects. In Experiment 2, systematic shifts in the context were administered. The obtained psychophysical data support the hypothesis that asymmetrical testing leads to the gradual changes as predicted.

LETTER/WORD PROCESSING III

Burgundy Room, Saturday Afternoon, 1:00-3:05

Chaired by Keith Rayner, University of Massachusetts

1:00-1:20 (355)

Semantic Context Effects on Fixation Time in Reading. ROBIN K. MORRIS, *University of South Carolina*, KEITH RAYNER, & ALEXANDER POLLATSEK, *University of Massachusetts* (read by Alexander Pollatsek)—The effects of sentence context on the processing of unambiguous nouns during reading were investigated. Words that were not predictable were fixated for less time in congruent sentence contexts than in neutral contexts. This effect cannot be accounted for by simple summation of activation from individual lexical items contained in the context. Modular and interactive models of lexical access during reading will be discussed.

1:25-1:45 (356)

Concept Mediation in Bilingual Translation. JUDITH F. KROLL & ERIKA STEWART, *Mount Holyoke College*—Research on bilingual memory has focused on the issue of whether the bilingual's two languages are related by lexical or conceptual mappings. The present study compared word naming and translation for fluent Dutch-English bilinguals in lists of words that were semantically categorized or randomly ordered. The results show that translation is slower in categorized context, suggesting that second language words are conceptually mediated. Implications for models of lexical and conceptual representation will be considered.

1:50-2:05 (357)

Imageability and Frequency Effects in Translation Recognition and Translation Production. ANNETTE M. B. DE GROOT, *University of Amsterdam*—The effects of word imageability and word frequency on performance of Dutch-English bilinguals were examined in two tasks. In a translation recognition task, subjects decided whether or not visually presented pairs of a Dutch and an English word consisted of translation equivalents. In a translation production task, subjects translated Dutch words into English. The translation task was followed by an unexpected explicit (recognition) or implicit (fragment completion or lexical decision) retention test. The results provide information on bilingual lexical representation as well as on the determinants of performance in episodic memory tasks.

2:10-2:25 (358)

Morphosyntactic Priming in German. ETTA DREWS, *Technische Universität Braunschweig* (sponsored by Friedrich Wilkening)—A series of lexical decision experiments addresses the issue of whether intralexical processes can account for syntactic priming effects as well as for semantic priming. For this purpose, the semantic and morphosyntactic relationship between pairs of inflected German verb forms and the stimulus onset asynchrony between prime/target presentation was systematically varied. The results indicate that lexical semantic and morphosyntactic information is processed by independent components of the visual word-recognition system.

2:30-2:45 (359)

The Information Used in Lexical Access. JOHN M. HENDERSON, PETER DIXON, & ALAN S. PETERSON, *University of Alberta* (read by Peter Dixon)—In reading text, the process of identifying a word and accessing its lexical representation begins before the word is actually fixated. In the present research, we examined the information gathered about a word before fixation and how that information is used in lexical access. Our results suggest that phonological information is crucial in lexical access, but that this information is not computed until after the word is fixated.

2:50-3:00 (360)

Integrating Word Length Information Across Fixations in Reading. ALBRECHT WERNER INHOFF, GREGORY BOHEMIER, & DEBORAH BRIHL, *SUNY at Binghamton*—The present study examined whether readers identify the length of the parafoveally available word and integrate this information across successive interword fixations in normal reading. During sentence reading, parafoveal word previews provided correct or incorrect word length information (e.g., the word *mattress* was presented parafoveally as *mattress* or *matress*). The intact word (*mattress*) was shown upon direct word fixation. The

results indicate that word length information is integrated across interword fixations.

PATTERN PERCEPTION II

Regency Ballroom A, Saturday Afternoon, 3:40-5:10

Chaired by Martha J. Farah, Carnegie-Mellon University

3:40-3:50 (361)

Contextual Effects on Perceived Uprightness During Pattern Recognition. MARIA I. LASAGA & ROBERT K. LEDUC, *University of Virginia* (sponsored by James R. Pomerantz)—In order to recognize an object, we need to determine its upright orientation to some extent. A series of experiments demonstrated that spatial layout can indicate a pattern's uprightiness for recognition purposes. This work shows that objects in a spatially extended array are processed most efficiently when they are oriented consistently with the layout, regardless of the layout's orientation. The contribution of several factors to such contextually induced alignment was also examined.

3:55-4:15 (362)

The Effects of Element Type and Spatial Grouping on Symmetry Detection. PAUL LOCHER, *Montclair State College*, & JOHAN WAGEMANS, *University of Leuven*—Subjects were required to detect whether briefly presented (125 msec) 36-element patterns were symmetric about an axis oriented either vertically, horizontally, or diagonally. Stimuli differed with respect to element type (dots or lines oriented either vertically, horizontally, or diagonally), type of mirror symmetry (single- or double-axis), and grouping of elements within the pattern and about the symmetry axis. Data indicate that a "symmetry token" is generated by the spatial grouping processes that derive the full primal sketch.

4:20-4:30 (363)

Oriental Effects in the Detection of Bilateral and Skewed Symmetry. JOHAN WAGEMANS, LUC VAN GOOL, PIET VANDEN BOSSCHE, & GÉRY D'YDEWALLE, *University of Leuven* (read by Géry d'Ydewalle)—Subjects were required to discriminate random from bilaterally or skewed symmetric dot patterns. Contrary to the situation for bilateral symmetry (to which all previous research on orientational effects has been restricted), the virtual lines connecting the symmetrically positioned dots are not orthogonal to the axis in skewed symmetry, so that the relative contribution of axis and virtual lines can be disentangled. The results show that the orientational effects are completely dependent on the skewing angle.

4:35-4:50 (364)

Discriminations Between One and Two Lines. DONALD L. KING, *Howard University*—Subjects counted (discriminated between) single horizontal and double colinear horizontal lines. Wide one-line stimuli produced a slower one-line response than did narrow one-line stimuli, but wide-wide two-line stimuli produced a faster two-line response than did narrow-narrow two-line stimuli. The conclusion is that with attention to 1 line, the two-line stimuli produced information of their total width, and with attention to each of two lines, the two-line stimuli produced information of the width of each line.

4:55-5:05 (365)

Visual Search for Incomplete and Complete Box Stimuli. DEAN G. PURCELL, DENISE G. KLEIN, *Oakland University*, & ALAN L. STEWART, *Stevens Institute of Technology*—Line-drawn box stimuli were used in a presence-absence judgment task. The target box was defined by virtue of a missing line element. Distractors were complete boxes. Decision times approached "pop-out" (10 msec/item) when the missing line element was external. When the missing line was internal, clear evidence for serial search was found. In a separate experiment which reversed target and distractor roles, serial search was found for both locations of missing lines.

COMPREHENSION/REASONING I

Regency Ballroom C, Saturday Afternoon, 3:45-5:05

Chaired by Kathleen M. Galotti, Carleton College

3:45-4:05 (366)

A Bootstrapping Solution to the Problem of Differentiating Spurious from Genuine Causes. YUNN-WEN LIEN & PATRICIA

CHENG, *University of California, Los Angeles* (read by Patricia Cheng)—When given information on the states of potential causes and of an effect, subjects use covariation to induce a category consisting of causes of the effect. When given formally identical information without the causal context, subjects do not induce such a category. Once induced, knowledge of this category is used to make judgments regarding whether specific covariational relations are spurious or genuine causes, depending on whether the relation involves a member of the category.

4:10-4:20 (367)

Inferences Made in Rule Discovery Tasks. JOHN B. BEST, *Eastern Illinois University*—A study of reasoning in the deduction game Mastermind provided evidence for the confirmation bias effect. Subjects read Mastermind problems and circled responses that they believed best answered the problem's question. Subjects partially overcame their confirmation biases when they were explicitly asked to disconfirm certain hypotheses, but resorted to confirmatory responses when this instruction was absent. These findings refute contentions that the confirmatory bias occurs only when the subjects generate their own responses.

4:25-4:45 (368)

Logic Problems: When Do People Decide There Is No Valid Conclusion? MARVIN LEVINE, *SUNY at Stony Brook*—The atmosphere effect is a linguistic (i.e., nonlogical) determinant that, for syllogisms, leads people to choose one of the four permissible conclusion statements. But why do people occasionally respond "there is no valid conclusion" (abb. \bar{V})? Another type of linguistic determinant, confusion factors (CFs), accounts for this response. The probability of the \bar{V} -response is a simple linear function of the number of CFs in the syllogism. This holds for both valid and invalid syllogisms.

4:50-5:00 (369)

A Perceived-Sufficiency Account of Conditional Reasoning. IN-MAO LIU & KING-CHUNG LO, *Chinese University of Hong Kong*—After reading a conditional statement, "if p then q," the perceived sufficiency of p for q refers to a tendency of p for producing a representation of q. This study manipulated perceived sufficiency and found that it was a powerful variable determining conditional reasoning. It was also found that the reasoner's performance can be improved markedly by providing a simple supplementary premise so as to raise the level of perceived sufficiency.

VISION II

Regency Ballroom D, Saturday Afternoon, 3:40-5:00

Chaired by Bruce Bridgeman, *University of California, Santa Cruz*

3:40-3:55 (370)

Characteristics of the Indirect McCollough Effect. LORRAINE G. ALLAN & SHEPARD SIEGEL, *McMaster University*—Contingent color aftereffect induction with a single chromatic grid sometimes results in illusory color on a grid not presented during induction. Such illusory color, contingently elicited by a noninduced grid, has been termed the "indirect ME." We elucidate the conditions under which an indirect ME is induced, and we show that characteristics of the indirect ME (seen following one-grid induction) are similar to those observed with the direct ME (seen following the usual, two-grid induction procedure).

4:00-4:10 (371)

Color Effects on Metacontrast. MARY C. WILLIAMS, *University of New Orleans*, BRUNO G. BREITMEYER, *University of Houston*, W. J. LOVEGROVE, *University of Wollongong*, & CAROLINA GUTIERREZ, *University of New Orleans* (read by Bruno G. Breitmeyer)—Relative to masks flashed on a white background, those flashed on a red ground attenuate metacontrast masking and shift its peak to shorter SOAs, whereas those flashed on a blue ground enhance it and shift its peak to longer SOAs. Red grounds also enhance target visibility at an SOA of 0 msec. These findings implicate distinct effects of background wavelength on transient M and sustained P pathways.

4:15-4:30 (372)

Equating Colors for Chroma: Effects of Relative Areas. WILLIAM P. DUNLAP, ROBERT H. MORRIS, CHARLES J. FRITCHIE, CHRISTOPHER M. LINNETT, & JANE E. CURRAN, *Tulane*

University—In a series of papers, Morriss and Dunlap showed that when adjusting the relative areas of two colored stimuli until they appeared balanced, subjects assigned smaller areas to high chroma (saturation) stimuli and larger areas to low chroma stimuli. These results correspond to a rule regarding color balance formulated by Munsell at the turn of the century. When we attempted to replicate these findings by having subjects adjust chroma rather than area we were surprised to find the opposite pattern of results. To better understand this reversal, the present psychophysical experiment had subjects practice equating chromas of colors in equal areas. Subjects then matched chromas in unequal areas. Larger areas were consistently assigned higher chromas and smaller areas lower chromas. Findings are discussed in terms of afterimages.

4:35-4:55 (373)

Discrimination Ellipsoids of Aperture and Surface Colors. TAROW INDOW, *University of California, Irvine*—An algorithm is presented by which discrimination ellipsoid is constructed in the (x, y, Y) space from binary judgment data by the method of constant stimuli. Ellipsoids around six colors (aperture- and surface-color modes, by matchings and this algorithm, two subjects, each) are compared. Theoretical discussion on the underlying mechanism for paired comparisons of colors is included.

3-D/MOVEMENT PERCEPTION II

Regency Ballroom H, Saturday Afternoon, 3:45-5:10

Chaired by Julian Hochberg, *Columbia University*

3:45-4:00 (374)

Perceiving Object-Relative Depth from Motion. CORRADO CAUDEK & DENNIS R. PROFFITT, *University of Virginia* (read by Dennis R. Proffitt)—The stereokinetic effect (SKE) is related to the kinetic depth effect, and especially to perceived motion parallax. An orthographic analysis applied to a motion parallax gradient of velocity is used to explain the main characteristics of SKE, as well as anomalies in motion parallax perception. SKE is geometrically inconsistent as a projection (orthographic or perspective) of any rigid object; however, its motions define those taken by the perceptual system in assigning object-relative depth.

4:05-4:20 (375)

Wayfinding from Multiple Sources of Information. JAMES E. CUTTING, *Cornell University*—Differential motion parallax (DMP), a nondecompositional approach to wayfinding, provides an adequate source of information from retinal flow down to gaze/movement angles of $.125^\circ$. Inspection of situations in which DMP fails to predict wayfinding reveals at least two other sources of information used—decelerations and reversals of direction on the retina. Comparisons with other sources of wayfinding information from optical flow will be made.

4:25-4:45 (376)

Temporal Thresholds for Perceiving 3-D Surfaces from Motion Parallax Information. BRIAN J. ROGERS, *University of Oxford*, HIROSHI ONO, & MASAO OHMI, *York University* (sponsored by Hiroshi Ono)—Rogers and Graham (1982) showed that the structure of 3-D surfaces specified by motion parallax information could be perceived when the peak-to-trough depth of sinusoidal corrugations was less than 30-arc-sec equivalent disparity. Our present study shows that the dots that provide the parallax information need only survive for less than 60 msec, during which time the maximum relative displacement is less than 2 arc min.

(377)

Withdrawn

ATTENTION III

Regency Ballroom F, Saturday Afternoon, 2:50-5:00

Chaired by Mari Riess Jones, *Ohio State University*

2:50-3:05 (378)

Curve Tracing and Visual Attention: Does the Mind Walk the Line? PETER A. MCCORMICK & PIERRE JOLICOEUR, *Univer-*

sity of Waterloo (read by Pierre Jolicoeur)—We present a model of curve tracing (Jolicoeur, Ullman, & MacKay, 1986) based on a moving variable size local operator. The model, motivated by findings on the orienting of visual attention, explains why nonlinear distance functions were observed previously in some curve tracing tasks. New stimuli were designed to test this model and to gain empirical control over the non-linearity. The role of shifting and focusing visual attention in curve tracing is discussed.

3:10-3:30 (379)

Attention and Express Saccades. ALAN KINGSTONE & RAYMOND KLEIN, *Dalhousie University* (read by Raymond Klein)—Our initial studies confirm the observation that removing a fixation stimulus shortly before the appearance of a visual target elicits unusually rapid ("express") saccadic responses even when target direction is uncertain. Fischer and Breitmeyer (1987) have proposed that attention must be disengaged before a saccade can be initiated, and that offset of any attended stimulus (pre-) disengages attention, thus permitting express saccades. Studies directly assessing the relationship between covert orienting and express saccades will be presented.

