

CONDENSED SCHEDULE A

Thursday Morning

Motor Control (1-12)	8:00-12:10, San Antonio
Foraging and Feeding (13-19)	8:00-10:25, Chenin
Psychobiology and Brain Function (20-23)	10:35-12:00, Chenin
Haptic and Sensory Interactions (24-32)	8:00-10:50, Cuyamaca
Misperception (33-36)	11:00-12:20, Cuyamaca
Memory I (37-48)	8:00-12:05, Laguna
Reading I (49-60)	8:00-12:20, Palomar
Attention I (61-74)	8:00-12:35, Sauterne

Thursday Afternoon

Social-Personality Processes (75-78)	1:00-2:20, San Antonio
Individual Differences (79-87)	2:30-5:30, San Antonio
Aversive Learning (88-94)	1:00-3:20, Chenin
Ontogeny of Animal Behavior (95-100)	3:30-5:30, Chenin
Cognition (101-106)	1:00-3:05, Cuyamaca
Judgment (107-114)	3:15-5:45, Cuyamaca
Memory II (115-128)	1:00-5:30, Laguna
Discourse Processing (129-142)	1:00-5:40, Palomar
Vision (143-156)	1:00-5:30, Sauterne

Friday Morning

Neuropsychology (157-162)	8:00-10:15, San Antonio
Sensory Function, Psychophysics, and Scaling (163-168)	10:30-12:20, San Antonio
Animal Conditioning (169-180)	8:00-12:10, Chenin
Perception of Faces (181-185)	8:00-9:50, Cuyamaca
Perceptual Development (186-192)	10:00-12:10, Cuyamaca
Lexical Processes (193-196)	8:00-9:30, Laguna
Picture-Word Processing (197-203)	9:45-12:00, Laguna
Language-Like Processes in Animals (204-206)	8:00-9:10, Palomar
Comprehension (207-215)	9:20-12:30, Palomar
Conceptualizations of Attention (216-222b)	8:00-10:55, Sauterne
Laterality (223-227)	11:05-12:40, Sauterne

Friday Afternoon

Action (228-230)	1:00-2:10, San Antonio
Human-Computer Interaction (231-238)	2:20-5:15, San Antonio
Cognitive Processes in Animals (239-244)	1:00-3:10, Chenin
Animal Memory (245-249)	3:20-5:20, Chenin
Conceptual Development (250-255)	1:00-3:05, Cuyamaca
Classification and Categorization (256-262)	3:10-5:10, Cuyamaca
Reading II (263-266)	1:00-2:05, Laguna
Memory III (267-276)	2:15-5:30, Laguna
Lexical Decision Processes (277-288)	1:00-5:30, Palomar
Perception (289-301)	1:00-5:35, Sauterne

Friday Evening

General Business Meeting	6:00-7:00, Sauterne
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Saturday Morning

Metaphor (302-304)	8:00-9:00, San Antonio
Decision Making (305-313)	9:10-12:15, San Antonio
Animal Learning (314-317)	8:00-9:20, Chenin
Animal Psychopharmacology (318-321)	9:30-10:35, Chenin
Psychopharmacology of Human Memory (322-327)	10:45-12:30, Chenin
Development of Language, Reading, & Memory (328-339)	8:00-12:10, Cuyamaca
Autobiographical Memory and Eyewitness Testimony (340-345)	8:00-10:00, San Diego
Music Perception (346-351)	10:15-12:20, San Diego
Speech Production and Perception (352-363)	8:00-12:20, Palomar
Problem Solving (364-374)	8:00-12:05, Laguna

Hospitality (Cash Bar) in Cuyamaca Room Wednesday, Thursday, and Friday, 6:30 p.m. - 1:00 a.m.

CONDENSED SCHEDULE B

	San Antonio	Chemin	Cuyamaca*	Laguna	Palomar	Sauterne	San Diego
Thursday Morning	Motor Control 8:00-12:10	Foraging & Feeding Psychobiology & Brain Function 8:00-10:25 10:35-12:00	Haptic & Sensory Interactions 8:00-10:50 Misperception 11:00-12:00	Memory I 8:00-12:05	Reading I 8:00-12:20	Attention 8:00-12:35	
Thursday Afternoon	Social-Personality Processes 1:00-2:20 Individual Differences 2:30-5:30	Aversive Learning 1:00-3:20 Ontogeny of Animal Behavior 3:30-5:30	Cognition 1:00-3:05 Judgment 3:15-5:45	Memory II 1:00-5:30	Discourse Processing 1:00-5:40	Vision 1:00-5:30	
Friday Morning	Neuropsychology 8:00-10:15 Sensory Function, Psycho- physics, & Scaling 10:30-12:20	Animal Conditioning 8:00-12:10	Perception of Faces 8:00-9:50 Perceptual Develop- ment 10:00-12:10	Lexical Processes 8:00-9:30 Picture-Word Processing 9:45-12:00	Language-Like Pro- cesses 8:00-9:10 Comprehension 9:20-12:30	Conceptualizations of Attention 8:00-10:55 Laterality 11:05-12:40	
Friday Afternoon	Action 1:00-2:10 Human-Computer Interactions 2:20-5:15	Cognitive Processes in Animals 1:00-3:10 Animal Memory 3:20-5:20	Conceptual Develop- ment 1:00-3:05 Classification & Cate- gorization 3:10-5:05	Reading II 1:00-2:05 Memory III 2:15-5:30	Lexical Decision Processes 1:00-5:30	Perception 1:00-5:35	
Friday Evening						Business Meeting 6:00-7:00	
Saturday Morning	Metaphor 8:00-9:00 Decision Making 9:10-12:15	Animal Learning 8:00-9:20 Animal Psychopharma- cology 9:30-10:35 Psychopharmacology of Memory 10:45-12:30	Development of Language, Reading, & Memory 8:00-12:10	Problem Solving 8:00-12:05	Speech Production & Perception 8:00-12:20		Autobiographical & Eyewitness Memory 8:00-10:00 Music Perception 10:15-12:20

**Hospitality (Cash Bar) in Cuyamaca Wednesday, Thursday, and Friday 6:30 p.m. - 1:00 a.m.*

CONDENSED SCHEDULE C

THURSDAY MORNING

Motor Control (1-12), San Antonio

- 8:00-8:15 Wright (1)
8:20-8:35 Jagacinski, Miller, & Plamondon (2)
8:40-8:50 Lovelace (3)
8:55-9:15 Abrams, Kornblum, Meyer, & Wright (4)
9:20-9:35 Zelaznik & Schmidt (5)
9:40-9:55 Redding (6)
10:00-10:15 Monahan (7)
10:30-10:45 Roy & Elliott (8)
10:50-11:05 Keele, Pokorny, & Corcos (9)
11:10-11:25 Stelmach & Teulings (10)
11:30-11:45 Newell & Carlton (11)
11:50-12:05 Mintz & Johnson (12)

Foraging & Feeding (13-19), Chenin

- 8:00-8:15 Maki, Gustavson, Berglund, & Thom (13)
8:20-8:40 Mellgren & Brown (14)
8:45-9:05 Kamil & Balda (15)
9:10-9:25 Hursh, Bauman, Leu, & Raslear (16)
9:30-9:45 Elsmore & Conrad (17)
9:50-10:00 Pierce & Perkins (18)
10:05-10:20 Valle (19)

Psychobiology & Brain Function (20-23), Chenin

- 10:35-10:50 Meck & Church (20)
10:55-11:15 Braun (21)
11:20-11:35 Frank & King (22)
11:40-11:55 Papini & Overmier (23)

Haptic & Sensory Interactions (24-32), Cuyamaca

- 8:00-8:15 Easton (24)
8:20-8:35 Newman, Hall, & Gupta (25)
8:40-8:50 Loomis (26)
8:55-9:05 Klatzky, Lederman, & Barber (27)
9:10-9:25 Craig (28)
9:30-9:45 Locher (29)
9:50-10:00 Lechelt (30)
10:05-10:20 Weisenberger (sp. Craig) (31)
10:25-10:45 Welch, Hurt, & Warren (32)

Misperception (33-36), Cuyamaca

- 11:00-11:20 Siegel & Allan (33)
11:25-11:40 Coren & Porac (34)
11:45-11:55 Jordan & Uhlarik (35)
12:00-12:15 Porac, Coren, & Wong (36)

Memory I (37-48), Laguna

- 8:00-8:15 Ellis (37)
8:20-8:35 Hertel & Anooshian (sp. Grice) (38)
8:40-8:50 Elmes, Chapman, & Selig (39)
8:55-9:05 McDaniel & Einstein (sp. Crowell) (40)
9:10-9:25 Anderson (41)
9:30-9:40 Saltz & Schell (42)
9:55-10:05 Oliver & Ericsson (43)
10:10-10:30 Bahrack (44)
10:35-10:45 Landauer (45)

- 10:50-11:10 Kinchla (46)
11:15-11:35 Gronlund & Shiffrin (47)
11:40-12:00 Gelfand, Bjork, & Kovacs (48)

Reading I (49-60), Palomar

- 8:00-8:20 Schustack, Ehrlich, & Rayner (49)
8:25-8:40 Siegel (50)
8:45-8:55 Brown, Vavrus, & Carr (51)
9:00-9:20 Healy, Volbrecht, & Nye (52)
9:25-9:40 Chen, Healy, & Bourne (53)
9:45-9:55 Inhoff, Lima, & Rayner (54)
10:00-10:15 Flowers & Carson (55)
10:30-10:45 Masson & Freedman (56)
10:50-11:05 Kowler, Anton, & Lopez (sp. Steinman) (57)
11:10-11:30 Proctor & Healy (58)
11:35-11:55 Haber & Haber (59)
12:00-12:15 Jacoby (60)

Attention I (61-74), Sauterne

- 8:00-8:15 Senders (61)
8:20-8:35 Dember, Warm, Bowers, & Lanzetta (62)
8:40-8:50 Loftus & Ginn (63)
8:55-9:10 Kallman & Brown (sp. Rosellini) (64)
9:15-9:25 Shaw & Chang (65)
9:30-9:50 Mulligan & Shaw (66)
9:55-10:10 Vaughn (67)
10:25-10:40 Hughes (68)
10:45-10:55 Juola, Cocklin, & Crouch (69)
11:00-11:15 Cheesman & Merikle (70)
11:20-11:35 Dunbar & MacLeod (71)
11:40-11:50 Vaid (sp. Harris) (72)
11:55-12:15 Grice, Canham, & Boroughs (73)
12:20-12:35 Baker, Holding, & Loeb (74)

THURSDAY AFTERNOON

Social-Personality Processes (75-78), San Antonio

- 1:00-1:15 Montgomery (75)
1:20-1:30 Wearing, Shulman, Craik, & Williamson (76)
1:35-1:50 McCain, Cox, Paulus, & Garbin (77)
1:55-2:15 Crowell, Anderson, Able, & Sergio (78)

Individual Differences (79-87), San Antonio

- 2:30-2:40 Skinner (79)
2:45-3:05 McDonald, Thiel, & Pellegrino (80)
3:10-3:30 Poltrock & Brown (sp. Johnston) (81)
3:35-3:50 Martin, Rossmessl, & Wing (82)
3:55-4:10 McGinley & VanVranken (83)
4:15-4:25 Rossmessl & Stern (sp. Wing) (84)
4:30-4:45 Goolkasian & Rimer (85)
4:50-5:00 Rohrman & Gallo (86)
5:05-5:20 Meyer, Ossana, & Hilterbrand (87)

Aversive Learning (88-94), Chenin

- 1:00-1:20 Levis & Malloy (88)
1:25-1:40 Minor (sp. Maier) (89)
1:45-2:00 Williams (90)
2:05-2:25 Anderson & Crowell (91)

- 2:30-2:45 Ross & Randich (92)
 2:50-3:00 Fanselow (93)
 3:05-3:15 Wideman & Murphy (94)

Ontogeny of Animal Behavior (95-100), Chenin

- 3:30-3:50 Denenberg (95)
 3:55-4:10 Soltysik, Nicholas, & Wilson (96)
 4:15-4:30 Karsh (97)
 4:35-4:55 Mineka, Gunnar, & Champoux (98)
 5:00-5:10 King, Hsiao, & Leeming (99)
 5:15-5:25 Hicks, Gomez, Kuroda, & Reyes (100)

Cognition (101-106), Cuyamaca

- 1:00-1:15 Kerr, Condon, & McDonald (101)
 1:20-1:40 Kubovy & Toth (102)
 1:45-2:00 Pinker (103)
 2:05-2:20 Tversky & Novick (104)
 2:25-2:40 Bartlett & Wallace (105)
 2:45-3:00 Hopkins, Campbell, & Peterson (106)

Judgment (107-114), Cuyamaca

- 3:15-3:30 Wasserman, Neunaber, Chatlosh, & O'Hara (107)
 3:35-3:50 Kuzmak (sp. Gelman) (108)
 3:55-4:10 Jonides & Naveh-Benjamin (109)
 4:15-4:25 Warren & Crockard (110)
 4:30-4:45 Witherspoon & Allan (111)
 4:50-5:00 Shoben & Dewey (112)
 5:05-5:15 Hirtle & Jonides (113)
 5:20-5:40 Petrusic (114)

Memory II (115-128), Laguna

- 1:00-1:20 Wickens, Young, & Williford (115)
 1:25-1:35 Nelson (116)
 1:40-1:55 Eich (117)
 2:00-2:15 Ozier (118)
 2:20-2:30 Horton, Van Summers, Horton, & Gabriel (119)
 2:35-2:50 Hall (120)
 2:55-3:05 Watkins & Kerkar (121)
 3:20-3:35 Adamson (122)
 3:40-3:50 Block, Nickol, & Brown (123)
 3:55-4:15 Murdock & Franklin (124)
 4:20-4:30 Williams (sp. Oscar-Berman) (125)
 4:35-4:50 Manning (126)
 4:55-5:10 Glenberg (127)
 5:15-5:25 Lippman (128)

Discourse Processing (129-142), Palomar

- 1:00-1:10 Schultz & Hardy (sp. Marschark) (129)
 1:15-1:30 Schulman (130)
 1:35-1:50 Brewer & Iran-Nejad (131)
 1:55-2:10 Voss, Post, Fincher, & Greene (132)
 2:15-2:25 Black & McGuigan (133)
 2:30-2:45 Harris & Lee (134)
 2:50-3:05 Crothers (135)
 3:10-3:25 Malt (sp. Clark) (136)
 3:40-3:50 Foos (137)
 3:55-4:10 Trabasso & van den Broek (138)
 4:15-4:30 McKoon & Ratcliff (139)
 4:35-4:50 Gibbs (sp. Bridgeman) (140)
 4:55-5:15 Brunner (sp. Pisoni) (141)
 5:20-5:35 Glowalla (sp. Perfetti) (142)

Vision (143-156), Sauterne

- 1:00-1:10 Wandell (143)
 1:15-1:35 Flock (144)
 1:40-1:50 Fox, Mauk, & Francis (145)
 1:55-2:10 Cowan (146)
 2:15-2:25 Wolfe (147)
 2:30-2:45 Corwin & Fotta (148)
 2:50-3:10 Beck & Halloran (149)
 3:25-3:35 Wolford & Chambers (150)
 3:40-3:55 Julesz & Sagi (151)
 4:00-4:10 Dixon (sp. Di Lollo) (152)
 4:15-4:30 Long (153)
 4:35-4:50 Aslin, Shea, & Osuobeni (154)
 4:55-5:10 Bridgeman & Fishman (155)
 5:15-5:25 Reeves (156)

FRIDAY MORNING

Neuropsychology (157-162), San Antonio

- 8:00-8:20 Richardson (157)
 8:25-8:45 Johnson & Kim (158)
 8:50-9:05 Rosenbaum & Goldstein (159)
 9:10-9:30 Posner, Friedrich, Walker, & Rafal (160)
 9:35-9:50 Eckerman, Gullion, & Long (161)
 9:55-10:10 Mitchell & Hunt (162)

Sensory Function, Psychophysics, & Scaling (163-168), San Antonio

- 10:30-10:45 Wasserman & Ross-Farhang (163)
 10:50-11:00 Kirk & Blampied (sp. Overmier) (164)
 11:05-11:20 Klein & Barresi (165)
 11:25-11:35 Zellner & Parker (166)
 11:40-11:55 Drewnowski (167)
 12:00-12:15 Warren & McMillan (168)

Animal Conditioning (169-180), Chenin

- 8:00-8:10 Palya (sp. Zeiler) (169)
 8:15-8:25 Williams (170)
 8:30-8:45 Miller, Kasproh, & Schachtman (171)
 8:50-9:10 Fairless, Stanhope, & LoLordo (172)
 9:15-9:30 Randich & Ross (173)
 9:35-9:45 Marlin (174)
 9:50-10:05 Best, Sowell, & Carrell (175)
 10:20-10:35 Barker & Weaver (176)
 10:40-11:00 Bitterman & Couvillon (177)
 11:05-11:20 Salafia, Marini, & Tatarowicz (178)
 11:25-11:45 Roberts & Holder (179)
 11:50-12:05 Brown, Anderson, & Crowell (180)

Perception of Faces (181-185), Cuyamaca

- 8:00-8:15 Tyrrell (181)
 8:20-8:40 Kyes & Candland (182)
 8:45-9:05 Kolers & Sundstroem (183)
 9:10-9:25 Groszofsky, Carello, & Michaels (184)
 9:30-9:45 Purcell, Stewart, Botwin, & Kreigh (185)

Perceptual Development (186-192), Cuyamaca

- 10:00-10:10 Beagles-Roos (sp. Kaye) (186)
 10:15-10:30 Zivian & Duffy (sp. Okada) (187)
 10:35-10:55 Herman (188)
 11:00-11:15 Kail (189)
 11:20-11:35 Fisher & Camenzuli (190)
 11:40-11:55 Cowan & Cowan (191)
 12:00-12:10 Shapiro, Haith, Campos, Bertenthal, & Hazan (sp. Michaels) (192)

Lexical Processes (193-196), Laguna

- 8:00-8:20 Kirsner, Smith, & Lockhart (193)
 8:25-8:45 Katz, Lukatela, & McCann (194)
 8:50-9:05 Feldman & Turvey (195)
 9:10-9:25 Bentin & Katz (196)

Picture-Word Processing (197-203), Laguna

- 9:45-10:00 Theios & Amrhein (197)
 10:05-10:20 Intraub & Nicklos (198)
 10:25-10:40 Kroll & Phailbus (199)
 10:45-11:00 Prinzmetal & Wright (sp. Kinchla) (200)
 11:05-11:20 Pezdek (201)
 11:25-11:40 Gernsbacher (sp. Foss) (202)
 11:45-11:55 Walls & Siple (203)

Language-Like Processes in Animals (204-206), Palomar

- 8:00-8:20 Herman, Wolz, & Richards (204)
 8:25-8:40 Pepperberg (sp. Wasserman) (205)
 8:45-9:05 Segal (206)

Comprehension (207-215), Palomar

- 9:20-9:35 Spoehr, Morris, & Smith (207)
 9:40-9:55 Baggett (sp. Olson) (208)
 10:00-10:10 Kemper, Mahoney, & Schadler (209)
 10:15-10:30 Olson, Trahan, Roshwalb, & Eaton (210)
 10:35-10:55 Maki & Berry (211)
 11:10-11:20 Glass (212)
 11:25-11:40 Clifton, Frazier, & Connine (213)
 11:45-12:00 Liu (214)
 12:05-12:25 Singer (215)

Conceptualizations of Attention (216-222b), Sauterne

- 8:00-8:20 Schneider (216)
 8:25-8:45 Hunt & Reed (217)
 8:50-9:05 Fisher (sp. Schneider) (218)
 9:10-9:30 Kahneman, Treisman, & Gibbs (219)
 9:35-9:50 Treisman & Kahneman (220)
 9:55-10:10 Hoffman & MacMillan (221)
 10:15-10:35 Sperling & Reeves (222a)
 10:40-10:50 Norman & Shallice (222b)

Laterality (223-227), Sauterne

- 11:05-11:20 Soper, Satz, Light, & Orsini (223)
 11:25-11:35 Searleman, Porac, & Coren (224)
 11:40-11:55 Kee, Bathurst, & Hellige (225)
 12:00-12:15 Reynolds & Chayka (226)
 12:20-12:35 Ferguson (227)

FRIDAY AFTERNOON**Action (228-230), San Antonio**

- 1:00-1:20 Townsend (228)
 1:25-1:45 Rosenbaum, Inhoff, & Gordon (229)
 1:50-2:05 Klapp (230)

Human-Computer Interaction (231-238), San Antonio

- 2:20-2:35 Ehrlich & Soloway (231)
 2:40-2:55 Sebrechts & Deck (sp. Seamon) (232)
 3:00-3:15 Eddy & Bauer (sp. Becker) (233)
 3:20-3:40 Polson, Kieras, Engelbeck, & Willer (234)
 3:45-4:05 Kieras & Bovair (235)

- 4:10-4:25 Jeffries (sp. Reder) (236)
 4:30-4:50 Carroll & Carrithers (237)
 4:55-5:10 Ross (sp. Medin) (238)

Cognitive Processes in Animals (239-244), Chenin

- 1:00-1:10 Luck, Colgrove, & Neuringer (239)
 1:15-1:30 Fountain, Schenk, & Annau (sp. Hulse) (240)
 1:35-1:55 Roitblat, Dopkins, Scopatz, & Bever (241)
 2:00-2:20 Bever, Scopatz, Dopkins, & Roitblat (242)
 2:25-2:45 Weisman (243)
 2:50-3:05 Clos & Denny (244)

Animal Memory (245-249), Chenin

- 3:20-3:40 Honig, Matheson, & Dodd (245)
 3:45-4:05 Kraemer & Roberts (246)
 4:10-4:30 Jagielo & Zentall (247)
 4:35-4:55 White (248)
 5:00-5:15 Spring & Miller (249)

Conceptual Development (250-255), Cuyamaca

- 1:00-1:20 Morrison (250)
 1:25-1:40 Horton (sp. Massaro) (251)
 1:45-2:05 Keil (252)
 2:10-2:25 Burns (sp. Rosch) (253)
 2:30-2:40 Resnick & Neshier (254)
 2:45-3:00 Kaye, Bonnefil, & Qi (255)

Classification & Categorization (256-262), Cuyamaca

- 3:10-3:30 Wallsten, Forsyth, De Soete, & Brooks (256)
 3:35-3:50 Oden (257)
 3:55-4:10 Erickson & Gaas (258)
 (259 withdrawn)
 4:15-4:25 Dahlgren (sp. Light) (260)
 4:30-4:45 Boynton & Stefurak (261)
 4:50-5:05 Burrows (262)

Reading II (263-266), Laguna

- 1:00-1:10 Shebilske & Fisher (263)
 1:15-1:30 Haberlandt (264)
 1:35-1:45 Petros, Ramsel, & Grabe (sp. Antes) (265)
 1:50-2:00 Parasnis (sp. Ison) (266)

Memory III (267-276), Laguna

- 2:15-2:30 Snodgrass (267)
 2:35-2:45 Doshier (sp. Wickelgren) (268)
 2:50-3:05 Jones (sp. Landauer) (269)
 3:10-3:25 Gorfein (270)
 3:30-3:45 Humphreys, Bain, & Pike (271)
 4:00-4:10 Bellezza (272)
 4:15-4:30 Hunt & Seta (273)
 4:35-4:50 Roediger & Blaxton (274)
 4:55-5:05 Brown & Bagnall (275)
 5:10-5:25 Logan (276)

Lexical Decision Processes (277-288), Palomar

- 1:00-1:10 Hale & Johnston (277)
 1:15-1:35 Kintsch & Mross (278)
 1:40-1:55 Schwanenflugel (sp. Shoben) (279)
 2:00-2:15 Whitaker (280)
 2:20-2:40 Besner (281)
 2:45-3:05 Neely, Fisk, & Ross (282)
 3:20-3:35 Lupker (283)
 3:40-4:00 Smith & Klein (284)
 4:05-4:20 Simpson & Burgess (sp. Deffenbacher) (285)

- 4:25-4:40 Seidenberg (286)
 4:45-5:05 Marchetti & Mewhort (287)
 5:10-5:30 Schweickert (288)

Perception (289-301), Sauterne

- 1:00-1:15 Palmer (289)
 1:20-1:40 Haber & Toye (290)
 1:45-2:00 Masin (291)
 2:05-2:25 Cutting (292)
 2:30-2:45 Uttal (293)
 2:50-3:05 Moravec (sp. Rundus) (294)
 3:20-3:35 Todd & Pittenger (295)
 3:40-3:55 Proffitt (296)
 4:00-4:15 Jolicoeur, Ullman, & Mackay (sp. Kosslyn) (297)
 4:20-4:35 Earhard (298)
 4:40-4:50 Halpern, Salzman, Harrison, & Widaman (299)
 4:55-5:10 Ebenholtz (300)
 5:15-5:30 Reynolds (301)

FRIDAY EVENING

General Business Meeting, Sauterne

- 6:00-7:00 George Mandler

SATURDAY MORNING

Metaphor (302-304), San Antonio

- 8:00-8:15 Tanenhaus & Carlson (302)
 8:20-8:35 Kroll (303)
 8:40-8:55 Glucksberg, Locksley, & Russo (304)

Decision Making (305-313), San Antonio

- 9:10-9:20 Forester & Johnson (305)
 9:25-9:40 Castellán (306)
 9:45-9:55 Cook & Schipper (307)
 10:00-10:20 Pliske, Gettys, Kelley, & Beckstead (308)
 10:25-10:45 Shanteau & Dino (309)
 10:50-11:05 Reyna (sp. Bartlett) (310)
 11:10-11:25 Carmody (sp. Locher) (311)
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- 8:00-8:15 Shimp (314)
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 10:55-11:05 Akiyama (336)
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- 10:15-10:35 Hansen, Kessler, & Shepard (346)
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**Papers read at the 24th Annual Meeting of the Psychonomic Society
Sheraton Harbor Island East Hotel, San Diego
November 17, 18, 19, 1983**

MOTOR CONTROL

San Antonio, Thursday morning, 8:00-12:10

Chaired by Donald Mintz, The City College of New York

8:00-8:15 (1)

Spatial Variability of Movements to Three Contrasting Goal Points. CHARLES E. WRIGHT, *Bell Laboratories* (sponsored by S. Sternberg)—Unidimensional wrist supinations made to temporally and spatially defined targets without concurrent visual feedback were studied for three contrasting goal conditions. The goal conditions defined functional movement endpoints analogous to those in throwing, striking, and pointing movements. Variance of movement distance increased linearly with the square of mean movement velocity, consistent with the symmetric-impulse variability model (Meyer, Smith, & Wright, 1982). Surprisingly, the relation governing spatial variability was the same for the three goal conditions.

8:20-8:35 (2)

A Finite-State Description of Capturing Moving Targets. RICHARD J. JAGACINSKI, RICHARD A. MILLER, & BRIAN D. PLAMONDON, *Ohio State University*—Subjects manipulated a control stick to position a cursor over a moving target that reacted with a computer-generated escape strategy. The time histories of the control stick movements were segmented into sequences of three modes of activity: rapid acquisition, close following, and a predictive mode. Constraints on the transitions among these activities represent capture strategies. This finite-state description of activity sequences provides the basis for a two-level description of skilled performance.

8:40-8:50 (3)

Seeing and Feeling in Guiding the Hand to a Target. EUGENE A. LOVELACE, *University of Virginia*—College students attempted to touch a target at arm's length in one steady motion with no visual input during response. Performance was poorer if the target location had been visually given (looking at it before responding) than if kinesthetically specified (the subject's passive hand moved to the target, then lowered to rest in the subject's lap before he or she responded). General disruption of orientation in space induced by the eyes' being closed has been ruled out as a cause.

8:55-9:15 (4)

Fitts's Law: Optimization of Initial Ballistic Impulses for Aimed Movements. R. ABRAMS, S. KORNBLUM, D. E. MEYER, *University of Michigan*, & C. E. WRIGHT, *Bell Laboratories* (read by S. Kornblum)—Some classical theories of Fitts's law, a logarithmic tradeoff between the speed and accuracy of aimed movements, have attributed it to mechanisms that analyze visual feedback and make corrective submovement. In contrast, a new theory proposed by Meyer et al. (*Psychological Review*, 1982) accounts for Fitts's law through a force-pulse generator that optimally programs the initial ballistic phase of aimed movements. Recent experiments with wrist rotations and varied visual feedback support the latter account.

9:20-9:35 (5)

Kinematic Properties of Single-Aiming Movements. HOWARD N. ZELAZNIK, *Purdue University*, & RICHARD A. SCHMIDT, *University of California, Los Angeles*—Two highly trained subjects performed single-aiming movements at three movement am-

plitudes (10, 20, and 30 cm) and three movement durations (150, 200, and 250 msec). Biomechanical techniques were utilized to generate two-dimensional trajectory information. The symmetric impulse model of aiming movements does not hold. Rather, it is suggested that, as a function of changes in movement duration, the braking aspects of the aiming movement determine the effective target width.

9:40-9:55 (6)

Toward a Model of Prism Adaptation. GORDON M. REDDING, *Illinois State University*—Prism adaptation illustrates adaptive response to natural misalignments between sensorimotor systems (e.g., eye-head, hand-arm). Systems are coordinated via directional control links such that one system cannot at the same time be in control of and controlled by another system. Discordance disrupts automatic coordination, and central processing (attention) is required for intersystem linkage. Afferece recalibration occurs in the controlled system, but adaptation can occur in multiple loci if task organization permits reversal in direction of control.

