CONDENSED SCHEDULE A

Friday Morning

Psycholinguistics I (1-6) ..... 8:00-10:10, Grand Ballroom A
Recognition/Recall (7-11) ..... 10:20-12:15, Grand Ballroom A
Human Learning/Memory I (12-18) ..... 8:00-10:20, Grand Ballroom B
Picture Memory/Processing I (19-23) ..... 10:30-12:15, Grand Ballroom B
Comprehension/Reasoning (24-30) ..... 8:00-10:15, Grand Ballroom C
Letter/Word Processing I (31-36) ..... 10:25-12:20, Grand Ballroom C
Psychobiology (37-41) ..... 8:00-10:00, West Ballroom A
Animal Cognition I (42-47) ..... 10:10-12:15, West Ballroom A
Repetition/Priming Effects I (48-55) ..... 8:00-10:25, West Ballroom B
Touch (56-60) ..... 10:35-12:15, West Ballroom B
Motor Control (61-68) ..... 8:00-10:30, Aspen Room
Problem Solving I (69-72) ..... 10:40-12:15, Aspen Room

Friday Afternoon

Connectionist Modeling (73-78) ..... 1:00-3:20, Grand Ballroom A
Letter/Word Processing II (79-84) ..... 3:30-5:45, Grand Ballroom A
Developmental/Aging Processes I (85-92) ..... 1:00-3:25, Grand Ballroom B
Human Cognition (93-99) ..... 3:35-5:40, Grand Ballroom B
Symposium: Behavior-Genetic Analysis with Phenotypes
Involving Learning and/or Instinct (100-106) ..... 1:00-3:50, Grand Ballroom C
Attention I (107-111) ..... 4:00-5:40, Grand Ballroom C
Laterality (112-119) ..... 1:00-3:25, West Ballroom A
Associative Learning I (120-125) ..... 3:35-5:40, West Ballroom A
Pattern Perception (126-132) ..... 1:00-3:45, West Ballroom B
Perception I (133-137) ..... 3:55-5:40, West Ballroom B
Ingestive Behavior (138-144) ..... 1:00-3:05, Aspen Room
Repetition/Priming Effects II (145-150) ..... 3:15-5:30, Aspen Room

Saturday Morning

Language/Discourse Processing I (151-155) ..... 8:00-9:45, Grand Ballroom A
Developmental/Aging Processes II (156-162) ..... 9:55-12:20, Grand Ballroom A
Implicit Memory/Priming (163-168) ..... 8:00-9:55, Grand Ballroom B
Letter/Word Processing III (169-175) ..... 10:05-12:25, Grand Ballroom B
Human Learning/Memory II (176-182) ..... 8:00-10:25, Grand Ballroom C
Spatial Cognition and Memory (183-188) ..... 10:35-12:20, Grand Ballroom C
Perception II (189-196) ..... 8:00-10:45, Aspen Room
Survey Research (197-200) ..... 10:55-12:20, Aspen Room
Animal Learning and Behavior I (201-207) ..... 8:00-10:35, East Ballroom
3-D/Movement Perception I (208-212) ..... 10:45-12:25, East Ballroom
Information Processing I (213-217) ..... 8:00-9:50, West Ballroom
Animal Cognition II (218-224) ..... 10:00-12:30, West Ballroom

Saturday Afternoon

Human Learning/Memory III (225-230) ..... 1:00-3:20, Grand Ballroom A
Attention II (231-236) ..... 3:30-5:35, Grand Ballroom A
Associative Learning II (237-242) ..... 1:00-3:00, Grand Ballroom B
3-D/Movement Perception II (243-250) ..... 3:10-5:40, Grand Ballroom B
Picture Memory/Processing II (251-255) ..... 1:00-2:45, Grand Ballroom C
Symposium: Retention and Remembering: Perspectives on
Memory from Animal Research (256-262) ..... 3:00-5:55, Grand Ballroom C
Behavioral Pharmacology (263-270) ..... 1:00-3:55, Aspen Room
Information Processing II (271-275) ..... 4:05-5:40, Aspen Room
Problem Solving II (276-280) ..... 1:00-2:50, East Ballroom
Vision (281-288) ..... 3:00-5:35, East Ballroom
Psychophysics (289-296) ..... 1:00-3:25, West Ballroom
Judgment/Decision Making I (297-302) ..... 3:35-5:40, West Ballroom