3:35-3:55 (380)

Evidence Against Slow- or Medium-Speed Switching in Concurrent Visual Discriminations. ANNE-MARIE BONNEL, *CNRS-LNF 1, Marseille*, & JEFF MILLER, *University of California, San Diego* (sponsored by Jeff Miller)—Subjects made concurrent same-different judgments about the lengths of lines within pairs to the left and right of fixation. Display durations varied randomly from 83 to 283 msec. Postmasks were used. If subjects switched attention between stimulus pairs at rates less than about 10 Hz, uncertain display duration should have produced a negative correlation between the accuracies of concurrent responses. It did not. Attention must be switched at a high rate, or shared.

4:00-4:15 (381)

Scene Segmentation Affects Perceptual Judgments. JON DRIVER, *Oxford University*, & GORDON C. BAYLIS, *University of California, San Diego* (read by Gordon C. Baylis)—The visual scene is readily segmented into visual objects. Two experiments suggest that perceptual judgments are easier within a single object. Subjects judged the relative positions of the apexes of two braces < > forming either the outside edges of a single hexagon or the inside faces of a pair of K-shaped pentagons. RTs were longer when subjects were presented with the two objects (Experiment 1) or attended to the two objects (Experiment 2), rather than the single central object.

4:20-4:30 (382)

Does Visual Attention Move Through Space? GARVIN CHASTAIN, *Boise State University*—Visual attention often is described as a spotlight moving through space between locations. Current results show that, when visual attention must be shifted from one spatial location to another 20° away, sensitivity to information at the second location increases while sensitivity at the first location simultaneously decreases. A fine-grained temporal analysis reveals that, during the attention shift, sensitivity averaged over the two locations remains constant.

4:35-4:55 (383)

Attention and Action in 3-D Environments: Action-Centered Internal Representations? STEVEN P. TIPPER & CATHY LORTIE, *McMaster University*—Much of the research studying visual selective attention has presented static 2-D displays and required verbal or manual responses. However, our perceptual-action systems have evolved to cope with interactions with 3-D environments. One example is reaching for a specific object while successfully ignoring other objects in the scene. We describe a number of preliminary studies that indicate that selec-

tive attention is based on action-centered internal representations in such ecologically valid tasks.

HUMAN LEARNING/MEMORY III Burgundy Room, Saturday Afternoon, 3:15-5:10

Chaired by Beth Kerr, *University of Washington*

3:15-3:35 (384)

Using ROC Data to Test Variance Assumptions of Memory Models. ROGER RATCLIFF, CHING-FAN SHEU, *Northwestern University*, & SCOTT D. GRONLUND, *University of Oklahoma*—The slope of an ROC curve transformed to z scores gives the ratio of the noise standard deviation to the signal standard deviation. ROC curves were collected for recognition memory in several experiments to provide this SD ratio for new and old items. Data show that the new item SD is 0.8 that of the old item SD, and independent of strength of the old items. These results are inconsistent with most current global memory models.

3:40-3:55 (385)

Mood and Memory: Experimental Attempts at Dissociation. MARCIA OZIER, *Dalhousie University*—A method is described for dissociating mood and memory. Subjects are induced into elation or depression (by the Velton technique or music) and tested for cued recall. Relative effectiveness of the two mood-induction techniques is reported, along with data that elation and depression may effect category and alphabetically cued recall differently. The advantages and disadvantages of the method are discussed.

4:00-4:15 (386)

The "JOL-Delay Effect": When Waiting Can Help You to Better Assess Your Recent Learning. THOMAS O. NELSON & JOHN DUNLOSKEY, *University of Washington*—Previous research has generally found that people's assessment of their recent learning is not very accurate for predicting subsequent retention performance. We varied the time at which the people made a given judgment of learning (JOL): immediately versus delayed (≈ 30 sec) after studying each item. Although people's accuracy at predicting their subsequent retention was not very high for immediate JOLs, it was nearly perfect for delayed JOLs. This finding has both theoretical and practical implications.

4:20-4:40 (387)

Exceptional Performance in Skilled Memory: Theory and Evidence. CHARLES P. THOMPSON, RAJAN S. MAHADEVAN, & THADDEUS COWAN, *Kansas State University* (read by Thaddeus Cowan)—Rajan Mahadevan's memory skills appear to reflect both exceptional natural ability and the effects of practice. We present evidence for both skilled performance as a child, memory span when first tested, the recitation of pi to 31,811 places, and practice effects in matrix learning. We discuss his performance in the context of a theoretical description of skilled memory differing only in a few respects from that put forward by Chase and Ericsson (1982).

4:45-5:05 (388)

Exceptional Performance in Skilled Memory: Data and Demonstration. JEROME FRIEMAN, CHARLES P. THOMPSON, & RODNEY J. VOGL, *Kansas State University* (read by Charles P. Thompson)—We present additional data on the skilled memory performance of Rajan Mahadevan, who demonstrates his skills by learning a 100-digit matrix and by finding digits at specific locations (or locating specific digit strings) in the first 5,000 digits of pi. While these studies confirm Mahadevan's skill with digits, they also demonstrate that his skill does not transfer to letters and transfers inappropriately to categorical word lists.

POSTER SESSION II

Regency Ballroom E, Saturday Evening, 5:00-6:30

(389)

Cerebral Asymmetry During Picture Recognition: Preliminary Evidence from Dolphins. PALMER MORREL-SAMUELS, LOUIS M. HERMAN, & ADAM A. PACK, *Kewalo Basin Marine Mammal Laboratory and University of Hawaii* (sponsored by William Uttal)—Recent research with dolphins suggests isolated gesture signs and simple gesture strings evoke a right-hemisphere advantage (RHA), whereas familiar gestures and complex strings evoke a left-hemisphere advantage. Earlier work shows dolphins successfully indicate (via keypresses) whether or not referents of gesture signs have been displayed previously. The current study reports recognition latencies for the videotaped objects themselves; we hypothesized an RHA would be manifest as faster latencies for stimuli presented to the left eye.

(390)

Sign Language Recognition in Dolphins, Human Native Signers, and Human Non-Native Signers. MELISSA R. SHYAN, *Bulter University*, LOUIS M. HERMAN, *University of Hawaii at Manoa*, BARBARA SZEKELY, SAM COHN, TOM SAVAGE, & STEPHANIE DRUM, *Southwest Texas State University* (sponsored by Louis M. Herman)—Two dolphins, human non-native signers, and human native deaf signers were tested for sign recognition strategies. Subjects received normal and modified signs in a free response task. Modified signs forced recognition choices through conflicting sign features. Subjects were matched for amount of and age of signing experience and tested in either language or nonlanguage contexts. Recognition of signs in sign language was influenced by testing context and language training experience.

(391)

Discrimination of Duration Ratios by Pigeons and People. J. GREGOR FETTERMAN, *IUPUI*—Fetterman, Dreyfus, and Stubbs (1989) trained pigeons to report which of two successive durations was longer or, in other conditions, whether the ratio of the two durations was less or greater than a criterion ratio (e.g., 4:1). Surprisingly, accuracy was similar for the shorter-longer and the ratio-based discrimination. In the present experiment, human subjects made similar shorter-longer and ratio-based temporal comparisons. Unlike pigeons, accuracy was significantly lower for the ratio comparison task.

(392)

Age and Sex Differences in Preadult Rats. ALLYSON J. BENNETT, JENNIFER C. WHITE, & MICHAEL J. RENNER, *Memphis State University* (presented by Michael J. Renner)—Sex differences in open field activities of adult rats are well known, but have not been previously reported for pre-adult rats. This study examined developmental and sex differences in Long-Evans rats. Littermate sextuplets were divided into sex-matched groups (30, 60, and 90 days) and individually videotaped for three nights in an arena containing objects. Multiple measures of exploration and object investigation increased significantly with age, but were not influenced by sex.

(393)

Environmental Novelty and Conditioned Hyperactivity with Morphine as US. MICHAEL T. SCOLES, *University of Central Arkansas*, & EDWARD J. CALLEN, *University of South Carolina at Aiken* (sponsored by William J. House)—For rats, paired exposures to a test environment (CS) and morphine (US) produce greater activity to the CS than unpaired CS/US exposures. This has been interpreted as an associative effect. However, gross activity following US-only exposures or no treatment equals that following paired exposures. Morphine may simply interfere with habituation of exploratory behavior. In addition to gross activity measures, analysis of videotape records compared conditioned hyperactivity to exploration of a novel environment.

(394)

Mental Simulation of One's Action. LAWRENCE M. PARSONS, *University of Texas at Austin*—I will present chronometric studies of the mental simulation of one's action. Results yield insight into the in-

ternal representations of the structure and kinematics of one's body and into the relationship between sensory-motor structures involved in action and cognitive ones involved in mental simulation. The findings also suggest how one's imagined spatial transformation of an object is influenced by its intrinsic structure.

(395)

Effects of Pointing Rate and Availability of Visual Feedback on Components of Prism Adaptation. GORDON M. REDDING, *Illinois State University*, & BENJAMIN WALLACE, *Cleveland State University*—When the limb becomes visible early in a pointing movement, proprioceptive adaptation is greater than visual, but if visual feedback is delayed until the end of the movement, the reverse is true. However, this effect occurs only if pointing rate is low. With high rates, adaptation is proprioceptive in nature regardless of feedback availability.

(396)

Slower Movement Times May Not Necessarily Imply "Online" Programming. MARK G. FISCHMAN & T. GILMOUR REEVE, *Auburn University* (sponsored by T. Gilmour Reeve)—Movement times to an initial target are slower for movements with multiple, rather than single, targets. This finding has been interpreted as evidence for online programming in which later components are planned during the initial component. An alternative interpretation is that the movement times are slowed because of changes in the mechanical constraints of the task. This experiment tested between these interpretations and provided evidence for the latter one.

(397)

Movement-Time Invariance of Writing Across Size, Effector, and Instructional Changes. CHARLES E. WRIGHT, *Columbia University* (sponsored by Barbara Landau)—Based on small samples, previous research has reported that handwriting time does not change across different writing sizes. This result is replicated in a larger, more systematic experiment. Time invariance was also found to hold across instructional conditions (write quickly versus carefully) but not across effectors: arm writing was slower and slowed with increasing size. These results are considered in the context of claims that effector-independent motor programs underlie writing.

(398)

Visual Timing of Action to Intercept Simulated Target Movement. BEN SIDAWAY, *Louisiana State University* (sponsored by Richard A. Magill)—Experiments examining the tau strategy in interceptive actions have calculated tau-margins assuming that the object is directly approaching the eye. This assumption is incorrect, however, in the majority of interceptive skills (e.g., hitting a baseball). This study used a sequential illumination of a series of LEDs to simulate a moving object that would pass to the side of the subject. Tau-margins calculated using the component of the object's velocity at the eye supported the tau strategy.

(399)

Text Manipulations Influence Representation and Reasoning in Children. TERRY R. GREENE, *Franklin and Marshall College* (sponsored by Richard S. Lehman)—Second-, fourth-, and sixth-grade children were given a passage which could be represented as a four-level class inclusion hierarchy. Top-down or bottom-up presentation and repetition or no repetition were manipulated in a 2x2 design. Children were instructed to create an external representation for the passage and to respond to questions requiring them to reason about its contents. Quality of representation and performance on the reasoning task were related to text manipulations. Educational implications of the results are considered.

(400)

Development of Spatial Memory in the Human Infant. P. MANGAN & L. NADEL, *University of Arizona* (presented by L. Nadel)—We have previously shown that 2-year-old children can perform cognitive mapping tasks, presumed to require function of the hippocampal formation of the brain, provided the memory load is not excessive. These results suggested that the hippocampus begins to approximate adult levels of function between 18 and 24 months. In the current study, performance of 1- and 2-year-old children on two spatial memory tasks was

compared. Children of both ages were able to perform the cue-based search task (not requiring hippocampal function), but only the 2-year-old children were successful on a task requiring place learning and a functional hippocampus. These results indicate that important hippocampal maturation occurs during the latter half of the second postnatal year of life.

(401)

Source Memory in Children with Learning Disabilities. THOMAS C. LORSBACH, DENISE MELENDEZ, & ANN MAHER, *University of Nebraska at Omaha*—On the basis of Johnson and Raye's (1981) reality-monitoring framework, this study examined whether two forms of source-monitoring ability develop in learning disabled (LD) and non-disabled (NLD) children in a comparable manner. LD and NLD children from grades 2 and 6 were assigned to one of two acquisition conditions in sentence completion task: "say-think" (internal source monitoring) or "say-listen" (reality monitoring). Analysis of source-monitoring performance revealed that the say-think condition produced lower scores than the say-listen condition, that sixth graders were superior to second graders, and that NLD children did better than LD children.

(402)

A Developmental Study of the Perceived Structure of Number Conservation Stimuli. BARBARA BURNS, *University of Louisville*—Burns and Shepp (1989) have reported developmental changes in classification of number conservation stimuli. Young children classified number-density objects by overall similarity relations whereas older children demonstrated an asymmetric pattern and classified by dimensional relations when the basis of classification was number. The present study examined classification performance of children between four and eight years of age in a dimensional instruction condition. Results showed that children as young as four had the ability to classify by shared number and shared density. No interactions were found between developmental level and dimension (number, density) or dimensional level (low, medium, high).

(403)

Effects of Technical Diagram Simplification on Retention from Training Manuals. ROBERT E. GEHRING, *University of Southern Indiana*, & MICHAEL P. TOGLIA, *SUNY at Cortland* (presented by Michael P. Toglia)—Undergraduate students and Navy personnel were tested for retention of information concerning engines from actual self-study training materials and from revised materials with simplified diagrams. Computer graphics enabled a gas-turbine-engine diagram to be simplified and separated into parts, which were presented closer in proximity to corresponding textual descriptions. The revised materials yielded higher face validity and better immediate recognition memory. Navy subjects did better than undergraduates and benefited more from revisions.

(404)

Repetition Effects on Lexical Decisions About Misoriented Letter Strings. KEVIN JORDAN, *San Jose State University*, & LAREE A. HUNTSMAN, *University of Wisconsin-Milwaukee*—Two experiments examined repetition effects on lexical decision times for mis-oriented letter strings. There were significant reductions in decision times for repeated words and nonwords compared to a novel set of stimuli. Additionally, repetition within 30° and 60° of the original stimulus orientation attenuated, but did not eliminate, repetition effects. This result could indicate broad tuning of memory for prior episodes or the imagined rotation of the misoriented stimulus to the most recent orientation presented.

(405)

Exploring the Graphemic Buffer Through Backward Spelling. ELISABET SERVICE & RAJA TURPEINEN, *University of Helsinki* (sponsored by Brian MacWhinney)—Current neuropsychological theories of spelling propose a working memory system for storing order and identity information of letters during the spelling process. The capacity of such a graphemic buffer was explored. Subjects had to type words backwards from memory, and the times between key presses were subjected to a cluster analysis looking for letter groups between pauses. A major pause divided the words into chunks of two and three letters irrespective of the syllabic structure of the words.