10:00-10:15 (7)

Determinants of Visual and Proprioceptive Adaptation. JOHN S. MONAHAN, *Central Michigan University*—Participants adapted to displacing prisms while throwing darts. A screen parallel to the throwing direction separated their throwing arms from their bodies. The screen was opaque, clear, clear near the shoulder, or clear beyond the elbow. Participants with clear or partially clear screens looked at their hands. Their adaptation was mainly proprioceptive. Participants with opaque screens adapted visually. Results are interpreted as supporting hierarchical recalibration models rather than attentional models of prism adaptation.

Chaired by Gordon Redding, Illinois State University

10:30-10:45 (8)

Manual Asymmetries in Visual Control of Aimed Movements. ERIC A. ROY, *Mount Sinai Hospital, Toronto*, & DIGBY ELLIOTT, *McMaster University, Hamilton*—Hand differences in the visual control of a rapid manual aiming response were examined under two light conditions: lights-on and lights-off when the movement was initiated. While the right hand was more accurate, the hand was not differentially affected by removal of the lights. The movement time data, however, revealed that the left hand speeded up in the lights-off condition, while the right hand slowed down, suggesting that the mode of processing feedback is different for the two hands.

10:50-11:05 (9)

Speed and Timing in Movement and Perception. STEVEN W. KEELE, ROBERT POKORNY, & DANIEL CORCOS, *University of Oregon*—People fast in repetitively moving one effector tend to be fast with another, and interresponse times are similar for different effectors, suggesting a common speed regulator. Likewise, timing precision is correlated across effectors. One contributor to timing variability appears to be motoric, because of a relation with movement speed, but another contributor is more central, because of a relation with precision of judging time intervals. The results suggest a common timing mechanism to production and perception.

11:10-11:25 (10)

Advance Planning and Parameter Restructuring in Handwriting. GEORGE E. STELMACH, *University of Wisconsin-Madison*, & HANS-LEO TEULINGS, *University of Nijmegen-Netherlands*—Two experiments are reported that examine handwriting response characteristics under advance planning and parameter restructuring situations. When the restructuring required complete reprogramming, the context of the prepared allograph had little effect on the movement characteristics of the restructured allograph. In contrast, when the restructuring required only a change in the size of the allograph to be executed, the context of the preparation not only affected the initial stroke but also altered the force-time relationship throughout execution of the altered allograph. The observed movement length, velocity, and duration parameters suggest that a robust timing mechanism underlies motor programming processes.

11:30-11:45 (11)

On the Force-Force Variability Relationship. K. M. NEWELL & LES G. CARLTON, *University of Illinois, Urbana-Champaign*—The search for a single force-force variability function is of limited value because a variety of functions can emerge according to the constraints imposed upon the subject during response production. Typically, however, within-subject force variability increases at a negatively accelerating rate with equal increments of force. There is an individual specific rate of force production which minimizes variability of peak force or impulse for any given set of task constraints.

11:50-12:05 (12)

The Effects of Feedback Variation in Force Differentiation. DONALD E. MINTZ & MARTIN JOHNSON, *City College of New York*—Human subjects emitted finger-pressing operants with a target force of 150 g. Feedback was provided as digital, digital difference, or binary visual displays immediately following response. Feedback probabilities were 1.0 or 0.2. All conditions generated response-force populations centered in close proximity to the target. Variability was least with digital and greatest with binary feedback. Reduced feedback probability increased variability.

FORAGING & FEEDING

Chenin, Thursday morning, 8:00-10:25

Chaired by Jay Braun, Arizona State University

8:00-8:15 (13)

A Laboratory Model of Foraging Within and Between Patches. WILLIAM S. MAKI, CARL GUSTAVSON, PAUL BERGLUND, & JANET THOM, *North Dakota State University*—In the wild, energy resources are distributed nonrandomly in "patches"; behaviors within patches differ from behaviors between patches. The within-between patch distinction was modeled in the laboratory by constructing radial-arm mazes which differed with respect to length of arms (and hence distance between food items). Several experiments indicated that adjacent-arm strategies were necessary for accurate performance in small mazes, and that rats used response cues in small mazes and place cues in large mazes.

8:20-8:40 (14)

Foraging Behavior and Environmental Constraints. ROGER L. MELLGREN & STEVEN W. BROWN, *University of Oklahoma*—Successful foraging requires an animal to utilize information gathered from the environment. Experiments in a seminaturalistic situation with a patchy distribution of prey will be summarized. Data on the effects of travel requirements, the distribution of patches in space (spatial memory), and the density and probability of prey per patch (patch utilization) will be presented. How these and other environmental constraints from more traditional animal learning studies influence foraging behavior and its approximation to optimality will be discussed.

8:45-9:05 (15)

Spatial Memory and Food Cache Recovery by Nutcrackers (*Nucifraga columbiana*). ALAN C. KAMIL, *University of*

Massachusetts, & RUSSELL P. BALDA, *Northern Arizona University*—Clark's nutcrackers possess a remarkable ability to locate their food caches, apparently using spatial memory. However, since nutcrackers actively select their cache sites, several nonmnemonic mechanisms, such as site preferences, could contribute to cache recovery. We eliminated these potential confounding factors by developing a procedure in which the experimenters choose the cache sites. The nutcrackers still recovered their caches accurately. Also, they showed no primacy or recency effects and frequently revisited already emptied cache sites.

9:10-9:25 (16)

Demand Curves for the Analysis of Reinforcement. STEVEN R. HURSH, RICHARD A. BAUMAN, JOHN R. LEU, & THOMAS G. RASLEAR, *Walter Reed Army Institute of Research*—A fundamental function used in economic analysis is the demand curve, obtained reinforcement as a function of price. Two parameters of this function are the slope (elasticity) and the elevation (level). To study variables that alter these parameters, one must determine a complete demand curve for each level of the independent variable, a time-consuming process. A technique for determining demand curves in 30-45 days has allowed us to study several variables which alter the parameters of demand.

9:30-9:45 (17)

Response Rate Rhythms: Effects of Reinforcement Rate and Delay Ratio. TIMOTHY F. ELSMORE & DONALD G. CONRAD, *Walter Reed Army Institute of Research*—Monkeys earned their entire daily ration of food pellets working under a four-ply MULT random-interval schedule, with sessions scheduled at six different times of the day. Total daily ration was manipulated across blocks of sessions. Circadian rhythms in response rate were evident under all schedules studied. There was an inverse linear relationship between rhythm amplitude and log reinforcement rate, and a direct relationship between rhythm amplitude and total daily ration.

9:50-10:00 (18)

The Relative Reinforcing Value of Food and Escape From Danger. KENT A. PIERCE & CHARLES C. PERKINS, *Kansas State University* (read by C. C. Perkins)—Pigeons were trained in a tilt box to steady state on concurrent VT-VT schedules in which escape from danger of shock reinforced one component schedule and food reinforced the other. In one experiment, the richness of the food schedule was varied between sessions. In another, continuous measures of relative times on the two schedules were obtained over 10-h sessions during which food satiation was approximated. Results and methodological issues are described.

10:05-10:20 (19)

Protein-Induced Secondary Drinking in Rats. FRED P. VALLE, *University of British Columbia*—Rats were alternated between blocks of high- and low-protein meals. Each switch to high-protein food led to an immediate increase in fluid consumption via primary drinking following meals (to replenish water lost through urine to excrete urea) and to a gradual increase in secondary drinking during meals (drinking that anticipated this fluid loss). Secondary drinking was facilitated by, and appeared to be conditioned to, a distinctive flavor that consistently accompanied the high-protein food.

PSYCHOBIOLOGY & BRAIN FUNCTION

Chenin, Thursday morning, 10:35-12:00

Chaired by Victor Denenberg, University of Connecticut

10:35-10:50 (20)

Nutrients That Modify Internal-Clock and Memory-Storage Speeds. WARREN H. MECK & RUSSELL M. CHURCH, *Brown University* (read by R. M. Church)—Rats trained on a 20-sec peak procedure consumed a 4-g protein (casein)-, carbohydrate (sucrose)-, or vitamin (phosphatidylcholine-lecithin)-rich "snack" 20 min prior to test sessions. The pattern of change in peak time indicated that the casein snack increased clock speed, the sucrose snack decreased clock speed, and the lecithin snack increased

memory-storage speed. The results are fit with a scalar timing model and are related to diet-produced changes in central neurotransmitter systems.

10:55-11:15 (21)

Foundations of Residual Associative Taste Salience in Rats Lacking Gustatory Neocortex. JAY BRAUN, *Arizona State University*—Degraded associative salience for taste stimuli accompanies gustatory neocortex (GN) ablation, and yet simple non-associative tests of reactivity to near-threshold taste stimuli reveal normal reactivity. In rats with the olfactory system intact, residual associative salience in the absence of GN appears to be based on olfactory stimuli. In rats lacking both GN and olfactory bulbs, residual associative salience may be based on a combination of feedback from reflex reactivity to taste stimuli and postingestional stimuli.

11:20-11:35 (22)

Brain Stimulation Reward Thresholds: Does the Operant Make a Difference? ROBERT A. FRANK & TIMOTHY KING, *University of Cincinnati* (sponsored by Robert M. Stutz)—The difference in response rate observed for the leverpressing and nose-poking operants has been attributed to the relative ease and "naturalness" of the nose-poking response. In order to determine whether this difference in rate is associated with lower nose-poke reward thresholds, absolute thresholds for brain stimulation reward were measured for both nose-poking and leverpressing. It was found that suprathreshold response rate was not a good predictor of reward threshold.

11:40-11:55 (23)

Serial Ablations of the Telencephalon and Avoidance Learning by Goldfish. MAURICIO R. PAPINI, *Universidad de Buenos Aires*, & J. BRUCE OVERMIER, *University of Minnesota* (read by J. B. Overmier)—Two-stage serial ablations of cortex often result in the sparing of a function that would be destroyed if the total ablation were achieved in a single operation. Sparing is often enhanced when selected treatments intervene between the serial ablations (e.g., S. Finger et al., 1973; Meyer & Meyer, 1977). We tested for this phenomenon under several conditions with respect to avoidance learning by telencephalon-ablated goldfish. No evidence of sparing was observed.

HAPTIC & SENSORY INTERACTIONS

Cuyamaca, Thursday morning, 8:00-10:50

Chaired by Jacob Beck, *University of Oregon*

8:00-8:15 (24)

Visual Dominance of Haptically Judged Size. RANDOLPH D. EASTON, *Boston College*—Studies are reported which extend a previous hypothesis forwarded by the author (Easton, 1976; Easton & Falzett, 1978) that observers' experiences during visual dominance are not exclusively in terms of vision but involve processing of nonvisual information as well. Previous work explored visual dominance of haptics during perception of curvature using a finger-pressure transduction technique. The new work uses finger-pressure transduction to explore visual dominance of haptics during size judgment.

8:20-8:35 (25)

Immediate Memory for Visually and Haptically Examined Braille Symbols. SLATER E. NEWMAN, ANTHONY D. HALL, & VASUDHA GUPTA, *North Carolina State University*—Immediately following the visual or haptic examination of each braille symbol, a subject reproduced it. Following visual examination, reproduction of the symbols was almost flawless; following haptic examination, however, there were many errors, even when a structured retrieval context was provided. Some implications re the learning of braille will be discussed.

8:40-8:50 (26)

Tactile and Visual Legibility of Seven Character Sets. JACK M. LOOMIS, *University of California, Santa Barbara*—Seven character sets, among them roman, katakana, braille, and graphic

symbols, were presented to observers as raised touch stimuli and as low-pass-filtered visual stimuli. The variations in legibility across the seven character sets were much the same for the two modalities ($r = .95$). The results permit a good characterization of the spatial filtering and pattern-sensing capabilities of the fingerpad and constitute an important constraint on models of tactile and visual legibility.

8:55-9:05 (27)

Inferring Pattern Information From Tactile Displays. ROBERTA L. KLATZKY, *University of California, Santa Barbara*, SUSAN J. LEDERMAN, & PAUL BARBER, *Queen's University at Kingston, Ontario*—After feeling raised-dot pathways, subjects answered questions about an inferred Euclidean line connecting the pathway endpoints. Critical questions concerned the length of the line and its orientation in the plane. Length estimates increased with the length of the pathway actually explored, while orientation estimates erred in direct relation to the line's angular distance from axes in the plane. These results suggest heuristics that use movement time and reference positions to infer pattern layout from haptic input.

9:10-9:25 (28)

Attending to Two Fingers. JAMES C. CRAIG, *Indiana University*—Measurements were made of the ability of subjects to attend to vibrotactile patterns presented to two fingers. Results from a discrimination task (patterns presented to two fingers) and from an identification task (one pattern presented to a single finger or split between two fingers) showed that subjects were able to attend to both fingers, but with some loss of information. The subjects were able to switch attention between two fingers as the time between two patterns exceeded 100 msec.

9:30-9:45 (29)

Effects of Experience Upon Haptic Filtering and Condensation Task Performance. PAUL LOCHER, *Montclair State College*—Experience with decks of raised line stimuli generated from the orthogonal combination of two attributes which could be felt but not seen resulted in increased speed of classification but not performance differences on filtering and condensation tasks. In a second experiment, condensation-task performance was further facilitated by directing subjects to attend simultaneously to both stimulus dimensions before each of 20 trials. Interaction of stimulus- and perceiver-determined aspects of haptic perception are discussed.

9:50-10:00 (30)

Spatial Asymmetries in Dynamic and Static Tactile Discrimination of Line Orientation. EUGENE LEHEL, *University of Alberta*—Thresholds were determined in sighted and blind observers for stimulus-orientation discrepancy from standard vertical, horizontal, and diagonal line orientations. The stimuli were presented to the distal pad of the left middle fingertip via an OPTACON (dynamic condition) and statically to the distal pads of the index fingers of both hands. Although blind and sighted groups did not differ, vertical and horizontal orientations were discriminated substantially more accurately than diagonals. Dynamic presentations were also discriminated more accurately than static presentations.

10:05-10:20 (31)

Vibrotactile Temporal Modulation Transfer Functions. JANET M. WEISENBERGER, *Central Institute for the Deaf* (sponsored by James C. Craig)—Amplitude-modulated stimuli have been used to study the temporal characteristics of vision and audition. The present experiments measured the response of the tactile system to sinusoidally amplitude-modulated vibratory signals presented to the thenar eminence. Results using both sinusoidal and noise carriers suggest that sensitivity to modulation varies as a function of the carrier. Implications of the present results for intermodality comparisons and for construction of vibrotactile aids for sensorially handicapped individuals are discussed.

10:25-10:45 (32)

The Contributions of Vision and Audition to Temporal Rate Perception. ROBERT B. WELCH, LANCE D. HURT, *University of Kansas*, & DAVID H. WARREN, *University of California, Riverside*—Several experiments were implemented to assess the

relative contributions of vision and audition to the perception of temporal rate. Using a perception-free indicator response (direct magnitude estimation), it was demonstrated that (1) visual rates are perceived as more rapid than physically identical auditory rates, and (2) when the two modalities are presented simultaneously, audition "dominates" the bisensory percept. Various parameters, including degree of visual-auditory spatial separation and of imposed visual-auditory discrepancy in rate, were also examined.

MISPERCEPTION

Cuyamaca, Thursday morning, 11:00-12:20

Chaired by Bruce Bridgeman, University of California, Santa Cruz

11:00-11:20 (33)

Learning and Orientation-Contingent Color Aftereffects. SHEPARD SIEGEL & LORRAINE G. ALLAN, *McMaster University*—Orientation-specific color aftereffects (the "McCullough effect") have usually been attributed to color adaptation of orientation-specific edge detectors. Alternatively, the effect may be due to Pavlovian conditioning: the grating orientation, because of its repeated association with a color, comes to evoke the response of the visual system to the color. This conditioning account is supported by evidence demonstrating that the McCullough effect is affected by manipulations such as "over-shadowing" and associative "blocking."

11:25-11:40 (34)

Individual Differences in Visual Illusion Magnitude: Spatial Skills as Predictors. STANLEY COREN, *University of British Columbia*, & CLARE PORAC, *University of Victoria*—Whether spatial cognitive skills predict visual-geometric illusion strength was explored using 490 subjects, tested on 28 illusion variants, including illusions of extent, direction, and contrast. Spatial skills included mental rotation, search, gestalt closure, and disembedding figures. The individual-difference pattern obtained confirms earlier suggestions that there are two major classes of visual illusions, since high spatial ability seems to predict greater illusions of extent, yet is negatively related to illusions of direction.

11:45-11:55 (35)

The Müller-Lyer Aftereffect: Temporal Separation Produces Length Contrast. KEVIN JORDAN, *Quincy College*, & JOHN UHLARIK, *Kansas State University* (read by J. Uhlarik)—Temporal separation of the contextual "fins" and the focal "shaft" of the Müller-Lyer figure resulted in length contrast. Thus, overestimation of the focal shaft was produced by prior inspection of *ingoing* fins, and underestimation of the shaft was produced by inspection of *outgoing* fins. The magnitude of the length aftereffect was equivalent for both 5- and 60-sec inspection of the contextual fins. This finding indicates that temporal separation, per se, produces length contrast.

12:00-12:15 (36)

Saccadic Exploration and Decrement in the Müller-Lyer Illusion. CLARE PORAC, *University of Victoria*, STANLEY COREN, *University of British Columbia*, & WAYNE WONG, *University of Victoria*—Previous research has shown that observers who scan the Müller-Lyer figure show greater reductions in illusion magnitude over time than do those who do not scan. The present experiments confirmed this finding and, in addition, showed that the reduction in illusion magnitude was related to the number of fixations made during the scanning period. Observers who scanned at a faster rate showed the largest amount of illusion reduction.

MEMORY I

Laguna, Thursday morning, 8:00-12:05

Chaired by Ron Kinchla, Princeton University

8:00-8:15 (37)

Mood and Memory Retrieval. HENRY C. ELLIS, *University of New Mexico*—Mood induction effects on output from memory are demonstrated in two experiments. Subjects rated a list of simple or elaborated sentences, then were given a mood induction placing them in either a neutral or depressed mood state, and then were given an incidental cued recall test of target words. In both experiments, depressed mood reduced recall of targets in both types of sentences.

8:20-8:35 (38)

Emotion in Bilingual Memory. PAULA HERTEL & LINDA ANOOSHIAN, *Trinity University* (sponsored by G. Robert Grice)—Two experiments demonstrated differentiation according to emotion within the memory systems of Spanish/English bilinguals. In the first, subjects judged pronounceability, activity, and emotionality of emotion and nonemotion words in both languages. They recalled emotion words more often, but only in their primary language. In Experiment 2, subjects either read or generated responses in a PA list. The generated advantage in recall was greatest for emotion pairs in the secondary language, indicating translation processes.

8:40-8:50 (39)

Effects of Induced Depression on the Spacing Effect. DAVID G. ELMES, P. F. CHAPMAN, & C. W. SELIG, *Washington & Lee University*—The spacing effect in the recall of neutral and affectively loaded words was determined for depressed and non-depressed subjects. The Velten mood induction procedure was used to induce changes in mood. Depressed subjects showed a spacing effect in the recall of affective words but not for the neutral words. Nondepressed subjects showed a spacing effect in the recall of neutral words but not for the affectively toned words.

8:55-9:05 (40)

The Mnemonic Effects of Bizarre Imagery: The Importance of Distinctiveness. MARK A. McDANIEL, *University of Notre Dame*, & GILLES O. EINSTEIN, *Furman University* (sponsored by Charles Crowell)—Two experiments investigated the effects of imagery type (bizarre or natural) on memory. In Experiment 1, bizarre imagery was found to facilitate memory when imagery type was manipulated within subjects but not when imagery type was manipulated between subjects. In Experiment 2, when additional learning intervened between imaginal processing and testing, bizarre imagery produced better memory for both within- and between-subjects manipulations. The results suggest that bizarre imagery facilitates memory through a distinctiveness mechanism.

9:10-9:25 (41)

I'd Know It I Did It, Wouldn't I? RITA E. ANDERSON, *Memorial University of Newfoundland*—Memories of tracing were confused more readily with memories of pretending to trace (TP group) than with memories of looking (TL group). TP subjects identified more pretend items as trace than vice versa, while TL subjects revealed a look bias. Both groups were most confident of trace identifications, regardless of accuracy. These patterns implicate operation of a metamemory assumption that doing is more memorable than either pretending or looking. Extensions and implications are considered.

9:30-9:40 (42)

Why Does Motoric Enactment Facilitate Memory? ELI SALTZ & DAVID SCHELL, *Merrill-Palmer Institute of Wayne State University*—Previous studies have shown that motoric enactment of a word or sentence facilitates later recall. The hypothesis was proposed, and tested, that enactment reduces interference from competing memory. Results failed to support the hypothesis, and other possibilities are discussed.

Chaired by David Elmes, Washington & Lee University

READING I

Palomar, Thursday morning, 8:00-12:20

Chaired by Michael Masson, University of Victoria

9:55-10:05 (43)

Actors' Memory for Their Parts. WILLIAM L. OLIVER & K. ANDERS ERICSSON, *University of Colorado* (read by K. A. Ericsson)—Since actors memorize prodigious amounts of text, they should develop skilled memory techniques. We studied the memory of actors for roles from their then current and past repertoires. Performance on retrieval tasks (for example, one task involved accessing phrases containing single-word cues) was analyzed to test hypotheses about how actors represent their parts in memory. We will discuss problems in extending current theories to explain storage, retrieval, and forgetting of exceptionally large memory structures.

10:10-10:30 (44)

Semantic Memory in Permastore—50 Years of Memory for Spanish. HARRY P. BAHRICK, *Ohio State University*—Retention of Spanish learned in school was tested over 50 years. Memory declines exponentially for the first 5 years. It then stabilizes for 3 decades, followed by a decline. Much information remains retrievable for 50 years without being rehearsed. The life-span frequency-distribution of learned responses is dichotomous; one portion has life spans of 0-6 years, the other of 25 years or more. This suggests a discrete transition to a permastore state during training.

10:35-10:45 (45)

Estimating the Functional Information Capacity of Human Long-Term Memory. T. K. LANDAUER, *Bell Laboratories, Murray Hill*—An attempt was made to determine the total information, in bits, that an adult has stored and can potentially retrieve under ordinary circumstances. Three approaches were taken: estimating learning rates and cumulating; assuming a fixed relation between capacity, input, and loss; and considering the content of a person's knowledge. Several sources of data were used, for which some new models were devised to extract information measures. Capacity estimates ranged around 10^9 to 10^{11} bits.

10:50-11:10 (46)

Attention in Memory. RONALD A. KINCHLA, *Princeton University*—A series of experiments will be reported which indicate how attentional processes in memory can be studied in much the same manner as they are in perception.

11:15-11:35 (47)

Retrieval Strategies in Human Memory. SCOTT D. GRONLUND & RICHARD M. SHIFFRIN, *Indiana University* (read by Richard M. Shiffrin)—Several experiments were carried out to explore the uses of retrieval strategies in human memory. Three strategies (e.g., alphabetical, physical size, and free recall) were utilized in episodic and semantic recall tasks, with differing results in the two tasks. We discuss models of retrieval to handle the findings, and present a computer simulation used to derive quantitative predictions.

11:40-12:00 (48)

Retrieval as a Recognition-Memory Modifier: A Distribution-Based Theory. HAROLD GELFAND, *St. Bonaventure University*, ROBERT A. BJORK, & KAREN E. KOVACS, *University of California, Los Angeles* (read by R. A. Bjork)—After the initial recall or nonrecall of a list of words, an unexpected test of yes-no recognition was administered either 15 min or 48 h later. Across input serial position, a markedly different pattern of effects of initial retrieval on subsequent recognition was obtained as a function of recognition-test delay. Those differential effects are of exactly the form predicted by a theory of test effects based on the distribution of item accessibility.

8:00-8:20 (49)

Separating Mechanisms of Local and Global Contextual Effects in Reading. MIRIAM W. SCHUSTACK, *Harvard University*, SUSAN F. EHRLICH, *Wang Laboratories*, KEITH RAYNER, *University of Massachusetts*—We investigated the influences of local and global contextual constraint by using two different reading tasks. In one experiment, subjects generated candidate words in highly constrained positions within paragraphs. Probability of generating the expected target word (and generation RT) were recorded. In the other experiment, subjects' eye movements were monitored while they read the complete original paragraphs. The results of the two tasks in combination illuminate the multiple mechanisms by which context influences normal reading.

8:25-8:40 (50)

Short-Term Memory, Phonological Coding, and Reading Disabilities. LINDA S. SIEGEL, *McMaster University*—Reading-disabled and normally achieving children were administered short-term memory tasks involving the recall of sets of rhyming and nonrhyming letters under 3- and 6-sec presentation rates. Children with reading disabilities demonstrated significantly poorer performance on the rhyming sets at the 6-sec but not the 3-sec condition. Therefore, the children with reading disabilities appear to be capable of using phonological coding in short-term memory, but access to this coding is slower for them than it is in normally achieving children.

8:45-8:55 (51)

Component Skill Profiles of Reading Ability: Variations, Trade-offs, and Compensations. TRACY L. BROWN, LINDA G. VAVRUS, *Michigan State University*, & THOMAS H. CARR, *IBM Watson Research Center* (read by T. H. Carr)—Readers aged 8-15 years performed a battery of tasks intended to tap component skills ranging from visual word recognition, phonological recoding, and phonemic awareness to context use and comprehension. Cluster analyses produced a number of different skill profiles, which are discussed in terms of tradeoffs and compensations among components. Emphasis is given to the complexity of the reading system and its interindividual variations.

9:00-9:20 (52)

The Effects of Perceptual Condition on Proofreading for Misspellings. ALICE F. HEALY, VICKI J. VOLBRECHT, & TERRY R. NYE, *University of Colorado*—Subjects proofread photocopies of typewritten text, text presented on a CRT screen, ditto copies that varied in legibility, and text with extraneous noise characters superimposed on some letters. Subjects adopted a hierarchical feature test giving first priority to resolving letter envelope and second priority to discriminating other letter features. When letter envelope was maintained, the subjects used a sophisticated guessing decision rule tolerating misspellings involving missing letter features or any added features that resembled the noise.

9:25-9:40 (53)

Effects of Text Display Complexity on Reading Comprehension. HSUAN-CHIH CHEN, *The Chinese University of Hong Kong*, ALICE F. HEALY, & LYLE E. BOURNE, JR., *University of Colorado*—In two experiments, text segments were presented successively to a single location on a CRT screen (RSVP). Either one or three segments were presented in each display, and in the three-segment displays either one or all segments provided new information. Lower comprehension in the three-segment displays indicates that executing control activities and attending to parafoveal information interfere with reading. These results suggest ways in which RSVP can be useful for improving reading skill.

9:45-9:55 (54)

Parafoveal Information in Reading: Effects of Frequency and Initial Letter Sequence. ALBRECHT WERNER INHOFF, SUSAN D. LIMA, & KEITH RAYNER, *University of Massachusetts, Amherst* (read by K. Rayner)—Eye-movement experiments compared reading performance when parafoveal information was available with performance when no information was available beyond the fixated word. Parafoveal information was facilitatory. Word frequency exerted a strong effect on fixation durations, such that parafoveal preview of a high-frequency word led to more facilitation than did preview of a low-frequency word. However, the amount of facilitation due to parafoveal information was unaffected by the degree of constraint imposed by a word's initial letters.

10:00-10:15 (55)

How Does Familiarity with Multicharacter Letter Strings Affect Visual Search? JOHN H. FLOWERS & DORIS J. CARSON, *University of Nebraska, Lincoln*—Do familiar letter strings (words) "pop out" of a background of unfamiliar letter strings in visual search? Despite a strong facilitation effect for familiar word targets as opposed to unfamiliar nonwords (e.g., SEX vs. SFX), the familiarity of a target primarily affects search speed (slope) but not the serial self-terminating search strategy.

Chaired by John Flowers, University of Nebraska

10:30-10:45 (56)

Rereading Inverted Sentences: Memory for Patterns or Pattern Analyzing Operations? MICHAEL E. J. MASSON & LARRY FREEDMAN, *University of Victoria*—Subjects read typographically transformed (upside-down) sentences faster than meaningless word strings. One week later, the subjects reread the sentences and word strings, which were reordered to form valid sentences. The two sentence types yielded about equal savings over new sentences, indicating that conceptually driven pattern analyzing operations used during initial reading were not remembered during rereading. The results suggest that memory for the visual patterns of individual words produced reading time savings.

10:50-11:05 (57)

Reading Desrever Text. EILEEN KOWLER, STANLEY ANTON, & LILLIAN LOPEZ, *Rutgers University* (sponsored by Robert M. Steinman)—Subjects accurately read text in which the order of (1) letters within a word or (2) words within a line, or (3) both, was normal or reversed. Reading time did not depend on the direction in which a line was scanned or on whether the order of letters within a word was the same as the order of words within a line. These results suggest use of flexible oculomotor patterns unconstrained by the visual or cognitive processes controlling decisions about the text.

11:10-11:30 (58)

Order-Relevant and Order-Irrelevant Decision Rules in Multi-letter Matching. ROBERT W. PROCTOR, *Auburn University*, & ALICE F. HEALY, *University of Colorado*—The role of order information in multi-letter matching was examined by including rearranged pairs in which the two strings contain the same letters, but in different orders. Responses were examined for order-relevant and order-irrelevant decision rules, with the two strings presented either successively or simultaneously. Similar results were obtained across both decision rules and methods of presentation, suggesting that effects of rearrangement have a common basis in the comparison process.