Saturday Evening

Business Meeting ..... 6:10-7:00, Grand Ballroom

Sunday Morning

Perception/Attention (303-311) ..... 8:00-11:00, Grand Ballroom A
Problem Solving III (312-316) ..... 11:10-12:50, Grand Ballroom A
Language/Discourse Processing II (317-323) ..... 8:00-10:40, Grand Ballroom B
Information Processing III (324-329) ..... 10:50-12:50, Grand Ballroom B
Autobiographical/Eyewitness Memory (330-336) ..... 8:00-10:20, Grand Ballroom C
Animal Learning and Behavior II (337-343) ..... 10:30-12:45, Grand Ballroom C
Human Learning/Memory IV (344-347) ..... 8:00-9:20, West Ballroom
Psycholinguistics II (348-356) ..... 9:30-12:35, West Ballroom
Judgment/Decision Making II (357-363) ..... 8:00-10:25, East Ballroom
Judgment/Decision Making III (364-370) ..... 10:35-12:55, East Ballroom
Discrimination/Generalization: Animals (371-379) ..... 8:00-10:55, Aspen Room
Human Learning V (380-384) ..... 11:05-12:50, Aspen Room

CONDENSED SCHEDULE B

	Grand Ballroom A	West Ballroom A	Grand Ballroom B	West Ballroom B	Grand Ballroom C	West Ballroom	East Ballroom	Aspen Room
Friday Morning	Psycholinguistics I 8:00-10:10 Recognition/Recall 10:20-12:15	Psychobiology 8:00-10:00 Animal Cognition I 10:10-12:15	Human Learning/ Memory I 8:00-10:20 Picture Memory/ Processing I 10:30-12:15	Repetition/ Priming Effects I 8:00-10:25 Touch 10:35-12:15	Comprehension/ Reasoning 8:00-10:15 Letter/Word Processing I 10:25-12:20			Motor Control 8:00-10:30 Problem Solving I 10:40-12:15
Friday Afternoon	Connectionist Modeling 1:00-3:20 Letter/Word Processing II 3:30-5:45	Laterality 1:00-3:25 Associative Learning I 3:35-5:40	Developmental/ Aging Processes I 1:00-3:25 Human Cognition 3:35-5:40	Pattern Perception 1:00-3:45 Perception I 3:55-5:40	Symposium: Behavior-Genetic Analysis with Phenotypes Involving Learning and/or Instinct 1:00-3:50 Attention I 4:00-5:40			Ingestive Behavior 1:00-3:05 Repetition/Priming Effects II 3:15-5:30
Saturday Morning	Language/Discourse Processing I 8:00-9:45 Developmental/Aging Processes II 9:55-12:20		Implicit Memory/Priming 8:00-9:55 Letter/Word Processing III 10:05-12:25		Human Learning/ Memory II 8:00-10:25 Spatial Cognition & Memory 10:35-12:20	Information Processing I 8:00-9:50 Animal Cognition II 10:00-12:30	Animal Learning & Behavior I 8:00-10:35 3-D/Movement Perception I 10:45-12:25	Perception II 8:00-10:45 Survey Research 10:55-12:20
Saturday Afternoon	Human Learning/ Memory III 1:00-3:20 Attention 3:30-5:35		Associative Learning II 1:00-3:00 3-D/Movement Perception II 3:10-5:40		Picture Memory/ Processing II 1:00-2:45 Symposium: Retention & Remembering: Perspectives on Memory from Animal Research 3:00-5:55	Psychophysics 1:00-3:25 Judgment/Decision Making I 3:35-5:40	Problem Solving II 1:00-2:50 Vision 3:00-5:35	Behavioral Pharmacology 1:00-3:55 Information Processing II 4:05-5:40
Sunday Morning	Perception/Attention 8:00-11:00 Problem Solving III 11:10-12:50		Language/Discourse Processing II 8:00-10:40 Information Processing III 10:50-12:50		Autobiographical/ Eyewitness Memory 8:00-10:20 Animal Learning & Behavior II 10:30-12:45	Human Learning/ Memory IV 8:00-9:20 Psycholinguistics II 9:30-12:35	Judgment/Decision Making II 8:00-10:25 Judgment/Decision Making III 10:35-12:55	Discrimination/ Generalization: Animals 8:00-10:55 Human Learning V 11:05-12:50