(406)

Lexical Access Without Frequency Effects in a Word Recognition Task. PATRICK BROWN, *Laurentian University*, PAUL FERA,

University of Waterloo, & CAROLYNN RACICOT, *Laurentian University* (sponsored by Steve Lupker)—Lexical access is generally thought to be sensitive to word frequency. Here, subjects responded to the direction (L/R) of an arrow. Arrows were preceded by letter strings whose lexical status cued direction (Yantis & Meyer, 1985). In two experiments, over SOAs from 17 to 150 msec, lexical status of strings constrained RT, but word frequency did not. Subjects showing larger lexicality effects also showed pseudohomophone effects (further evidence of lexical access) but no frequency effects.

(407)

Control of Fixation Positions in Words During Reading. PAUL W. KERR & GEORGE W. MCCONKIE, *University of Illinois at Urbana-Champaign* (presented by George W. McConkie)—Eye fixation positions (landing sites) on word locations during reading are normally distributed when conditionalized on the position of the prior eye fixation (launch site). The mean landing site is a linear function of the launch site, and is the same whether the word location contains an appropriate word, inappropriate word, or orthographically irregular string. However, luminance patterns do produce a small effect. Landing site in a word is primarily determined by perceptuo-oculomotor factors.

(408)

Postaccess Effects of Word Frequency and Word Familiarity: Further Assessments. JOHN W. MULLENNIX & SHEYMA F. A. GATES, *Wayne State University* (sponsored by Patricia Siple)—Recently, Connine et al. (in press) demonstrated that word frequency and word familiarity have substantial effects on word recognition in a delayed naming task. In the present study, the effects of frequency and familiarity on word pronunciation were assessed in further detail. Frequency and familiarity were manipulated while controlling experimental variables affecting access and production components of word naming. The results are discussed in terms of postaccess factors implicated in the word-pronunciation task.

(409)

Multiple-Choice Tests: Pondering Alternatives May Be Hazardous to Your Knowledge. ALAN S. BROWN & HILDY E. HALLIDAY, *Southern Methodist University*—Using general information questions, an initial recall test (with immediate feedback) was followed by an interpolated task where subjects rated incorrect alternatives for some of the questions. A final test on all questions from the initial test was given immediately or one week after interpolation, and consisted of a recall or multiple-choice format. Rating incorrect alternatives made final test performance more difficult for those items, compared to control (noninterpolated) items.

(410)

Associations, Retrieval Capacity, and Cued Recognition. STEVEN E. CLARK, *University of California, Riverside*, & RICHARD M. SHIFFRIN, *Indiana University* (sponsored by Robert A. Bjork)—SAM, TODAM, MINERVA 2, Matrix, and Independent Cue models are applied to single, cued, pair, and associative recognition. Results show pair > single > cued > associative. The cuing disadvantage (single > cued) remains even as associative recognition performance increases with slower presentation rates. This result is contrary to all models except SAM, which predicts only cuing disadvantages. However, subsequent experiments show a cuing advantage for common but not rare words. Modifications to models are discussed.

(411)

Memory Impairment with the Modified Test: Centrality and Retention Interval. ROBERT F. BELLI & STEVE E. WINFREY, *Creighton University* (sponsored by Elizabeth F. Loftus)—Prior post-event misinformation studies using the modified test of McCloskey and Zaragoza with undergraduates have failed to find memory impairment. In this experiment, subjects viewed slides in which critical items were presented centrally. Memory impairment with a modified test was discovered with a 1-week, but not with a 15-min, retention interval. Previous failures to induce impairments are attributed to the peripheral presentation of items and the lack of forgetting with short retention intervals.

(412)

Central Locus of Short-Term Visual Memory for Repetitions. STEPHEN A. WURST, GEORGE SPERLING, *New York University*, & BARBARA ANNE DOSHER, *Columbia University* (sponsored by George Sperling)—Subjects must detect a target stimulus that is repeated

within four frames in sequence of 30 frames (in which all stimuli are repeated). Successful detection implies a match occurs between an incoming item and a previous item retained in short-term visual repetition memory (STVRM). A descriptive model of item strength in STVRM quantitatively predicts both accuracy and confidence data. That dicopic viewing and interleaved masking fields have only slight effects implies a central locus of STVRM.

(413)

Illusory Conjunctions of Information in Long-Term Memory. MARK TIPPENS REINITZ, WILLIAM J. LAMMERS, & BARBARA PITTS COCHRAN, *Southeastern Louisiana University* (sponsored by Robert Dale)—In an old-new recognition experiment, subjects falsely recognized new test stimuli (two-syllable nonsense words, e.g., GUBRAK) if both syllables occurred in stimuli presented during study. A second experiment showed that subjects were confident in their responses and that the effect was not due to demand characteristics. In the third experiment, subjects often falsely recognized a new face if its features were contained in two separate study faces, and subjects were confident in their responses.

(414)

The Effect of Number of Response Alternatives on Parallel Search. RONALD OKADA, *York University*, & DAVID BURROWS, *Skidmore College*—Subjects decided if a test item was either the same as or a synonym of any item in a short memorized list. On negative trials, the test item was an antonym of a memorized item. The data support the notion that retrieval occurs in parallel whether subjects use two buttons (one for same and synonym decisions and one for antonym decisions) or three buttons (one for each type of decision) when they respond.

(415)

Word Frequency Effect: A Test of Processing Explanation. HAJIME OTANI & HOWARD L. WHITEMAN, *Central Michigan University* (sponsored by Milton H. Hodge)—We conducted a study to see whether Einstein and Hunt's (1980) notions of relational and item-specific processing can explain the word frequency effect (WFE). The WFE was reversed in recognition when subjects processed item-specific information. In contrast, the WFE was not modified in free recall even when subjects were required to use relational processing. We concluded that the differential processing of relational and item-specific information cannot explain the WFE.

(416)

Rhyme's Role in Recall. WANDA T. WALLACE, *Duke University* (sponsored by David C. Rubin)—Rhyme can influence recall. Two experiments using ballad verses and word lists as stimuli indicate that rhyme can stabilize individual words but has little impact on recall of the entire list or ballad verse. Rhyme could stabilize words and make rhyming words more memorable by either forming a strong association between words at study or by constraining possible word choices at recall. The last experiment presented is an initial attempt to distinguish between these mechanisms.

(417)

Attentional and Semantic Factors in the Suffix Effect. DIANE WILLIAMS, *Navy Health Research Center* (sponsored by Donald Bamber)—Previous research has found that the suffix effect is affected by attentional factors, but minimally by semantic factors. Subjects were asked to listen to lists of numbers followed by "recall" or "zero" presented in either the same or a different voice. The results showed that both factors produced a substantial change in the suffix effect. The influence of semantic factors suggests that the recency effect may rely less on sensory memory than previously hypothesized.

(418)

Pragmatics and Memory for To-Be-Forgotten Information. JONATHAN M. GOLDING, SUSAN B. FOWLER, *University of Kentucky*, & DEBRA L. LONG, *University of California, Davis* (sponsored by Robert Lorch, Jr.)—Two experiments investigated the effect of pragmatics on memory for to-be-forgotten (TBF) information. Subjects were presented with a phone number and instructed to forget it because (1) although correct, it should not have been mentioned (a slip), or (2) it was incorrect (a mistake). Pragmatics affected memory such that a mistake led to lower TBF recall and recognition than a slip. These results indicate the importance of pragmatics on memory for TBF information.

(419)

TOTimals: A Controlled Method for Observing the Tip-of-the-Tongue Phenomenon. STEVEN M. SMITH, JEFFREY M. BROWN, & STEPHEN P. BALFOUR, *Texas A&M University*—Studies of tip-of-the-tongue (TOT) phenomena have tested extra-experimentally acquired knowledge. Problems include lack of control over learning and retention factors, uncertainty about subjects' intended targets, and limitations in phonological and semantic characteristics of targets and interlopers. We examined the efficacy of TOTimals, imaginary animals, for inducing TOT states. Subjects studied a list of TOTimals and reported TOTs when recalling TOTimal names, given picture cues. High frequencies of TOT states were reported.

(420)

Components of Memory: A Confirmatory Factor-Analytic Study. DOUGLAS HERRMANN, *Bureau of Labor Statistics*, CARMİ SCHOOLER, PAULA DARBY LIPMAN, *National Institute of Mental Health*, JORDAN GRAFMAN, *National Institute of Neurological Diseases and Strokes*, & CARRIE SCHOENBACH, *National Institute of Mental Health*—Typically, the identification of components in the memory system has been experimental. The present research explored the nature of memory components and their interrelationships with confirmatory factor analysis. Three data sets, each involving a wide variety of memory measures, were analyzed. The results for all three data sets supported a model that assumes five components: two short-term memory components (visual and auditory) and three long-term memory components (semantic, associative, and visual).

(421)

Analogy, Complexity, and Number of Exemplars in Text-Based Memory and Inference. LESLIE J. CAPLAN & CARMİ SCHOOLER, *National Institute of Mental Health* (sponsored by Carmi Schooler)—Subjects read series of passages (one or two "original learning" passages followed by a target passage) about analogous topics. Processing complexity of original learning passages was manipulated, as was the amount of analogical information provided. On tests over the target passage, complexity interacted with number of original learning passages for inference measures, and with amount of analogical information for memory measures. The results generally support the hypothesis that complexity improves performance when conditions encourage conceptual abstraction.

(422)

Double Dissociation of Selective Interference and Domain-Specific Short-Term Memory. ALAN HALTINER, *University of Health Sciences*, NAFTALI RAZ, *Memphis State University*, & MICHAEL S. SEIDENBERG, *University of Health Sciences* (presented by Naftali Raz)—Twenty subjects performed verbal and spatial short-term memory tasks concurrently with two types of secondary tasks: counting and visual-spatial tracking. Interference tasks were performed either during stimulus presentation (encoding) or during the poststimulus (rehearsal) interval. Regardless of interference timing, both verbal and spatial stimuli were better recalled when the interference modality was incongruent. Thus the results revealed a hypothesized double dissociation between memory and interference by modalities.

(423)

Self-Reports of Speeded Performance: Diazepam Effects. THOMAS S. CRITCHFIELD, ROLAND R. GRIFFITHS, *Johns Hopkins University School of Medicine*, & MICHAEL PERONE, *West Virginia University* (sponsored by Michael Perone)—In a within-subjects design, four men matched to sample (DMTS) under a conjunctive speed + accuracy contingency of reinforcement until reinforcement rates stabilized. Then, with feedback about DMTS outcomes withheld, the men self-reported, via a yes/no button press, whether each response qualified for reinforcement; correct self-reports were intermittently reinforced. Under these conditions, at doses that minimally disrupted DMTS performance, diazepam reduced self-report accuracy, specifically by increasing the tendency to report reinforcement when in fact none was earned.

(424)

The Psychology of Windfall Gains. HAL R. ARKES, CYNTHIA A. JOYNER, JANE GRADWOHL-NASH, MARK PEZZO, *Ohio University*, CARYN CHRISTENSEN, *University of Illinois at Chicago*, WENDY SCHWEIGERT, *Bradley University*, LAWRENCE E.

BOEHM, *Thomas More College*, KAREN SIEGEL-JACOBS, & ERIC STONE, *University of Michigan*—Several of our questionnaire studies suggest that windfall money is more likely to be spent than money that is earned. Six studies using hypothetical money and one using real cash led us to conclude that the unanticipated nature of the windfall money is responsible for its spendability. Thus, the source of money influences the probability it will be spent or saved. This finding complicates predictions derived from traditional economic theory.

(425)

Effects of Active/Passive Causal Behaviors on the Base Rate Fallacy. PAUL C. AMRHEIN & MARY LOU CHRISTOPHERSEN, *University of New Mexico* (sponsored by Henry C. Ellis)—Choice and judgment were examined manipulating base rate of active/passive causal behaviors and availability of nondiagnostic individuating information. In situations (accidents, diseases) with individuating information, a *passive* behavior was more likely chosen as the cause; in situations without it, an *active* behavior was more likely chosen as the cause. Further, judged probability of chosen cause was overestimated. These effects occurred independent of the base rate fallacy effect.

(426)

Framing as a Manipulation of Apparent Conflict. SANDRA L. SCHNEIDER, *University of South Florida* (sponsored by James J. Jenkins)—This study tests the assertion that people are risk averse for positively framed options but risk seeking for negatively framed options. The typical framing paradigm was extended using more and less risky options across several scenarios. Although subjects were generally risk averse for positively framed options, their choices varied under the negative frame. Individual difference analyses suggest that a negative frame produces conflict by highlighting the tradeoff between uncertainty and outcome whereas a positive frame obscures this tradeoff.

(427)

Decision Making: Are the Rich Different? RALPH G. NOBLE & MARK LAW, *Rensselaer Polytechnic Institute*—The present study evaluated the influence of perceived wealth on decision making under uncertainty by asking 250 undergraduates to make choices under three different conditions (assume you are rich, assume you are poor, and a no-instruction control). Only the rich condition produced significant effects, and increased the time required to make decisions. Apparently college students perceive themselves as poor, which may influence their decision making.

(428)

The Accuracy of Future Forecasts and Past Judgments. BRUCE W. CARLSON, *Ohio University* (sponsored by Frank Bellezza)—Two experiments are reported that examined the accuracy of probability judgments of future and past events. When future and past judgments were made by the same individuals, the Brier score and, in particular, discrimination were worse for future than for past judgments; when future and past judgments were made by different individuals, the Brier score and, in particular, calibration and noise were better for future than for past judgments. These results are discussed.

(429)

Order Effects in Belief Updating with Consistent and Inconsistent Evidence. RICHARD M. TUBBS, GARY J. GAETH, IRWIN P. LEVIN, & LAURA A. CHILD, *University of Iowa* (presented by Gary J. Gaeth) (sponsored by Irwin P. Levin)—This experiment required subjects to evaluate three hypotheses: whether a work environment caused cancer, whether an advertisement caused people to buy bread, and whether a loose connection caused a stereo malfunction. Subjects needed to sequentially update beliefs upon receiving additional positive and negative evidence. Results demonstrate a recency effect which is a function of the difference in independent strengths of evidence. This effect may be stronger when evidence is consistent than when it is mixed.

(430)

The Allocation of Visual-Spatial Attention Prior to a Saccadic Eye Movement. JOHN M. HENDERSON, *University of Alberta* (sponsored by Vincent Di Lollo)—The amount of information derived from a more distinct extrafoveal stimulus increased and the amount derived from a closer extrafoveal stimulus decreased when a subject was about to execute a saccade to the far location in comparison to a condition in which the subject maintained fixation. These results suggest that visual-

spatial attention is directed away from the fovea and to the target location of an impending eye movement.

(431)

Attentional Inhibition: General Mechanism Or Task Effect? JIM CHEESMAN, PATRICIA L. GRAF, & D. A. BOURASSA, *University of Saskatchewan* (sponsored by Philip M. Merikle)—Attentional inhibition, which has been explained in terms of a general attentional mechanism, was evaluated as a function of task practice. In Experiment 1, under accuracy instructions, attentional inhibition decreased as a function of practice. In Experiment 2, under speeded instructions, attentional inhibition was observed initially, but the effect reversed to yield a facilitation effect with practice. The results indicate that attentional inhibition is transitory and may be best described as a task orienting effect.