11:35-11:55 (59)

What Are the Spelling Rules of English? LYN HABER & RALPH NORMAN HABER, *University of Illinois, Chicago*—Several procedures in vogue claim to follow the spelling rules, yet allow the generation of nonword sequences of letters (that then appear in experiments). These include orthographic regularities, bigram frequencies, and approximations to English. All are flawed in that they generate illegal sequences that are nonproductive. The proper procedure begins with a syllable, organized around

a nuclear vowel. The analysis is presented in detail, and from it all of the spelling rules of English are described.

12:00-12:15 (60)

Effects of Recent Prior Experience on Spelling. LARRY L. JACOBY, *McMaster University*—The influence of reading a word on its later spelling was investigated. Spelling was found to be speeded or slowed dependent upon whether or not the word had been correctly spelled when previously read. These effects were observed even though recognition memory for the previously read words was very poor. Like word perception, spelling reflects memory for a recent prior experience rather than being totally reliant on knowledge of rules or some other abstract representation that is not easily modified.

ATTENTION I

Sauterne, Thursday morning, 8:00-12:40

Chaired by Colin MacLeod, Scarborough College

8:00-8:15 (61)

Models of Visual Scanning Processes. JOHN W. SENDERS, *University of Toronto/University of Maine*—Visual scanning of displays is a common modern task. I present some plausible models of how people distribute visual attention and some data from laboratory experiments. The principal determinant of the frequency with which a display is looked at is the bandwidth of the signal feeding the display. Conditional sampling models have high face validity but do not predict the behavior of well-trained subjects. Whether or not this finding can be generalized is an important question.

8:20-8:35 (62)

The Role of Intrinsic Motivation in a Cognitive Vigilance Task. WILLIAM N. DEMBER, JOEL WARM, JOHN BOWERS, & THOMAS LANZETTA, *University of Cincinnati*—To test the hypothesis that the improved performance over time found on a complex cognitive vigilance task is attributable to intrinsic motivation, subjects were either paid or not paid for participating in either a complex or a simple task. Payment should reduce intrinsic motivation. As predicted, paid subjects' performance declined over time on watch on the complex task, whereas unpaid subjects' did not. The usual vigilance decrement occurred on the simple task, regardless of payment.

8:40-8:50 (63)

Perceptual and Conceptual Masking of Pictures. GEOFFREY R. LOFTUS & MICHAEL GINN, *University of Washington*—For 50 msec we showed pictures that were followed by a mask that varied in terms of (1) luminance and (2) attentional demand. Mask effectiveness was determined by memory performance for the pictures. When mask followed picture immediately, luminance determined mask effectiveness, whereas attentional demands had no effect. When mask was delayed by 300 msec, attentional demands determined mask effectiveness, whereas luminance had no effect. We conclude that immediate masking is qualitatively different from delayed masking.

8:55-9:10 (64)

Backward Recognition Masking of Duration and Pitch. HOWARD J. KALLMAN & SHIRLEY C. BROWN, *SUNY-Albany* (sponsored by Robert A. Rosellini)—The effect of a white-noise backward mask on resolution of the (1) duration and (2) pitch of a sinusoidal test tone was assessed in separate experiments. Although substantial masking was found in the duration experiment, pitch masking was minimal. These results are problematic to the view that the mask replaces the test tone in preperceptual storage; if such were the case, substantial masking should have occurred in both cases. Alternative explanations for backward masking will be discussed.

9:15-9:25 (65)

A General Theory of Attention for Detection Tasks. MARILYN L. SHAW, *Bell Laboratories & Rutgers University*, & J. J. CHANG, *Bell Laboratories*—Does division of attention affect en-

coding processes, decision processes, or both? We shall criticize alternative approaches and present a theory of attention for answering this question that embodies methods for doing so. We report results from experiments that explore the role of attention in visual form detection and discuss the relation of our findings to the distinction of automatic and controlled processes.

9:30-9:50 (66)

Attending to Frequency-Specific Channels. ROBERT M. MULLIGAN, *Rutgers University*, & MARILYN L. SHAW, *Rutgers University & Bell Labs*—The consequences of increasing the number of distinct "frequency channels" among which attention is shared was examined in two experiments with pure-tone stimuli. Our analysis indicates that the drop in performance observed with increasing tone set size is attributable entirely to errors in the decision process, rather than to capacity limitations in the encoding process. An alternative explanation based on a narrow-band, rapid, frequency-scanning mechanism (attention switching) is also considered.

9:55-10:10 (67)

Shifting Attention from Periphery to Fovea Varies With Distance. JONATHAN VAUGHN, *Hamilton College*—Recent demonstrations of moving attention to the peripheral visual field suggest that the rate of attention shift back towards the fovea might be measurable. A peripheral cue drew attention 3, 6, or 9 deg parafoveally. RT to foveal targets when attention was 9 deg parafoveal was about 20 msec longer than when it was only 3 deg away. This is consistent with a rate of shift of attention towards fixation of about 3 msec/deg.

Chaired by Geoffrey Loftus, University of Washington

10:25-10:40 (68)

Effects of Spatial Attention and Flash Luminance on Visual Latency. HOWARD C. HUGHES, *Dartmouth College*—The effects of flash intensity and positional expectancies were investigated in a simple visual reaction time task. Positional expectancies were generated using a precue (left- or right-pointing arrow). The results showed that intensity variation had similar (additive) effects on RTs to flashes in both expected and unexpected locations, while the a priori validity of the precue had interactive effects. The results indicate that spatial attention operates after intensity-dependent processing within the visual system.

10:45-10:55 (69)

Dilation and Contraction of the Functional Fovea. JAMES F. JUOLA, THOMAS COCKLIN, *University of Kansas*, & TIMOTHY CROUCH, *University of Colorado*—Subjects were given cues for probable locations of target letters inside or outside a circle of 1 deg radius and asked to focus their attention according to cue. Correct cues, miscues, and a no-cue control condition were used in an attempt to assess respective benefits and costs in the cue conditions. Analysis of mean response times indicated a significant cost for miscues and a nonsignificant benefit for correct cues relative to the control condition.

11:00-11:15 (70)

Distinguishing Conscious From Unconscious Processes. JIM CHEESMAN & PHILIP M. MERIKLE, *University of Waterloo* (read by P. M. Merikle)—Awareness, as indicated by discriminated verbal reports, was varied for the color words in a Stroop task. Interference and facilitation occurred at all levels of awareness. However, changes in strategy, induced by variations in the relative frequency of interference and facilitation trials, occurred only for a high level of awareness. These results suggest that different levels of awareness lead to qualitatively different perceptual states that reflect conscious and unconscious processes.

11:20-11:35 (71)

Stroop Effects With Transformed Words: Insufficiency of "Horse Race" Models. KEVIN N. DUNBAR & COLIN M. MacLEOD, *University of Toronto* (read by C. M. MacLeod)—Four experiments investigated Stroop interference using geometrically transformed words. Over experiments, reading was

made increasingly difficult via manipulation of item and orientation uncertainty. Time to read color words increased dramatically. Yet, even when base rates were considerably slower for reading transformed words than for naming ink colors, Stroop interference persisted. Furthermore, interference due to transformed words was virtually identical to that caused by normal words. Simple "horse race" models that explain interference in terms of vocal response competition cannot accommodate these results.

11:40-11:50 (72)

Skilled Processing of Number in a Semialphabetic Script. JYOTSNA VAID, *University of California, San Diego* (sponsored by Lauren J. Harris)—When native readers of English judge which of two simultaneously displayed numbers is numerically the larger, their responses are influenced by variations in the numbers' physical size. Interference occurs in the numeral, but not in the word, mode of presentation (Besner & Coltheart, 1979). Similar findings characterize Spanish-English but not Chinese-English bilinguals, who experience interference in both modes (Tzeng & Wang, 1983). The present study compared Hindi-English bilinguals, as Hindi is neither ideographic nor fully alphabetic.

11:55-12:15 (73)

Combination Rule for Redundant Information in Divided Attention. G. ROBERT GRICE, LYN CANHAM, & JOSEPH M. BOROUGHES, *University of New Mexico*—Strength of redundant information in RT distributions is a linear function of the sum of the separate sources. This relation has been obtained in five experiments.

12:20-12:35 (74)

Noise Interacts. MARY ANNE BAKER, *Indiana University S.E.*, DENNIS H. HOLDING, & MICHEL LOEB, *University of Louisville*—Earlier data that we have presented indicate that there are aftereffects of noise, similar to and perhaps indicative of fatigue, which vary as a function of age, sex, time of day, and task. The present data update these findings.

SOCIAL-PERSONALITY PROCESSES San Antonio, Thursday afternoon, 1:00-2:20

Chaired by Glenn Meyer, Lewis & Clark College

1:00-1:15 (75)

Goal Setting and Performance Among Friends and Strangers. ROBERT L. MONTGOMERY, *University of Missouri-Rolla*—After an experimenter had anchored groups on one of three goal ranges varying in difficulty level, goal setting, and performance, behaviors were studied in groups of friends or strangers over eight trials in an intergroup skittles competition situation. Strangers set higher goals and performed better than did friends, and support was found for Locke's (1968) hypothesis that difficult, though reasonable, goal range caused higher goals and performance than did easy or extremely difficult ones.

1:20-1:30 (76)

A Field Experimental Study of Telecommunication Behavior. ALEXANDER J. WEARING, *University of Melbourne*, ARTHUR D. SHULMAN, *Washington University*, JOHN CRAIK, *Telecom Australia*, & MAUREEN WILLIAMSON, *University of Melbourne*—A field experiment is described in which the relationships over time between attitude towards, and evaluation and use of, new telecommunication facilities and the effect of these facilities on psychological well-being are examined. Results indicate that these relationships vary over time as a function of facility and experimental condition. Policy implications are summarized.

1:35-1:50 (77)

Prison Deaths: Ethnic Differences. GARVIN McCAIN, VERNE COX, PAUL PAULUS, & CALVIN GARBIN, *University of Texas, Arlington*—Data on about 800 deaths in a period of 15 years were obtained from a large state system. Age, cause of death, and ethnic identification were available. Death rates varied greatly among non-Hispanic whites, blacks, and Hispanics. Whites

had the highest rate, followed by blacks and Hispanics. This differs greatly from "free world" data. The data are discussed in terms of possible psychological variables.

1:55-2:15 (78)

Systematic Changes in Bank-Teller Courtesy Behavior Through Variations in Expectations, Feedback, and Social Reinforcement. CHARLES R. CROWELL, D. CHRIS ANDERSON, DAWN ABLE, & JOSEPH SERGIO, *University of Notre Dame*—Controlled observations of teller transactions eventuated in 11 behavioral categories that defined courtesy. Measurement was accommodated by microphones located at each booth and a taping system. A reliable scoring system was evolved in which points could be earned for different behaviors. Baseline determinations showed an average of 61 points. Exposition of the measurement and scoring system increased courtesy to 74 points. Individual charting and feedback increased courtesy to 83, and manager praise incremented the average to 94 points. Removal of feedback returned it to 83 points, and praise again added 13 more points.

INDIVIDUAL DIFFERENCES

San Antonio, Thursday afternoon, 2:30-5:25

Chaired by Adam Drewnowski, *University of Michigan*

2:30-2:40 (79)

Individual Differences in Mental Rotation of Objects. NICHOLAS F. SKINNER, *King's College, University of Western Ontario*—In contrast to previous research, after scrutinizing the spatial orientations of a three-dimensional test object and a pair of simultaneously presented versions of that test object, rotated equally or unequally through two and three dimensions, respectively, subjects more frequently chose the two-dimensional rotation as being closer to the position of the test object. Males made significantly more correct choices, as did participants with high scores on emotional stability and extraversion.

2:45-3:05 (80)

Judgment Accuracy Following Three-Dimensional Mental Rotation. THOMAS McDONALD, CHRISTOPHER THIEL, & JAMES W. PELLEGRINO, *University of California, Santa Barbara* (read by J. E. Pellegrino)—Adult subjects were presented Metzler and Shepard block stimuli and asked to mentally rotate them 0-180 deg. The "mental representation" was then compared with a new stimulus systematically deviating from the appropriate representation. Detection of deviation was a systematic function of degree of deviation and amount of rotation. Results will be discussed in terms of theories of spatial processing and individual differences in spatial ability.

3:10-3:30 (81)

Imagery Components of Spatial Ability. STEVEN E. POLTROCK, *Bell Laboratories*, & POLLY BROWN, *University of Denver* (sponsored by James C. Johnston)—To examine the role of imagery in spatial ability, six imagery tests and eight spatial tests were administered to 79 adults. Latencies in the imagery tests were interpreted as measures of efficiency of image generation, integration, addition, rotation, and scanning processes. Accuracy was interpreted as a measure of image quality. A structural equation model indicated that spatial ability can be largely decomposed into a linear combination of these cognitive components.

3:35-3:50 (82)

Validity of Cognitive Tests in Predicting Army Training. CLESSEN J. MARTIN, PAUL G. ROSSMEISSL, & HILDA WING, *U.S. Army Research Institute for the Behavioral & Social Sciences*—Several combinations of cognitive tests contained in the Armed Services Vocational Aptitude Battery were examined to determine their predictiveness of training success in 11 Army jobs. The results demonstrated that tests measuring general verbal and mathematical ability were nearly as effective in predicting training success in specialized courses as were tests of technical knowledge.

These results generalized to samples comprising different races and gender.

3:55-4:10 (83)

Psychometric Structure of the ACT and the CPI: Preliminary Report. HUGH MCGINLEY & RUTH VANVRANKEN, *University of Wyoming*—The development of psychometric instruments such as the ACT (American College Testing) has been in response to the real-world needs of the college academic community to select and advise students. Once these instruments have been implemented, there is a continuing need to study their psychometric properties and uses. This paper, based on the data from 125 college students, evaluates the psychometric structure of the ACT and reports on the structural relationship between the ACT and the CPI (California Personality Inventory).

4:15-4:25 (84)

The Application of Meta-Analytic Techniques in Estimating Selection/Classification Parameters. PAUL G. ROSSMEISSL & BRIAN M. STERN, *U.S. Army Research Institute* (sponsored by Hilda Wing)—The Armed Services Vocational Aptitude Battery (ASVAB) is a test battery used by the military services to make selection and classification decisions for enlisted personnel. Precise estimation of criterion-related validity information, such as correlations and regression weights, can be accomplished through modern meta-analytic techniques (Hunter, Schmidt, & Jackson, 1982). These parameter estimates, coupled with new methods for determining the economic impact of selection, will permit more accurate determination of the economic value of selection and classification systems.

4:30-4:45 (85)

Pain Reactions in Dysmenorrheic and Pregnant Women. PAULA GOOLKASIAN, *University of North Carolina, Charlotte*, & BOBBY A. RIMER, *Charlotte Memorial Hospital & Medical Center*—Data from studies that measured reactions to radiant heat stimuli in dysmenorrheic and pregnant women will be presented. In the first study, ROC curve parameters were computed for each phase of the menstrual cycle. Nondysmenorrheic women varied cyclically in their ability to discriminate painful from nonpainful stimuli, while dysmenorrheic women responded consistently across menstrual phase. In the second study, pain reactions of pregnant women were measured during routine visits to the obstetrical clinic from the 5th month through to the postpartum visit.

4:50-5:00 (86)

Preliminary Investigation of the Relationship Between Self-Concept and Self-Recognition. NICHOLAS L. ROHRMAN, *Colby College*, & DONALD GALLO, *New York University*—Previous research has shown large individual differences in reactions to personal photographs, suggestive of some inaccuracies in self-image. Subjects were shown a set of photographs, including their own, and recognition thresholds were established. There is a strong negative correlation between self-recognition threshold and physical self-concept, as measured by the Tennessee Self-Concept Scale. There is also a strong negative correlation between threshold and self-ratings of photographs. Interesting sex differences are also found.

5:05-5:20 (87)

Research Patterns of Nongraduate Psychology Departments. GLENN E. MEYER, SHELLY OSSANA, *Lewis and Clark College*, & KATHY HILTERBRAND, *University of Southern California*—Faculty of 100 liberal arts colleges without graduate programs were asked to supply a vita or publication list. Three hundred fifty of 640 faculty replied. Data for others were obtained from indices. Also determined were citation statistics. Comparisons were made across school, sex, age, specialty, and place of graduate training. Results suggest publication differences based on specialty and school but not sex or age. The proportions of each sex by specialty were significantly different.

AVERSIVE LEARNING**Chenin, Thursday afternoon, 1:00-3:20***Chaired by Paula Goolkasian, University of North Carolina***1:00-1:20 (88)**

The Development of Extreme Resistance to Extinction of Human Avoidance Behavior: A Test of the Serial CS Hypotheses. DONALD J. LEVIS, *State University of New York at Binghamton*, & PAUL MALLOY, *VA Center, Jackson, & University of Mississippi*—The weight of laboratory evidence suggests that conditioned fear and avoidance behavior is short-lived when the CS is presented in the absence of the UCS. This finding is problematic for behavioral theories attempting to explain human symptom maintenance via an avoidance model. Stampfl, addressing this paradox, proposed an avoidance model incorporating serial CSs which, when tested, markedly increased resistance to extinction of infrahuman avoidance responding. This paper described the first successful test of this model using human subjects. Support was obtained from behavioral, autonomic, and self-report indices.

1:25-1:40 (89)

Learned Helplessness, Response-Choice Escape, and Selective Attention in Rats. THOMAS MINOR, *University of Colorado* (sponsored by Steven F. Maier)—Response-choice escape learning was examined under a variety of test conditions in rats exposed to escapable, inescapable, or no shock 24 h earlier. Deficits in choice performance were observed in inescapably shocked rats only when differential, task-irrelevant cues were present during testing. These data will be discussed in terms of a modification of attentional processes by inescapable shock.

1:45-2:00 (90)

Influence of Shock Controllability/Uncontrollability on Maternal Behavior in Rats. JON L. WILLIAMS, *Kenyon College*—Eight-day postpartum mother rats given yoked-inescapable shock, in contrast to dams receiving wheel-turn escape training or restraint without shock, later approached the nest area more slowly, spent less time on the nest, and licked their pups less frequently. These findings will be discussed with regard to the various interpretations of learned helplessness and previously reported changes in other species-typical behaviors resulting from uncontrollable stress.

2:05-2:25 (91)

Effects of Pre- and Posttreatment Short Fixed-Duration Shocks on Longer, Fixed-Duration Shock Treatments. D. CHRIS ANDERSON & CHARLES R. CROWELL, *University of Notre Dame*—After water-lick training, three of five groups received 90 ¼-sec shocks prior (Group 1), after (Group 2), or in the absence of (Group 3) 90 10-sec shock treatments. Group 4 received only the 90 shock treatments, and Group 5 was untreated. Following retraining to water lick, half of each group was tested while drinking with non-lick-contingent and the other half with lick-contingent shocks. All shock-treated groups except Group 1 evinced markedly greater lick suppression than did nontreated Groups 4 and 5.

2:30-2:45 (92)

The Associative Basis of Conditioned Analgesia. ROBERT T. ROSS & ALAN RANDICH, *University of Iowa*—A visual stimulus repeatedly paired with a shock unconditioned stimulus acquired the capacity to evoke both conditioned freezing behavior and an analgesic response, as measured by the hot-plate assay of pain sensitivity. Analgesia evoked by the visual stimulus was not reversible by prior naloxone administration. Conditioned analgesia was not established in a variety of Pavlovian control procedures, including explicitly unpaired. The data support associative learning accounts of acquired analgesia.

2:50-3:00 (93)

Analgesia in Response to the Odor of a Stressed Conspecific. MICHAEL S. FANSELOW *Dartmouth College*—Analgesia was assessed by observing rats for formula-induced recuperative behavior in either a clean chamber or one that previously had held a stressed conspecific. Latency to recuperate was elevated in the

rats tested in the latter chamber. This analgesia was attributed to odors released by the stressed conspecific. No analgesia was detected in rats tested in chambers that contained either a novel neutral odor (citronella) or the odor of an unstressed conspecific.

3:05-3:15 (94)

Age and Ulcer Induction in Brattleboro and Long-Evans Rats. CYRILLA H. WIDEMAN & HELEN M. MURPHY, *John Carroll University* (read by H. M. Murphy)—Susceptibility to activity-stress ulcers was studied in 6- and 18-week-old Brattleboro and Long-Evans rats. The younger animals developed significantly more ulcers in the glandular portion of the stomach. In older subjects, some ulcers were induced in the glandular portion of the stomach, but gastric pathology was significantly greater in the rumenal portion of the stomach. In all instances, Brattleboro animals had significantly more lesions than the Long-Evans animals.

ONTOGENY OF ANIMAL BEHAVIOR**Chenin, Thursday afternoon, 3:30-5:30***Chaired by Jon Williams, Kenyon College***3:30-3:50 (95)**

Early Experiences and Brain Laterality in Rats. VICTOR H. DENENBERG, *University of Connecticut*—I will review research showing that (1) the standard laboratory rat is lateralized for some affective and spatial functions, (2) early experiences will enhance laterality differences already present and can induce laterality where none previously existed, and (3) prenatal testosterone affects and modifies postnatal laterality in the newborn rat.

3:55-4:10 (96)

Ontogeny of Defensive Classically Conditioned, Respiratory, and Vocal Responses in Cats. STEFAN SOLTYSIK, T. NICHOLAS, & W. J. WILSON, *UCLA Mental Retardation Research Center*—Footshock UCS (4 mA, 60 Hz, 300 msec) elicited changes in respiratory rate and amplitude in cats at all studied ages: 1, 4, 8, and 12 weeks, 6 months, and adult. Vocal UCRs were absent in 1- and 4-week-old subjects, but were found at older ages. Respiratory CRs were present at all ages: typically, tachypnea and reduction of amplitude occurred. Vocal CRs, absent at younger ages, were common in the 12-week and older subjects.

4:15-4:30 (97)

Critical Period of Socialization for Cats. EILEEN B. KARSH, *Temple University*—Kittens handled from 3 weeks of age showed significantly greater social responses to people than did kittens handled from 7 weeks of age and kittens not handled at all for 14 weeks. Differences between kittens handled at 1 week and those handled from 3 weeks of age were not reliable. Late-handled kittens (7-14 weeks) were not much more socialized than the non-handled controls. This indicates that the critical period is probably from 2 to 4 weeks of age.

4:35-4:55 (98)

Effects of Control on Social and Emotional Development in Monkeys. SUSAN MINEKA, *University of Wisconsin*, MEGAN GUNNAR, *University of Minnesota*, & MARIBETH CHAMPOUX, *University of Wisconsin*—Two master groups of infant monkeys were reared in controllable environments, with control over food, water, and treats. Two yoked groups were reared in uncontrollable environments, and one no-stimulation group was reared in a standard environment. At 7-9 months of age, master monkeys showed less fear of a mechanical monster, more eagerness to enter a novel playroom, and more exploratory behavior in the playroom than both the yoked and the no-stimulation groups.

5:00-5:10 (99)

Microanalysis of Licking Responses in Young and Aged Squirrel Monkeys. JAMES E. KING, SIGMUND HSIAO, & MICHAEL LEEMING, *University of Arizona*—A detailed behavioral analysis of sucrose-solution drinking at a sipper tube by young and aged

squirrel monkeys was performed. Old monkeys displayed significantly more variability in "tongue on" times than did young monkeys, but the two groups did not differ in licking rate or in measures of total consummatory activity or licking efficiency. Increased consumption of higher molarity sucrose solutions was accomplished by increased length and number of lick bursts.

5:15-5:25 (100)

REM Deprivation and Age Affect Nonspecific Aggression in Rats. ROBERT A. HICKS, STEVEN GOMEZ, MAXINE KURODA, & JOSEPH REYES, *San Jose State University*—To measure the effects of REM sleep deprivation (RD) on nonspecific aggression, groups of young juvenile and adult rats were either treated as controls or were REM deprived for a 4-day period. When these animals were subsequently tested in a standard food-competition apparatus against a cotton-ball barrier, we found that RD significantly increased nonspecific aggression only in the young animals. Furthermore, the salience of the RD manipulation declined as a function of age.

COGNITION

Cuyamaca, Thursday afternoon, 1:00-3:05

Chaired by Gary Olson, *University of Michigan*

1:00-1:15 (101)

Cognitive Spatial Processing and the Regulation of Posture. BETH KERR, SANDRA M. CONDON, & LAURA A. McDONALD, *University of Washington*—Blindfolded subjects performed the Brooks (1967) spatial and nonspatial memory tasks both alone and while required to maintain a difficult standing balance position. The standing balance task affected spatial memory performance but did not affect the control nonspatial task. Balance performance during spatial and nonspatial memory conditions did not differ. Cognitive spatial processing may rely on neural mechanisms that are also used for the regulation of standing posture.

1:20-1:40 (102)

Mental Rotation: Effects of Body Orientation and Axis Orientation. MICHAEL KUBOVY & NELSON TOTH, *Rutgers—The State University*—Three variables characterize a rigid rotation of an elongated object (which seems to have an axis of symmetry, but is asymmetric): the orientation of the axis of rotation, the orientation of the body axis with respect to the former, and the extent of the rotation. We will tell you (1) whether subjects construct an axis of rotation before performing a mental rotation, and (2) whether the relation between the two axes affects the speed of rotation.

1:45-2:00 (103)

Perspective Information in Visualized Scenes. STEVEN PINKER, *Massachusetts Institute of Technology*—Subjects viewed objects suspended in space, then marked on a surface in front of them the projected positions of the objects visualized in their original location and in a location displaced in depth. The marks were fit onto scaled perspective and parallel projections of the scene, which suggested that subjects' images preserved information about the perspective projection of the scene as originally viewed, but not as it would appear from novel viewing distances.

2:05-2:20 (104)

Transforming Our Knowledge of Geometric Analogies. BARBARA TVERSKY & LAURA NOVICK, *Stanford University*—We have found that, in solving geometric analogies, people apply mental transformations such as move, rotate, and enlarge in a consistent, transitive order. Neither the order in which the transformations are identified in the first half of the analogy nor the relative difficulty of performing the transformations singly accounted for the application order. We speculate on the role of working memory and the role of perceptual strategies in determining transformation orders.

2:25-2:40 (105)

Encoding of Orientation from Well-Ordered Slide Sequences. JAMES C. BARTLETT & THERESE DeNEAL WALLACE, *University of Texas, Dallas*—We examined orientation encoding with photographic sequences depicting walks through naturalistic environments. With a well-ordered sequence and young-adult subjects, we found reliable discrimination between "old" and "new-but-belonging" pictures *only* if pictures were oriented correctly at test. This suggested that these subjects encoded "orientation invariants" that impaired discrimination when pictures were reversed. This pattern was absent with a nonordered sequence and with elderly adults regardless of sequence.

2:45-3:00 (106)

Conceptualization of Cardiovascular Variables by Veterinary Students. RONALD H. HOPKINS, KENNETH B. CAMPBELL, & NILS PETERSON, *Washington State University*—Multi-dimensional scaling was used to study the cognitive effects of playing a computer game intended to improve student appreciation of cardiovascular dynamics. Veterinary students completed the necessary ratings, before and/or after several sessions with the game, for the scaling of 17 major variables of the cardiovascular system. Students initially conceptualized the variables along static, anatomical dimensions. Exposure to the game seemed to modify the students' conceptualizations.

JUDGMENT

Cuyamaca, Thursday afternoon, 3:15-5:45

Chaired by Ronald Hopkins, *Washington State University*

3:15-3:30 (107)

Judgment of Cause-Effect Relations by College Students. E. A. WASSERMAN, D. J. NEUNABER, D. L. CHATLOSH, & M. W. O'HARA, *University of Iowa*—Early research into the perception of cause-effect relations cast human competence in a dim light. More recent experimentation has raised the assessment of human causal perception. Using a free-operant procedure, we have found that college students' judgments of cause-effect relations can be virtually isomorphic with a measure of response-outcome contingency—the delta coefficient. Causal judgments were strongly related to operant response rates when reinforcers were made available on numerous probabilistic schedules.

3:35-3:50 (108)

The Influence of Information Types on Judgments of Predictability. SYLVIA D. KUZMAK, *Learning Research and Development Center, University of Pittsburgh* (sponsored by Rochel Gelman)—What are the determinants of how predictable a phenomenon is considered to be? Three types of information which may influence judgments of predictability are differentiated: mechanism, outcome, and success information. In two experiments, the relative influence of mechanism and success information on adults' judgments of predictability was investigated. Results indicated that mechanism information is not the only, or even the primary, determinant of adults' judgments of predictability. Success information had a strong influence on judgments.

3:55-4:10 (109)

Level of Processing Influences the Coding of Frequency. JOHN JONIDES, *University of Michigan* & MOSHE NAVEH-BENJAMIN, *Ben-Gurion University of the Negev*—Several researchers have claimed that the encoding of information about frequency of occurrence is automatic. One sense in which automaticity has been defined is that frequency coding should be independent of the strategy that subjects employ during learning. In two experiments, we show that level of processing *can* influence the coding of frequency as revealed by later absolute frequency judgments.

4:15-4:25 (110)

Age Differences in Frequency Judgment: Reality Monitoring and Self-Generation. LINDA R. WARREN & JANE

CROCKARD, *University of Alabama in Birmingham*—Three groups (college, young adults, elderly) judged the frequency of self-generated or read items. In Experiment 1, self-generated and read items were different words; in Experiment 2, they were the same words. In Experiment 1, a positive effect of self-generation occurred in the young groups, but not in the elderly group. In Experiment 2, a positive effect of self-generation occurred in all groups, but the elderly group was more affected by the interfering frequency.