(432)

Oculomotor Readiness and Covert Orienting: The Effects of Central Versus Peripheral Precues. PATRICIA A. REUTER-LORENZ & ROBERT FENDRICH, *Dartmouth Medical School* (sponsored by Howard C. Hughes)—In spatial precuing paradigms, the costs produced by invalid cues are influenced by the spatial arrangement of the cue and target (e.g., with respect to the visual meridians). If oculomotor programs mediate attention shifts, these effects should be similar for saccades and manual responses. We found this to be true only with central precues; with peripheral precues a distinctly different pattern of costs emerged. The implications for oculomotor readiness and other attention models are discussed.

(433)

Selection by Color: Mediated by Location But Not by a Moving Spotlight. KYLE R. CAVE & HAROLD PASHLER, *University of California, San Diego* (sponsored by Harold Pashler)—Subjects viewed successive frames of red and green digit pairs, reporting the highest green (or red) digit of the series. Accuracy was higher if green digits all occupied the same location, confirming that color selection depends on location selection. However, selection by alphanumeric category does not. Additionally, when green digits appeared at different locations, distance between locations had no effect. Contrary to spotlight models, attention shifts over longer distances did not require more time.

(434)

The Covert Orienting of Attention to Stereoscopic Targets. LYNN ZIMBA & DONALD J. TELLINGHUISEN, *University of Iowa* (sponsored by James V. Hinrichs)—Spatial precuing can produce significant differences in detection latencies to targets presented at attended versus unattended locations on a 2-D visual surface. We report that when the precue indicates a location in 3-D (stereoscopic) space, and the attended and unattended locations fall on opposite sides of the horopter, detection latencies are unaffected. This outcome suggests that the mechanism which signals depth from retinal disparity cues may be immune to the effects of spatial expectancy.

(435)

Failure to Maintain Equivalence of Groups in Cognitive Research: Dual Task. F. RICHARD FERRARO, *Washington University*, GEORGE KELLAS, *University of Kansas*, & GREG B. SIMPSON, *University of Nebraska at Omaha* (sponsored by George Kellas)—Poulton (1982) has criticized within-subject manipulations of the standard conditions for dual-task methodology. Two experiments compared between-versus within-subjects designs employing lexical decisions. The results confirmed Poulton's claim of asymmetry of transfer within repeated-measures designs. Conclusions regarding attention allocation, therefore, are equivocal as compared to independent groups designs.

(436)

Coarse Location Mechanism for Feature Integration. ASHER COHEN, *Indiana University*, & RICHARD B. IVRY, *University of California, Santa Barbara* (sponsored by Richard M. Shiffrin)—Evidence suggests that features (e.g., color, line orientation) are processed separately. How are the specific features of each object conjoined? We suggest a coarse location mechanism that works as follows: Each feature is perceived with coarse location information. The visual system integrates features with overlapping location information. This mechanism works only when objects are not spatially adjacent. A series of experiments using visual search paradigm support this contention and explore properties of this mechanism.

(437)

Using Converging Operations to Test for Parallel Versus Serial Processing. DALE DAGENBACH, *Wake Forest University*, & HOWARD EGETH, *Johns Hopkins University* (sponsored by Howard Egeth)—Two diagnostics of parallel versus serial processing were simultaneously applied in visual search experiments. The diagnostics are based on mean RT, in one case as a function of display size (load) and in the other as a function of a within-trial manipulation of visual quality of the stimuli. Convergent and divergent findings of the two diagnostics are then assessed, along with the merits of using such converging operations.

(438)

Local and Global Belongingness in the Benary Effect. TIZIANO AGOSTINI, *University of Trieste*, NICOLA BRUNO, *University of Padova*, & WALTER GERBINO, *University of Trieste* (presented by Walter Gerbino)—We argue that two kinds of belongingness coexist in the Benary effect: global (the triangle is part of a figure) and local (the long side of the triangle is aligned with a figure edge). These conditions presuppose different processing mechanisms. To test which is responsible for lightness induction, we manipulated local and global belongingness in a paired-comparison experiment. Although both factors proved reliable, global belongingness produced stronger differences than local.

(439)

Crossmodal Pattern Perception. PAUL MICHAEL EVANS, *Willemette University* (sponsored by James C. Craig)—Subjects were presented with two letters in succession, one visually and one tactually. In the first experiment, the subjects' task was to indicate whether the two letters were the same or different. Correct "same" responses were faster than correct "different" responses. In the second experiment, the subjects' task was to identify the second letter. Identification responses were fastest when the target was preceded by a spatially identical letter (albeit in the other modality). The results suggest that similar processes may be involved in intra- and intermodal matching of spatial stimuli.

(440)

Perceptual Discrimination of Fractal Textures. FRANK M. MARCHAK, *TASC* (sponsored by George L. Wolford)—Marchak (1989) examined the validity of the fractal model in predicting roughness estimates of unpatterned texture surfaces in comparison to standard texture descriptors, such as second-order statistical measures. In the present study, subjects made same-different judgments of stimuli in which the center and surround differed in fractal dimensionality. Reaction time data were used to determine the limits of discriminability based on fractal dimension on both computer-generated textures and textured surfaces in nature.

(441)

Interactions Between Shape Recognition and Stereo Fusion. MARY A. PETERSON & BRADLEY S. GIBSON, *University of Arizona*—Shapes of differential prototypicality were separated by stereo contours; half were random dot (RDS), half were luminance contour (LCS). Disparity determined the figure for all RDS and for those LCS specifying high-prototypical shapes as figure. For LCS specifying low-prototypical shapes as figure, high- and low-prototypical shapes were figure for equal durations, implying (1) shapes on both sides of luminance contour are identified prior to fusion, and (2) shape recognition input can override disparity.

(442)

Visual Search for Simple Volumetric Shapes. JAMES M. BROWN, *University of Georgia*, NAOMI WEISSTEIN, *SUNY at Buffalo*, & JAMES G. MAY, *University of New Orleans* (sponsored by Naomi Weisstein)—Four experiments measured RT to detect target presence or absence dependent on the number of display items and their depicted 3-D orientation. Each experiment examined every pairwise combination of two simple volumetric shapes in two orientations. Conditions exhibiting pop-out would be predicted by differences in their 2-D features. Conditions in which serial search was evident support previously found search asymmetries for particular 2-D features. Neither 3-D shape nor 3-D orientation seem to be factors in producing pop-out for these stimuli.

(443)

Intersensory Conflict in Form Identification. MORTON A. HELLER, *Winston-Salem State University*—A vertical mirror induced

a discrepancy in direction and form between vision and touch. Fourteen subjects touched the embossed letters *p*, *q*, *b*, *d*, *W*, and *M*, while viewing them in a vertical mirror, and were asked to identify the letters. Thus, subjects touched a *p* but saw themselves touching a *b* in the mirror. Six of the conflict subjects relied on touch, and only one showed visual dominance. Others showed a compromise between the senses.

(444)

Inferring Motion from Static Diagrams. MARY HEGARTY, *University of California, Santa Barbara* (sponsored by Russell Revlin)—Reaction-time and eye-fixation data are analyzed to determine how individuals infer the motion of components of a dynamic system from a static diagram. The data indicate that this process involves mentally stepping through the kinematic chain of events from the input of the system to the motion of the component in question. This process is discussed in relation to capacity limitations of spatial information processing.

(445)

Determinants of Stability in the Perception of Subjective Contours. CYNTHIA A. LAURIE, *Westminster College*, JOEL S. WARM, WILLIAM N. DEMBER, & ROBERT A. FRANK, *University of Cincinnati* (presented by William N. Dember)—Subjective contour perception is shown to be unstable with continued viewing under photopic illumination. Generally, fragmentation occurred within the first 15 sec of a 240-sec inspection period, and whole or partial outage was present for 28% of the viewing time. Stability varied directly with inducing area size and contrast, and was greater for figures with Cartesian (square) as compared to oblique (diamond) orientations.

(446)

Implicit Knowledge About Motion. NANCY J. COOKE & SARAH D. BREEDIN, *Rice University and Lockheed Engineering and Sciences Company* (sponsored by Randi C. Martin)—Why do people make incorrect predictions about motion in the lab, yet successfully interact with moving objects in the world? This paradox was addressed by examining conditions that affect such errors. Results indicated that people without formal physics training made fewer errors when trajectories were selected, rather than produced. Similar results held for explanations of trajectories and, in general, suggest that inexperienced individuals have knowledge of motion, but are unable to access it directly.

(447)

Optic and Somatic Contributions to Body Orientation in the Pitch Dimension. KENNETH NEMIRE & MALCOLM M. COHEN, *NASA-Ames Research Center* (sponsored by Malcolm M. Cohen)—In a factorial design, each participant attempted to set his body erect or 45° back from erect while restrained in a movable bed surrounded by an adjustable box. The box provided an illuminated grid, two luminous lines, or a dark environment. The grid was more effective than lines in biasing pitch orientation; effects of box pitch were greatest for nonerect positions. We present a model of pitch orientation involving vestibular, somatosensory, and visual inputs.

(448)

Pitched Environments and Apparent Height. ARNOLD E. STOPER, *California State University, Hayward*—The pitch of a structured visual environment has previously been shown to strongly influence apparent eye level. In the present experiment, subjects judged the apparent height of standing triangular forms as well as eye level in a "pitchroom." The walls and ceiling of this pitchroom could be varied in pitch, but the floor remained level. All subjects showed a strong effect of pitch on apparent height as well as apparent eye level.

(449)

Detection of Stimulus Organization: Task- and Intelligence-Related Differences. SALVATORE A. SORACI, JR., MICHAEL T. CARLIN, & ALFRED A. BAUMEISTER, *Vanderbilt University* (sponsored by Jeffery J. Franks)—Research has indicated that intelligence-related differences in the detection of stimulus organization exist under conditions of reduced stimulus information (Soraci et al., 1990; Carlin et al., 1990). Detection performances have been assessed using both match-to-sample and signal-detection methodologies. Cross-study comparisons have indicated that the unique processing demands of the two tasks differentially affect the performances of mentally retarded and nonretarded individuals. Such processing differences have implications for identifying the locus of the intelligence-related differences mentioned previously.

(450)

Asymmetric Patterns of Inductive Judgments for Different Types of Categories. SHARON LEE ARMSTRONG, *Drake University* (sponsored by Jonathan Vaughan)—Following Rips, subjects were told that for a category (bird) one of the species (robins or hawks) had a property (disease) and then were asked to estimate the probability that other species of birds had the disease. Little generalization was found from an atypical species whereas extensive generalization was found from a typical species. This study tests additional types of categories and properties, memory of the generalization, and its effects on further inductive judgments.

(451)

Expert Chess Memory Without Chess Knowledge: A Training Study. K. ANDERS ERICSSON & MATHEW S. HARRIS, *University of Colorado at Boulder*—A student with minimal knowledge of chess received training on Chase and Simon's memory test for briefly presented chess positions. Within 50 h of practice, her memory performance improved from that of a novice to the average performance of chess masters. No corresponding improvement of random chess positions was observed and her performance was unaffected by manipulations interfering with STM. An analysis of her encodings revealed a memory skill consistent with Chase and Ericsson's skilled memory theory.

(452)

Not All Differences Are the Same: Similarity as the Alignment of Conceptual Frames. ARTHUR B. MARKMAN & DEDRE GENTNER, *University of Illinois* (presented by Dedre Gentner)—A common intuition is that similar objects have many commonalities and few differences, whereas dissimilar objects have few commonalities and many differences. Contrary to this intuition, we find that, while subjects list more commonalities for pairs of similar objects than for pairs of dissimilar objects, they list roughly the same number of differences. Analyzed with respect to conceptual frames, similar pairs have different values on common slots, whereas dissimilar objects have different slots altogether.

(453)

A Different Perspective on Human Object Recognition: The Identification of Objects in Unfamiliar Views. MICHAEL J. TARR, *Yale University* (sponsored by Steven Pinker)—Studies of object recognition have demonstrated systematic orientation effects on response time. However, some evidence suggests prior context diminishes effects of orientation because orientation-invariant features are used. Alternatively, subjects project the appearance of objects into unfamiliar, but anticipated, orientations. Several experiments confirmed this, demonstrating that diminished effects were limited to anticipated orientations and were absent when no orientation could be reliably anticipated. This indicates that recognition is orientation dependent, but remarkably flexible in response to the environment.

(454)

Is Judged Displacement a Modular Process? TIMOTHY L. HUBBARD, *Eastern Oregon State College*, & JAMSHED J. BHARUCHA, *Dartmouth College* (sponsored by Jamshed J. Bharucha)—Subjects observed a target in apparent motion either bounce off or pass through a barrier. The target then vanished and subjects judged the location of the vanishing point. Subjects were cued as to which type of motion to expect, and the validity of the cue was varied. Forward displacement of the target, similar to that described by Freyd, was greater on valid trials than on invalid trials, suggesting that displacement is not a modular process.

(455)

Stroop Interference: Interactions Between Representations of Colors and Color Words. DALE S. KLOPFER, *Bowling Green State University* (sponsored by Ryan D. Tweney)—Most explanations of the Stroop effect hold that color naming and word reading are independent processes varying in speed. These studies show that the amount of Stroop interference depends partly on the similarity between the actual color of the word and the color denoted by the color word (e.g., there is more interference with YELLOW in orange ink than YELLOW in blue ink). These results favor an interactive account of the Stroop effect.

(456)

Evidence from the Old Testament Relevant to the Historical Development of Consciousness. SAM REVUSKY, *Memorial University of Newfoundland*—Julian Jaynes has claimed (1) that decision making took the form of hallucinatory experiences several thousand years ago; and (2) that the transition to consciousness inhibited this early way of thinking, making people unhappy because they lost their gods. A number of passages in the Old Testament will be shown to be interpretable in this way. The only alternative interpretation that fits these passages is fundamentalism: that the experiences described reflected objective reality.

(457)

Causal Reasoning in Rube Goldberg Devices. N. JANE ZBRODOFF, *University of Illinois* (sponsored by Gordon D. Logan)—A causal reasoning experiment was conducted to determine the strength of causality between events in a device. Subjects judged the likelihood that events would or would not occur in a Rube Goldberg device given that earlier events did or did not occur. Judgments of target events were more than 20% higher when earlier events were on the essential causal chain of the device than when they were off the chain. Distance between events had no effect.

(458)

Statistical Structure and Sequence-Specific Learning in a Serial RT Task. MICHAEL A. STADLER, *Louisiana State University* (sponsored by R. C. Mathews)—Sequence-specific learning occurs in a serial RT task when learning is faster for a continuously repeated sequence of trials than for a randomly generated sequence. Any repeating sequence imposes constraints on the statistical structure of the overall sequence; the probabilities of each event or subsequence of n events are not equal. Two experiments demonstrate the effect of varying the statistical structure of the sequence on learning.