4:30-4:45 (111)

Time Judgments and the Repetition Effect in Perceptual Identification. DAWN WITHERSPOON & LORRAINE G. ALLAN, *McMaster University* (read by L. G. Allan)—Identification of briefly presented words has been shown to improve after a single prior presentation. Although exposure duration has been constant, subjects report that some words appear longer than others. We varied exposure duration and obtained duration judgments in a perceptual identification task. Duration judgments depend upon prior presentation and correct identification, whereas duration discrimination is relatively independent of these variables. The theoretical implications for perceptual identification and time perception will be discussed.

4:50-5:00 (112)

Irrelevant Dimensions in Comparative Judgments. EDWARD J. SHOEN & GERALD I. DEWEY, *University of Illinois*—Two experiments examined the effects of irrelevant dimensions on judgments of symbolic magnitude. In both studies, subjects selected the larger of two items more readily when the larger item was also fiercer than the smaller item. Many models of linear orders have difficulty with this result.

5:05-5:15 (113)

Comparative Distance Judgments in Perceptual and Memorial Tasks. STEPHEN C. HIRTLE, *SUNY at Albany*, & JOHN JONIDES, *University of Michigan*—A series of experiments measuring reaction time on a comparative distance task is reported. The experiments vary on perceptual and memorial requirements of the subject. The results for the perceptual tasks are best predicted by a curvilinear relationship between judgment difficulty and judgment time, whereas the results for the memory task are best predicted by a linear relationship. However, performance variability suggests that this difference may be attributable to quantitative differences rather than to qualitative differences.

5:20-5:40 (114)

Comparing Perceptual Magnitudes: Difficulty and Semantic-Congruity Effects. WILLIAM M. PETRUSIC, *Carleton University*—Semantic-congruity effects are shown to occur in two experiments requiring perceptual comparisons with confusable stimulus pairs. In an experiment requiring comparisons of visual extent, it is demonstrated that the magnitude of the effect is dependent on the speed/accuracy tradeoff adopted and the difficulty of the comparison. A second experiment, examining comparisons of heaviness, showed that although confidence of judgment and response time are both subject to semantic-congruity effects, accuracy is not.

MEMORY II

Laguna, Thursday afternoon, 1:00-5:30

Chaired by Susan Karp Manning, Hunter College

1:00-1:20 (115)

Retrieval Time and Interference at Short Time Intervals. DELOS D. WICKENS, *Colorado State University*, A. GRANT YOUNG, & BRUCIE WILLIFORD, *Louisiana State University*—Using the Wickens, Moody, and Dow (1940) adaptation of Sternberg's paradigm, RT was measured as a function of memory type (primary and secondary), set size (2 or 4), retention interval in SM (4, 8, 16, 32 sec), and interference. Memory sets were taxonomically homogeneous with category shifts every three trials.

Interference occurred only in SM, its magnitude being about the same for both set sizes. Retrieval time increased nonmonotonically with retention interval.

1:25-1:35 (116)

Relationship Between the Feeling of Knowing and Memory-Search Duration. THOMAS O. NELSON, *University of Washington*—Previous studies have produced conflicting results concerning the relationship between the feeling of knowing and the amount of time elapsing before an unsuccessful memory search is terminated (i.e., incorrect-recall latency). The present findings show that this relationship depends critically upon the type of retrieval failure: A positive relationship occurs when the retrieval failure is an omission error, but a null or negative relationship occurs when the retrieval failure is a commission error. Hence, the overall observed relationship depends upon the relative frequencies of omission errors and commission errors.

1:40-1:55 (117)

Recognition, Spelling, and the Memory/Awareness Distinction. ERIC EICH, *University of British Columbia*—The uncommon interpretation of a target homophone was biased by having subjects study it in the context of a related modifier cue (e.g., *taxi-FARE*). Five minutes or 5 days later, the subjects were tested for both recognition and spelling of the target homophones. Results revealed that (1) at either retention interval, the probability of uncommon spelling was higher for old (previously studied) than for new homophones, regardless of whether or not the old homophones were recognized as such, and (2) as the retention interval lengthened, both the size of the "spelling effect" and the accuracy of recognition diminished. Implications of these results for models of memory and awareness will be discussed.

2:00-2:15 (118)

Overloading the Initial-Letter Cue: Massed is Fast. MARCIA OZIER, *Dalhousie University*—Subjects were required to memorize five successive lists of instances according to initial letter, category, or free recall instructions under conditions of either massed (five successive lists in 1 h) or distributed (five lists, 1 week intervening between presentations). The results indicated that memorization of semantically encoded items took a different course over lists from that taken by memorization according to initial letters. The results are discussed in relation to other reported differences between alphabetic and semantic characteristics of the memory trace.

2:20-2:30 (119)

Target Set Size Effects in the Recognition Failure Paradigm. DAVID L. HORTON, WALTER VAN SUMMERS, *University of Maryland*, CHRISTOPHER D. HORTON, *Pennsylvania State University*, & JANI K. GABRIEL, *University of Maryland*—A series of experiments investigated the effects of target set size in the recognition failure paradigm. Set size refers to the number of associates or rhymes given to words in controlled association. The results indicated no effect of set size in recognition but did show set size effects in cued recall. The implications of these findings concerning predictions of recognition failure and the relations between recall and recognition are discussed.

2:35-2:50 (120)

Evidence Supporting an Attentional Account of the Spacing Effect. JAMES W. HALL, *Northwestern University*—With standard free recall instructions, spaced repetitions were superior to massed repetitions and prolonged exposures with fast and slow presentation rates when spacing was manipulated within lists. That superiority held only with the slow rate when spacing was manipulated between lists. Study instructions directing attention to massed repetitions eliminated the spacing effect. Apparently, both reallocation of nominal study time and attenuation of processing effort contribute to the usual superiority of spaced repetitions.

2:55-3:05 (121)

On the Genesis of Generic Memory. MICHAEL J. WATKINS & SHANTA P. KERKAR, *Rice University*—Recall of twice-presented items was found to exceed recall of either of two once-

presented items, whereas recall of the details of presentation was more accurate for once-presented items. Contrary to contemporary theorizing, recall of twice-presented items apparently results, at least in part, from a nonepisodic, generic memory.

Chaired by Delos Wickens, Colorado State University

3:20-3:35 (122)

Order Effects on Recall. ROBERT ADAMSON, *Florida Atlantic University*—We compare recall and clustering of terms that may be ordered in a category and terms that are categorical but not subject to order. Immediate free recall of such items shows greater recall and clustering scores for the ordered items. Also, although not ordered at input, items showed order (from unmarked to marked) at recall. The results are related to various aspects of list memory.

3:40-3:50 (123)

Serial-Position Judgments: Accuracy and Confidence. RICHARD A. BLOCK, LEO H. NICKOL, & JEANNE A. BROWN, *Montana State University*—Following presentation of a series of words, subjects judged the serial position of test words in the original series and indicated a 50% confidence interval for each judgment. Existing indexes of position-judgment accuracy have serious drawbacks. A new index of accuracy reveals a serial-position curve different from that reported previously by others. Confidence data show that subjects are overconfident in the accuracy of their position judgments.

3:55-4:15 (124)

Associative and Serial-Order Information: One or Two Memory Systems? BENNET MURDOCK & PATRICIA FRANKLIN, *University of Toronto*—Two versions of a distributed-memory model (Murdock, 1982, 1983) leave open the question of whether there are separate systems for associative and serial-order information or only one. To test, a standard Sternberg paradigm was embedded in a paired-associate probe recognition task, a serial-order probe recognition task, or both. The item-recognition serial-position curves were quite different in the two conditions. In general, the data were more consistent with the idea of separate memory systems than of one combined system.

4:20-4:30 (125)

A Window on the Suffix Effect. DIANE WILLIAMS, *VA Medical Center, Boston* (sponsored by Marlene Oscar-Berman)—When subjects listen to lists of words terminated by an extra-list item, such as "Recall," their recall performance is worse than it is for an unsuffixed list. This decrease, called the stimulus suffix effect (SSE), has been reported to be confined to auditory presentations of list and suffix. Research reported here demonstrates that the SSE can be produced with suffixed lists of printed words using a new technique. A modality-independent account of SSE is proposed.

4:35-4:50 (126)

When Do Visual Suffixes Act Auditory? SUSAN KARP MANNING, *Hunter College of the City University of New York*—Using auditory stimuli and spoken, lipread, graphic, and drawn suffixes, instructions to ignore or attend to (reproduce) the suffix were compared. In the ignore condition, only spoken and lipread suffixes led to suffix effects. Although not affecting spoken or graphic results, attentional instructions increased terminal effects of lipread, and preterminal effects of drawn, suffixes, thus questioning temporal presentation and sensory trace theories of the suffix effect, while supporting a modified levels-of-processing view.

4:55-5:10 (127)

Phonemic and Category Similarity Disrupt the Long-Term Modality Effect. ARTHUR GLENBERG, *University of Wisconsin, Madison*—When each TBR word is preceded and followed by distractor activity, recall from the last few serial positions is benefited by auditory presentation as opposed to visual presentation. Recently, Gregg and Gardiner demonstrated that, with some distractor tasks, this long-term modality effect is disrupted by phonemic similarity of the TBR words. Comparison of the disruption

caused by phonemic similarity to that caused by categorical similarity helps to evaluate alternative accounts of the long-term modality effect.

5:15-5:25 (128)

Serial Isolation and Response Production. LOUIS G. LIPPMAN, *Western Washington University*—Subjects were instructed either to anticipate or to avoid anticipating a perceptually isolated, or prelearned, item in a continuous series. In a third experiment, item distinctiveness, resulting from prelearning, was evaluated through the use of a reconstruction procedure. In addition to showing subjects' use of cues in a continuous series, the results also indicate that isolation effects may be contingent upon a task requirement for response production.

DISCOURSE PROCESSING

Palomar, Thursday afternoon, 1:00-5:40

Chaired by Hans Brunner, Honeywell Corporation

1:00-1:10 (129)

Abstractive Processes in Passage Length Effects. E. EUGENE SCHULTZ, JR., *University of North Carolina, Asheville*, & JAMES K. HARDY, *University of Florida* (sponsored by Marc Marschark)—Thirty-six learners performed a secondary task (detecting stimuli on a video display) while listening to critical story segments preceded by relevant, irrelevant, or no-background proactive segments. Learners then recalled information in critical segments. Response latencies to secondary stimuli were longest in the irrelevant background condition; recall was greatest in the no-background condition. Amount of recall correlated negatively with response latency. Results support an abstractive view of passage length effects.

1:15-1:30 (130)

"Cryptic" Crosswords, Mental Repunctuation, and Memory. ARTHUR I. SCHULMAN, *University of Virginia*—The solver of a "cryptic" crossword must abandon a lifetime's parsing habits in order to decipher its clues and determine their answers. Ironically, the expert who penetrates a clue's disguise may fail to see how it misleads the novice. Here I discuss the psycholinguistic demands such crosswords make upon solvers and describe the consequences for memory of avoiding the "deeper" processing that usually attends the parsing of text. Solution protocols from various experts are compared.

1:35-1:50 (131)

Memory for Story Schemas vs. Memory for Event Schemas. WILLIAM F. BREWER & ALI IRAN-NEJAD, *University of Illinois, Urbana-Champaign*—This paper distinguishes event schemas, narrative schemas, and story schemas and argues that all previous studies of story memory have confounded these types of schemas. Two experiments dealing with memory for story schemas are reported. One experiment shows the impact of reader suspense (as distinct from character's emotional response) on story recall. The other experiment shows how recall of setting information can be manipulated through the use of the story schema for surprise stories.

1:55-2:10 (132)

Relation of Domain Knowledge and Working Memory in Text Processing. JAMES F. VOSS, TIMOTHY A. POST, REBECCA H. FINCHER, & TERRY R. GREENE, *University of Pittsburgh*—A summary of results is presented which suggests that high-knowledge individuals, in processing domain-related input, are able to minimize the presumed capacity limitations of working memory. When compared with the performance of low-knowledge individuals, the effects are shown to be task-specific.

2:15-2:25 (133)

The Memory Strength of Inferences in Text Understanding. JOHN B. BLACK & STUART MCGUIGAN, *Yale University*—We examined memory for statements in narratives that were either unconnected or were connected by explicitly repeated referents,

inferred (implicit) referents, or inferred causal relations. Statements connected by causal inferences were remembered best in both cued and free recall. Furthermore, statements connected by referential inferences were remembered better than those connected by explicitly repeated referents, and both of these were remembered better than statements with no connections.

2:30-2:45 (134)

The Effect of Cultural Schemata on Cognitive Processing. RICHARD J. HARRIS & D. JOHN LEE, *Kansas State University*—The application of cognitive schema theory to cross-cultural information processing is explored. Knowledge of a culture may be conceptualized as sets of schemas, which a newcomer to that culture must learn and integrate to his/her knowledge system. A discourse memory study demonstrated the effect of such cultural schemas on recall of a story about either a Brazilian or North American restaurant. Applications of a cross-cultural schema theory to ESL education and counseling will be considered.

2:50-3:05 (135)

Representing Paragraph Structure for Comprehension Research. EDWARD CROTHERS, *University of Colorado*—Presents a forthcoming book by the same title. A three-dimensional graph representational scheme for paragraph interpositional relations is developed which supersedes the standard hierarchical tree graph. The three graph axes—horizontal, vertical, and oblique—represent, respectively, the assumed three major classes of hierarchical relations—consequence, particularization, and conjunction. For cross-hierarchical relations, the notion of propositional correspondence is introduced. Corresponding propositions are denoted by placement of their respective nodes at corresponding graph positions.

3:10-3:25 (136)

Discourse Structure and Verb-Phrase Ellipsis. BARBARA C. MALT, *University of Massachusetts* (sponsored by Herbert H. Clark)—Several experiments investigated the role of discourse structure in interpreting sentences with verb-phrase ellipses (e.g., "Yes, he did"). Elliptical sentences were easier to understand when they formed the second half of a sequence with clear dependencies between the sentences (e.g., question and answer) than when they did not (e.g., declarative sequences). These results suggest that information likely to be needed for interpreting subsequent sentences is selectively retained in STM for that purpose.

Chaired by Richard Harris, Kansas State University

3:40-3:50 (137)

Input Sequence in Simple Stories: A Second Look. PAUL W. FOOS, *Florida International University*—If a schema is constructed during story processing, then flashback sequences should take longer. Baker's (1978) work has been taken as evidence against schema construction (Alba & Hasher, 1983) because no difference between chronological and flashback sequences was found. One of her flashback sequences, however, has been shown to be no more difficult than chronological sequence when memory load is reduced (Foos & Sabol, 1981). Taking this into consideration, a repetition of Baker's study demonstrates schema construction.

3:55-4:10 (138)

Causal Thinking and Story Understanding. TOM TRABASSO & PAUL van den BROEK, *The University of Chicago*—A model of comprehension involving causal thinking is tested against the data of Omanson (1982) for immediate and delayed recall, summarization, and importance ratings of stories by college students. Three aspects of the model account for variance in the data: (1) whether an event is in a causal chain, (2) the number of causal connections for an event, and (3) the story "grammar" category of the event. Other properties of the event, such as concreteness, serial position, and argument overlap between events, account for substantially less variance and little or no unique variance.

4:15-4:30 (139)

Inferences About Predictable Events. GAIL McKOON & ROGER RATCLIFF, *Northwestern University* (read by R. Ratcliff)—Paragraphs were written to describe events ("falling off a tall building") with a very probable consequence ("death"). When tested immediately after reading a paragraph, subjects were slow to decide that a word expressing the consequence ("death") had not been explicitly stated. When tested after a delay, subjects were slow and inaccurate in making the same decision—but only if the consequence word was primed by a word from the paragraph, not if primed by "ready."

4:35-4:50 (140)

Remembering Rhetorical Questions in Conversation. RAYMOND W. GIBBS, JR., *University of California, Santa Cruz* (sponsored by Bruce Bridgeman)—Questions can be used not only as a way of seeking information, but to make assertions as well. People often say things like "Does anyone study Aristotle anymore?" to mean "I believe no one studies Aristotle anymore." My study examined memory for the surface forms of these expressions. My hypothesis was that rhetorical questions would be remembered better than direct assertions. The results suggest that the pragmatic condition in which these are heard affects how well they are remembered.

4:55-5:15 (141)

Perceptual Constraints on the Given/New Hypothesis for Spoken Text Comprehension. HANS BRUNNER, *Honeywell Corporation* (sponsored by David B. Pisoni)—A gating paradigm was used to measure the degree of contextual facilitation for the recognition of individual words in spoken target sentences. Contrary to the given/new hypothesis, neither were words serving as the given, or presupposed, information in a sentence the first to be recognized nor did they receive the most contextual facilitation. Rather, it was the new or focal information—articulated with more contrastive stress—which was the first to be comprehended. Other results will also be discussed.

5:20-5:35 (142)

The Roter Faden—an Interactive Model for Text Processing. ULRICH GLOWALLA, *Philipps-Universität Marburg* (sponsored by Charles A. Perfetti)—The Roter Faden model consists of an interactive processing system for text comprehension, together with specific knowledge structures utilized during the comprehension process. The model discriminates between the Roter Faden (main train of thought) and dead ends of a text and more or less macrostructure units. In a recognition experiment, these two variables have been varied independently. Percentages of correct answers and response latencies were measured. Both variables proved to be highly effective.

VISION

Sauterne, Thursday afternoon, 1:00-5:30

Chaired by Adam Reeves, Northeastern University

1:00-1:10 (143)

Color Discrimination and Color Constancy. BRIAN A. WANDELL, *Stanford University*—Discrimination of colored lights may be limited by (1) visual sensitivity and (2) rules for combining information across visual channels. An important null hypothesis is that discriminability is limited only by sensitivity. Measurements of the discriminability of colored lights show, however, that easily detectable signals are regularly suppressed. The pattern of results suggests that detectable visual signals are ignored when stimulus differences appear to be due to differences in illumination rather than to differences in surface reflectance.

1:15-1:35 (144)

Unique Visual Structures for Relative and Absolute Lightness Constancy. HOWARD R. FLOCK, *York University*—Several different structures in the visual stimulus, which uniquely specify

whether absolute or relative lightness constancy will occur, will be identified and described. The variables have wide generality and produce relatively little observer variability. Only a few explanatory concepts are required to explain the data from a variety of different experiments.

1:40-1:50 (145)

Suppression During Fusion Differs from Rivalry Suppression. ROBERT FOX, DEBORAH MAUK & ELLIE FRANCIS, *Vanderbilt University*—Contours in one eye, combined with the homogeneous ground in the partner eye, yield stable fusion yet raise the threshold (in the partner eye) by the same amount as rivalry suppression. To determine if suppression during fusion operates like rivalry suppression, we varied contrast in spatial frequency of the inducing contours and found that, unlike rivalry, threshold elevation was stimulus dependent, a result suggestive of different mechanisms for the two kinds of suppression.

1:55-2:10 (146)

Vector Summation and Binocular Fusion. THADDEUS M. COWAN, *Kansas State University*—A model of vector summation of patterns is described which addresses two classical problems in binocular vision: (1) binocular fusion and (2) binocular rivalry within Panum's region. If time allows, some possible relevance for the horizontal-vertical illusion will also be discussed.

2:15-2:25 (147)

Probing the Visual System With the Tilt Aftereffect (TAE). JEREMY M. WOLFE, *Massachusetts Institute of Technology*—Brief test flashes (10 msec) produce a TAE that is at least twice as large as that produced by longer test flashes. The difference is not due to greater decay of the TAE during longer flashes. Instead, different mechanisms seem to be activated by the brief stimuli. Binocularity of the visual system (e.g., interocular transfer of the TAE) seems to be similar for brief and longer test stimuli.

2:30-2:45 (148)

Temporal Enhancement of Luminance Increments and Decrements at Threshold. THOMAS R. CORWIN & MICHAEL E. FOTTA, *University of Rochester*—We measured detection thresholds for luminance increments and decrements in a large uniform field, using either 50- or 250-msec flashes. For each duration, decrements were more detectable than increments, and for each polarity, short flashes were more detectable than long ones. Thus, detection-vs.-duration curves are nonmonotonic for both increments and decrements.

2:50-3:10 (149)

Two-Dot Vernier Acuity. JACOB BECK, *University of Oregon*, & THOMAS HALLORAN, *University of Southern California*—Experiments investigated how vernier acuity for dot targets is affected by dot spatial separation, dot temporal separation, and retinal eccentricity. The results are interpreted to support the hypothesis that there is, first, an encoding of dot positions in retinal coordinates and, second, a relating of the positions of the dots through the orientations of the virtual lines joining them.

Chaired by Robert Fox, Vanderbilt University

3:25-3:35 (150)

Contour Interaction as a Function of Retinal Eccentricity. GEORGE WOLFORD & LARRY CHAMBERS, *Dartmouth College*—Targets (Landolt Cs) were presented 0, 2, or 5 deg from the center of the fovea. The targets were surrounded by bar masks. The spacing between the target and masks was varied parametrically. The extent of contour interaction was a direct function of target eccentricity. The methodological and theoretical implications of these results will be discussed.

3:40-3:55 (151)

Duration of Focal Attention Shifts Does Not Increase With Distance. BELA JULESZ & DOV SAGI, *Bell Laboratories*—We presented, at the same eccentricity, two targets (e.g., T and L, L and L, or T and T) among many xs for a brief duration, followed by a masker. Discrimination scores did not increase with physical distance between the targets. Interestingly, the closest

targets were the most difficult to tell apart, probably because they appeared as a single entity, requiring additional decrease of focal aperture size.

4:00-4:10 (152)

The Category Effect in Visual Detection and Partial Report. PETER DIXON, *University of Alberta* (sponsored by Vincent Di Lollo)—Visual detection experiments indicate that one can selectively attend to only letters or digits in a mixed array, while partial report experiments indicate that one cannot do so. This discrepancy has been resolved by using a task that can approximate either visual detection or partial report, depending on stimulus timing. The results demonstrate that similar processes are used in both tasks, and argue against some traditional notions of iconic memory.

4:15-4:30 (153)

Visual Persistence From Letters and Pictures. GERALD M. LONG, *Villanova University*—For both pictorial and letter stimuli, wavelength and luminance conditions were selected so as to produce photopically and scotopically matched sets of stimuli. The duration of visual persistence from brief presentations of these targets against photopic backgrounds was assessed in an asynchrony-judgment task. Small, foveal stimuli (letters or pictures) produced equal degrees of persistence for photopically matched colors, while larger stimuli involving greater retinal regions produced equal degrees of persistence for scotopically matched colors.

4:35-4:50 (154)

Horizontal, Vertical, and Oblique Saccades to Double-Step Target Displacements. RICHARD N. ASLIN, SANDRA L. SHEA, & EBI PETER OSUOBENI, *Indiana University*—A small visual target was displaced 10 deg either horizontally or obliquely. After a delay of 50, 100, 150, or 200 msec, the target was displaced again within the same hemifield. In contrast to Becker and Jurgens (1979), who found that double-step displacements within the same hemifield resulted in an amplitude transition function based on the average target location, we found a discontinuous relation between saccade latency and the angular direction of the initial saccade.

4:55-5:10 (155)

Eye-press Does Not Induce a Straight-Ahead Shift. BRUCE BRIDGEMAN & RENATA FISHMAN, *University of California, Santa Cruz*—Sensory and motor effects of pressing an eye while fixating may be due to Harris's straight-ahead shift. To test this possibility, subjects set an auditory source to straight-ahead with and without a structured visual field, and with and without eye-press. We also measured audio-visual matching under the same four conditions. Eye-press biased audio-visual matching with and without a structured field, but did not induce a straight-ahead shift.

5:15-5:25 (156)

The Two-Process Explanation of Metacontrast. ADAM REEVES, *Northeastern University*—U-shaped metacontrast functions are artifacts of averaging trials in which target and mask appear simultaneous (and target visibility declines to long SOAs) with trials in which they appear successive (and target visibility rises with SOA). Photoreceptor explanations in which fast-acting cones generate a successiveness process, and slower rods generate simultaneity, are invalid; the same findings occur with red stimuli seen—by cones alone—on a rod desensitizing green field.

NEUROPSYCHOLOGY

San Antonio, Friday morning, 8:00-10:15

Chaired by Henry Soper, University of California, Los Angeles

8:00-8:20 (157)

Human Memory, Mental Imagery, and Closed Head Injury. J. T. E. RICHARDSON, *Brunel University*—Closed head injury reliably impairs long-term memory function. Experiment 1 showed that this decrement was specific to concrete material, suggesting a selective impairment of imaginal encoding. Experiment 2 repli-

cated these results following both minor and severe head injuries. Experiment 3 showed that the deficit on concrete material could be removed by the use of imagery mnemonic instructions. This implies that dysfunction following brain injury can be alleviated by training in relevant cognitive strategies.

8:25-8:45 (158)

Do Korsakoff Amnesic Patients Develop and Retain Affective Reactions? MARCIA K. JOHNSON & JUNG K. KIM, *State University of New York, Stony Brook*—Two experiments exploring acquisition of affect in Korsakoff patients will be reported. Experiment 1 compared Korsakoffs and age/education matched controls in their development of impressions about people based on biographical information. Experiment 2 compared the effect of exposures of unfamiliar melodies on Korsakoffs' and controls' preferences for the melodies. Results are interpreted within the multiple entry, modular memory model proposed by Johnson (1983).

8:50-9:05 (159)

Differential Attention Mechanisms and Seizure Disorders. GERALD ROSENBAUM & PERRY C. GOLDSTEIN, *Wayne State University*—This study reconciles conflicting results on attention deficits in temporal lobe epileptics (TLE) and generalized seizure patients (GSP). TLE subjects show difficulty in maintaining voluntary preparatory motor sets on a variable foreperiod reaction-time task, while GSP subjects show impairments on the continuous performance test, which requires arousal and vigilant attention to external stimuli. Different brain systems implicated in these attention functions are discussed.

9:10-9:30 (160)

Neural Control of Covert Visual Orienting. MICHAEL I. POSNER, *University of Oregon & Good Samaritan Hospital*, FRANCES J. FRIEDRICH, JOHN WALKER, & ROBERT D. RAFAL, *Good Samaritan Hospital*—Lesions of the parietal lobe affect the ability to orient to contralateral targets. The deficits involves the cognitive operation of disengaging from the current focus of attention. The lesion effects are more marked for within-field shifts of attention when the direction of the target from the cue is opposite to the lesioned hemisphere (e.g., leftward movements for a right-side lesion). This finding suggests that parietal lobes control the direction of covert attention shifts.

9:35-9:50 (161)

Utilizing Cognitive Tasks to Assess Neurotoxicity in Human Populations. DAVID A. ECKERMAN, CHRISTINA M. GULLION, & EUGENE R. LONG, *University of North Carolina*—A computerized test battery based on experimental cognitive tasks (e.g., continuous recognition, choice reaction time) is being developed to evaluate effects of toxic substances on information processing of unpracticed subjects. Issues and examples related to this goal will be discussed, including individual differences in RTs and speed-accuracy tradeoff, stability and sensitivity of task parameters for unpracticed subjects, and optimal scoring of multivariate tasks.

9:55-10:10 (162)

Generation Effect and Reality Monitoring: Senile Dementia and Normal Aging. DAVID B. MITCHELL, *Southern Methodist University*, & R. REED HUNT, *University of North Carolina, Greensboro*—Deficits in reality testing are characteristic of psychosis. The possibility that such deficits are related to memory was investigated empirically in people diagnosed with senile dementia Alzheimer's type (SDAT) and in healthy young and elderly adults. The two latter groups revealed the standard generation effect in recall, while SDAT subjects experienced no memorial benefit from generating their own responses. SDAT subjects were also unable to discriminate self-generated from external stimuli in a recognition task.

SENSORY FUNCTION, PSYCHOPHYSICS, & SCALING San Antonio, Friday morning, 10:30-12:20

Chaired by Steve Link, *McMaster University*

10:30-10:45 (163)

Signal Detection and Electroretinographic Measures of Visual Sensitivity in *Limulus*. GERALD S. WASSERMAN & SANDRA ROSS-FARHANG, *Purdue University*—*Limulus* visual thresholds vary daily and seasonally. ERG and signal detection rating measures based on behavioral response amplitudes were used to localize these variations. The ERG gave a seasonal variation matching the behavioral seasonal threshold variation. But the ROCs gave daily sensitivity variations which did not correlate with the daily ERG variation. This suggests that two sites influence sensitivity variation: a retinal site that varies seasonally and a more central site that varies daily.

10:50-11:00 (164)

Determinants of Bias in Rats' Signal Detection Performance. RAYMOND C. KIRK & NEVILLE M. BLAMPIED, *Canterbury University* (read by N. M. Blampied; sponsored by J. B. Overmier)—Rats' detection of a tone signal was assessed in a lever-press yes-no task. In one phase, the relative reinforcement rate for hits and correct rejections was held constant while signal presentation probability was varied. In another phase, signal presentation probability was held constant while relative reinforcement rate varied. Both manipulations affected bias, contrary to predictions of recent theories of operant signal detection performance.

11:05-11:20 (165)

Saliency of Number and Spacing of Elements in Line Stimuli. RAYMOND KLEIN & JOHN BARRESI, *Dalhousie University* (read by J. Barresi)—Subjects sorted pairs of lines in a serial categorization task based on their length after judging their similarity. The pairs of lines were constructed from element dots on a CRT such that one line was twice the length of the other and either maintained the same number of elements or the same spacing between elements. The relative importance of number and spacing of elements and line length varied only slightly between the two tasks.

11:25-11:35 (166)

Far From Good: Evaluative Ratings Scaled by Conjoint Measurement. DEBRA A. ZELLNER, *University of Pennsylvania*, & SCOTT PARKER, *The American University* (read by S. Parker; sponsored by Paul Rozin)—Each subject category-rated the similarity in 81 food-number pairs which combined (1) nine numbers between -100 and +100 indicating "(dis)liking" for a food and (2) names of nine food spanning the subject's (dis)likeability range roughly evenly. Conjoint measurement applied to the similarity ratings provided a scale for each subject's psychological spacing of the numbers. Likeability (positive) and dislikeability (negative) rating values behave differently and are not symmetric around zero.

11:40-11:55 (167)

Good For You: Nutritional Beliefs and Food Preferences. ADAM DREWNOWSKI, *University of Michigan*—Multidimensional scaling procedures were used to map the perceptual space for a variety of common food names. Foods were also rated for macronutrient content and their caloric and nutritional values. While no differences in the perception of food names were observed between normal-weight and massively obese individuals, their stated food preferences were significantly different. Normal-weight subjects preferred foods also viewed as nutritious, but obese subjects showed no such relationship.

12:00-12:15 (168)

Application of Active Psychophysics to an Altitude Regulation Task. RIK WARREN & GRANT R. McMILLAN, *Air Force Aerospace Medical Research Laboratory*—Results are presented for aircraft altitude regulation in the presence of vertical wind gusts. Since the computer-simulated display provided both im-

posed (by the gust) and obtained (by the pilot's control inputs) stimulation, performance is not properly evaluated using traditional psychophysical techniques which assume a helpless observer. Instead, an "active psychophysics" is indicated, one which explicitly accommodates the inherent interplay of perceiving and acting that is a hallmark of the ecological approach to perception.

ANIMAL CONDITIONING Chenin, Friday morning, 8:00-12:10

Chaired by Fred Valle, University of British Columbia

8:00-8:10 (169)

Reinforcing and Eliciting Effectiveness of Reliable and Unreliable Food Predictors. WILLIAM L. PALYA, *Jacksonville State University* (sponsored by Michael D. Zeiler)—Informative stimuli were added to a sign-tracking situation with pigeons in which stimuli simply alternated throughout the interfood interval. A unique predictor of food was absent, contiguous, or not contiguous with food. Contiguous unreliable stimuli controlled responding in their presence but did not function as reinforcers. Reliable stimuli, even when not contiguous, both controlled responding in their presence and functioned as reinforcers. Separate use of the various stimuli as Pavlovian reinforcers obtained the predicted results.

8:15-8:25 (170)

Attention, Stimulus Validity, and Conditional Discrimination. BEN A. WILLIAMS, *University of California, San Diego*—Pigeons were trained on a conditional discrimination involving form and color elements in an autoshaping procedure. When the colors were also illuminated during 50% of the ITIs, the discrimination was not acquired, indicating a loss of salience for stimuli not temporally predictive of reinforcement. But when all stimulus elements were similarly illuminated, the discrimination was acquired, indicating that the relative stimulus validity, not the absolute temporal predictiveness, per se, was the controlling variable.

8:30-8:45 (171)

Analysis of the Comparator Hypothesis of Conditioned Response Generation. RALPH R. MILLER, WESLEY J. KASPROW, & TODD R. SCHACHTMAN, *SUNY-Binghamton*—Fantino (1969), Gibbon and Blasam (1981), and Rescorla (1968) view conditioned responding as arising from a comparison between the associative strength of the CS and that of the context. Animal conditioning data will be presented that supports this viewpoint; they demonstrate that the comparator context is that in which conditioning, as opposed to testing, occurs, and, through post-conditioning contextual inflation and deflation, differentiates between the associative value of the conditioning context at the time of conditioning and the time of testing. Implications for the format of retained information and the nature of conditioned inhibition will be discussed.

8:50-9:10 (172)

Effect of Context Shift Upon Responses to Conditioned Inhibitors. JEFFREY FAIRLESS, KELLY STANHOPE, VINCENT M. LoLORDO, *Dalhousie University* (read by V. M. LoLordo)—Pigeons received a high rate of response-independent food in context A and a very low rate in B. A key-light CS correlated with a moderate rate of food in A evoked withdrawal, as did a key light correlated with no food. Then these key lights were reliably followed by food in B. Autoshaping to the previously nonreinforced CS was retarded, whereas autoshaping to the previously reinforced one was facilitated.

9:15-9:30 (173)

Contextual Stimuli: Measurement of Context Conditioning and Mechanisms of Context Blocking. ALAN RANDICH & R. T. ROSS, *University of Iowa*—Conditioning of contextual stimuli was demonstrated by the acquisition of escape responses from contextual stimuli previously paired with shock USs. Contextual stimuli blocked CER conditioning of a discrete CS paired with shock, but only when CER conditioning occurred in an excitatory

context. However, performance of this context blocking effect was manifested when testing of the discrete CS occurred in either an excitatory or neutral context, although excitatory contextual stimuli tend to reduce performance of the CER evoked by a discrete CS.

9:35-9:45 (174)

Context and CS Fear in Delay and Trace Conditioning. NANCY A. MARLIN, *University of Missouri, Rolla*—Using either a delay or trace conditioning procedure, rat subjects were given a different number of tone-footshock pairings. Greater contextual fear was observed with more training trials, but this did not differ between the delay and trace conditioning groups. In contrast, greater fear of the nominal CS was present with delay than with trace conditioning, but this was not affected by the number of trials.

9:50-10:05 (175)

Lithium-Mediated Environmental Potentiation. MICHAEL R. BEST, MICHAEL K. SOWELL, *Southern Methodist University*, & LAURA E. CARRELL, *VA Medical Center, Dallas*—When saccharin was consumed in a distinctive environment, lithium conditioned a strong aversion to this environment, as measured by subsequent water intake in the chamber. Conditioning in the flavor group was also significantly stronger than that in a group receiving either water or no fluid in the chamber during conditioning. Though established by noningestive stimuli, this phenomenon has characteristics of illness-mediated flavor potentiation.

Chaired by Eve Segal, San Diego State University

10:20-10:35 (176)

Inhibitory and Excitatory Backward Conditioning Following Illness-Flavor Sequences. LEWIS M. BARKER & CHARLES A. WEAVER III, *Baylor University*—We investigated "backward" conditioning in which flavored solutions (CSs) were presented to a rat following injections with a toxin (the US). Results were as follows: (1) Rats tasting vinegar 30 min after a lithium chloride US form aversions to the taste of vinegar, but learn to prefer the flavor if the delay interval is 75 min. (2) Rats tasting both saccharin 30 min and vinegar 75 min following a lithium US learn to prefer the vinegar and avoid the saccharin. (3) Multiple trials are necessary to form inhibitory but not backward excitatory conditioning. Inhibitory and excitatory backward conditioning are compared.

10:40-11:00 (177)

The Overlearning-Extinction Effect and Successive Negative Contrast in Honeybees. M. E. BITTERMAN & P. A. COUVILLON, *University of Hawaii*—The previously discovered overlearning-extinction effect in honeybees was replicated under various conditions and shown to depend on magnitude of reinforcement (concentration of sucrose). An explanation of the effect in terms of frustration was tested in an experiment on successive contrast.

11:05-11:20 (178)

Rabbit NMR Conditioning: Temporal Control of Single-Alternation Pattern Learning. W. RONALD SALAFIA, DOMENIC MARINI, & LINDA M. TATAROWICZ, *Fairfield University*—Single-alternation patterning behavior was investigated for the classically conditioned nictitating membrane response employing three variations of interstimulus interval (ISI) and three variations of the interval between reinforced and non-reinforced trials (RNI). Best performance occurred with a short RNI combined with a long ISI. Results suggested that two different types of information processing were involved, namely low-level associative carry-over and higher level representational processes, which may be differentially vulnerable to physiological manipulations.

11:25-11:45 (179)

Do Conditioning and Time Discrimination Use the Same Clock? SETH ROBERTS & MARK D. HOLDER, *University of California, Berkeley*—Others have found that changing the duration of the CS changes the amount of conditioning, suggesting that timing of the CS precedes a conditioning decision. A time-

discrimination experiment of ours suggests the opposite: A conditioning decision precedes timing. Another experiment of ours resolves the conflict by suggesting that the CS is timed by two different clocks—one to decide if the CS is a signal and the other to guide a time-discrimination response.

11:50-12:05 (180)

Startle Magnitude and Movement as Determined by Design, Hunger, and Stimulus Spacing Conditions. JUDSON S. BROWN, *University of Oregon Health Sciences*, D. CHRIS ANDERSON, & CHARLES R. CROWELL, *University of Notre Dame*—Twelve rats (80% body weight) were given 20 exposures to a startle stimulus either 47 or 1 h following eating at either 20-sec or 20-min spacings in a manner that permitted either elimination of or influence by carry-over effects from one condition to another. Startle magnitude was attenuated for the massed and 47-h conditions when carry-over effects were possible, but was intensified for the 47-h condition when carry-over effects were eliminated. Movement prior to and following startle showed similar trends.

PERCEPTION OF FACES

Cuyamaca, Friday morning, 8:00-9:50

Chaired by Don Read, *University of Lethbridge*

8:00-8:15 (181)

Infant Recognition of Photographs and Caricatures of Human Faces. DONALD J. TYRRELL, *Franklin & Marshall College*—Preference for novel faces was measured in 7-month-old infants familiarized on caricatures or photographs and tested with pictures of the opposite type. Preference for novel faces emerged on the second test during a single session, unaffected by subject's sex, stimulus type, or order of test type. Differences related to sex of familiarization and test stimuli will be investigated along with preliminary analyses of specific features relevant to face recognition.

8:20-8:40 (182)

Baboon (*Papio hamadryas*) Visual Preferences for Socially Relevant Stimuli. RANDALL C. KYES & DOUGLAS K. CANDLAND, *Bucknell University* (read by D. Candland)—Aspects of facial communication and troop-member recognition were investigated in three hamadryas baboons. The subjects were presented a series of photographic slides depicting various facial areas of a troop member and slides displaying individual troop members. The experimental design applied the method of pair comparison. Slides of full faces were consistently chosen, with the eye region attracting greatest attention. Baboon recognition of troop members and a preference based on troop members' dominance status is suggested.

8:45-9:05 (183)

Recognition of Misoriented Faces. PAUL A. KOLERS & GUNILLA SUNDSTROEM, *University of Toronto*—Misoriented faces are often said to be more difficult to recognize than normally oriented faces. A continuous recognition test varied the orientation of faces and tested for their recognition. The results indicate that misoriented faces are recognized as well as normally oriented faces when test conditions permit it. Contrasts of the effects of orientation on recognition of faces and recognition of words are also brought out.

9:10-9:25 (184)

Facial Attractiveness of Optimal Growth: An Archetypal Analysis. ALEXIS GROSOFKY, CLAUDIA CARELLO, *SUNY Binghamton*, & CLAIRE MICHAELS, *Lake Forest College* (read by C. Michaels)—Facial attractiveness judgments were made of photographs of human faces that had been manipulated to simulate possible growth outcomes. Faces that were closer to their archetype were generally seen as more attractive, with a slight bias toward more convex facial curves. Age judgments were also obtained for each of the stimulus faces. Convex profiles were always seen as younger than concave ones. Implications for a concrete definition of attractiveness in terms of function are discussed.

9:30-9:45 (185)

A Face Superiority Effect: Hemiretina Effects. DEAN G. PURCELL, *Oakland University*, ALAN L. STEWART, *Stevens Institute of Technology*, MICHAEL BOTWIN, *Oakland University*, & ROBERT KREIGH, *Arizona State University*—A detection mask was used to investigate a face superiority effect (FSE). Under backward masking, comparing normal to inverted faces, the FSE was stronger in the right hemiretina. Normal, as compared with scrambled, faces produced an even larger FSE, but hemiretina effects were not reliable. In the absence of a mask, the FSE was not pronounced. Tilting a face by 45 deg produced a FSE. The magnitude of the FSE was inversely related to stimulus duration.

PERCEPTUAL DEVELOPMENT

Cuyamaca, Friday morning, 10:00-12:15

Chaired by Joel Freund, *University of Arkansas*

10:00-10:10 (186)

The Role of Perception and Cognitive Planning in Children's Construction. JESSICA BEAGLES-ROOS, *Pitzer College* (sponsored by Daniel Kaye)—Children from grades K, 2, and 4 were asked to describe, plan to build, reproduce, and find embedded figures in a hierarchically structured model. In contrast to previous theoretical and empirical work, construction ability was primarily related to a perceptual measure, the ability to find embedded figures in the model, and secondarily to a cognitive measure, the ability to formulate a step-by-step sequence of elements to make the model.

10:15-10:30 (187)

Processing of Ratios and Differences by Young Children. MARILYN T. ZIVIAN & JIM DUFFY, *York University* (sponsored by Ronald Okada)—In four separate experiments, children, ranging in age from 4 to 10 years, were asked to indicate the "longer" of two lines, the "shorter" of two lines, the "fuller" or "emptier" of two drawn beakers of liquid, or the "closer" of two objects to either the experimenter or the child. Choice reaction times in all four experiments indicate that children use both the ratios and differences between the stimuli when making their choices.

10:35-10:55 (188)

Children's Distance and Time Estimates: The Effects of Environmental Segmentation. JAMES F. HERMAN, *Washington University*—Seven-, 9-, and 11-year-olds made distance and time estimates in two conditions. In the Segmented condition, they walked through qualitatively different areas of their school (e.g., cafeteria, hall, vestibule, hall, etc.). In the Unsegmented condition, they walked an equivalent distance through a relatively undifferentiated area (i.e., main hall). Children at all three grade levels estimated distance (but not time) to be longer in the Segmented than in the Unsegmented condition.

11:00-11:15 (189)

Growth Functions for Information-Processing Parameters. ROBERT KAIL, *Purdue University*—Age differences are ubiquitous on tasks in which RT is the dependent variable, yet these differences remain poorly understood. The aim of this research was to derive a precise description of these differences by fitting developmental data to common growth functions. Parameters from mental rotation, memory scanning, and letter matching tasks were fit to logistic, monomolecular, and Gompertz equations. Results of principal interest concern changes in the value of the growth parameter across tasks.

11:20-11:35 (190)

The Left-Right Effect Across Age and Egocentric Position. CELIA B. FISHER & CHERYL A. CAMENZULI, *Fordham University*—The relative influence of egocentric vs. environmental cues on the left-right effect was examined in three age groups. Preschool children egocentrically oriented either 0 or 90 deg found environmentally defined left-right problems more difficult to learn than

up-down problems. Eight-year-olds' response latencies for environmentally defined left-right problems were significantly longer than up-down latencies. Adult latencies showed no evidence of a left-right effect.

11:40-11:55 (191)

Auditory Memory Across 20 Seconds in Preschool Children. NELSON COWAN & PRISCILLA ROTH COWAN, *University of Massachusetts*—Recent adult studies suggest that one form of auditory memory lasts 20 sec (Watkins & Watkins, 1980). The present study assessed this in preschoolers, of interest because they use fewer retention strategies than adults. The technique involved pictures given two names (e.g., *rope* vs. *string*). One name was spoken as a target on each trial. After a silent distractor task, retention was tested with a rhyming task in which semantic retrieval would not help. A 20-sec auditory memory was confirmed.

12:00-12:10 (192)

Motion Enhances Object Perception for Infants. BETH A. SHAPIRO, MARSHALL M. HAITH, JOSEPH J. CAMPOS, *University of Denver*, BENNETT I. BERTENTHAL, *University of Virginia*, & CINDY HAZAN, *University of Denver* (sponsored by Claire F. Michaels)—The role of motion in visual perception of objects during infancy has received little attention. We used a forced-choice paradigm to reveal that 5-month-olds prefer a subjective contour to a nonsubjective contour when displays rotated, but not when they were stationary. Apparently, movement yielded a whole-form percept unavailable with a static display. Thus, whole-form perception during infancy may depend upon the transformations in which stimuli participate.

LEXICAL PROCESSES

Laguna, Friday morning, 8:00-9:30

Chaired by Jyotsna Vaid, *University of California, San Diego*

8:00-8:20 (193)

The Bilingual Lexicon: Language-Specific Units in an Integrated Network. KIM KIRSNER, *University of Western Australia*, MARILYN C. SMITH, & ROBERT S. LOCKHART, *University of Toronto* (read by M. C. Smith)—Five experiments evaluated hypotheses concerning lexical organization in bilinguals. Experiments 1 to 3 demonstrated that the repetition effect (the speeded response to a previously presented word) occurs only if the word is repeated in the same language on both presentations unless overt translation occurs during initial presentation. However, if semantically related pairs of words are presented either simultaneously or with a very short ISI, evidence for interlingual facilitation is found, suggesting that interlingual facilitation is very transitory.

8:25-8:45 (194)

The Autonomy of Grammar and Semantics. LEONARD KATZ, *University of Connecticut*, GEORGIJE LUKATELA, *University of Belgrade*, & JOAN McCANN, *University of Connecticut*—Are grammatical and semantic sources of information in speech processed independently? An auditory lexical decision experiment was run using Serbo-Croatian, a language that depends strongly on word inflection as a carrier of grammatical information. Target nouns and pseudonouns were primed by adjectives and pseudo-adjectives with which they either agreed or disagreed grammatically. The results suggest that grammatical processing is autonomous once it is initiated, but that it must first be triggered by the presence of meaning.

8:50-9:05 (195)

Morphological Analysis in Word Recognition. LAURIE B. FELDMAN, *Haskins Laboratories*, & M. T. TURVEY, *University of Connecticut & Haskins Laboratories*—The lexical organization of morphologically related words was examined in Serbo-Croatian, a highly inflected language. Adult and third-grade native speakers performed a lexical decision task on inflected forms, some of which were presented twice during the session. Adult latencies revealed a facilitation that did not vary whether repetitions in-

involved changes or same case, whereas times for children indicated that changes in inflectional case did diminish facilitation. Results are interpreted in terms of morphological analysis in reading.

9:10-9:25 (196)

Semantic Awareness in a Nonlexical Task. SHLOMO BENTIN, *Aranne Laboratories*, & LEONARD KATZ, *Haskins Laboratories & University of Connecticut*—Depth of processing of printed words was investigated in a task in which subjects made lexical decisions on all trials, or "case" (upper or lower) and lexical decisions on alternating trials. Thirty-two words were preceded either by semantic associates or by unrelated words. For both "case" and "word" decision conditions for the prime, equal facilitation was found for related words, suggesting that in the "case" decision the words were also analyzed at a semantic level.

PICTURE-WORD PROCESSING Laguna, Friday morning, 9:45-12:00

Chaired by William Cooper, *University of Iowa*

9:45-10:00 (197)

A Model for the Cognitive Processing of Successively Presented Pictures and Words. JOHN THEIOS & PAUL C. AMRHEIN, *University of Wisconsin*—A model is developed to account for the time to decide whether two successively presented stimuli have the same conceptual meaning. On "same" trials, surface structure is varied for both picture (P) and word (W) stimuli, so the observer never sees the same stimulus twice. An encoding bias favoring words as the first stimulus was found, such that WW and WP processing times were equal, and were faster than PW and PP times, which were equal.

10:05-10:20 (198)

Effect of Orienting Questions on Free Recall of Visual Scenes. HELENE INTRAUB, *University of Delaware*, & SUSAN NICKLOS, *Bucknell University*—In four experiments, the effects of physical and semantic orienting questions on free recall of complex visual scenes was studied. Contrary to results typically obtained with words, physical orienting questions lead to superior recall of the briefly glimpsed pictures (250-500 msec) than the semantic questions did. The results are discussed in terms of the sensory-semantic model of memory.

10:25-10:40 (199)

Picture and Word Names as Analogies in Reading Aloud. JUDITH F. KROLL & EILA PHAILBUS, *Mount Holyoke College*—Models of reading aloud suggest that words can be named by grapheme-to-phoneme translation or by analogy with other stored lexical forms. Reliance on lexical analogy was investigated by comparing naming latencies for pseudowords that followed words and pictures with similar or different pronunciations (e.g., CUP-LUP vs. DOG-LUP). Naming latencies were shorter in the word conditions, suggesting that access to a stored articulatory representation is not the sole basis for determining a pronunciation.

10:45-11:00 (200)

Cognitive and Linguistic Factors Affect Visual Feature Integration. WILLIAM PRINZMETAL & MICHELLE M. WRIGHT, *Princeton University* (sponsored by Ron Kinchla)—A series of experiments demonstrate that subjects make more errors integrating color and letter-shape information with pronounceable or meaningful letter strings than with nonwords. Our explanation is that word-like letter strings are processed in multiletter perceptual units and that feature integration errors are more likely within a perceptual unit than between units. Errors in feature integration may provide a method for exploring perceptual units of analysis in reading, such as syllables or spelling units.

11:05-11:20 (201)

The Relationship Between Memory and Comprehension of Text Versus Television and Radio. KATHY PEZDEK, *Claremont Graduate School*—This study compares the cognitive processes involved in reading with those involved in comprehending tele-

vision and radio. Third- and sixth-graders read one story and were presented the television *or* radio version of another story, counter-balanced for story and presentation order. Memory and comprehension for the television and reading conditions were not significantly correlated; however, for the radio and reading conditions they were positively correlated. Thus, the memory and comprehension processes involved in reading appear to be similar to those involved in processing radio but not television, with performance in the radio condition inferior.

11:25-11:40 (202)

Loss of Surface Information Following Picture Story Comprehension. MORTON A. GERNSBACHER, *University of Oregon* (sponsored by Donald J. Foss)—Shortly after comprehending a passage, information about its exact surface form (e.g., its word order) becomes less available. This phenomenon was explored following comprehension of narrative stories “told” solely by pictures. The surface information tested was each picture’s original left/right orientation. Several experiments mapped the time course of this type of surface information loss, isolated item and subject-related factors that prevent it, and, primarily, evaluated causal explanations of it.

11:45-11:55 (203)

The Time Course of Semantic Activation with Pictures and Words. WAYNE WALLS & PATRICIA SIPLE, *Wayne State University* (read by P. Siple)—Studies using combined picture and word stimuli have proved useful in the investigation of the semantic and linguistic systems. This study utilizes a priming paradigm in which a same-different category decision is made to the prime and target. The time course of semantic activation was observed at 50, 150, 250, and 400 msec for all combinations of picture and word stimuli. Prime type, target type, and interstimulus interval were maintained as within-subject factors.

LANGUAGE-LIKE PROCESSES IN ANIMALS

Palomar, Friday morning, 8:00-9:10

Chaired by D. Chris Anderson, *University of Notre Dame*

8:00-8:20 (204)

Bottlenosed Dolphins Can Understand Sentences. LOUIS M. HERMAN, JAMES P. WOLZ, & DOUGLAS G. RICHARDS, *University of Hawaii*—Two bottlenosed dolphins demonstrated their understanding of sentences expressed in artificial acoustic or gestural languages. The sentences were imperative statements instructing the dolphins to carry out named actions relative to named objects and named modifiers. Comprehension was measured by the ability to carry out the instructions correctly. The dolphins’ understanding extended to novel sentences as well as familiar ones, and to sentences whose meaning changed with changes in word order.

8:25-8:40 (205)

Interspecies Communication: Functional Vocalizations by an African Grey Parrot. IRENE M. PEPPERBERG, *Purdue University* (sponsored by Gerald S. Wasserman)—A parrot has been trained to identify, categorize, quantify, request, and/or refuse more than 50 different objects by means of spoken English vocalizations. Our subject has functional use of “no” and the phrases “come here,” “wanna go X,” and “I want Y.” To investigate comprehension of the categories “color” and “shape,” the subject’s ability to decode and reply vocally to queries concerning either color *or* shape for exemplars that incorporate both variables were examined.

8:45-9:05 (206)

Generalized Discriminative-Response Sequences (Syntax?) in a Barbary Macaque. EVE SEGAL, *San Diego State University*—The macaque (Mac) was trained to respond discriminatively to the color of objects by pressing keys (6 colors, 6 keys). Then Mac was trained to respond discriminatively to the shape of objects by placing each object in a hole of corresponding shape (8 colorless objects, 8 holes). Color responses generalized to novel color ex-

emplars, and shape responses generalized to novel colored exemplars of the shapes. Finally, Mac was trained to classify colored objects first by color and then by shape, and this ordered sequence generalized to novel colored objects.

COMPREHENSION

Palomar, Friday morning, 9:20-12:30

Chaired by Arnold Glass, *Rutgers University*

9:20-9:35 (207)

Comprehension of Instructions for Operating Devices. KATHRYN T. SPOEHR, MICHAEL E. MORRIS, *Brown University*, & EDWARD E. SMITH, *Bolt Beranek & Newman*—Two experiments assessed the processes by which written instructions for operating a piece of equipment are comprehended. Experiment 1 showed that comprehension is fastest when information on the action to be performed, the consequences of the action, and the conditions under which it is to be performed match the order in which it is needed to fill in a schema for executing the instruction. Experiment 2 showed that subjects can develop specific comprehension strategies for different types of instruction formats.

9:40-9:55 (208)

The Effect of Conceptualization in Instructions on Assembly Task Performance. PATRICIA BAGGETT, *University of Colorado* (sponsored by Richard K. Olson)—Subjects watched videotapes showing assembly of a complex object from a kit of pieces. The tapes showed a “typical” and a “minority” conceptualization, i.e., division into subassemblies. (Their derivations will be described.) In building the object from memory, “typical” subjects far outperformed “minority” ones, suggesting a principle: The conceptualization presented in instructions should match the conceptualization that the majority of people who are to be instructed by them bring to the situation naturally.

10:00-10:10 (209)

Culinary Expertise and Inference Making. SUSAN KEMPER, ELLEN MAHONEY, & MARGARET SCHADLER, *University of Kansas* (read by M. Schadler)—Expert and novice cooks read simple and difficult recipes and answered questions about them. Half the recipes consisted of sequences of actions and the resulting states; only the actions were described in the remainder. The questions asked for causal explanations of essential actions. The task demands of recipe difficulty and format interact with level of expertise to affect reading times and question-answering latencies and accuracy measures.

10:15-10:30 (210)

Natural Language Descriptions of Procedures. GARY M. OLSON, MARY TRAHAN, LYNN ROSHWALB, & MARY EATON, *University of Michigan*—Writers wrote natural language descriptions of two simple procedures. The texts of half the writers (experimental) were read by three readers, who thought out loud while they learned the procedure. Videotapes of these sessions were used as feedback for revising the texts. Control writers revised without feedback. Experimental writers revised more than controls, but did not produce measurably better texts. For all, texts that were rated most effective had many examples.

10:35-10:55 (211)

Monitoring Comprehension: Who Can Do It and How? RUTH H. MAKI, *North Dakota State University*, & SHARON BERRY, *Florida State University*—Subjects read textbook material and predicted how well they would do on a test after reading each section. Monitoring accuracy was assessed by comparing ratings of material related to correct and incorrect test answers. Subjects who scored above the median on the test were able to monitor comprehension with some accuracy; students who scored below the median were not. Ratings, but not test performance, were correlated with section length and serial position.

Chaired by Patricia Baggett, University of Colorado

11:10-11:20 (212)

The Verification of Sentences Requiring Imagery. ARNOLD GLASS, *Rutgers University*—Only statements that require visual or spatial imagery take longer to verify when read than when heard. A series of experiments tested different explanations of this effect. The results were consistent with the predictions of the hypothesis that the acts of reading and verifying the high-imagery statement accessed a common representation.

11:25-11:40 (213)

Lexical Category Expectations in Sentence Comprehension. CHARLES CLIFTON, JR., LYN FRAZIER, & CYNTHIA CONNINE, *University of Massachusetts*—Two experiments measured the time readers took to make acceptability judgments of sentences. Judgments were made more quickly when the syntactic form of a sentence was congruent with the more frequently used subcategorization frame of its verb than when they were incongruent. In a third experiment, secondary task reaction time was reduced under these conditions. One experiment additionally provided evidence that readers used lexical subcategorization information to modulate an initial preference for transitive constructions.

11:45-12:00 (214)

Evidence of Sentence Comprehension as Constructing Unitary Representations. IN-MAO LIU, *The Chinese University of Hong Kong*—In a sentence-sentence verification task, the subject verified a sentence (e.g., *Bus hit kola*) against another sentence (*Car touched tree*) that had no surface element in common. Under this circumstance, it was reasoned that the subject had to construct a unitary representation (overall meaning) for each sentence, and could not rely on constituent comparisons or on strategic recoding of negative sentences. The results support a model of sentence comprehension as constructing unitary representations.

12:05-12:25 (215)

Process of Answering Wh- Questions About Brief Passages. MURRAY SINGER, *University of Manitoba*—In two experiments, subjects answered wh- questions about the agents, patients, and instruments of actions described in three- or nine-sentence passages. Subjects needed more time to correctly indicate that an answer was not available than to provide the answer when it was available. Also, response latency was shorter for agent than for patient or instrument questions. The results are interpreted with reference to a process model that identifies stages of question encoding, retrieval of requested information, and response index "bookkeeping."

CONCEPTUALIZATIONS OF ATTENTION Sauterne, Friday morning, 8:00-10:55

*Chaired by Irving Biederman,
State University of New York at Buffalo*

8:00-8:20 (216)

A Simulation of Automatic/Controlled Processing Predicting Attentional and Practice Effects. WALTER SCHNEIDER, *University of Illinois*—A quasi-neural simulation model is described. The model quantitatively defines automatic and controlled processing in terms of activation levels and connection strengths between processing units. The model uses neurophysiology and communication theory concepts to illustrate: (1) why attention must be limited; (2) how parallel processing can develop with consistent practice; and (3) why automatic processing is limited by factors different from those affecting controlled processing. The fit of simulations to classic attention and search data is presented.