(459)

The Role of Working Memory in Plausibility Effects in Syllogistic Reasoning. KATHLEEN M. GALOTTI, *Carleton College*—Undergraduates evaluated plausible and implausible conclusions for categorical syllogisms. Half of the problems were presented with two premises, and half with six (i.e., four extra premises irrelevant to the conclusion), in an effort to increase demands on working memory. Presentation of irrelevant premises slowed encoding and resulted in lower accuracy. Contrary to expectation, plausible conclusions took longer to evaluate than did implausible conclusions.

(460)

Effects of Reader Preferences on Prose Understanding. DAVID ALLBRITTON & RICHARD J. GERRIG, *Yale University* (presented by Richard J. Gerrig)—In the course of understanding a narrative, readers generate hopes (or preferences) about how the story will turn out. In three experiments, we showed that readers' preferences can interfere with verification of previously known information about story outcomes, both immediately after text presentation and after a brief delay. By contrast, our manipulation of readers' preferences did not affect verification of information unrelated to outcomes. These results highlight the need to include readers' affective responses in theories of text comprehension.

(461)

Effect of Bilingualism on Word Perception. ZEHRRA F. PEYNER-CIOGLU & ALI I. TEKCAN, *American University, Washington, D.C.*—Bilinguals often perform worse than monolinguals on data-driven tasks. In our study, bilinguals located words in an array of letters (played Boggle) in their native or second language and in both languages together; monolinguals also located words. The task was data driven but many correct responses existed. Bilinguals located no fewer words in their native language than did monolinguals. Moreover, they located more words in both languages together than in either language alone.

(462)

Language Recognition in Skilled Bilinguals. JYOTSNA VAID, *Texas A&M University*, & CHERYL FRENCK, *American University in Cairo* (sponsored by Steve Smith)—For bilingual speakers, part of the process of recognizing a word involves deciding what language the word is in. What factors influence on-line and retrospective judgments about language membership? We examined this issue using bilinguals

tested on a speeded language classification task and in an incidental memory for language paradigm. Our results indicate that language perception is influenced by orthographic markedness and that retention of language-of-input information is affected by the level of processing at encoding.

(463)

Some Evidence That Irregular Forms Are Retrieved From Memory But Regular Forms Are Rule Generated. SANDEEP PRASADA, STEVEN PINKER, & WILLIAM SNYDER, *MIT* (presented by Steven Pinker)—Do people retrieve irregular inflected forms from memory, but generate regular inflected forms on-line? In three experiments, subjects saw verb stems and uttered their past tense forms. Stimuli included pairs of irregular verbs matched on base frequency but differing on past frequency, and pairs of regular verbs selected in the same way. Low-frequency irregular pasts were produced with longer latencies than high-frequency irregular pasts; there was no such effect for regular verbs.

(464)

Measures of Association and the Scope of a Word's Meaning. JULIA C. JORGENSEN, *Lehman College of CUNY* (sponsored by Rachel Joffe Falmagne)—Response availability in continued free word association has been taken as a measure of the amount of information in the mental representation of a word's meaning (DeGroot, 1989). Another such measure is the semantic scope of the set of substitutes for the word in a representative range of its contexts. Here these two measures are compared in terms of findings regarding lexical concreteness and frequency, and the nature of the lexical structures elicited in free association is discussed.

(465)

Effect of Syntactic Context on Naming Bisyllabic Words. ALAN H. KAWAMOTO, WILLIAM T. FARRAR IV, & MICHELLE OVERBEEK, *University of California, Santa Cruz* (sponsored by Raymond W. Gibbs, Jr.)—Although grammatical category is incorporated in stress assignment rules, there is no evidence to date that grammatical category affects recognition of multisyllabic words. We present evidence that it does; naming bisyllabic words with canonical stress (SW nouns, WS verbs) is facilitated in an appropriate syntactic context relative to a neutral context, but naming words without canonical stress (WS nouns, SW verbs) is inhibited. We discuss these results in terms of interactive and autonomous models.

(466)

Word Meaning and Resemblance. BARBARA C. MALT, *Lehigh University* (sponsored by Andrea R. Halpern)—Nouns label sets of entities that are perceived as similar to one another, but the nature of this similarity remains unclear. This study examined the sorts of resemblances that exist among entities labeled by the same noun. Examples of objects labeled by 18 common English nouns were collected, along with examples of objects judged similar yet labeled differently. Analysis of the pattern of naming suggested at least five important dimensions of resemblance.

(467)

The Effects of Text Revision on Comprehension and Comprehension Monitoring. CHARLES A. WEAVER III & KEVIN D. BURNS, *Baylor University* (sponsored by Lewis M. Barker)—Well-written expository texts were compared with poorly written texts on measures of both comprehension and comprehension monitoring. Though true/false and verbatim recognition performance did not differ in the two conditions, measures of comprehension monitoring did. Predictions of future performance were accurate only for well-written passages. Furthermore, though performance was above chance for both types of comprehension measures, only the predictions of performance for the true/false questions were accurate.

(468)

The Recognition of Unseen Words. J. VIVIEN BAINBRIDGE, *University of Oklahoma* (sponsored by Stephan Lewandowsky)—Words in context reflect only a restricted component of their possible meaning. Two experiments investigated the representation of this context-specific sense using recognition judgments. The results showed that subjects accept as present in the text words which have not appeared but

which name the text-appropriate meaning of a word that has been presented. This result occurred when subjects were tested immediately after reading the prime, showing that context-appropriate meaning is immediately determined.

(469)

Gastric Emptying to Context, Odor, and Taste CSs Paired with LiCl Administration. CYNTHIA L. MEACHUM & ILENE L. BERNSTEIN, *University of Washington* (sponsored by Michael R. Best)—Delayed gastric emptying is one physiological response to LiCl administration. Whether this unconditioned response to LiCl becomes conditioned to context, odor, or taste cues repeatedly paired with LiCl was examined. Exposure to LiCl-paired context and odor CSs led to significant delays in gastric emptying. A LiCl-paired taste increased emptying. These outcomes contrast with our previous behavioral observations indicating that CRs to LiCl-paired taste cues are similar to the behaviors observed after drug administration.

(470)

Context Specificity of Taste-Mediated Odor Potentiation. MICHAEL R. BEST & W. ROBERT BATSELL, JR., *Southern Methodist University*—The acquisition of taste-mediated odor potentiation occurs better in a familiar conditioning context than in a novel one and is also readily demonstrated in the familiar conditioning context. However, with these acquisition procedures, odor potentiation is not observed in the home cage.

(471)

Social Transmission of a Place Preference in Pigeons. DAVID E. HOGAN, *Northern Kentucky University*—Follower pigeons observed a leader bird peck either one of two key locations at a rapid, slow, or intermediate rate. All followers strongly preferred to peck a key located near the leader's rather than a more distant one under conditions of non-differential reinforcement. The strength of the place preference was independent of the leader's peck rate, suggesting that the vigor of foraging by a leader does not communicate the incentive value of that area to observers.

(472)

Primary Bradycardia But Not Vagal Inhibition with a Reflexive Response. PAUL HAERICH, *Loma Linda University Riverside*, & W. KEITH BERG, *University of Florida* (presented by W. Keith Berg)—Reflex eye blinks were elicited by tactile or acoustic stimuli while subjects were engaged in a temporal discrimination task. Contrary to expectation, cardiac cycle lengths were increased rather than decreased—as in vagal inhibition—when responses were initiated early (as opposed to late) in that cycle. These results, using reflexive responses, suggest the importance of factors other than the response initiation itself in producing the vagal inhibition effect.

(473)

Conditioning Alcohol Preferences by Pairing Cocktails with "Getting Well." LEWIS M. BARKER & LAURA HEBERT, *Baylor University*—Rats were conditioned to prefer a sweetened solution containing alcohol by administering the cocktail during recovery from lithium-induced toxicosis. Two parameters were investigated: the amount of the cocktail ingested during conditioning, and the effect of concurrently conditioning a flavor aversion during each acquisition trial of the cocktail preference conditioning. Both variables were found to be important: larger CS amounts and the concurrent conditioning of a flavor aversion produced greater preferences for the cocktail solution.

(474)

Vitamin and Aspirin Use During Pregnancy and Health Problems of Offspring. WALTER F. MCKEEVER, *Northern Arizona University*, & DEBORAH RICH, *Rainbow Babies and Children's Hospital*—Possible benefits and risks to offspring associated with vitamin and with aspirin ingestion during pregnancy were studied. Mothers' reports of vitamin and aspirin use, and of medical problems in their children, were obtained from 249 mothers for 689 pregnancies. Significant associations of vitamin exposure and immune disorders obtained for female offspring. Aspirin ingestion was associated with significantly higher rates of immune disorders, structural defects, and learning disabilities in male offspring.

(475)

Outline Analyzed After Static or Kinetic Shape-from-Shading.

JOHN M. KENNEDY & ANDREA L. NICHOLLS, *University of Toronto*—Two experiments studied outline versions of shape-from-shading pictures. One used static pictures. The other involved motion and a display created by Cavanagh and Anstis, with a variety of objects. Outline figures were recognized much more poorly than negatives of shape-from-shading figures. Patchwork black-and-white (Street) figures not using shape-from-shading are recognized at the same rate

in negative versions and outline, a third study shows. Shape-from-shading processing occurs before outline.

(476)

Research Support from the NIMH. DOROTHY T. CARLSON, *NIMH, Executive to the Psychobiology and Behavior Review Committee.*

(477)

Research Support from the National Science Foundation. FRED STOLLNITZ, *NSF Program Director for Animal Behavior*, & JOSEPH YOUNG, *NSF Program Director for Human Cognition and Perception.*

RECOGNITION/RECALL I**Regency Ballroom A, Sunday Morning, 8:00-10:15***Chaired by Charles J. Brainerd, University of Arizona***8:00-8:10 (478)**

Strength-Based Judgments of Prior Recall. JAN RABINOWITZ, *Barnard College of Columbia University*—How do people determine whether or not they have previously recalled something? The present experiments manipulated memory strength using a repetition manipulation. Items that were presented twice and never tested for recall were more likely to be incorrectly judged as having been recalled than items that were presented once and not tested for recall. These results suggest that subjects use memory strength to judge whether or not an item was previously recalled.

8:15-8:30 (479)

Speed Versus Accuracy and the Mirror Effect in Recognition Memory. MURRAY GLANZER & KISOK KIM, *New York University*—The mirror effect is a strong regularity in recognition memory that calls into question current strength theories of memory. Attention/likeness theory is offered as an alternative to those theories. As a test of the theory, the effect of speed versus accuracy instructions on the mirror effect is examined. A forced-choice recognition experiment with low and high frequency is presented. Attention/likeness theory predicts the regularities found in the data.

8:35-8:50 (480)

Factors Affecting Forgetting, Reminiscence, and Hypernesia. DAVID G. PAYNE & XIANMING LIAO, *SUNY at Binghamton*—Several experiments are reported that examined the effects of interpolated activity on forgetting, reminiscence, and hypernesia. Results indicated that reminiscence and forgetting are differentially affected by the nature of the stimulus materials, encoding processes, length of the retention interval, and the nature of tasks performed during the retention interval. These findings indicate that a complete account of hypernesia must involve factors beyond those that have been proposed to date.

8:55-9:15 (481)

Memory for Day of the Week. JANELLEN HUTTENLOCHER, LARRY HEDGES, *University of Chicago*, & VINCENT PROHASKA, *Lehman College of CUNY*—Evidence is presented that the week is hierarchically organized in memory. Reports from 814 people 1-10 weeks after an event were fit with the following model. People encode the day an event occurred (e.g., Thursday) and whether it was the weekend or weekday period. Memory is inexact but unbiased except for hierarchical effects. In reporting, people combine information from different levels, creating bias due to truncation of uncertainty at the weekday/weekend boundaries.

9:20-9:30 (482)

College Professors' Recognition Accuracy for Names of Their Former Students. ANDREA C. JUDSON, THOMAS E. LUDWIG, & JOHN J. SHAUGHNESSY, *Hope College* (read by John J. Shaughnessy)—Individualized 2AFC tests were constructed for 51 professors. Targets were names of students taught once or twice by a given professor. Distractors were names taken from the same portion of the alphabet but the students were taught by another professor. Distractors and targets were matched on gender, grade, retention interval (6-8 years), course level, class size (1-19, 20-40, >40), and class standing. Some—but not all—of these seven factors affected recognition accuracy.

9:35-9:55 (483)

Retrieval-Based and Familiarity-Based Recognition. DAVID L. HORTON, TIMOTHY J. PAVLICK, & MARC W. MOULIN-JULIAN, *University of Maryland, College Park*—Further evidence will be presented for two kinds of recognition memory that depend on qualitatively different underlying processes. It will be shown that improvements in performance in these two kinds of recognition memory are

often inversely related to one another. Some implications of this interpretation will be discussed, particularly as it pertains to the distinction between episodic and semantic memory.

10:00-10:10 (484)

Metamemory Influences on Reports of Recollective Experience. JOHN A. ROBINSON, *University of Louisville*—People may use generalizations about memory to evaluate and report recollective experience. Reports based on actual memories were compared with estimates of recollective experience for hypothetical memories. Estimates were obtained from subjects who had experienced an alternative occasion of the target event, or who had never experienced it. Actual recollections did not differ from hypothetical recollections. This implies that the same judgment heuristics were used for both actual and hypothetical memories.

ANIMAL COGNITION III**Regency Ballroom C, Sunday Morning, 8:00-10:40***Chaired by Ronald J. Schusterman, University of California, Santa Cruz***8:00-8:20 (485)**

Common Coding by Pigeons in a Spatial One-to-Many Matching Task. THOMAS R. ZENTALL, JANICE N. STEIRN, LOU M. SHERBURNE, *University of Kentucky*, & PETER J. URCUIOLI, *Purdue University*—Pigeons use common codes to represent sample stimuli that map on to common comparisons in many-to-one matching tasks. We now report common coding of comparisons mapped on to common samples in a spatial one-to-many task (hue samples followed by left-right comparisons on some trials or up-down comparisons on others), in which pigeons learn partial reversals (that involve disrupting the common codes) slower than total reversals (that allow the common codes to be maintained).

8:25-8:45 (486)

Exploring Common Coding with a Connectionist Network. WILLIAM S. MAKI, *North Dakota State University*—Matching-to-sample (MTS) research suggests that pigeons acquire common codes for associatively equivalent stimuli. A multilayer network not only learns MTS (by error backpropagation) but also exhibits common coding in simulations of many-to-one matching experiments. For example, when each comparison stimulus is associated with two samples, the network develops a common representation of each sample. Other similarities and differences between simulations and laboratory results will be discussed.

8:50-9:05 (487)

Transfer Across Delayed Discrimination: Evidence for the Nature of Anticipatory Memory. PETER J. URCUIOLI, *Purdue University*, & THOMAS R. ZENTALL, *University of Kentucky*—Pigeons were taught separate delayed discriminations involving different initial and different test stimuli. Later, the initial stimuli from one task were substituted for those in the order. Transfer of performance was routinely observed when the initial stimuli in both tasks were associated with different trial outcomes. Otherwise, transfer was absent. The data indicate that birds readily anticipate the retention-test outcomes but apparently do not anticipate how they will respond to the test stimuli.