8:25-8:45 (217)

Automatic and Controlled Responding in Stroop-Like Situations. EARL HUNT, *University of Washington*, & PAUL REED,

University of California, Santa Barbara—A combined production system and semantic activation model has been applied to the study of Stroop-like phenomena. The production system part of the model is intended to mimic controlled processes, and the semantic activation part, to mimic automatic activation processes. The results of simulations of several Stroop-like situations will be described.

8:50-9:05 (218)

Is Attention MIRVed? DONALD L. FISHER, *University of Massachusetts* (sponsored by Walter Schneider)—Evidence from consistent mapping studies of visual search has suggested that attention is focused internally over the entire encoded display. However, the results from recent experiments indicate that attention can be focused on a maximum of three to five stimuli and that the items are analyzed in registers or channels that operate independently of one another. A quantitative theory of attention, which assumes that there are multiple independent registers in visual search, will be described.

9:10-9:30 (219)

Moving Objects and Spatial Attention. DANIEL KAHNEMAN, ANNE TREISMAN, & BRIAN GIBBS, *University of British Columbia*—Evidence will be presented for the existence of temporary representations of objects in which information accumulates and is integrated over time. When several objects are in motion, two letters presented successively within the same moving object interact more strongly than do letters presented in different objects, with physical distance controlled. Various displays illustrating these effects will be shown.

9:35-9:50 (220)

The Accumulation of Information Within Object Files. ANNE TREISMAN & DANIEL KAHNEMAN, *University of British Columbia*—We describe a number of studies that explored whether the information that accumulates within "object files" comprises sensory data, abstracted identity or category labels, or response priming. We also discuss the conditions under which information appears to be object-specific and the role of attention in creating object representations.

9:55-10:10 (221)

Is Semantic Priming Automatic? JAMES E. HOFFMAN & FRANK MacMILLAN, *University of Delaware*—The latency of a lexical decision on a word string is reduced when the word is preceded by a semantically related word (e.g., "bread-butter"). At least some portion of this priming effect is thought to be "automatic." A series of experiments tested this proposition by engaging subjects in a sensory discrimination at the moment of prime presentation. Priming was eliminated, suggesting the involvement of a limited-capacity mechanism in semantic activation.

10:15-10:35 (222a)

Gating Model of Visual Attention. GEORGE SPERLING, *New York University*, & ADAM REEVES, *Northeastern University*—With delay $\tau \approx 250$ msec after a signal to switch attention from point A to point B in the visual field, an attentional gate opens to admit information from B into a visual short-term memory. The temporal course of gate opening $a(t)$ is described by a gamma function $a(t) = (t - \tau)\tau^{-2}\text{EXP}[(t - \tau)\tau^{-1}]$. Order relations between reported items are accounted for by lateral inhibitory interactions in memory. The model yields extremely efficient data predictions: only τ varies between experimental conditions.

10:40-10:50 (222b)

Attention to Action: Willed and Automatic Control of Behavior. DONALD A. NORMAN, *University of California, San Diego*, & TIM SHALLICE, *Applied Psychology Unit, Cambridge, England*—We propose a model of attention that focuses upon the initiation of action. The basic idea is that when a plan must be modified, some novel action sequence performed, or some habitual act prevented from occurring, then deliberate attentional intervention is necessary. The result is three modes of the control of performance: automatic, contention scheduling without deliberate direction, and deliberate conscious control. Will becomes the application of attentional resources to the control of action.

LATERALITY

Sauterne, Friday morning, 11:05-12:40

Chaired by Clare Porac, University of Victoria

11:05-11:20 (223)

Dangers of Improper Respect for the Null Hypothesis in Neuropsychology. HENRY V. SOPER, PAUL SATZ, ROGER LIGHT, & DONNA L. ORSINI, *University of California, Los Angeles, & Camarillo State Hospital*—Finding inconsistency and contradiction between studies of hemispheric asymmetry, we reanalyzed our neuropsychological data from 300 sinistrals, taking 40 subsamples of 36-65 subjects each. This produced numerous spurious significancies, some suggesting clinical import. In one case, two samples gave contradictory results. Frequently, a true difference was strongly denied. The results indicate that differences found between studies often are attributable to chance variations. Investigators using these types of data are urged to replicate their own findings.

11:25-11:35 (224)

Lateral Preferences and Writing Hand Posture. ALAN SEARLEMAN, *St. Lawrence University*, CLARE PORAC, *University of Victoria*, & STANLEY COREN, *University of British Columbia*—The relationship between writing-hand posture and lateral preference for hand, foot, eye, and ear was investigated in a sample of 3,709 college undergraduates. Left-handed male inverters displayed a tendency toward more leftward lateral preferences in all four indexes, while left-handed female inverters reflected, if anything, a tendency toward more rightward lateral preferences.

11:40-11:55 (225)

Lateralized Interference in Finger Tapping: Assessment of Block Design Activity. DANIEL W. KEE, *California State University, Fullerton*, KAY BATHURST, *University of California, Los Angeles*, & JOSEPH B. HELDIGE, *University of Southern California*—Dual-task procedures were used to evaluate lateralized processing of WISC block design activities. Right-handed college subjects tapped alone or while solving block-design problems. Lateralized interference, implicating right-hemisphere processing, was observed when subjects physically completed block designs with the nontapping hand. A different pattern of lateralized interference was observed when physical block manipulation was not required. The results are discussed in terms of Gazzaniga's distinction between visuospatial versus manipulospatial processing.

12:00-12:15 (226)

Sex Differences and Hemispheric Specialization for Tactile Processing. ALLAN G. REYNOLDS & SHARON CHAYKA, *Nipissing University College*—In contrast to Witelson's oft-cited findings of male children's left-hand superiority for meaningless shape discrimination, the present study (in a replication and extension of Witelson's design) found general superiority for the right hand in both boys and girls aged 4-13 years. In addition, a significant interaction demonstrated a pronounced left-hand deficit for girls of all ages. Dichotic listening tests confirmed that all subjects were left-hemisphere dominant. Results are interpreted in terms of a verbal coding strategy rather than in terms of right-hemisphere processing of tactile information.

12:20-12:35 (227)

Effect of Motivation on Position and Location Judgments Under Lateral and Foveal Viewing. EVA DREIKURS FERGUSON, *Southern Illinois University, Edwardsville*—Hungry and satiated subjects served in two tachistoscopic studies that investigated position judgment and location judgment of words (serial position, and left, right, or center viewing location). Variables that affected learning of serial position were different from those that affected learning of viewing location. Under lateral encoding (Study 1), but not under foveal encoding (Study 2), visual field (VF) and drive interacted in recall of word location: RVF-left hemisphere locations were best recalled under hunger, but LVF-right hemisphere locations were best recalled under satiation.

ACTION

San Antonio, Friday afternoon, 1:00-2:10

Chaired by Richard Jagacinski, Human Performance Center

1:00-1:20 (228)

Prospectus for a Global Dynamic Action Theory. JAMES T. TOWNSEND, *Purdue University*—My goal is to develop a mathematical theory capable of representing behavior in a continuous time "game" environment, containing the psychological aspects of perception, learning, memory, motivation, decision, and motion. The theory will emphasize the macroscopic interactions rather than the fine points of individual subsystems. Dynamic systems theory will be strongly utilized, whereas digital computer concepts will be minimized. I expect to design it for different levels of resolution—for instance, linear deterministic vs. topological stochastic versions.

1:25-1:45 (229)

A Hierarchical Editor Model for Choosing Between Response Sequences. DAVID A. ROSENBAUM, ALBRECHT W. INHOFF, & ANDREW M. GORDON, *Hampshire College*—In choice RT experiments, how do people choose between two possible sequences of motor responses? Based on a series of experiments, we propose that after identification of the choice reaction signal, two passes are made through an abstract, hierarchically organized plan. In the first, Edit pass, all initially uncertain aspects of the plan are specified. In the second, Execution pass the plan is successively unpacked, with response execution occurring whenever terminal elements are encountered.

1:50-2:05 (230)

Interference of Simple Simultaneous Responses: A New Interpretation. STUART T. KLAPP, *California State University, Hayward*—It is difficult to perform two simple responses simultaneously with the right and left hands. For the case of tapping incompatible temporal rhythms, we show that this effect is not due to linkage between the hands. Subjects exhibit similar interference when manually following incompatible visual and auditory rhythms with two hands and with a single hand. This task is possible when the situation is perceived in an integrated form, e.g., with linked stimuli.

HUMAN-COMPUTER INTERACTION

San Antonio, Friday afternoon, 2:20-5:15

Chaired by Kathryn Spoehr, Brown University

2:20-2:35 (231)

Plans: Expert-Novice Differences in the Comprehension of Computer Programs. KATE EHRLICH & ELLIOT SOLOWAY, *Yale University*—Expert-novice differences in the domain of programming were examined by varying the "planliness" of programs, i.e., the typicality of the solution method. All the programs were executable. We found that the experts comprehended the programs better than the novices, but only when the programs were plan-like. The unplan-like programs were equally hard for all subjects to comprehend. These results point to a plan-based organization of programming knowledge.

2:40-2:55 (232)

When Do Actions Speak Louder than Goals? MARC M. SEBRECHTS & JOSEPH G. DECK, *Wesleyan University* (sponsored by John G. Seamon)—Executing even relatively simple procedures requires a set of plans that are organized around goals or actions and that include the necessary goal-action links. This paper described three experiments that examine the influence of goal-action structure on learning simple computer procedures. Immediate performance is enhanced by action-goal sequencing of instructions, whereas delayed testing shows better performance for goal-action sequencing. These results suggest contrasting practical implications for different organizations of conceptual plans.

3:00-3:15 (233)

Representation of Command Language Syntax. JOHN K. EDDY & DAVID W. BAUER, *American Bell, Inc.* (sponsored by Curtis A. Becker)—Two experiments compared two methods of representing command language syntax. One notation uses text characters to represent grammar, while the other uses boxes and arrows like a graph. In Experiment 1, subjects learned the graphic representation faster than the text format, and also demonstrated better retention of the rules. In Experiment 2, subjects used the same set of rules as reference material. Here, subjects extracted information from graphic representations faster and more accurately.

3:20-3:40 (234)

Effects of Mental Models on Acquisition of Operating Procedures. PETER G. POLSON, *University of Colorado*, DAVID E. KIERAS, *University of Arizona*, GEORGE ENGELBECK, & NANCY LEE WILLER, *University of Colorado*—Kieras and Polson (1982) hypothesized that mental models can facilitate learning and transfer of operating procedures if they contain the knowledge necessary to correctly infer steps in these procedures and explain or rationalize operator goals. Experimental and control groups learned several different utility tasks for a sophisticated word processor, to a criterion of three perfect repetitions. They were then transferred to various related utility tasks. The experimental group received a fairly complete explanation of how the machine functioned.

3:45-4:05 (235)

Mental Models and Learning How to Operate a Device. DAVID KIERAS & SUSAN BOVAIR, *University of Arizona*—Understanding how a system or device works should be helpful in learning how to operate it, but industry disagrees, and the literature on the role of metaphors and mental models is inconsistent. The results of several experiments, in which subjects learn to operate an artificial device, argue that a mental model helps only if, unlike general metaphors, it allows inference of the exact specific action sequences required to operate the device.

4:10-4:25 (236)

The Whys and Wherefores of Early Lisp Programming Errors. ROBIN JEFFRIES, *Carnegie-Mellon University* (sponsored by Lynne Reder)—During the early stages of learning any skill, students make errors in applying the basic concepts of the domain. From several experiments that examined errors novices made in evaluating simple Lisp functions, we have developed a model that accounts for the most frequent error types and for why certain errors (almost) never occur. The majority of errors are not due to systematic misconceptions, but to temporary "glitches" in the learner's procedure for applying recently learned definitions.

4:30-4:50 (237)

Blocking Learner Error States in a Training Environment. JOHN M. CARROLL, *IBM Watson Research Center*, & CAROLINE CARRITHERS, *Columbia University*—A commercial word processing system was modified to make typical and troublesome error states "unreachable"—thus eliminating sources of some new-user learning problems. Creating a training environment from a subset of the system's own basic function afforded 20%-55% faster learning coupled with 50%-100% better learning achievement and 40% better performance on a comprehension posttest. Subjects in a control group spent 25% of their free time recovering from the very error states that were unreachable in the training system.

4:55-5:10 (238)

Reminders in Learning a Cognitive Skill. BRIAN H. ROSS, *University of Illinois* (sponsored by Douglas L. Medin)—The learning of cognitive skills includes many cases of reminders, the memory retrievals of earlier learning episodes. Reminders were investigated in the learning of computer text-editing and probability theory, using performance data and verbal protocols. These studies document the occurrence of reminders during the early phases of learning and show that reminders can have strong and predictable effects on performance.

COGNITIVE PROCESSES IN ANIMALS

Chenin, Friday afternoon, 1:00-3:10

Chaired by Thomas Zentall, University of Kentucky

1:00-1:10 (239)

Information Superior to Reward When Pigeons and People Learn Sequences. STEVE LUCK, MARIANNE COLGROVE, & ALLEN NEURINGER, *Reed College* (read by A. Neuringer)—Pigeons received 2 sec of either food (reward group) or overhead light (information group) for the first two responses of a three-response sequence. All pigeons received 6 sec of food for completing the sequence. The information group made significantly fewer errors. Similarly, an informational light was better than points leading to money for college students learning an analogous, though more complex, sequence. These results support B. Schwartz (1982): Rewards can induce maladaptive response stereotypy.

1:15-1:30 (240)

Sequential Stimuli and the Organization of Sequential Behavior. STEPHEN B. FOUNTAIN, DAVID E. SCHENK, & ZOLTAN ANNAU, *Johns Hopkins University* (sponsored by Stewart H. Hulse)—A new method was used to test rats' ability to track the successive locations of blinking lights that appeared at one of six horizontal positions. The lights blinked on and off at a fixed pace and in a prescribed order. Error rates, response omission rates, and intrusion rates were examined to determine whether rats responded more to simple features of pattern structure than to the relative frequency of pattern elements.

1:35-1:55 (241)

Discrimination of Three-Item Sequences by Pigeons. HERBERT L. ROITBLAT, STEVEN DOPKINS, ROBERT A. SCOPATZ, & THOMAS G. BEVER, *Columbia University*—Pigeons were trained to discriminate one order of three visually presented stimuli from other orderings of the same stimuli. The pattern of acquisition suggested that stimuli appearing at the end of the string came to control discrimination earlier than did stimuli appearing early in the string. A decision model fit to the acquisition data confirmed this and revealed the gradual appearance of control by two and, ultimately, three stimulus units.

2:00-2:20 (242)

The Beginning and End of Sequence Discrimination. THOMAS G. BEVER, ROBERT A. SCOPATZ, STEVEN DOPKINS, & HERBERT L. ROITBLAT, *Columbia University*—Pigeons were trained to discriminate one order of three visually presented stimuli (ABC) from other orderings of the same stimuli (negative sequences). In Experiment 1, additional positive sequences (AXX, ABX, or XXC, XBC; X = a 1-sec dark key) and their corresponding negative orderings were presented. In Experiment 2, only a subset of negative sequences was presented: either none starting with A or none ending with C. In both experiments, manipulations that left the information at the end of the sequence intact resulted in faster learning.

2:25-2:45 (243)

Cognitive Integration of Order Information in Delayed Sequence Discriminations. R. G. WEISMAN, *Queen's University*—Extensive data from two- and three-event delayed sequence discriminations provided reliable rank ordering of the discrimination of negative from positive sequences. Analysis of these rankings found that (1) the integration of order and nonorder information follow different rules, and (2) the integration of information from three or more events requires a weighting constant not necessary with any two events.

2:50-3:05 (244)

Learning of a Nonperformed Response by Observation of Two-Choice Contingencies. CARLA CLOS & M. RAY DENNY, *Michigan State University* (read by M. R. Denny)—In a go/no-go discrimination setting, model-absent observational learning occurred and was liable to contextual blocking when go/no-go trials were preceded by 100 food-tray associations. Male rats were superior to females in this learning, as shown in a transfer-of-

training test and on reversal of the S+ and S- "manipulanda" when manipulanda were first made accessible. The role of gonadal steroids and attentional mechanisms was examined.

ANIMAL MEMORY

Chen, Friday afternoon, 3:20-5:20

Chaired by Frances McSweeney, Washington State University

3:20-3:40 (245)

Transfer of a Delayed Conditional Discrimination Based Upon Differential Outcome Expectancies. W. H. HONIG, WILLIAM MATHESON, *Dalhousie University*, & PETER W. D. DODD, *St. Mary's University*—Red and green initial stimuli cued a discrimination between vertical and horizontal test stimuli in pigeons, and signaled food and water as trial outcomes. Similar DOEs were established with blue and white, which then replaced red and green in a transfer phase. If the DOEs based on blue and white were consistent with the original line discrimination, transfer was almost perfect; if inconsistent, transfer was terrible, and performance with red and green was also disrupted. The findings support a mediational function for DOEs in discrimination learning.

3:45-4:05 (246)

Short-Term Memory in Pigeons for Visual and Auditory Stimuli. PHILIPP J. KRAEMER & WILLIAM A. ROBERTS, *University of Western Ontario* (read by W. A. Roberts)—In a symbolic delayed matching-to-sample procedure, two groups of pigeons were trained to peck comparison stimuli mapped onto either visual or auditory sample stimuli. Several experiments showed that visual and auditory short-term memory were affected in equivalent ways by manipulation of temporal variables and by presentation of houselight and white noise during the retention interval. In further work, a single group of pigeons trained to perform both visual and auditory delayed matching was tested with element and compound sample stimuli.

4:10-4:30 (247)

Fixed-Delay Matching to Sample: Predictability Causes Long-Latency Sample Responses. JOYCE A. JAGIELO & THOMAS R. ZENTALL, *University of Kentucky* (read by T. R. Zentall)—When pigeons are trained on delayed matching to sample with fixed delays (within sessions), latency of sample observing responses increases as delay (between sample offset and comparison onset) increases. Increased observing response latency is due to predictability of long-delay trials, and not to "loss of association" between sample pecks and choice-response/reinforcement. With a within-sessions, mixed-delay procedure, increased observing-response latency occurred only when long delays were predictable.

4:35-4:55 (248)

Forgetting Functions in Delayed Matching to Sample. K. GEOFFREY WHITE, *Victoria University of Wellington*—Functions relating the decrement in pigeons' accuracy to increasing delay-interval duration in delayed matching to sample were described in terms of accuracy at zero delay and rate of decrement. Accuracy at zero delay was affected by the sample-stimulus response requirement, and rate of decrement was influenced by interpolation of a houselight in the delay interval. Both were affected by intertrial-interval duration. The data question the independence of the two measures.

5:00-5:15 (249)

Sustained Increases in CRF Responding Following a Single Extinction Session. WILLIAM SPRING & LAURENCE MILLER, *Western Washington University* (read by L. Miller)—Four groups of five rats each leverpressed for water on CRF for 10 ½-h sessions. During Session 11, Group 1 remained on CRF; Group 2 was placed on VI 30 sec; and Groups 3 (no secondary reinforcer) and 4 (secondary reinforcer present) were placed on extinction. Compared with Group 1, Groups 2, 3, and 4 exhibited sustained increases in rate of CRF responding for the 10 sessions following Session 11.

CONCEPTUAL DEVELOPMENT Cuyamaca, Friday afternoon, 1:00-3:05

Chaired by Nancy Stein, University of Chicago

1:00-1:20 (250)

Mechanisms of Cognitive Growth: Development versus Learning. FREDERICK J. MORRISON, *University of Alberta*—Compare and contrast "development" and "learning" perspectives on cognitive growth. Be sure to include in your answer a discussion of why the development-learning distinction has recently resurfaced, as well as consideration of ways to theoretically or empirically disentangle the two concepts.

1:25-1:40 (251)

Category Familiarity and Taxonomic Organization in Young Children. MARJORIE S. HORTON, *University of California, Santa Cruz* (sponsored by Dominic W. Massaro)—Children's development of taxonomic organization is proposed to depend largely on their knowledge of conceptual hierarchies. A standard classification task compared children's taxonomic organization of explicit, familiar superordinate categories vs. implicit, unfamiliar categories. A proactive inhibition paradigm examined children's short-term memory organization for explicit vs. implicit categories. The findings suggest that category knowledge is a major factor underlying children's ability to use taxonomic organization in contexts requiring the explicit discovery of taxonomic organization.

1:45-2:05 (252)

The Acquisition of Natural Kind and Artifact Terms. FRANK C. KEIL, *Cornell University*—Three studies investigated how children learn the meanings of natural kind and artifact terms. The results suggest that children's representations of natural kind terms change with development from representations based mostly on characteristic features of concepts to representations that refer to underlying causal structure. This pattern is contrasted to that for artifact terms. Evidence that even young children will go beyond characteristic features with respect to certain very general conceptual categories is also presented.

2:10-2:25 (253)

The Development of Attentional Flexibility to Nonsymbolic and Symbolic Codes. BARBARA BURNS, *Mount Holyoke College* (sponsored by Eleanor Rosch)—This research examines the relation between nonsymbolic and symbolic codes for the same objects in nursery school children and adults. Restricted classification tasks are employed with sets of stimuli that vary nonsymbolically in a continuous fashion, yet symbolically vary discontinuously. The influence of labeling these objects before making classifications is also examined. Implications of a developing attentional flexibility to symbolic context for the developing perceptual and conceptual representational systems are discussed.

2:30-2:40 (254)

Learning Complex Concepts: The Case of Decimal Fractions. LAUREN B. RESNICK, *University of Pittsburgh*, & PEARLA NESHER, *Haifa University*—Research on children's initial conceptions of decimal fractions reveals parallels to "naive theories" in physics. Interview protocols show that decimal-fraction concepts are constructed by overgeneralization from decimal whole numbers and ordinary fractions and are complicated by systematic misinterpretations of zero. Gradual recognition of the infinite divisibility of numbers allows children to construct correct interpretations of decimal fractions. Findings on decimal knowledge are used to suggest general processes of conceptual learning in complex domains of knowledge.

2:45-3:00 (255)

The Development of Efficiency in Arithmetic Computation. DANIEL B. KAYE & VIRGINIA L. BONNEFIL, *University of California, Los Angeles*—The development of arithmetic problem-solving efficiency was studied using a secondary task probe procedure. Subjects in grades 2, 4, 6, and college computed simple addition problems (primary task) while simultaneously detecting

auditory probes (secondary task). The procedure allowed the measurement of probe RT at different stages of arithmetic problem solving. Probe and answer RTs were examined as functions of individual differences in psychometrically assessed mathematical ability.

CLASSIFICATION AND CATEGORIZATION Cuyamaca, Friday afternoon, 3:10-5:10

Chaired by Michael Doherty, Bowling Green State University

3:10-3:30 (256)

Comparing Likelihood Ratio and Prototype Models of Ill-Defined Categorization. THOMAS S. WALLSTEN, BARBARA FORSYTH, *University of North Carolina, Chapel Hill*, GEERT DE SOETE, *University of Ghent*, & JEFFREY BROOKS, *University of North Carolina, Chapel Hill*—Theories of ill-defined categorization and probabilistic inference tend to differ, although the tasks are similar. We contrasted a perceptual prototype categorization model to a stochastic likelihood ratio inference model by judiciously constructing two-dimensional stimuli that could have come from either of two ill-defined populations. Stimulus dimensions were integral or separable for different subjects, each of whom learned about and categorized the stimuli. Neither model alone describes the data, although the relative adequacy of each differs markedly for the separable and integral conditions.

3:35-3:50 (257)

Everything is a Good Example of Something. GREGG C. ODEN, *University of Wisconsin*—Some recent categorization results, while in some ways puzzling, can be naturally accommodated by a fuzzy propositional model of semantic memory. This will be explained with particular reference to pet fish, square melons, apples that are not apples, and other curious objects.

3:55-4:10 (258)

Classification Learning for Artificial and Natural Stimulus Populations. JAMES R. ERICKSON & ELIZABETH GAAS, *University of Texas, Arlington*—Subjects were trained on 9 exemplars (of 16) in a classification experiment and tested for transfer to other exemplars. Stimuli were either geometric forms varying only along four binary dimensions or famous people selected to fit four binary dimensions, but varying haphazardly on a number of others. The subjects were either informed or uninformed about dimensions. Learning and transfer data are compared with predictions from several models, and model parameters are compared with multidimensional scaling data.

(259 withdrawn)

4:35-4:45 (260)

The Structure of Social Categories. KATHLEEN DAHLGREN, *Pitzer College, Claremont Colleges* (sponsored by Leah Light)—Members of natural kind and artifact categories have been shown to bear a family resemblance relationship to each other. The structure of four social-role categories, "worker," "professional," "employer," and "politician" was investigated using procedures similar to those of Rosch and Mervis. We will present evidence that the relationship among members of social-role categories is different and that the difference is explained by the greater abstractness and complexity of social-role categorization.

4:30-4:45 (261)

Independence of Memory for Categorically Different Colors and Shapes. ROBERT M. BOYNTON & D. LEO STEFURAK, *University of California, San Diego*—We inhibited the use of names by making rewards contingent upon accurate solutions to mental arithmetic problems. We found independence of memory for shapes and colors: Gray shapes are remembered as easily as colored ones, and the colors of stimuli of the same shape are as easily remembered as those uniquely associated with different shapes. Moreover, there is no deleterious effect of adding or eliminating redundant shape or color cues between inspection and test periods.

4:50-5:05 (262)

A Parallel Dependent Model for Semantic Classification. DAVID BURROWS, *Skidmore College*—In three separate tasks, subjects classified stimulus words as belonging to a single category, to either of two unrelated categories, or to either of two related categories. Classification times for the related categories condition were less than for the unrelated categories condition, and approached those for the single-category condition. The results are consistent with a parallel model of classification in which the different component processes influence each other.

READING II

Laguna, Friday afternoon, 1:00-2:05

Chaired by Judith Kroll, Mount Holyoke College

1:00-1:10 (263)

The Eye-Mind Assumption is False. WAYNE SHEBILSKA, *University of Virginia*, & DENNIS F. FISHER, *Human Engineering Lab, Aberdeen Proving Grounds*—A reader's mind, according to the eye-mind assumption, processes a word for the same amount of time as the eyes gaze at it. This assumption is critical in major research projects that use gaze duration to estimate processing time. We will present evidence against the assumption, and we will present viable alternatives to gaze-duration measures.

1:15-1:30 (264)

A Word on Final Words. KARL HABERLANDT, *Trinity College*—People reading texts in the moving-window condition spend a longer time reading the final word than they do the remaining words of a sentence. Such sentence "wrap-up" is positively related to the number of propositions in the sentence and to the difficulty of the text and inversely related to the serial position of the sentence. These findings will be examined in light of recent models of reading comprehension.

1:35-1:45 (265)

Adult Age Differences in Processing Prose. THOMAS PETROS, DEE RAMSEL, & MARK GRABE, *University of North Dakota* (sponsored by James R. Antes)—Prose comprehension was examined in young and older adults. Reading times and immediate recall measures were both used as measures of comprehension. Older adults recalled less and had longer reading times, but both age groups favored the main ideas in their recalls and spent more time reading them. The results suggest that young and older adults process narrative passages in a similar manner. Potential sources of age differences in prose recall will be discussed.

1:50-2:00 (266)

Relationship Between the Tongue-Twister Effect and Articulatory Coding During Reading. ILA PARANIS, *National Technical Institute for the Deaf, Rochester Institute of Technology* (sponsored by James R. Ison)—Hearing and congenitally deaf undergraduates read tongue-twisters and matched control sentences aloud and silently. Tongue-twisters were created (1) by repeating word-initial phonemes, or (2) by repeating word-initial place of articulation using visually dissimilar phonemes. Longer silent reading times occurred for tongue-twisters than for control sentences but were not related to hearing status, speech intelligibility, or aloud reading performance, raising questions about the nature of the tongue-twister effect and the evoked articulatory code during normal reading.

MEMORY III

Laguna, Friday afternoon, 2:15-5:30

Chaired by Henry Roediger III, Purdue University

2:15-2:30 (267)

The Pragmatics of Measuring Recognition-Memory Performance. JOAN GAY SNODGRASS, *New York University*—I argue that a valid measure of recognition-memory performance should satisfy three criteria: (1) be invariant across changes in

bias; (2) be defined when error rates are zero; and (3) be maximally sensitive to robust memory variables. A comparison of seven point measures based on dichotomous judgments showed that only the one derived from two-high-threshold theory fulfilled all three criteria. Six-interval confidence ratings were more sensitive than point measures to the independent variables.

2:35-2:45 (268)

Discriminating Experimental from Preexperimental Memories. BARBARA ANNE DOSHER, *Columbia University* (sponsored by Wayne A. Wickelgren)—A word-pair recognition study was conducted with semantically related and unrelated pairs and a speed-accuracy tradeoff procedure. False-alarm rates were relatively high for semantically related distractors when response times less than 1 sec were forced, with partial recovery of false-alarm rates after 1 sec. This pattern also held in another experiment in which semantically related pairs were never presented in learning. Subjects apparently suppress semantic information after retrieving experimental context.