9:10-9:30 (488)

Preliminary Evidence of Mental Rotation in the Dolphin. LOUIS M. HERMAN, *Kewalo Basin Marine Mammal Laboratory and University of Hawaii*, STANLEY A. KUCZAJ, *Southern Methodist University*, MELISSA SHAW, & PALMER MORREL-SAMUELS, *Kewalo Basin Marine Mammal Laboratory and University of Hawaii* (read by Stanley A. Kuczaj)—Previous work has shown dolphins can make forced-choice discriminations between similar 2-D designs or 3-D objects. We now report successful matching-to-sample with six 2-D designs in a two-alternative forced-choice paradigm, with the correct choice being rotated 90° or 180° and distractors being unrotated, rotated 90°, or 180°. We examine whether the performance may be best explained as an instance of mental rotation by the dolphin or as stimulus generalization.

9:35-9:55 (489)

Stay/Shift Strategies and the Radial Maze Performance of Clark's Nutcrackers. RUSSELL P. BALDA, *Northern Arizona University*, ALAN C. KAMIL, DEBORAH J. OLSON, *University of Massachusetts at Amherst*, & CAROL COTTEN, *Northern Arizona University* (read by Alan C. Kamil)—Clark's nutcrackers (*Nucifraga columbiana*) removed a seed from four locations during the first phase of each trial. Following a retention interval (5 min–24 h), four of eight locations contained seeds. The stay group had seeds in the old locations; for the shift group they were in new locations. Performance declined as retention interval increased. There were no differences between the groups. These results imply that spatial memory in nutcrackers is independent of response strategy.

10:00-10:15 (490)

Pattern Tracking on the Radial Maze: Tracking Multiple Patterns at Different Spatial Locations. MARIA T. PHELPS & WILLIAM A. ROBERTS, *University of Western Ontario* (read by William A. Roberts)—A series of experiments examined the rat's ability to learn four different patterns using a four-arm radial maze. Patterns consisted of either random or predictable strings of reinforcement and nonreinforcement. Despite the fact that the assignment of patterns to arms varied daily, mean rank of arm choice indicated that pattern learning had occurred in the case of predictable patterns. The findings are interpreted as supporting a rule-encoding model of pattern learning.

10:20-10:35 (491)

Landmark-Based Spatial Memory in Chickadees and Pigeons. KEN CHENG, *University of Toronto*, & DAVID SHERRY, *University of Western Ontario*—Pigeons and chickadees learned to find hidden food at a constant place near the middle of one edge of a square tray. On occasional unrewarded tests, a nearby landmark was shifted. Places of peak searching along each principal axis paralleling the sides of the tray were determined solely by landmark position along that axis, and unaffected by landmark position along the orthogonal axis. This suggests that positions on each principal axis are independently calculated.

PSYCHOLINGUISTICS

Regency Ballroom D, Sunday Morning, 8:00-11:00

Chaired by Laurie B. Feldman, *Haskins Labs & SUNY at Albany*

8:00-8:15 (492)

Consistency Effects in the Generation of Past Tense Morphology. MARK S. SEIDENBERG, *University of Southern California*, & MAGGIE BRUCK, *McGill University*—In a series of studies, we examined the use of knowledge concerning the past tenses of verbs. Subjects performed tasks that required them to generate the past tenses of verbs. Generation latencies show neighborhood effects: RTs depend on the frequency and consistency of the mapping between present and past tense within a neighborhood of related words. The results are related to theories concerning the representation of morphological regularities and irregularities in memory.

8:20-8:40 (493)

Implicit Causality and the Time Course of Referent Activation. JANET L. McDONALD, *Louisiana State University*, & BRIAN MACWHINNEY, *Carnegie-Mellon University* (read by Brian MacWhinney)—A cross-modal probe task measured the processing of sentences like "Kay trusted Tom completely, because he was so sincere." At and after the pronoun, faster reaction times are found to the first noun (Kay) for stimulus-experiencer verbs ("amazed"), but not for the experiencer-stimulus verbs ("trusted"). Before and after the pronoun, but not at the pronoun, reaction times are faster to sentences with different-sexed referents ("Kay/Tom") than same-sexed referents ("Tom/Ken").

8:45-9:00 (494)

Using Morphologically Explicit Case Marking in Sentence Parsing. CHARLES CLIFTON, JR., GREG LAMONTAGNE, & LYNN FRAZIER, *University of Massachusetts*—Eye fixations were measured while subjects read sentences such as "I knew [that] John was wrong" and "I knew [that] he was wrong" to determine what use English speakers make of morphological casemarking. Readers do seem to use explicit casemarking to guide their initial analysis of a sentence, avoiding garden paths, but only when they fixate on the casemarked pronoun.

This argues that structural case and other modules are precompiled into a sentence parsing system.

9:05-9:25 (495)

Would Quayle Become Kennedy If He Changed His Name to "Kennedy"? ROBERT J. STERNBERG & DAVID ALLBRITTON, *Yale University*—Recent debates among psychologists regarding theories of meaning have contrasted alternative featural and prototype-based accounts. Philosophers, however, have recently concentrated on historical accounts, according to which meaning inheres in the history of a concept. In three experiments, we contrasted the roles of physical features versus historical data for natural kinds, artifacts, and proper names. Is something a diamond or a computer, or is someone John Kennedy, by virtue of physical appearance, historical data, or some combination of both?

9:30-9:45 (496)

Interaction of Semantic, Syntactic, and Visual Factors in Syntactic Ambiguity Resolution. CURT BURGESS, *Syracuse University*, JOHN TRUESWELL, MICHAEL K. TANENHAUS, *University of Rochester*, & SUSAN GARNSEY, *University of Illinois* (read by Michael K. Tanenhaus)—In an eye-tracking study modeled upon Ferreira and Clifton (JML, 1986), but with more constraining materials, we found that biasing semantic information eliminated the garden path typically associated with reduced relative clauses. In several self-paced reading studies, we further found that whether or not semantic constraints are effective depends on both the degree of semantic constraint and on how the text is segmented. Theoretical implications and a preliminary model will be discussed.

9:50-10:10 (497)

Parsing in Discourse: Contextual Influences and Their Limits. CHARLES A. PERFETTI, ANNE BRITT, *University of Pittsburgh*, KEITH RAYNER, *University of Massachusetts*, & SIMON GARROD, *Glasgow University*—How does discourse information combine with syntax to provide a semantic interpretation of a sentence? According to autonomous parsing principles, discourse effects on parsing are limited. In several self-paced and eye-movement studies, using syntactic structures that produce garden path effects, we found contextual influences for certain structures but not others. The results are consistent with a model of comprehension that gives syntax an autonomous role but with restricted semantic influences.

10:15-10:30 (498)

Syllabification of Bisyllabic Nonwords: Evidence from Short-Term Memory Errors. REBECCA TREIMAN, *Wayne State University*, KATHLEEN STRAUB, *University of Rochester*, & PATRICK LAVERY, *Wayne State University*—Errors in short-term memory for spoken stimuli sometimes combine one syllable from one to-be-remembered item with another syllable from a second to-be-remembered item. In three experiments, we show that adults' recombination errors for consonant-vowel-consonant nonwords can shed light on how they syllabify the stimuli. The results are discussed in relation to linguistic theories of syllabification and to previous studies using metalinguistic tasks.

10:35-10:55 (499)

Hand Movements in Braille Reading: Influence of Syntactic Ambiguity. PAUL BERTELSON & PHILIPPE MOUSTY, *Université libre de Bruxelles*—Skilled braille readers read syntactically ambiguous sentences allowing either a minimal attachment interpretation ("The spy saw the cop with the binoculars") or a nonminimal attachment interpretation ("... with the revolver"). Just as for visual reading (Rayner, Carlson, & Frazier, 1983), overall reading speed decreased in the disambiguating region, but only for nonminimal attachment sentences. The effect, however, results entirely from increased occurrence of regressive movements, the speed of first-pass scanning being unaffected.

JUDGMENT/DECISION MAKING II

Regency Ballroom H, Sunday Morning, 8:00-10:20

Chaired by Steven J. Sherman, *Indiana University*

8:00-8:15 (500)

Investment Decision Making: Short-Term Interest and Long-Term Yield. HARRIET SHAKLEE, *Seattle University*—Investments are normally presented in terms of their annual rates of return. However, in-

vestors may not understand the implications of such short-term yield information for long-term investment outcomes. We asked subjects to project future values for investments earning 6% to 12% in interest, compounded annually. Subjects substantially underestimated the long-term yields of these investments, with the greatest bias for higher interest rates and longer time periods. Females were even worse than males at anticipating long-term investment yield.

8:20-8:35 (501)

Effects of Anchoring and Adjustment and Framing on Judgments of Probability. THOMAS E. NYGREN & TONI L. STRAND, *Ohio State University*—Starting from one of two extreme anchoring points, 1/100 (low) or 99/100 (high), subjects in either lottery or investment contexts adjusted probability of winning (or losing) values in a two-outcome gamble to equate the gamble with a specified sure thing. Results indicated that although an interaction between anchoring and framing effects was evident for several types of gambles, the interaction was different for those situations in which a real loss could occur versus those in which it could not.

8:40-8:55 (502)

Hindsight Bias in Relative Importance Judgment. ROBERT M. HAMM, *Army Research Institute, Fort Leavenworth*—Does outcome knowledge influence the retrospective evaluation of the relative importance of predictive factors in a hypothetical military decision? Such judgments are pertinent for allocating attention and resources. After reading about a commander's situation and plan, subjects judged probability of mission success and rated the relative importance of eight factors in determining the outcome. Though there was a strong effect of outcome knowledge on judged *p* (success), its effect on judged factor importance was smaller.

9:00-9:15 (503)

Actor-Observer Differences in Judgmental Probability Forecasting of Control Response Efficacy. NIGEL HARVEY, *University College London*, & PETER AYTON, *City Polytechnic London*—Controllers made decisions in order to bring output of a dynamic system into a target range. Each controller was paired with an observer. After each decision, both subjects in a pair independently estimated its probability of being effective. These probabilities were overestimated but this overconfidence was less in observers than in controllers. A second experiment examined whether this difference occurred because observers gave lower forecasts when their implicit decisions were different from controllers' explicit ones.

9:20-9:35 (504)

Cue-Addition Effects on Quantity Judgment. JU-WHEI LEE & J. FRANK YATES, *University of Michigan* (read by J. Frank Yates)—Individuals sometimes make judgments of a quantity on the basis of a given collection of cues, and then that cue set is extended (e.g., in medical prognostic judgment a new test becomes available). The present research examines how such cue additions affect specific aspects of the judgment process and the resulting assessments. Among the most persistent effects are reductions in the variability of subjects' judgments as the number of cues increases.

9:40-9:55 (505)

Palatability Versus Money: A Conflict in Humans. MICHEL CABANAC & PIERRE SAMSON, *Laval University*—Ten healthy subjects taken individually had lunch four times in the laboratory. On the first session, they rated the palatability of small sandwiches, from 10 different dishes. On the following sessions, they were asked to eat the number of sandwiches that they had eaten on the first session and they had to pay for each sandwich a price that increased with palatability. As the price increased, the subjects ate more of the less palatable sandwiches.

10:00-10:15 (506)

Multiple Methods for Examining Contingency Judgments. IRWIN P. LEVIN, EDWARD A. WASSERMAN, & SHU-FANG KAO, *University of Iowa*—Subjects evaluated relationships based on diagnostic information in 2×2 contingency tables. Across analyses at the individual and group levels using ANOVA, regression and paired-comparison techniques, converging evidence was provided that subjects differentially weight call entries. Greatest weight is given to the cell representing the co-occurrence of the two events (e.g., improvement

in disease following administration of drug). These results are contrary to the normative (equal-weight) model and to subjects' self-reports.

MOTOR CONTROL II

Regency Ballroom F, Sunday Morning, 8:00-10:50

Chaired by Richard A. Magill, *Louisiana State University*

8:00-8:15 (507)

The Effect of Cognitive Load on the Variability of Isochronous and Rhythmic Tapping. ALAN WING, *MRC Applied Psychology Unit, Cambridge* (sponsored by Charles Collyer)—The production of a rhythmic temporal pattern would appear to be cognitively more demanding than the production of an isochronous response train. To test whether this is the case, subjects were asked to tap isochronous or rhythmic sequences while performing a variety of simultaneous secondary tasks chosen to contrast cognitive or motor factors. An elevation of variance of the interresponse intervals was found due to the various secondary tasks. However, the effects were no greater when tapping a rhythm than when tapping an isochronous sequence. Implications for models of timing control will be discussed.

8:20-8:40 (508)

Categorical Time Production. CHARLES E. COLLYER, *University of Rhode Island*, HILARY A. BROADBENT, & RUSSELL M. CHURCH, *Brown University*—Subjects tapped steadily at periods ranging from 175 to 825 msec, first in synchrony with a periodic stimulus and then at the same rate without a synchronizing stimulus. Although subjects approximated the target period quite accurately, a pattern of small biases and other performance measures indicated that tapping is not controlled by a single, continuously adjustable oscillator, but rather by a series of oscillators with different intrinsic periods and limited ranges of entrainment.

8:45-9:00 (509)

Planning Simple Tapping Movements: The Virtual Amplitude Hypothesis. FREDERICK J. DIEDRICH, JONATHAN VAUGHAN, *Hamilton College*, & DAVID A. ROSENBAUM, *University of Massachusetts* (read by Jonathan Vaughan)—How do we efficiently plan an action when we have alternative ways to achieve it, and how are surplus degrees of freedom eliminated? We measured finger, hand, and arm movements of 4 subjects tapping a rigid bumper at different frequencies (1, 3, and 5 Hz) and impulses of collision (soft, medium, and hard). Their performance suggests that tapping movements are planned by adopting a truncated periodic oscillation whose amplitude and period, only, are explicitly specified.

9:05-9:20 (510)

Speed-Accuracy Relations in Discrete and Repetitive Aimed-Hand Movements. HOWARD ZELAZNIK, *Purdue University*—The speed-accuracy relation for aimed-hand movements was examined. In the first experiment, discrete aimed-hand movements exhibited a linear relation between speed and accuracy. In the second and third experiments, repetitive tapping and line drawing movements produced a linear speed-accuracy tradeoff, with a reduced slope for the speed-accuracy relation compared to the discrete case. Kinematic analysis demonstrated that the speed-accuracy relation is not dependent upon a particular kinematic profile.

9:25-9:40 (511)

Coordination of Prosthetic and Normal Hands. STEPHEN A. WALLACE, LAWRENCE E. CARLSON, & GERRY M. GRAMMENS, *University of Colorado at Boulder*—Of the estimated 50,000 upper extremity prosthesis wearers in the United States, a large majority opt to use body-powered prostheses. We performed a case study with an experienced user who wore a voluntary-closing prehensor. The results showed two distinct relative timing patterns of aperture closing in the prosthetic hand and only one in the normal hand. Both mechanical and functional constraints in the coordination of prosthetic and normal hands are discussed.

9:45-10:05 (512)

The Speed-Accuracy Tradeoff in Space-Time. K. M. NEWELL, L. G. CARLTON, & S. KIM, *University of Illinois at Urbana-Champaign*—The spatial and temporal accuracy of movement was

examined over a range of space-time demands in a single limb movement. The findings showed a strong compatibility of spatial and temporal error consistent with the space-time account of the speed-accuracy tradeoff (Hancock & Newell, 1985). A new finding is that under certain task constraints spatial error can even decrease as movement velocity increases.

10:10-10:25 (513)

Eye-Hand Coordination: Spatial Localization after Saccadic and Pursuit Eye Movements. RICHARD A. ABRAMS, PAMELA OWENS, MARYL ZEFFREN, & MICHELE DROTMAN, *Washington University*—Subjects produced speeded and unspeeded hand movements to a visible target after either saccadic or pursuit eye movements to the target. Hand movements began from either the same location as the eye movement, or from some other location. Pointing accuracy depended systematically on the type of eye movement, the speed of the hand movement, and the initial hand location. The results reveal details of the mechanisms underlying eye-hand coordination and motor control in general.

10:30-10:45 (514)

Response Priming Effects on Performance of Unimanual and Bimanual Movements. GENE W. FOBER, *Army Research Institute, Fort Benning*, & T. GILMOUR REEVE, *Auburn University* (read by T. Gilmour Reeve)—Reaction times and movement times were analyzed in two experiments, which used a response priming procedure with unimanual and bimanual movements. For one experiment, primes specified unimanual movements, whereas for the other experiment, they specified bimanual movements. On 20% of the trials, the primes were invalid and the alternative type of movement was required. Findings are interpreted in terms of a motor programming account of bimanual control.

HUMAN LEARNING/MEMORY IV

Burgundy Room, Sunday Morning, 8:00-11:00

Chaired by Charles P. Thompson, *Kansas State University*

8:00-8:20 (515)

Priming, Theories of Memory, and Theories of Retrieval. TIMOTHY P. MCNAMARA, *Vanderbilt University*—Theories of memory differ in how they explain priming effects. One class of theories attributes priming to spreading activation; a second attributes priming to the construction of compound retrieval cues; and a third relies on both mechanisms. We tested these alternative accounts by manipulating the types of primes, the lags between primes and targets, and the items surrounding primes and targets.

8:25-8:40 (516)

Dual Cues in Item Recognition: An Ensemble Model of Priming. BARBARA ANNE DOSHER & GLENDA ROSEDALE, *Columbia University*—Spreading activation and cue-combination models of priming in recognition memory were contrasted in an item recognition paradigm. Test items were preceded by two cue words—zero, one, or two of them related to target tests. Priming was restricted to holistic cue-test combinations (the three elements matched a learned triple). An ensemble-cuing variant of a cue-combination model of memory retrieval is suggested.

8:45-9:00 (517)

DEMOS: A Yeoman Model of Conceptual Knowledge. RUSSELL REVLIN, *University of California, Santa Barbara*, & ELEEN ESCHELMAN, *Carnegie-Mellon University*—DEMOS is a completely declarative model of conceptual knowledge, in which real-world facts and inference rules are part of its predicate structure. The model reflects an alternative to totally procedural or declarative-procedural hybrid models. It is evaluated by its ability to account for the benchmark phenomena of semantic retrieval, including relatedness, priming, and response constraint.

9:05-9:25 (518)

Category-Based Retrieval Inhibition in Human Memory. MICHAEL C. ANDERSON & ROBERT A. BJORK, *University of California, Los Angeles* (read by Robert A. Bjork)—After studying six instances of eight different categories, subjects practiced retrieving half of the instances from half of those categories. Retrieval practice was performed (via cues such as: Fruits OR _____) three times on

each of these instances. Three experiments demonstrated a category-specific retrieval inhibition effect: On a final recall test, practiced instances of a category profited from retrieval practice, while their unpracticed siblings suffered retrieval inhibition, relative to the recall observed for unpracticed categories.

9:30-9:45 (519)

Direct and Indirect Measures of Inhibition in Directed Forgetting. ELIZABETH LIGON BJORK, ROBERT A. BJORK, & HEIDI A. KILPATRICK, *University of California, Los Angeles*—Prior results suggest that a postlist cue to forget temporarily inhibits the to-be-forgotten (TBF) items, one consequence of which is to eliminate interference owing to those items in the recall of subsequent to-be-remembered (TBR) items. The present research explores whether such "inhibited" items nonetheless prime performance on a subsequent indirect test (word fragment completion), and whether the fragment-completion process itself reinstates the TBF items, as measured by whether they once again interfere in the recall of TBR items.

9:50-10:05 (520)

The Disparate Effects of Repeated Testing: Reconciling Ballard's and Bartlett's Results. HENRY L. ROEDIGER III & MARK A. WHEELER, *Rice University*—Ballard (1913) showed improvements in recall over repeated testing; Bartlett (1932), using the serial reproduction method, reported increasingly poor retention over tests. We report research that produces both results in the same experiment. Subjects studied 60 pictures (either in a list or as part of a story) and then were tested repeatedly, with different groups receiving varying numbers of tests at different delays. The delay between study and test and the interval between successive tests are two critical factors.

10:10-10:25 (521)

Retrograde Amnesia Following Damage to the Hippocampal Formation in Monkeys. LARRY R. SQUIRE & S. ZOLA-MORGAN, *School of Medicine, University of California, San Diego, and VAMC, San Diego*—Retrograde amnesia was assessed in monkeys with bilateral lesions of the hippocampal formation. Five different sets of 20 two-choice object discrimination pairs were trained beginning 16, 12, 8, 4, and 2 weeks prior to surgery. Memory for all 100 pairs was assessed postoperatively by presenting each pair for a single trial. Normal monkeys exhibited forgetting; operated monkeys remembered remote information significantly better than recent information. The results provide evidence for gradual reorganization of memory. As time passes, the role of the hippocampus diminishes, and more permanent memory develops elsewhere, probably in neocortex.

10:30-10:40 (522)

Does Short-Term Memory Cause Long-Term Recency Effects? ROBERT L. GREENE, *Case Western Reserve University*—Recency effects may be found in delayed recall if each item is preceded and followed by a distractor task. Several authors have suggested that subjects might habituate to the distractor task, making it ineffective in eliminating storage of items in a short-term memory store. Thus, retrieval of items from short-term memory might be responsible for these effects. This hypothesis was tested by several manipulations of practice and task difficulty.

10:45-10:55 (523)

An Index of Variability in Sleep Patterns Predicts Increased Forgetting. JUDITH A. SUGAR, *Colorado State University*—Researchers have demonstrated that many factors affect memory, including learning activities, types of tests, characteristics of the materials, and subjects' characteristics. In this study, college students kept diaries of their sleep patterns and instances of everyday forgetting. Greater variability in sleep patterns, but not amount of sleep, was associated with more instances of reported forgetting. The effects of sleep patterns on other cognitive processes and the mechanisms of such effects remain to be investigated.

ATTENTION IV

Regency Ballroom A, Sunday Morning, 10:25-1:15

Chaired by Raymond Klein, *Dalhousie University*

10:25-10:40 (524)

Do Nonattentive Processes Limit Visual Search Performance? JOHN PALMER, CYNTHIA T. AMES, & DELWIN T. LINDSEY,

University of Washington—In visual search, set-size effects may be due to sensation, decision, or attention. In a simple search task, subjects searched for a longer line among a homogeneous set of shorter lines, and the line length threshold was measured as a function of set size. Analysis of the results indicated that the set-size effect was due to a decision phenomenon, an increase in false alarms with multiple distractors. This conclusion contradicts several existing theories of attention.

10:45-11:05 (525)

The Movement of Attention, Behavior and Biology. WALTER SCHNEIDER, *University of Pittsburgh*, GREGORY MCCARTHY, *VAMC, West Haven*, & JEFF RUEDA, *Yale University Medical School*—The nature of attentional movement was examined in a positional scanning experiment in which attention is attracted to one location and then scans to four other locations. The scanning rate was fairly insensitive to changes in the complexity of the comparison and distance of attentional movement. The rate of movement is compared to the presumed biological switching times of the assumed neurons involved. Surface mapping of event potentials supports the local nature suggested movement of attention.

11:10-11:25 (526)

A Cognitive-Anatomical Approach to Visual Word Form Activation. PAUL COMPTON, PETER GROSSENBACHER, MICHAEL I. POSNER, DON TUCKER, & DEVON WIEL, *University of Oregon* (read by Michael I. Posner)—Studies of blood flow during passive reading indicate activation in the left ventral occipital lobe occurring only for orthographically regular strings. Our studies explore the component processes in activating this area. Scalp recordings indicate the time course for distinguishing words from control strings. Different functions relate response time to target position, when attention is to features, letters, or words. These patterns suggest serial search for letters and different more parallel processes for features and words.

11:30-11:45 (527)

Attentional Activation of Spatial Locations and Associated Contents. WILLIAM P. BANKS, *Pomona College and Claremont Graduate School*, DAVID KRAJICEK, *Claremont Graduate School*, & CAROL UYENO, *Pomona College*—What is the benefit conferred on an attended area of visual space not given to an unattended area? William James asked this in the *Principles of Psychology*; we still await an answer. We have investigated attention-induced changes in acuity, MTF, and breadth of lateral masking. We are evaluating the hypothesis that spatial selection activates high-frequency spatial channels more than low-frequency channels and that the activated spatial region activates non-spatial conceptual information associated with the region.

11:50-12:10 (528)

The Effects of Dual-Task Interference on Movement-Related Brain Potentials. ALLEN OSMAN & CATHLEEN MOORE, *University of California, San Diego*—To specify further the locus of attentional limitations underlying dual-task interference, we observed how the temporal overlap between concurrent reaction-time tasks influenced movement-related brain potentials. Increasing overlap delayed both reaction times and the development of lateralized motor potentials for the second of two tasks, but did not affect the temporal relation between the two measures. This suggests that the interference entirely preceded the preparatory processes associated with the motor potentials.

12:15-12:30 (529)

Must We Attend to Every Abrupt Onset? JEREMY M. WOLFE & STACIA R. FRIEDMAN-HILL, *MIT*—Yantis and colleagues have shown that abrupt onsets capture attention even when such capture is inappropriate. Is attention incapable of ignoring irrelevant onsets? Our subjects performed standard visual search tasks while randomly positioned spots appeared, one every 400 msec. Attention was not continuously captured by these spots. Compared to control conditions, subjects paid a constant but small RT cost, independent of set size (~40 msec on target trials). Apparently, subjects could filter out frequent and regular onsets.

12:35-12:50 (530)

Stimulus-Driven and Goal-Directed Mechanisms of Attentional Priority. STEVEN YANTIS & DOUGLAS N. JOHNSON, *Johns Hopkins University*—Subjects searched displays containing multiple high-priority and multiple low-priority objects, with priority defined explicitly

(goal directed) or not (stimulus driven). Using multiple onset and no-onset elements (stimulus-driven priorities), we found that approximately four onset elements are tagged for attentional preference. These high-priority elements are processed earlier or receive more computational resources than lower priority elements do. A similar mechanism may operate when priority is specified by goal-driven selection criteria.

12:55-1:10 (531)

Failure to Process Unattended Objects: The Search for Boundary Conditions. JAMES C. JOHNSTON, *NASA-Ames Research Center*, & STEVEN YANTIS, *Johns Hopkins University*—Previous experiments have shown that spatial attention can be focused so completely that unattended objects are not processed to the point of identification. New experiments explored the boundary conditions for this finding. Identification of to-be-unattended objects was not increased by providing them with a 96-msec head start, but was increased by reducing the number of objects in the display. Implications of these results for models of selective attention will be discussed.

SPEECH PERCEPTION

Regency Ballroom C, Sunday Morning, 10:50-12:45

Chaired by Shlomo Bentin, Hebrew University

10:50-11:05 (532)

Principles of Auditory Organization Versus the Speech Signal. ROBERT E. REMEZ, STEFANIE M. BERNIS, *Barnard College of Columbia University*, & PHILIP E. RUBIN, *Haskins Laboratories*—Our recent studies have challenged the adequacy of the familiar explanation of auditory organization. By using sine-wave replicas of utterances, we have exposed the action of a complex principle of organization in the perception of speech which is not derivable from existing simpler principles. New results on the perception of dichotically presented sine-wave replicas in the presence of distracting single-tone foils indicate that the principles of organization must accommodate the time-varying coherence of the products of vocalization. The prospects for a general or special account will be discussed.

11:10-11:30 (533)

Selective Adaptation Five Years Later: Bringing Home the Her- ring. ARTHUR G. SAMUEL & DONNA KAT, *Yale University*—At the 1985 meeting of this Society, Samuel argued that the selective adaptation paradigm could be a very useful tool for speech research. We will review several lines of research that we have conducted using this technique. The studies examine perception of normal speech, whispered speech, and nonspeech, using both identification and reaction time measures. The research program supports the existence of three qualitatively different levels of perceptual analysis, and confirms the utility of the technique.

11:35-11:50 (534)

The Nonlinear Dynamics of Categorical Perception. BETTY TULLER, PAMELA CASE, & J. A. SCOTT KELSO, *Florida Atlantic University*—Much research on speech perception over the years has focused on uncovering examples of the nonlinear relationship between acoustics and perception (so-called "categorical perception"). However, little is known concerning the dynamics of this phenomenon. A variation of the classical categorical perception paradigm was used in which a single acoustic parameter was gradually increased or decreased. Signature properties of nonlinear dynamic systems were observed in speech perception, namely, hysteresis effects, bistability, and phase transitions.

11:55-12:10 (535)

Priming and the Perceptual Units in Auditory Word Recognition. DEBORAH A. GAGNON & JAMES R. SAWUSCH, *SUNY at Buffalo* (read by James R. Sawusch)—The segmental units underlying auditory word recognition were investigated using a priming paradigm. The phonetic overlap between prime and target was varied. Predictions based on allophonic, phonetic, and position specific phoneme units were tested using phoneme monitoring, naming, and lexical decision tasks. Phoneme monitoring results supported an allophonic representation while naming and lexical decision followed position specific phoneme predictions. Alternative explanations for these results and their implications for auditory word recognition will be discussed.

12:15-12:25 (536)

Influence of Lipreading on Detection of Speech in Signal-Correlated Noise. BRUNO H. REPP, *Haskins Laboratories*, & RAM FROST, *Hebrew University of Jerusalem*—Simultaneous presentation of matching visual information (the speaker's face) does not improve the detectability of spoken disyllabic words in signal-correlated noise. However, it has a strong influence on subjects' tendency to say "yes." Subjects thus register the correspondence between the visual information and the amplitude envelope of the masking noise. Frost et al. (*JML*, 1988) obtained the same result with printed rather than lipread words, but found a much smaller effect with printed nonwords. We report results from a second experiment using lipread (visemic) nonwords.