2:50-3:05 (269)

An Associational Approach to Differences in Short- and Long-Term Retrieval. WILLIAM P. JONES, *Bell Laboratories, Murray Hill* (sponsored by Tom K. Landauer)—Two experiments directly compared performance in the Sternberg and fact-retrieval tasks using the same subjects and materials. Results are well described by an associational, spreading-activation model with two features of interest: (1) Pretrial activation levels of areas in memory vary to reflect differences between short- and long-term retrieval; and (2) for related material, decisions can be based upon indirect pathways which connect the elements of a test probe through pre-experimental associations in memory.

3:10-3:25 (270)

Memory Availability and Contextual Constraint as a Function of Homograph Dominance. DAVID S. GORFEIN, *Adelphi University*—The release from proactive inhibition technique applied to heterophones by Gorfein and Viviani (this meeting 1981) is used to investigate the availability of both senses of homographs under two levels of contextual constraint. In separate experiments, balanced homographs (mean dominance = 54%) and highly polarized homographs (mean dominance = 98%) are studied. Results are discussed in terms of a view of memory retrieval.

3:30-3:45 (271)

Recognizing in Context. MICHAEL S. HUMPHREYS, JOHN D. BAIN, & RAY PIKE, *University of Queensland*—A distributed memory model for the recognition of items tested in the presence of the other member of the study pair is presented. It is assumed that target items are either matched against the memory for the study list or against the output of a retrieval process. An extension of the model to the general issue of deciding whether an item had occurred at a particular time or place is discussed.

Chaired by William Jones, Bell Laboratories

4:00-4:10 (272)

The Role of Internal Cues in Recall Following Semantic Processing. FRANCIS S. BELLEZZA, *Ohio University*—Theories concerned with mnemonic techniques indicate that organized internal cues are necessary for complete recall. Organization of internal cues may also be important for recall following tasks used in levels-of-processing experiments. Data are presented from recall following semantic-processing tasks in which task difficulty, degree of self-reference, degree of semantic elaboration, degree of induced word discrimination, and degree of organization of internal cues all varied. Only organization was related to recall performance.

4:15-4:30 (273)

Relational and Individual Item Information in Memory for Social Actions. R. REED HUNT & CATHERINE E. SETA, *University of North Carolina, Greensboro*—Is memory for the actions of another person better when those actions are consistent or when they are inconsistent with a known social prototype? Based upon our previous ideas concerning the simultaneous im-

portance of relational and individual item information in recall, we suspected that memory for consistent and inconsistent actions would depend upon whether attention focused upon the similarities or differences between the actions and the prototype during encoding. The data were consistent with these predictions.

4:35-4:50 (274)

Priming in Word Fragment Completion: Effects of Modality and Orthography. HENRY L. ROEDIGER III & TERESA A. BLAXTON, *Purdue University*—Subjects studied words presented visually (typed vs. printed) or auditorily and later attempted to complete typed or printed word fragments, half of which had been presented during study. Fragments were better completed for previously studied words in all conditions, but the magnitude of this priming effect increased as the similarity between study and test conditions increased. This same pattern was not observed in recognition memory performance, however.

4:55-5:05 (275)

Orthographic Prime Interference in Name Retrieval. ALAN S. BROWN & JAMIE BAGNALL, *Southern Methodist University*—Proper-name retrieval to sentence cues (The black comedian in "The Toy" was _____) was preceded by a neutral (— — —), correct (Pryor), unrelated (Cossell), initially orthographically similar (Presley), or terminally orthographically similar (Garner) prime. The outcome suggested orthographic prime interference: a prime with the initial portion in common with the target inhibited retrieval, as evidenced by longer latencies (and higher errors) than after a neutral prime.

5:10-5:25 (276)

Stopping Thoughts and Actions. GORDON D. LOGAN, *University of British Columbia*—Subjects making category and rhyme judgments were occasionally asked to inhibit their responses. Re-presentation of word pairs showed repetition priming only if the subjects responded to the first presentation; inhibited responses were generally not primed upon re-presentation. These results differ from findings with recognition memory; memory was the same whether or not subjects responded to the first presentation. The results bear on differences between recognition memory and repetition priming and on the nature of attentional control.

LEXICAL DECISION PROCESSES Palomar, Friday afternoon, 1:00-3:35

Chaired by Ray Klein, Dalhousie University

1:00-1:10 (277)

How Sentence Context Affects Word Identification: A Signal Detection Theory Analysis. BENITA L. HALE & JAMES C. JOHNSTON, *Bell Laboratories* (read by J. C. Johnston)—Hypothesis-testing theories of word identification predict that sentence context should improve sensitivity. Information-pooling theories predict that only bias should change. These predictions were tested with a perceptual matching task. Sentence frames (Xs in the control condition) were displayed on a CRT one word at a time. Subjects judged whether a final stimulus word (degraded) matched a test word and gave a confidence rating. Sensitivity and bias effects were assessed using signal detection theory.

1:15-1:35 (278)

The Role of Discourse Context in Word Identification. WALTER KINTSCH & ERNEST F. MROSS, *University of Colorado*—Two types of context effects on word identification are distinguished: thematic effects arising from the text representation that is being constructed during comprehension, and associative effects arising from the words themselves that make up a text. An experiment is reported which shows that the latter are primarily responsible for priming effects in a lexical decision task in which subjects respond to visually presented stimuli while listening to a discourse.

1:40-1:55 (279)

Effects of Sentence Constraint and Cue Validity on Lexical Decisions. PAULA J. SCHWANENFLUGEL, *Florida Atlantic*

University (sponsored by Edward J. Shoben)—Four experiments demonstrated that decreasing sentence constraint broadened the range of completions that are facilitated in lexical decision. Low-constraint sentences facilitated expected as well as unexpected words. High-constraint sentences facilitated only expected words. Increasing the cue validity of the experiment narrowed the scope of facilitation for high- but not for low-constraint sentences. The findings are consistent with the view that more restrictive featural expectations are generated as sentence constraint and cue validity increase.

2:00-2:15 (280)

Blocking Effect on Reaction Times to Positive and Negative Signs. LESLIE WHITAKER, *University of Missouri*—Reaction times to positive (e.g., LEFT) and negative (e.g., NOT LEFT) signs were measured. To determine the effect of context, some blocks included both positive and negative signs. Reaction times were faster for both positive and negative signs in the separated-blocks condition. However, negative signs were still slower than positive signs by 280 msec.

2:20-2:40 (281)

Visual Word Recognition: Analysis and Synthesis of Open and Closed Class Items. DEREK BESNER, *University of Waterloo*—Five experiments address the question of whether processing differences underlie the recognition of open (content words) and closed (functors) class items in tachistoscopic report, lexical decision, and naming. Differences are seen in tachistoscopic report but not in lexical decision or naming. An account which supposes that these differences emerge in synthesis but not analysis is sketched.

2:45-3:05 (282)

On Obtaining Facilitatory and Inhibitory Priming Effects at Short SOAs. JAMES H. NEELY, WILLIAM J. FISK, & KENT L. ROSS, *Purdue University*—At short prime-target stimulus onset asynchronies (SOAs) in lexical decision tasks, Neely (1977, *JEP:G*) obtained facilitation and no inhibition from related and unrelated primes, respectively, whereas Antos (1979, *JEP:HPP*) obtained no facilitation and inhibition. To find out why, we manipulated variables that differed in their experiments. Whether SOA was manipulated between or within subjects and whether nonwords were validly predicted by word primes affected related-prime facilitation but not unrelated-prime inhibition.

Chaired by Leslie Whitaker, University of Missouri

3:20-3:35 (283)

Semantic Priming Without Association: A Second Look. STEPHEN J. LUPKER, *University of Western Ontario*—In 1977, Fischler demonstrated "semantic" priming without association in a lexical decision task, presumably underlining the importance of semantics for models of priming. The generalizability of this result was examined in the present studies. Semantic relatedness referred to prime and target belonging to the same semantic category (e.g., CAR-BOAT). Basic conclusions were: semantic relatedness (1) primes lexical decisions, (2) has little effect on naming, and (3) does nothing to augment the effects of association in either task.

3:40-4:00 (284)

Timecourse of Lexical Activation with Variations in Prime-Target Relationship. LEE SMITH & RAYMOND KLEIN, *Dalhousie University* (read by R. Klein)—An adequate evaluation of the widely held two-process model of semantic context effects requires a fresh, parametric approach. Our lexical decision experiments manipulated: type of prime (related, unrelated, BLANK), prime target interval (-40-, 0-, 40-, 80-, 160-, 320-, and 640-msec SOAs), probability of a related target (75% vs. 25%), and strength and nature (categorical, associative, mediated) of prime-target relationship. The timecourse of priming we observed with different materials violates basic expectations of the two-process model.

4:05-4:20 (285)

The Timecourse of Meaning Activation of Ambiguous Words. GREG B. SIMPSON & CURT BURGESS, *University of Nebraska,*

Omaha (sponsored by Kenneth A. Deffenbacher)—A lexical decision experiment examined the timecourse of meaning activation of ambiguous words, using relatively long prime-target intervals (300, 500, and 750 msec). Both meanings were available at 300 msec, but by 750 msec, only the dominant meaning was still activated. In conjunction with previous research using shorter intervals, the results suggest a two-stage model for processing ambiguous words in isolation.

4:25-4:40 (286)

Two Kinds of Lexical Priming. MARK SEIDENBERG, *McGill University*—Lexical priming derives from two sources: automatic spreading activation (a prelexical effect) and judgments that stimuli are related (a postlexical effect). Lexical decisions are sensitive to both processes, naming is sensitive to only the former. "Syntactic" priming, "backwards" priming, and changes in the magnitude of the priming effect as a function of the proportion of related stimuli are postlexical effects; only garden-variety semantic priming is not.

4:45-5:05 (287)

An Analysis of the WSE and Spreading-Activation Theory. F. MARCO MARCHETTI & D. J. K. MEWHORT, *Queen's University* (read by D. J. K. Mewhort)—Spreading-activation theory anticipates a WSE when a trailing pattern mask is used to limit performance, but claims that the WSE should not occur without use of a mask. In contrast, we demonstrate a WSE using both luminance adjustment and direct feature loss. Furthermore, because manipulations that destroy wordness (e.g., columnar presentation) also eliminate the WSE, the luminance adjustment and direct degradation cases represent true context enhancement, not an artifact of too low performance on letter trials.

5:10-5:30 (288)

Speed-Accuracy and Additive Factors: Lexical Decision, Memory Scanning, and Choice. RICHARD SCHWEICKERT, *Purdue University*—If certain assumptions are met, error rates are irrelevant to whether factors have additive effects on RT. Furthermore, factors selectively influencing serial processes will have additive effects on log percent correct and roughly additive effects on errors. Accuracy in choice (Schwartz, Pomerantz, & Egeth), lexical decision (Schubert, Spoehr, & Lane), and memory scanning (Lively) tasks is analyzed with a chi-square test. In each case, the accuracy analysis supports the conclusions of the RT analysis.

PERCEPTION

Sauterne, Friday afternoon, 1:00-5:35

*Chaired by Diane Halpern,
California State College at San Bernardino*

1:00-1:15 (289)

On Goodness, Gestalt, Groups, and Garner. STEPHEN E. PALMER, *University of California, Berkeley*—Garner's analysis of figural goodness as "R&R subset size" is contrasted with an alternative based on *symmetry groups*. R&R subset size is shown to be isomorphic with a special case of the group theoretical analysis, and data are presented that require the additional complexity of the general case. The symmetry analysis is then extended to "local symmetries" over restricted regions of space, and further data are presented that demonstrate the influence of this more general structure on perceived goodness. Implications for a theory of perceptual organization are considered.

1:20-1:40 (290)

We Perceive Layout of Space, Not Distance of Objects. RALPH NORMAN HABER, & RICK TOYE, *University of Illinois, Chicago*—Most theories of space perception take the explanation of the perceived distance of objects as their primary task; most research is concerned with measurement of distance from an observer. New methods and metrics are presented that measure perception of the arrangement of objects in a scene. Data show that these are far more descriptive of what observers actually perceive when looking at scenes. From these, we can demonstrate that the shape of perceived layout of space is nearly veridical.

1:45-2:00 (291)

An Experimental Comparison of Three- versus Four-Surface Phenomenal Transparency. SERGIO CESARE MASIN, *University of Padua*—The three-surface transparency occurs when an object seen through a transparency does not jut out under the transparent surface. The four-surface transparency occurs when the object juts out. Observers rated the density of the transparent surface in both kinds of transparency. The results seem to show that the topological diversity between the two kinds of transparency has no functional significance. The stimulus conditions ruling the generation of the two phenomena were detected and discussed.

2:05-2:25 (292)

Three Gradients and the Perception of Flat and Curved Surfaces. JAMES E. CUTTING, *Cornell University & Atari Inc.*—Viewers assessed the phenomenal three-dimensional character of projections of flat and curved surfaces receding in the distance. Inter-stimulus judgments were scaled, and multiple correlation on scale values revealed that the perspective gradient is most important in judging flat surfaces, the compression gradient for curved surfaces, and density gradients are unimportant for either. These results show that *slant per se* is irrelevant to the perception of flatness, and has been misapplied to surface perception.

2:30-2:45 (293)

Form Effects in Nonplanar Dot Pattern Detection. WILLIAM R. UTTAL, *University of Michigan*—The three-dimensional shape of a nonplanar surface (consisting of arrays of dots) affects its detectability when it is embedded in random three-dimensional masking dots. Surfaces defined by third-degree polynomial or sinusoidal expressions that contain more than a single maximum or minimum do show strong form effects as a function of the amplitude of the deviation of the surface away from a prototypical plane. Theoretical implications and a mathematical model are considered.

2:50-3:05 (294)

Training Influences the Processing of Figural Information in Apparent Motion. LAURA L. MORAVEC, *New College of University of South Florida* (sponsored by Dewey Rundus)—Observers were shown 120 trials of multiple oscillations of an ambiguous apparent motion display. In each trial, the direction of figural identity was switched on a randomly chosen oscillation. For untrained observers, the perceived direction of motion did not change with a change in the direction of figural identity. Trained observers did follow the changes in direction. I investigated the number of switches per trial that trained observers could follow.

Chaired by William Uttal, University of Michigan

3:20-3:35 (295)

Perceived Structure from Motion for Scintillating Surfaces. JAMES T. TODD, *Brandeis University*, & JOHN PITTENGER, *University of Arkansas, Little Rock*—Two experiments examined the ability of observers to discriminate changes in slant for rotating planar surfaces in which texture elements appeared and disappeared at random. Variables investigated included the number of display frames for which each texture element was visible, the percentage of elements that changed during each frame transition, and the spatial separation between old and new elements. The results are considered in relation to existing algorithms for computing structure from motion.

3:40-3:55 (296)

Factors Affecting Multistability in Moving Point-Light Displays. DENNIS R. PROFFITT, *University of Virginia*—Researchers in motion perception often make use of reduced point-light displays in order to examine the role that motion plays in organizing the visual world. A series of experiments examined many of the most frequently studied point-light stimuli and found them to be multistable. Factors affecting this ambiguity included: proximity, orientation, occlusion, and other conditions influencing the meaningfulness of these displays. The relative contribution of these factors in fully structured situations is discussed.

4:00-4:15 (297)

Boundary Tracing: An Internal Visual Process. PIERRE JOLICOEUR, *University of Saskatchewan*, SHIMON ULLMAN, *Massachusetts Institute of Technology*, & MARILYN E. MACKAY, *University of Saskatchewan* (sponsored by Stephen Kosslyn)—The time to decide whether two Xs are on a common boundary or on different boundaries in a brief visual display increases monotonically with increasing boundary distance between the Xs. The results suggest that people have an internal visual process that can trace along boundaries in a visual display, and that the rate of boundary tracing is limited. The average rate of boundary tracing is 25 msec/deg of visual angle.

4:20-4:35 (298)

Discriminability of Line Elements in Briefly Presented Outline Forms. BRUCE EARHARD, *Dalhousie University*—The supposition has been advanced that the processing of form begins with the outer contours and moves inward. A series of experiments investigated the discriminability of constituent line elements in briefly exposed outline forms. Under unconstrained processing conditions, some measure of support was found for an outside-in processing sequence.

4:40-4:50 (299)

The Multiple Determination of Illusory Contours: An Empirical Investigation. DIANE F. HALPERN, *California State College, San Bernardino*, BILLY SALZMAN, *University of California, Riverside*, WAYNE HARRISON, *University of Nebraska, Omaha*, & KEITH WIDAMAN, *University of California, Riverside*—Judgments of contour strength or saliency for 24 illusory contour configurations were subjected to a confirmatory factor analysis. A four-factor model that posited the involvement of simultaneous contrast, linear effects, depth/completion cues, and feature analyzers accounted for a substantial proportion of the variance in judgments of illusory contour strength. The hierarchical addition of a fifth factor, diffuse illusory contours, significantly improved the overall fit of the model, but added little to the proportion of explained variance.

4:55-5:10 (300)

Blur Modulates Orientation Perception in the Rod-and-Frame Task. SHELDON M. EBENHOLTZ, *University of Wisconsin, Madison*—Three levels of blur were introduced in the frame while the rod remained in clear focus. At zero blur, the frame edge represented a square wave with a spatial frequency of .581 cycles deg⁻¹, and the three blur conditions approximated sinusoidally modulated luminance distributions of .606, .216, and .078 cycles deg⁻¹. Orientation errors fell into two categories, the two highest blur conditions in one, zero and low blur in the other. Theoretical implications will be discussed.

5:15-5:30 (301)

Estimation of Auditory Distance After Active or Passive Visual Deprivation. ROBERT I. REYNOLDS, *Fordham University*—Subjects estimated distances between themselves and a familiar sound source immediately after being blindfolded and after 75 min of visual deprivation. One group of 12 subjects sat passively, while a second group actively pursued daily activities. The passive group showed no improvement in accuracy of distance estimation. Subjects with active experience showed a significant ($p < .001$) increase in accuracy, giving estimations even superior to those made while sighted.

METAPHOR

San Antonio, Saturday morning, 8:00-9:00

Chaired by Greg Lockhead, Duke University

8:00-8:15 (302)

Processing Surface and Deep Anaphors: Multiple Representations in Discourse Processing. MICHAEL K. TANENHAUS, *University of Rochester*, & GREG N. CARLSON, *Wayne State University*—We present evidence that in processing certain anaphors (termed "surface anaphors" by Hankamer & Sag) readers initially retrieve a linguistic-level (grammatical representation) of the ante-

cedent material, while in processing other ("deep") anaphors they retrieve a conceptual or discourse-model representation. Our data suggest that both of these types of representations are used during discourse processing—a view consistent with modular models of language comprehension.

8:20-8:35 (303)

A Metaphor is Like a Foggy Day: Understanding Metaphors. NEAL KROLL, *University of California, Davis*—Participants classified similes as good/bad figurative communication. To investigate context effects on comprehension and memory of similes, "context sentences" preceding each simile presentation were relevant (literalized the simile), irrelevant (did not refer to a common property of the simile's subject and predicate), or misleading (referred to a common property not related to the simile's ground). Decision times, misclassifications, and subsequent recognition performance will be discussed in terms of processes involved in comprehension of sentence pairs.

8:40-8:55 (304)

Do Metaphors Convey Information Other Than What Speakers Intend? SAM GLUCKSBERG, *Princeton University*, ANNE LOCKSLEY, *New York University*, ALYCE RUSSO, *Princeton University*, & CHARLES STANGOR, *New York University*—How literally are metaphors taken? For example, if a strong person is described as "a bull," do listeners attribute other bull-like qualities, such as stubbornness or quick temper, to that person? Subjects made old-new judgments of such descriptions in a continuous recognition paradigm. Patterns of latencies to new items that were conceptually related to either metaphorical or literal old items suggest that people do not draw unwarranted inferences from such metaphorical descriptions.

DECISION MAKING

San Antonio, Saturday morning, 9:10-12:15

Chaired by Curt Becker, *American Bell*

9:10-9:20 (305)

Evidence for a General Time-Sharing Ability. JOHN FORESTER & PEDER J. JOHNSON, *University of New Mexico* (read by P. Johnson)—Time sharing as a general ability was investigated using six single tasks and three dual tasks. The dual tasks were constructed to emphasize the contribution of cognitive factors while minimizing the contribution of response strategies upon performance. A multiple regression analysis assessing the relationship among different dual tasks, while controlling for single-task abilities, showed strong evidence for a general time-sharing ability.

9:25-9:40 (306)

Response Times and Models of Probabilistic Decision Tasks. N. JOHN CASTELLAN, JR., *Indiana University*—Models proposed for probabilistic judgment tasks typically focus on traditional measures such as response proportions, accuracy, and similar indices. The hypothesis generation model makes predictions about response times in such tasks. In a series of experiments in which cue validities and base rates were varied, observed response times were well predicted by the model, giving additional support to the processing assumptions of the model. The results have implications for the validity of other decision models.

9:45-9:55 (307)

The Use of Reliability in Multiple-Cue Probability Processing. PAUL J. COOK & LOWELL M. SCHIPPER, *Bowling Green State University* (read by L. M. Schipper)—A modification of the MCPP model, introduced by Jones, Schipper, and Holzworth (1978), incorporates differential reliabilities of certain cues. The addition of this dimension, reliability, enables a further analysis of the types of strategies that may be used by the decision maker. It also evaluates the effect of differential reliability of cues over and above their actual probabilistic (predictive) value.

10:00-10:20 (308)

The Role of Problem Analysis and Definition in Act Generation. REBECCA M. PLISKE, CHARLES F. GETTYS, MICHELLE KELLEY, & JASON W. BECKSTEAD, *University of Oklahoma* (read by C. F. Gettys)—Three experiments investigated the role of problem analysis and definition in generating possible solutions to a common decision problem. Cuing subjects with either generic or specific solutions showed that subjects could not generalize the information when it was presented as a specific solution to the problem. A second, surprise session resulted in elaboration of first-session ideas. Training in problem analysis and definition resulted in the generation of a larger variety of generic solutions.

10:25-10:45 (309)

Stress Effects on Problem-Solving and Decision-Making Behavior. JAMES SHANTEAU & GERI A. DINO, *Kansas State University*—What happens to higher cognitive processes when people are under long-term environmental stress? Thirty-two subjects were placed in a small, hot, and crowded chamber for 24 or 48 h. They were given several problem-solving and decision-making tasks. Under stress, subjects showed decreases in creativity, lower reliability in decision making, and shifts in serial-position effects. In contrast, stress had little impact on verbal problem solving, general intelligence, or decision complexity.

10:50-11:05 (310)

To Believe or Not Believe: Pragmatics of Topic and Source. VALERIE F. REYNA, *University of Texas, Dallas* (sponsored by James Bartlett)—This research focuses on opinion formation in decision makers who must rely on sources (e.g., experts). Experiments eliciting choices, decision times, and believability ratings examined the following factors: topic and a source's reliability, expertise, and confidence. Results indicate that topic interacts with confidence such that, paradoxically, a less confident source can be more persuasive than a more confident source; also, a source's credibility is augmented more by his reliability than by his expertise.

11:10-11:25 (311)

Viewing Radiological Images: Teaching Practices. DENNIS P. CARMODY, *Saint Peter's College* (sponsored by Paul J. Locher)—Radiology instructors and residents were surveyed for their methods of instruction concerning viewing techniques. A similar group of radiologists had their eye activity measured as they viewed chest images. Image-reading techniques are taught to be systematic and directive with comparisons of bilateral features. Yet, most images are read by a free-search method; bilateral comparisons comprise less than 5% of the visual activity. Instructors and residents show this discrepancy between instructional techniques and reading practice.

11:30-11:50 (312)

Judgments of Salary Bias and Test Bias. MICHAEL H. BIRNBAUM & LINDA HYNAN, *University of Illinois, Champaign*—Academics examined correlation scatterplots and judged group bias. Half judged salary bias from graphics showing salary vs. merit with separate ellipses for each group. Others judged test bias from graphs of job performance vs. test scores. Centroids and within-group correlations were varied. Judgments were not consistent with regression definitions of bias. Instead, it was judged unbiased when the difference in standard deviation units was equal on both dimensions, consistent with Birnbaum's one-mediator model.

11:55-12:10 (313)

Mental Models in Dynamic Decision Making. ANDREW MACKINNON, IAN CESA, & ALEXANDER J. WEARING, *University of Melbourne*—The management of complex dynamic systems presumably requires a model (set of rules) to guide the manager's decisions. A series of experimental results are reported which elucidate some of the rules employed in systematically varied tasks requiring sequences of decisions. An interaction is noted between type of task and rules and heuristics utilized.

ANIMAL LEARNING

Chenin, Saturday morning, 8:00-9:20

Chaired by Joseph Ternes, VA Medical Center, Philadelphia

8:00-8:15 (314)

An Associative-Learning Computer-Simulation Model for Operant Behavior. CHARLES P. SHIMP, *University of Utah*—An improved version of a computer-simulation model (AL) successfully describes both molar and molecular properties of behavior in concurrent operant situations. It also successfully describes some important features of acquisition and of variability during asymptotic performance. Previous versions of AL have described various aspects of animal timing so that overall AL applies to a broad range of phenomena.

8:20-8:40 (315)

Contingency Effects on Time Allocation. ARTHUR TOMIE & ERIC LOUKAS, *Rutgers University*—The effects of response (1 sec occupancy of target area)-reinforcer (ICS) contingency on time allocation in the open field in rats was evaluated by parametric variation of $X = p(\text{ICS}/\text{response})$ and $Y = p(\text{ICS}/\text{no response})$. The results indicate that rate of acquisition and asymptotic level of time allocation bias were closely approximated by the Weber fraction $(X - Y)/X$.

8:45-8:55(316)

Simple- and Multiple-Schedule Responding and Behavioral Contrast. FRANCES K. McSWEENEY, *Washington State University*—Two studies examined differences between responding during simple schedules and during comparable components of multiple schedules. The results generally resembled multiple-schedule behavioral contrast. Differences were not observed when naive pigeons served as subjects and the discriminative stimuli did not appear on the instrumental key. Differences sometimes appeared when the simple schedule was the less favorable, but not the more favorable, component of the multiple schedule and pigeons pressed treadles for food reinforcers.

9:00-9:15 (317)

Differential Schedule Efficacy for Four Differentially Conditionable Responses. SAMUEL G. CHARLTON, *University of New Mexico* (sponsored by Douglas P. Ferraro)—Previous research has shown that success in conditioning grooming is determined by the reinforcement schedule used. Statements about the relative conditionability of behavior will thus depend upon the schedules used to compare conditioning. In the present investigation, hamsters were reinforced for four differentially conditionable behaviors; open rearing, digging, scrabbling, and grooming, under FCD, FI, and VI schedules of food reinforcement. The obtained data are discussed in terms of an empirical systematization, or continuum, of conditionability.

ANIMAL PSYCHOPHARMACOLOGY

Chenin, Saturday morning, 9:30-10:35

Chaired by David Eckerman, University of North Carolina

9:30-9:40 (318)

Nicotinic Receptors and Tonic Immobility (TI) in Chickens. RICHARD W. THOMPSON, *Western Washington University*—In Experiment 1, chicks were tested for TI following injections of 0, .1, or .4 mg/kg of nicotine or 4.5 or 9 mg/kg of hexamethonium, a peripheral nicotinic blocker. Results revealed that .4 nicotine increased TI durations. In Experiment 2, birds were injected with water or .4 mg/kg of nicotine and water or 9 mg/kg of hexamethonium prior to TI testing. Nicotine increased TI durations and hexamethonium did not block this increase.

9:45-10:00 (319)

Morphine Tolerance in Hamsters. PAUL SCHNUR, *University of Southern Colorado*—Morphine produces biphasic effects on locomotor activity in hamsters: Activity is first depressed and then elevated relative to that of saline controls. The present experiments

investigated the development of tolerance to morphine's locomotor effects in hamsters. In the first experiment, daily injections of morphine produced a decrease in morphine's depressant actions and an increase in morphine's excitatory actions. In the second experiment, changes in both portions of the time-effect pattern were shown to be context-specific.

10:05-10:15 (320)

Evidence That Rats Learn to Like the Taste of Morphine. J. W. TERNES, D. A. ZELLNER, K. BERRIDGE, & H. J. GRILL, *University of Pennsylvania*—Three groups of weanling rats drank morphine, quinine, or water for 90 days. Morphine rats drank more morphine than water in two-bottle choice tests. Morphine rats also showed positive orofacial responses to morphine solutions, both during morphine maintenance and following 72 h of morphine abstinence. Both water and quinine controls showed negative orofacial responses in both conditions. All three groups showed positive orofacial responses to sucrose solutions.

10:20-10:30 (321)

Psychopharmacology of Negative-Contrast Alleviation. CHARLES FLAHERTY & HOWARD BECKER, *Rutgers University*—Rats shifted from 32% to 4% sucrose consume less 4% than do unshifted 4% animals. This negative-contrast effect is alleviated by anxiolytic drugs (chlordiazepoxide, ethanol, sodium amobarbital) but not by nonanxiolytics (haloperidol, scopolamine, imipramine). Since the anxiolytics potentiate GABA, it is possible that GABA mediates recovery from contrast. However, our recent studies indicate that the serotonin antagonist cyproheptadine also alleviates negative contrast. Possible GABA and serotonin mechanisms of contrast recovery will be considered.

PSYCHOPHARMACOLOGY OF HUMAN MEMORY

Chenin, Saturday morning, 10:45-12:35

Chaired by Elizabeth Bjork, University of California, Los Angeles

10:45-11:00 (322)

Effects of Social Drinking on Sober Mood State and Memory. ISABEL M. BIRNBAUM, THOMAS H. TAYLOR, *University of California, Irvine*, & ELIZABETH S. PARKER, *NIAAA*—The meaning of correlations between amount of social drinking, sober mood state, and memory was explored. In two studies, subjects were assigned randomly to groups instructed either to abstain from alcohol or to maintain alcohol consumption for several weeks. Potential reversibility of the effects of alcohol was the prime concern, and some evidence for reversibility was found.

11:05-11:20(323)

Memories on the Rising and Falling Blood-Alcohol Curve. ELIZABETH S. PARKER, *National Institute on Alcohol Abuse and Alcoholism*, RONALD SCHOENBERG, *National Institute of Mental Health*, BARBARA L. SCHWARTZ, & ENDEL TULVING, *University of Toronto*—Young men saw a long list of words during an 8-h drinking episode, at different levels of blood-alcohol concentration. Priming effects in a word-fragment completion task, and the subjects' recognition memory for words were measured in a similar protracted test session 7 days later. Recognition-memory performance was affected by changes in the blood-alcohol level, whereas priming effects in word-fragment completion were identical for alcohol and placebo subjects.

11:25-11:40 (324)

Psychophysics of Chronic and Acute Ethanol Tolerance in Humans. WILLIAM P. BANKS, *Pomona College and Claremont Graduate School*, ROGER P. BENTON, *Claremont Graduate School*, NANCY E. WEBBER, *Pomona College*, & DIRK RUIZ, *Stanford University*—Magnitude estimations of perceived blood level of ethanol show acute tolerance effects in single drinking sessions as well as chronic tolerance when moderate and heavy drinkers are compared. Tolerance acquired in a single drinking session is shown to persist into subsequent sessions over 24 h later, with a week of abstinence required for complete recovery from drinking-induced tolerance. Magnitude estimation, psychomotor

performance, and ad-lib drinking show these effects, but, oddly, recognition memory does not.

11:45-11:55 (325)

Caffeine Habits, Beliefs, and Cognitive Effects Among College Students. JOSEPH PUTNAM BLOUNT & W. MILES COX, *University of Minnesota, Morris* (read by W. M. Cox)—Survey studies disclosed light caffeine consumption among college students, false beliefs that diet soda drinks are caffeine-free, and other findings. In coordinated experiments, the ill effects of state-dependent learning found with other stimulant drugs were not produced by caffeine. Contrary to other research, there were no performance effects due to caffeine or relationships between habitual usage and academic achievement. Thus, moderate caffeine usage appears to have no adverse cognitive consequences.

12:00-12:15 (326)

Effect of Vasopressin Analog on Memory for Implicational Sentences. BILL E. BECKWITH & ROBERT E. TILL, *University of North Dakota*—Subjects in a treatment \times sex \times encoding \times test design were administered a 60- μ g dose of a vasopressin analog (DDAVP) or a placebo 20 min before hearing a list of implicational sentences. During sentence presentation, the subjects performed a memorization task or a comprehension task. They were housed in free recall or cued recall (with implications as cues). A treatment effect was found only for males, i.e., DDAVP improved memory but did not interact with encoding or test variables.

12:20-12:30 (327)

Longer Delay, Better Recall with Amphetamine. JOHAN HUETING, MICHAEL DEBOECK, & ERIC SOETENS, *University of Brussels*—In a series of four experiments, the effects of 10 mg d-amphetamine on free recall were studied. With a memory drum, 10 lists, each containing 20 words, were presented at rates of 1 and 4 sec. There was no effect on immediate recall after each list. There was a significant effect on final recall after the 10 lists. There was clearly a stronger effect on delayed recall after 24 h. The effects hold for all the recall curves and are more conspicuous for the 4-sec rates.

DEVELOPMENT OF LANGUAGE, READING, & MEMORY Cuyamaca, Saturday morning, 8:00-12:10

Chaired by Richard Cimbalò, Daemen College

8:00-8:20 (328)

Procedures for Summarizing Text. SUSAN R. GOLDMAN, *University of California, Santa Barbara*—Summaries of social science texts were analyzed to determine the procedures used by elementary and secondary school children. Procedures ranged from simple selection and deletion of presented material to the construction of evaluations and statements that encompassed global text meaning. Use of specific procedures depended on the content structure of the texts and on the length of the summary. Relationships between the use of specific procedures, task constraints, and summarization strategies are discussed.

8:25-8:35 (329)

Developmental Changes in Factors Predicting Reading Comprehension. GEORGE MARSH, PETER DESBERG, & RENI DOUGHTERY, *California State University, Dominguez Hills*—Students in the 2nd, 4th, 6th, and 8th grades were given several measures as predictors of reading comprehension. These included word recognition, listening, vocabulary, and listening comprehension tests. A multiple regression analysis showed that the greater part of the variance in reading comprehension at 2nd grade was predicted by the word recognition measure. In the higher grades, the greater part of the variance was predicted by general language vocabulary and comprehension measures.

8:40-9:00 (330)

Reading Strategies for Children and Adults: A Quantitative Model. DORIS AARONSON & STEVEN FERRES, *New York University*—An additive model of reading times for 5th graders and adults, in recall and comprehension tasks, includes processors

for lexical, structural, and meaning information. Word-by-word RTs and nine indices of linguistic coding support the model. The model and data suggest that adults spend relatively more time processing structure in the retention task, but meaning in the comprehension task. In contrast, children show mixtures of the adult task-linked strategies.

9:05-9:25 (331)

The Development of Storytelling Skills. NANCY L. STEIN, *University of Chicago*—The concept of a story and its development were investigated in a four-part analysis of stories told by children ranging in age from 5 to 11 years. The four analyses concerned children's definitions of a good story, their knowledge about goal conflict situations, the methods they use to resolve their problems, and the themes that occur within their stories. The relevance of the data to theories of story comprehension and cognitive development will be discussed.

9:30-9:45 (332)

Preschoolers' Acquisition of Verbal Expression of Desired Helping Behavior. DONNA McALINDEN, *Rutgers, The State University*, SONIA MOCARSKI, *University of Pennsylvania*, & ALBERT E. GOSS, *Rutgers, The State University* (read by A. E. Goss)—Stories with the moral "May I please help you?" were read to preschoolers. After each story, they answered eight questions, ending with "What does this story tell us?" Half were then told the story moral (verbalized); half were not told the moral (unverbalized). With older children (≤ 49 months), correct verbalization of the moral increased over stories under the verbalized, but not under the unverbalized, condition. With younger children, verbalization made no difference.

9:50-10:05 (333)

Onsets and Primes as Units of Syllables: Evidence from Children. REBECCA TREIMAN, *Indiana University*—Several linguistic theories propose that spoken syllables consist of an *onset* (initial consonant or cluster) and a *rime* (vowel and any following consonants). Consistent with these claims, three experiments found that children performed better in phonemic analysis tasks that required them to divide syllables into onsets and rimes than in tasks that required other divisions. A fourth study showed that syllable structure also affects beginning readers' ability to decode printed words.

Chaired by Susan Goldman,
University of California, Santa Barbara

10:20-10:35 (334)

Use of Pragmatic Information in Young and Older Adults. LEAH L. LIGHT & JANET L. CAPPS, *Pitzer College*—It has been argued that older adults are less likely than young ones to draw inferences based on pragmatic considerations due to inefficient semantic processing. We will discuss data from several studies of anaphor resolution and pragmatic implication that suggest that this conclusion is unwarranted.

10:40-10:50 (335)

A Developmental Study of Sentence Similarity Judgments. JUDITH SUGAR, *York University* (sponsored by Donald A. Schumsky)—Children, ranging in age from 8 to 11 years, and adults were asked to judge the similarity of sentences with syntactic changes, single lexical changes, and double lexical changes. Although scaling analyses revealed general agreement on the overall order of sentences on the similarity scales, a developmental shift from holistic to featural similarity was observed which is consistent with previous work in other cognitive domains, such as concept acquisition.

10:55-11:05 (336)

Denials in Young Children. M. MICHAEL AKIYAMA, *University of Oklahoma*—The study tested the universality hypothesis stating that children deny statements the same way across languages. Young English-speaking children and Japanese-speaking children were asked to deny statements, e.g., *A ship is large*. Responses were categorized into semantic denials (e.g., *A ship is small*) and syntactic denials (e.g., *A ship isn't large*). The youngest

English-speaking children used semantic denials more frequently (50%) than their Japanese counterparts (24%). The hypothesis was not supported.

11:10-11:25 (337)

Isolation Effect in a Three-Dimensional Array: Children and Adults. RICHARD S. CIMBALO, *Daemen College*, ROBERT R. DEMERATH, *Ohio State University*, LAUREN A. LAWENDOWSKI, *Research Institute on Alcoholism*, & ANA RUSSELL, *Daemen College*—Making an item outstanding in an otherwise homogeneous three-dimensional array facilitated the recall of placement for adults and item recognition for young children. Introducing a story to impose a linear ordering improved the item-recognition performance for adults but not for children. Story plus isolation inhibited item-recognition performance on later list items for adults, but performance improved for children. Differences are discussed in terms of the development of meta-memory.

11:30-11:45 (338)

Age-Related Changes in Learning to Learn: A Difference in Strategy? JOEL S. FREUND & KENNETH L. WITTE, *University of Arkansas*—The present experiment was designed to test two explanations of an age-related change in approach to paired-associate learning: a processing capacity deficit vs. a change in metamemorial skills. Young and elderly adults learned five paired-associate lists by a self-paced, study-test method. Some subjects alternated study and test trials, whereas others could regulate the study-test sequence. Results are discussed in terms of the hypotheses tested and as they relate to the age-related deficit in paired-associate learning.

11:50-12:05 (339)

Effort Training Increases Generalized Self-Control. ROBERT EISENBERGER, MAUREEN MITCHELL, & FRED A. MASTERTON, *University of Delaware*—Baseline self-control in preadolescent children was measured by repeated choices between copying nonsense syllables for large reward versus waiting the same length of time for small reward. Next, the children were rewarded for high effort in object counting, picture memory, and shape matching, were rewarded for low effort, or did not undergo effort training. When again tested for self-control, children with high-effort training chose to work more frequently than did the other groups.

AUTOBIOGRAPHICAL MEMORY & EYEWITNESS TESTIMONY

San Diego, Saturday morning, 8:00-10:00

Chaired by Michael Humphreys, *University of Queensland*

8:00-8:15 (340)

Witnesses' Attribution of Responsibility Toward Rape Victims and Rapists. DAN YARMEY, *University of Guelph*—Young and middle-aged adults (1) viewed, or (2) heard about, or (3) heard about and saw a photograph of a victim and her assailant in a sexual assault. The victim resisted or offered no resistance and was provocative or not provocative in demeanor. The rapist was pleasant or unpleasant in appearance. Subjects made judgments of the length of prison sentence and the responsibility of the victim and assailant. Results are discussed with reference to attribution theory and eyewitness memory.

8:20-8:40 (341)

Misleading Postevent Information and Memory for Events. MARIA S. ZARAGOZA & MICHAEL McCLOSKEY, *Johns Hopkins University* (read by M. McCloskey)—Many studies have shown that misleading postevent information can influence performance on tests of memory for an event. These results have been interpreted to mean that postevent information can alter memory for an event. Examination of the procedure used in these studies reveals that this procedure is not appropriate for making inferences about effects of postevent information on memory. A

new procedure for assessing the effects of postevent information on memory is introduced, and results obtained with this procedure presented.

8:45-9:00 (342)

Enhancement of Eyewitness Memory: The Cognitive Interview. R. EDWARD GEISELMAN, *University of California, Los Angeles*, & RONALD P. FISHER, *Florida International University*—Actors were employed to carry out a staged classroom incident, and eyewitness memory was evaluated after 48 h. Subjects who were instructed in memory retrieval mnemonics from cognitive psychology generated significantly more correct information than did control subjects in response to both open-ended and pointed questions. Unlike other memory-enhancement procedures, the cognitive interview did not lead to an increase in incorrect information or in eyewitness confidence in incorrect information.

9:05-9:20 (343)

Reversing the Misleading-Questions Effect in Recognition. RICHARD HAMMERSLEY & J. DON READ, *University of Lethbridge*—Subjects saw 33 slides of a robbery. They were asked leading or misleading questions about 9 slides and then recognized an original, misleading, or new version of each slide. On one slide, misled subjects said "yes" to all versions more than did led subjects. All subjects then recognized the original slides. The misleading effect vanished. It seems that, due to specific test conditions, the effect is rare and reversible. It is not due to permanent fact integration.

9:25-9:35 (344)

Rehearsal of a Brief Event: Photo Identification and Eyewitness Testimony Effects. J. DON READ & RICHARD H. HAMMERSLEY, *University of Lethbridge*—Mental rehearsal or unrelated distractor activity followed viewing of a videotaped robbery (either immediately or after a 5-min delay). Additionally, the effects of such rehearsal upon photo identification (both suspect-present and suspect-absent conditions) and memory for significant details were assessed either immediately or after 1 week. Detail memory was improved by immediate, but not by delayed, rehearsal. Photo identification, however, benefited more from delayed than from immediate rehearsal, particularly through a reduction in false alarms.

9:40-9:55 (345)

Autobiographical Memory. CARLTON T. JAMES, *Rutgers University*—In recent years, studies of memory have emphasized abstraction and interpretation. This active view may be contrasted with traditional accounts which implied a passive learner. The experimental paradigm greatly influences the apparent degree of activity. When 16 students recollected 10 past events on two occasions (with 6 months intervening), they remembered considerable detail, with few contradictions. Memory thus appears to contain a combination of active interpretations superimposed upon a wealth of passively encoded detail.

MUSIC PERCEPTION

San Diego, Saturday morning, 10:15-12:20

Chaired by Stephen Palmer, *University of California, Berkeley*

10:15-10:35 (346)

Music Perception Here and in Bali: A Cross-Cultural Study. CHRISTA HANSEN, EDWARD J. KESSLER, & ROGER N. SHEPARD, *Stanford University* (read by R. N. Shepard)—For cross-cultural investigations of music perception, we adapted the probe-tone technique of Krumhansl and Shepard, which reveals the cognitive hierarchy of tonal functions induced in a listener by a particular musical scale or melodic context. We report on experiments, using Western and Balinese musical contexts, carried out at Stanford and in two villages in Bali with listeners accustomed to musical scales (slendro and pelog) that are quite different from Western diatonic scales.

10:40-10:50 (347)

Tonal Hierarchies in the Music of North India. CAROL L. KRUMHANSL, *Cornell University*, JAMSHED BHARUCHA, *Dartmouth College*, & MARY A. CASTELLANO, *Cornell University*—Krumhansl and Shepard's (1978) probe tone method was applied to the themes from 10 North Indian rāgs. The circle of thāts, which is used to classify rāgs, was recovered from the rating data; the pattern was somewhat clearer for listeners experienced with Indian music. That inexperienced listeners also produced certain theoretically predicted patterns suggests possible commonalities with Western music and that the theme contexts provide rich information about the underlying tonal organization.

10:55-11:15 (348)

Anchoring Effects in Melody Perception. JAMSHED BHARUCHA, *Dartmouth College* (sponsored by Carol L. Krumhansl)—When listening to a tonal melody, an unstable tone was found to be assimilated or anchored to the tonal schema if it was followed by a stable tone that was proximal in pitch. In a same-different task of tones embedded within a melody, subjects confused an unstable tone with a stable tone more often when the unstable tone was anchored than when it was not. Converging data were obtained in a rating task.

11:20-11:35 (349)

Modality and Suffix Effects in Memory for Music. DAVID R. MILLEN, LINDA A. ROBERTS, CAROLINE PALMER, & VIVIEN C. TARTTER, *Rutgers University* (read by V. Tartter)—Three experiments were conducted to explore modality and suffix effects in music. Experiments 1 and 2 demonstrated a recency effect for serial recall of musical notes for both auditory and visual presentation with fast and slow presentation rates. Results of Experiment 3 (visual presentation) suggested a larger recency decrease for an appended visual note than for a tone or a written letter. A dual-code representation of musical notes is proposed.

11:40-12:00 (350)

A Left-Right Anisotropy in the Perception of Tonal Sequences. DIANA DEUTSCH, *University of California, San Diego*—When dichotic sequences of tones are presented, simultaneous tone pairs in which the higher is to the right and the lower to the left are more accurately perceived and localized than simultaneous tone pairs in which the higher is to the left and the lower to the right. This anisotropy can lead to de facto patterns of ear advantage for tonal materials. Implications for patterns of ear advantage for verbal materials are also discussed.

12:05-12:15 (351)

Pitch Interval Perception by Birds. STEWART H. HULSE, *Johns Hopkins University*—Starlings were trained to discriminate between simultaneous pairs of tones (chords) separated by various pitch intervals (octaves, fifths). The results of discrimination training will be reported, together with measures of the birds' ability to classify exemplars of the chords into interval categories, among other things. The work adds to a comparative study of acoustic information processing—pitch perception in particular.

SPEECH PRODUCTION AND PERCEPTION

Palomar, Saturday morning, 8:00-12:20

Chaired by Bruno Repp, *Haskins Laboratory*

8:00-8:15 (352)

Priming Syntactic Form in Speech Production. J. KATHRYN BOCK, *Cornell University*—The syntactic structure used in one spoken sentence is likely to be repeated in subsequent sentences. This repetition effect was obtained with a picture-description task that eliminated thematic and semantic relationships among sentences, and minimized subjects' attention to structural characteristics of utterances. The results suggest that syntactic structures can be primed somewhat independently of communicative intentions and discourse strategies, providing further evidence that

general characteristics of information retrieval constrain syntactic processing in sentence formulation.

8:20-8:40 (353)

A Direct Output Approach to Language Production. SUSAN F. EHRLICH, *Wang Laboratories*—A rationale will be presented for a direct output model of language production. In this framework, production of a sentence involves movement within long-term memory. The syntactic structure of a sentence is the direct consequence of the direction of movement. This approach will be contrasted to other current production models, and key psycholinguistic studies will be considered.

8:45-8:55 (354)

Planning Speech: A Picture's Words' Worth. WILLIAM E. COOPER, *University of Iowa*, CARLOS SOARES, & ROBERT TIMOTHY REAGAN, *Harvard University*—Ten adult speakers described 25 pictures depicting common scenes using both single long sentences and multiple short sentences. Reaction time to initiate speech was longer and fundamental voice frequency was higher at the beginning of single long sentences, indicative of speech planning. Analyses of pausing, syntax, and semantics provided further information about mental operations that accompany speaking.

9:00-9:15 (355)

Control of Rapid Speech: Limits on Utterance Programming Capacity. STEPHEN MONSELL & ERIC NELSON, *University of Chicago*—When speakers complete prepared utterances as fast as possible, latency and speech rate are influenced by utterance length. One model assumes that each unit of a stored "utterance program" takes longer to retrieve/activate during execution, the more units are stored. Using overlearned word sequences, we have explored the limits on programming capacity suggested by the utterance lengths at which latency and rate effects reach asymptote, its units, and its relation to other temporary memory capacities.

9:20-9:35 (356)

Perceiving Speech by Eye and Ear. DOMINIC W. MASSARO, *University of California, Santa Cruz*—Children and adults identified speech events while watching and listening to the speaker on a video monitor. Synthetic speech was used to independently manipulate the auditory and visual dimensions of the speech event. Both sources of information contributed to the perception of the speech event. The results provide information about the relative contribution of the sources, the integration of the sources, perceptual classification, and changes in these processes with age.

9:40-10:00 (357)

Activation-Verification in Detecting Mispronunciations. JERRY SUE THOMPSON & KENNETH R. PAAP, *New Mexico State University* (read by K. R. Paap)—Listeners responded to mispronunciations that were either highly constrained (completion probability greater than 60%), "Most shark attacks occur very close to *thore*," or unconstrained (all words less than 15%), "Most such incidents occur very close to *thore*." The advantage of contextual constraint was twice as great for mispronunciations that were near matches to the expected word as for mispronunciations that were near matches to an unexpected word. The results are interpreted within the framework of the activation-verification model.

Chaired by Kathryn Bock, *Cornell University*

10:15-10:30 (358)

Exploring the "McGurk Effect." BRUNO H. REPP, *Haskins Laboratories*, SHARON Y. MANUEL, *Haskins Laboratories & Yale University*, ALVIN M. LIEBERMAN, *Haskins Laboratories & University of Connecticut*, & MICHAEL STUDDERT-KENNEDY, *Haskins Laboratories and CUNY*—Several studies explored the effects of conflicting acoustic and optic information on consonant perception. The following questions were asked: (1) Do subjects report a consonant even when no consonantal cues

are contained in the acoustic signal (an isolated vowel)? (2) How is acoustic-optic place of articulation conflict resolved when acoustically specified manner (e.g., nasal, stop) restricts possible places of articulation? (3) How far does observers' awareness of acoustic-optic discrepancy reduce cross-modal integration?

10:35-10:50 (359)

Automatic and Controlled Processing of Speech Syllables. JAMES R. SAWUSCH, JOHN W. MULLENNIX, & LAURIE F. GARRISON, *State University of New York, Buffalo*—Studies of attention in speech perception have used either meaningful stimuli or dichotic presentation, making it difficult to isolate the stage(s) of processing at which attentional effects occur. The present study used CV syllable lists presented binaurally. The number of targets, consistent versus varied mapping of targets over trials, and the diversity of acoustic-phonetic variation were manipulated. Results will be discussed in terms of the degree to which the auditory-to-phonetic coding of speech is automatic.

10:55-11:10 (360)

The Role of the Mental Lexicon in Phonemic Restoration. ARTHUR G. SAMUEL, *Yale University* (sponsored by Wendell R. Garner)—When part of an utterance is replaced by another sound, listeners nevertheless usually report that no speech was missing. The present study investigates how the mental representation of words influences the strength of this illusion. Words with unusual beginnings may be differentiated from alternatives sooner than words with common beginnings. Excised phonemes near the end of such unusual-beginning words were restored more than matched phonemes in words with more common beginnings, supporting an on-line lexical influence in phonemic restoration.

11:15-11:30 (361)

Like A Phonetic MTF. ROBERT E. REMEZ, *Barnard College*, & PHILIP E. RUBIN, *Haskins Laboratories*—The perception of phonetic structure from speech signals often depends on changes in the acoustic spectrum. However, the identification of phonetic segments from time-varying spectrum properties is also contingent on syllabic rate, indicating that the relationship between spectral change and perceptual segment is a subtle one. The experiments we report employed a technique of format-frequency compression to study this interaction of syllabic rate and spectrum variation in phonetic perception of sentences.

11:35-11:50 (362)

Single-Formant Contrast in Vowel Identification. ROBERT G. CROWDER, *Yale University*, & BRUNO H. REPP, *Haskins Laboratories*—Subjects rated steady-state vowels from a synthetic continuum with regard to phonetic categories. In separate conditions, the precursor, presented just before each target, was a hiss (control), one of the two endpoints from the phonetic continuum, or single-formant (F1) versions of the endpoints. Although the single-formant vowels did not sound like they belonged to the target continuum, they produced contrast comparable to that obtained with the full vowels.

11:55-12:15 (363)

Shared Mechanisms for Perceiving and Producing Phonetic Features in Speech. DAVID E. MEYER & PETER C. GORDON, *University of Michigan*—Some new links are reported between rapid speech perception and production. When subjects prepare to produce a particular speech segment, this affects their speed at perceiving another segment with phonetic features similar to those of the prepared segment. Conversely, perceiving a given segment affects their speed at producing another subsequent segment with similar features. As postulated by models such as the motor theory of speech perception, such results suggest that perception and production share certain basic mechanisms.

PROBLEM SOLVING
Laguna, Saturday morning, 8:00-12:05

Chaired by Stephen Reed, Florida Atlantic University

8:00-8:20 (364)

Consciousness, Cause, and the Structure of Subjective Evidence. DON E. DULANY & RICHARD A. CARLSON, *University of Illinois, Urbana-Champaign*—Subjects attempted to solve fictional murder mysteries, reporting degree of belief in what could be observed, hypothesized, and remembered. We examined a number of ideas about the structure of causal inference: (1) It includes tests for the fit of causal propositions to a cluster of predicates thought to describe a true cause. (2) It consists of operations interrelating states that are conscious and introspectable. (3) Those operations are fairly well described by simple, but nonnormative, equations.

8:25-8:40 (365)

Can Scientists Assess Conditional Inferences? RYAN D. TWENEY, *Bowling Green State University*, & STEPHEN A. YACHANIN, *Lake Erie College*—Previous studies have found that scientists perform poorly on Wason's selection task, overlooking, as do undergraduates, evidence which could disprove the truth of possible "if-then" conditionals. In the present study, tasks were used in which the conditional nature of the inference was clarified. When given to 20 active research scientists, nearly all correctly avoided merely confirmatory evidence, and most also correctly selected disconfirming evidence, thus disproving the claim that scientist's expertise is excessively confirmatory.

8:45-9:00 (366)

Learning the Components of a Cognitive Task. ALEX CHERRY WILKINSON, *Bell Laboratories*, & BETH A. HAINES, *University of Wisconsin, Madison*—We studied training methods and self-improvement in children's learning of a block-stacking task. Mathematical models identified two cognitive components used to perform the task and three strategies for combining the components. One component was easier to train than the other and was also the major source of self-improvement. Inconsistency in performing the task was partly a result of wavering strategies.

9:05-9:20 (367)

A Model That Builds and Transforms Game-Playing Strategies. EVELYNE CAUZINILLE-MARMECHE, *Laboratoire de Psychologie Genetique, Université Rene Descartes, Paris*, & JACQUES MATHIEU, *Université de Rouen* (sponsored by Lauren B. Resnick)—We observed five levels of performance in a two-player game in subjects that ranged in age from 8 years to adult. These performance levels have been formalized as production systems whose major processes are analysis, hypothesis testing, and anticipation. A model of learning builds the first-level production system from general rules in the subject's knowledge base. It then constructs the systems for successive levels of performance, using processes of analogy, contradiction, reinforcement, and general heuristics.

9:25-9:40 (368)

Gender and Conversational Style in Cooperative Problem-Solving. JEAN E. NEWMAN, *University of New Mexico* (sponsored by Peder Johnson)—In a within-subject design, 40 subjects were video-taped as they negotiated the identity or sequence of target shapes with a visually hidden partner of the same or opposite sex. Consistent with hypothesized gender differences in conversational style, mixed-sex dyads in the first session were less efficient than same-sex dyads. Second-session performance was faster and equivalent for all dyad types. Analyses of problem-solving strategies and concomitant changes in linguistic interactions across dyads will be reported.

9:45-10:00 (369)

The Processing of Complex Arithmetic Expressions. MARK H. ASHCRAFT & WILLIAM R. MILLER, *Cleveland State*

University—Complex arithmetic expressions such as “ $3(8+5)=$ ” were paired with three kinds of answers for true/false judgments, same form, $3(8+5)$, intermediate solution, 3×13 , and final answer, 39. The RT and error results reveal computation order, problem-size effects, and confusions between operations. The associative and distributive principles pale in comparison with “parenthesis-first” processing, although subjects even ignored parentheses when the arithmetic was easy. We conclude by discussing the relationship between these results and algebra problem solving.

Chaired by Ryan Tweney, Bowling Green State University

10:15-10:35 (370)

Effect of Computer Graphics on Improving Estimates for Algebra Word Problems. STEPHEN K. REED, *Florida Atlantic University*—College students estimated the answers to average speed, mixture, and tank problems both before and after viewing computer simulations of these events. I compared different versions of the simulations to determine which would be most effective in improving students’ estimates and, hopefully, their intuitive understanding of the problems.

10:40-10:55 (371)

Abstraction of Operator Schemata in Problem Solving. MATTHEW W. LEWIS & JOHN R. ANDERSON, *Carnegie-Mellon University* (read by J. R. Anderson)—Three studies, motivated by ACT theory, argue that operator schemata are acquired as are object schemata. A prototype effect was found in both a geometry problem-solving and a maze-search task. Operator schemata were learned more accurately during active than during passive hypothesis testing, and after extended practice, performance degraded with delayed feedback. A model of classification learning and a simulation of active hypothesis testing fit the prototype accuracy results.

11:00-11:15 (372)

The Effects of Anxiety and Impulsivity on Analogical Reasoning. MARJORIE ROTH LEON & WILLIAM REVELLE, *Northwestern University* (read by W. Revelle)—Individual differences in analogical reasoning have been associated with differences in intellectual ability. In two experiments which examined geometric analogies, time stress led to faster response times but higher error rates for more anxious subjects. Without time stress, more anxious subjects were slower and less accurate than less anxious subjects. The interaction of impulsivity and time stress could be interpreted as speed-accuracy differences. We conclude that motivational differences are important sources of variance in analogical reasoning.

11:20-11:40 (373)

Problem-Solving Activity in Human Visceral Learning. LARRY E. ROBERTS, *McMaster University*—Prevailing accounts of visceral learning have depicted this phenomenon as a conditioning process. A different aspect is emphasized by the experiments of this paper which show (1) that success at biofeedback learning is accompanied by verbal awareness of activities related to the response, and (2) that learning can be predicted by probing the subject’s problem space before he has seen his first feedback trial. The role of deliberative processes in biofeedback is discussed.

11:45-12:00 (374)

The Influence of Two Error Types on Predictions. MICHAEL E. DOHERTY, HOWARD ROTHSTEIN, & LOWELL M. SCHIPPER, *Bowling Green State University*—Uncertainty has been a major interest in cognitive psychology. In most research, uncertainty is pre-encoded for subjects as percentages or probabilities, as in, e.g., many heuristics and biases studies. In the MCPL paradigm, however, data uncertainty is realized by adding random error to the feedback. The present study manipulates data uncertainty by presenting random feedback on some proportion of the trials, a form of error we have labeled “system failure error.”