12:30-12:40 (537)

Memory for Visible Speech Sounds. BEATRICE DE GELDER & JEAN VROOMEN, *Tilburg University* (sponsored by Paul Bertelson)—Memory for spoken syllable lists presented either auditorily, visually, or bimodally, showed a recency effect, whether list items differ in consonants or in vowel, but not when the list items rhyme. Suffix effects are strongest when presentation modality of list and suffix are matched. These findings suggest that two separate stores (a modality specific and a common one) contribute to memory for spoken language.

RECOGNITION/RECALL II

Regency Ballroom D, Sunday Morning, 11:10-1:05

Chaired by Michael Palij, *New York University*

11:10-11:25 (538)

Memory Permanence Versus Memory Replacement in Sentence Recall. STACY L. BIRCH & WILLIAM F. BREWER, *University of Illinois at Urbana-Champaign* (read by William F. Brewer)—Subjects recalled sentences known to produce high rates of lexical substitutions (Brewer, 1975, 1977). Subjects then completed fragments of originally studied words and of words frequently substituted for original words. Fragment completion of original items that had been replaced during recall showed no facilitation, whereas fragment completion of correctly recalled items and no-recall items showed facilitation. The data argue against a memory-permanence hypothesis and are consistent with a memory-replacement hypothesis.

11:30-11:50 (539)

Triage III. CHARLES J. BRAINERD, *University of Arizona*—This is the third report to the Society on a counterintuitive relationship between the strengths of words' memory representations and the order in which they are retrieved during unconstrained recall. In the present experiments, interest centered on the relative degrees of control over the triage effect that are exerted by semantic and episodic factors. Surprisingly, triage seemed to be chiefly under episodic control. Although semantic factors affected triage, these effects usually required episodic priming. The subjects were children and adolescents, so developmental trends were also examined.

11:55-12:15 (540)

The List-Strength Effect in Recognition Memory. ANDREW YONELINAS, *University of Toronto*, WILLIAM HOCKLEY, *Wilfrid Laurier University*, & BENNET B. MURDOCK, *University of Toronto* (read by Bennet B. Murdock)—Ratcliff, Clark, and Shiffrin failed to find a list-strength effect in recognition memory, and concluded that this was counter to all current global-matching memory models. We have conducted several experiments using rapid sequential visual presentation and, with a yes-no procedure, clearly do find a list-strength effect.

12:20-12:40 (541)

Age of English Acquisition and the Recognition of English Words. MICHAEL PALIJ & DORIS AARONSON, *New York University*—Previous research (Palij & Aaronson, 1989) has shown that age of English acquisition (AEA) does not affect recall of English words even though SAT verbal scores systematically decrease with increasing AEA. We report an experiment using a forced-choice recognition task with an intervening verbal task based on the SAT. Correct recognition was unrelated to AEA while performance on the verbal task decreased as a function of AEA. We examine some mechanisms for this dissociation.

12:45-1:00 (542)

A Constraint on the Lag Effect in Free Recall: Individual Differences. THOMAS C. TOPPINO, KRISTINE KRAJNAK, & SCOTT

SPIELMAN, *Villanova University*—Subjects received a multitrial free-recall task with lists containing some words that were presented twice. First-trial recall of twice-presented items was analyzed as a function of the lag separating repetitions and as a function of whether subjects were categorized as high or low organizers on the basis of an intertrial-repetition measure of their recall protocols. Results indicated that only high organizers exhibited a distributed lag effect. Theoretical implications are considered.

JUDGMENT/DECISION MAKING III

Regency Ballroom H, Sunday Morning, 10:30-1:00

Chaired by Valerie F. Reyna, *University of Arizona*

10:30-10:50 (543)

Effects of Experience on Preference Reversals in a Context of Uncertainty. CLAUDIA CECILIA GONZALEZ & THOMAS S. WALLSTEN, *University of North Carolina at Chapel Hill* (read by Thomas S. Wallsten)—Various theories account for preference reversals in which more is bid for a lottery offering a larger outcome, but the lottery providing the higher probability to win is chosen. Two experiments investigate the effects of experience on this phenomenon in a context in which event probabilities can be judged, but are not given precisely. Both predicted and unpredicted reversals decrease with experience at rates modulated by other manipulated variables. Theoretical implications will be discussed.

10:55-11:15 (544)

Social Dilemmas with Uniformly Distributed Resources: The Sequential Paradigm. DAVID V. BUDESCU, *University of Haifa*, AMNON RAPOPORT, & RAMZI SULEIMAN, *University of Arizona*—Most empirical research on social dilemmas has focused on situations where the size of the resource is known to all participants, and all requests are registered simultaneously. In this paper, we describe two experiments in which the size of the resource is a uniformly distributed random variable and the players make their demands sequentially with, or without, information regarding the requests of the previous players. Nash equilibrium solutions are derived and empirically tested.

11:20-11:35 (545)

Reasoning and Judgment Processes in Probability Assessment. P. GEORGE BENSON, SHAWN P. CURLEY, & GERALD F. SMITH, *University of Minnesota* (read by Shawn P. Curley)—When we state probabilities, what information do we convey? The answer is neither obvious nor clearly formulated despite the prevalence of probability language in formal techniques and lay usage. We present a cognitive analysis of probability judgments as arising from belief processing activities. Reasoning, in translating data to conclusions, is highlighted as a critical activity. This argument-centered theory supports better understanding of the assessment literature and has implications for new lines of research.

11:40-11:50 (546)

A Disjunction Fallacy. MAYA BAR-HILLEL, *Hebrew University of Jerusalem*—Formally, a conjunction fallacy and a disjunction fallacy cannot be distinguished. Intuitively, they are different. Furthermore, the pragmatics of disjunctions differ from those of conjunctions. This study demonstrates a disjunction fallacy, analogous to Kahneman and Tversky's conjunction fallacy, and shows how the ranking of options by the order in which one would like to bet on them compares with their ranking by probability. Though normatively these orderings should coincide, they may elicit different demand characteristics.

11:55-12:05 (547)

Correlated Evidence. GEORGE WOLFORD, *Dartmouth College*—Is uncorrelated evidence always preferable to correlated evidence? No, a highly predictive but correlated measure might be preferable to a less predictive, uncorrelated measure. Subjects appear to be aware of this tradeoff.

12:10-12:30 (548)

Experimental Tests of Fundamental Axioms in Value Difference Theory. JOHN M. MIYAMOTO, *University of Washington*, & JAMES W. LUNDELL, *Hewlett-Packard*—Enormous progress has been made over the past 30 years in the axiomatic analysis of models of subjective difference. With the exception of a few, isolated studies, however, the progress has been restricted to mathematical research. We will report

experimental tests of fundamental axioms for judgments of differences in subjective value. The axioms tested include the quadruple condition (a central axiom for the value difference representation) and independence properties that characterize multiattribute models.

12:35-12:55 (549)

Testing Utility Theories by Measuring Surfaces of Subjective Equivalence. RICHARD A. CHECHILE & ALAN D. COOKE, *Tufts University*—A set of equivalence surfaces were established in a space with dimensions for probability and monetary payoffs. For each surface, the genetic utility theory (GUT) of Miyamoto was assumed for parameter fitting. By examining the variation in a parameter that ought to be stable across surfaces, GUT was found to fail for both the power and exponential versions. A model based on the ratio of expected benefit to expected risk described the data well.

COMPREHENSION/REASONING II

Regency Ballroom F, Sunday Morning, 11:00-1:15

Chaired by Marvin Levine, SUNY at Stony Brook

11:00-11:15 (550)

Argument Structures and Argument Generation. JAMES F. VOSS, TONYA SCHOOLER, JOEL KENNET, *University of Pittsburgh*, & CHRISTOPHER WOLFE, *Miami University of Ohio*—Using controversial social issues, this paper presents the results of studies designed to investigate the nature of argument structures and how individuals generate arguments. The findings indicate that argument structures are relatively small and/or inaccessible, and also relatively unstable. Also, beliefs showing agreement or disagreement with a conclusion produced substantial differences in reasons generated and their perceived strength.

11:20-11:40 (551)

Time Course of Beginners' and Advanced Learners' Knowledge Retrieval. FRANZ SCHMALHOFER, *Universität Kaiserslautern*, & STEFAN BOSCHERT, *University of Freiburg*—In a 2×2 design, 40 beginners (subjects without any programming experience) and 40 advanced learners acquired LISP knowledge either from a text or from informationally equivalent examples. For all subjects, the time course of knowledge retrieval in sentence and example verification tasks was then traced with a speed-accuracy tradeoff tapping method. The results show that contrary to the deep knowledge (situation model), the more superficial knowledge is retrieved early and at the end about equally well in all learners.

11:45-11:55 (552)

The Effects of Foregrounding on Spontaneous Generation of Predictive Inferences. BILL G. RITCHIE & PAUL WHITNEY, *Washington State University* (read by Paul Whitney)—When subjects read a passage about a swimmer stepping on a piece of glass, do they infer that the swimmer has a cut foot? Previous studies investigating readers' use of such predictive inferences have found that these inferences are made minimally or not at all. We have obtained data that predictive inferences are made during comprehension, but only if the action related to the target inference is foregrounded in the passage.

12:00-12:15 (553)

Validation of Causal Bridging Inferences. MURRAY SINGER, MICHAEL HALLDORSON, *University of Manitoba*, RUSSELL REV-LIN, *University of California, Santa Barbara*, JEFFREY C. LEAR, & PETER ANDRUSIAK, *University of Manitoba*—We proposed that causal bridging inferences must be validated with reference to world knowledge. Suppose one reads, "Dorothy took the aspirins; her headache went away." Then, inferring that the first event caused the second ought to activate the pertinent idea, "Aspirin relieves pain." In four experiments, people answered questions such as "Does aspirin relieve pain?" after having read causal and control sequences. Priming of the pertinent ideas was consistently detected, supporting the main hypothesis.

12:20-12:35 (554)

Calibration of Comprehension Is Higher for Important Parts of Text. RUTH H. MAKI, *North Dakota State University*, & MATT SERRA, *Purdue University*—Subjects read text that contained impor-

tant and unimportant sentences with important sentences either highlighted or not. Next, subjects predicted their test performance. Half of the test questions tapped important material and half tapped unimportant material. Correlations between predictions and test performance were higher for questions that tapped important material, particularly when important sentences had been highlighted. Increasing the processing of material by highlighting increased calibration of comprehension.

12:40-12:55 (555)

Question Answering in the Context of Generic Concepts. ARTHUR C. GRAESSER & JOSEPH P. MAGLIANO, *Memphis State University*—A model of question answering (called QUEST) accounts for the quality of answers to why, how, and other open-class questions. In each trial, subjects received a generic concept (e.g., child), followed by a question and answer to the question. They judged whether the answer was a "good" versus a "bad" answer to the question. Their judgments were significantly predicted by variables associated with three of QUEST's components: (1) arc search, (2) structural distance, and (3) constraint satisfaction.

1:00-1:10 (556)

Studies of Barpress Conditioning in a Crustacean Species. CHARLES I. ABRAMSON & RICHARD D. FEINMAN, *SUNY Health Science Center at Brooklyn*—We have recently demonstrated an operant conditioning apparatus for studying barpress training in a crustacean species, the green crab. We describe studies of the effect of fixed ratio schedules of reinforcement, the effect of external feedback stimuli, and cutter versus crusher claw. In addition to its importance for comparative analysis of behavior, the Crustacean "Skinner Box" may provide access to the underlying neuronal substrate of operant learning.

ASSOCIATIVE LEARNING II

Burgundy Room, Sunday Morning, 11:10-12:55

Chaired by Mark A. Gluck, Stanford University

11:10-11:25 (557)

Necessary Conditions for the Development of Conditioned Inhibition. RALPH R. MILLER, NICHOLAS J. GRAHAME, & STEVE C. HALLAM, *SUNY at Binghamton*—The associative structure of differential conditioned inhibition was examined with conditioned suppression. Following A+X- training, rats were extinguished with A and the training context, the training context alone, or nothing. The inhibitory potential of X was then assessed using summation and retardation tests. The extinction manipulations similarly attenuated inhibition. Consequently, differential inhibition appears to depend on the excitatory value of the training context, rather than that of A. Thus, differential inhibition, like other forms of conditioned inhibition, requires a stimulus not be reinforced under circumstances in which an accompanying stimulus predicts reinforcement.

11:30-11:45 (558)

Is the Target in the Facilitation Paradigm a Conditioned Inhibitor? JOSEPH R. TROISI II, *Johns Hopkins University*, & PHILIP J. BERSH, *Temple University* (read by Philip J. Bersh)—Two experiments assessed the development of conditioned inhibition by a target of a facilitation paradigm. Experiment 1 found that the target was no more response suppressive than a neutral stimulus during subsequent inhibition training. In Experiment 2, concomitant conditioned inhibition training of a facilitation target yielded no more inhibition than a stimulus given only conditioned inhibition training, as revealed by a summation test. These data suggest that facilitation training does not produce target inhibition.

11:50-12:10 (559)

Blockade of Pavlovian Fear Conditioning by the NMDA Antagonist, APV. MICHAEL S. FANSELOW, J. J. KIM, J. P. DeCOLA, & J. LANDEIRA-FERNANDEZ, *University of California, Los Angeles*—Long-term potentiation (LTP) has been proposed as a synaptic mechanism for the encoding of memory. NMDA receptor antagonists block acquisition but not expression of LTP. If LTP is involved in long-term storage of Pavlovian conditional fear, then NMDA antagonists should have similar effects on fear measures. Consistent with this predic-

tion, a selective NMDA antagonist, APV, prevented encoding but not consolidation or performance of conditional freezing in a test given 24 h after shock.

12:15-12:30 (560)

Blocking and Overshadowing in Planaria: Lloyd Morgan's Canon Revisited. H. D. KIMMEL & EILEEN LAI, *University of South Florida*—Planaria received 3 days of either CS-US pairings (70% reinforcement), unpaired CSs and USs, or handling. CS was light or vibrator; US was shock. All subjects then received 2 days of compound conditioning, followed by 2 days of testing on both CSs. Responding to "blocked" CS was significantly lower than to "nonblocked" CS in initially paired but not unpaired condition. Vibrator blocked light but not

vice versa. Vibrator-light difference was insignificant in overshadowing controls.

12:35-12:50 (561)

Separable Effects of Preexposure to Telereceptive and Interoceptive Cues on Ingestion. JOSEPH J. FRANCHINA & ANDREW P. SMILER, *Virginia Polytechnic Institute and State University*—Nine-day-old chicks received ingestional preexposure to visual (telereceptive) cues (red- or clear-colored solutions) or to taste (interoceptive) cues (water or 4.0% vinegar) prior to testing with a compound ingesta of red 4.0% vinegar. Preexposure to red visual cues produced a reliably faster latency to initiate drinking, but preexposure to vinegar cues produced a reliably shorter duration for completing the next nine drinking responses, suggesting that interoceptive cues eventually override telereceptive cues.