Hospitality (Cash Bar) in the Metropolitan Ballroom (3rd floor), each day from 6:00 p.m.
Business meeting in Grand Ballrom A/B, Saturday, 6:10-7:00 p.m.

CONDENSED SCHEDULE C

FRIDAY MORNING

Psycholinguistics I (1-6), Grand Ballroom A

8:00-8:15 Bock (1)
8:20-8:40 Tanenhaus, Boland, & Garnsey (2)
8:45-9:00 Ferreira, Clifton, Jr. (3)
9:05-9:20 Whalen (4)
9:25-9:40 Perfetti, Adams, Bell, & Weitz (5)
9:45-10:05 Aaronson & Watts (6)

Recognition/Recall (7-11), Grand Ballroom A

10:20-10:40 Shiffrin (7)
10:45-11:00 Glanzer & Adams (8)
11:05-11:25 Maki (9)
11:30-11:50 Roitblat & Fratzke (10)
11:55-12:10 Toppino & Willetts (11)

Human Learning/Memory I (12-18), Grand Ballroom B

8:00-8:10 Warren (12)
8:15-8:35 Bjork & Richardson-Klavehn (13)
8:40-8:55 Goggin & Jurado (14)
9:00-9:15 Wagenaar (15)
9:20-9:30 Greene (16)
9:35-9:55 Rabinowitz (17)
10:00-10:15 Smith & Vela (18)

Picture Memory/Processing I (19-23), Grand Ballroom B

10:30-10:50 Pollatsek, Henderson, Boyce, & Rayner (19)
10:55-11:10 Intraub & Richardson (20)
11:15-11:30 Steiner, Keller, & Bischof (21)
11:35-11:50 Jenkins & Tuten, III. (22)
11:55-12:10 Wallace, Persanyi, & Gerboc (23)

Comprehension/Reasoning (24-30), Grand Ballroom C

8:00-8:10 Johnson & Henley (24)
8:15-8:30 Hansen & Halpern (25)
8:35-8:50 Antes & Grabe (26)
8:55-9:10 Graesser, Golding, & Millis (27)
9:15-9:30 Voss, Finchel-Kiefer, & Ney (28)
9:35-9:45 Zechmeister & Hill (29)
9:50-10:10 Rabinowitz, Howe, & Lawrence (30)

Letter/Word Processing I (31-36), Grand Ballroom C

10:25-10:35 Krueger (31)
10:40-11:00 Healy, Fendrich, & Proctor (32)
11:05-11:20 Potter & Noel (33)
11:25-11:40 Healy, Cunningham, & Chizzick (34)
11:45-12:00 Oden & Sanocki (35)
12:05-12:15 Marsh & Desberg (36)

Psychobiology (37-41), West Ballroom A

8:00-8:20 Roberts (37)
8:25-8:40 Campbell & Richardson (38)
8:45-9:05 Elkins, Hobbs, Carl, & Walls (39)
9:10-9:30 Fountain (40)
9:35-9:55 Randich, Ness, Hofstadter, & Gebhart (41)

Animal Cognition I (42-47), West Ballroom A

10:10-10:25 Dooling (42)
10:30-10:45 Page & Hulse (43)
10:50-11:10 Weisman & Ratcliffe (44)
11:15-11:30 Pepperberg (45)
11:35-11:50 Cook, Wright, & Kendrick (46)
11:55-12:10 Bhatt & Wasserman (47)

Repetition/Priming Effects I (48-55), West Ballroom B

8:00-8:10 Weisgerber & Johnson (48)
8:15-8:30 Hintzman & Hartry (49)
8:35-8:45 Bowles (50)
8:50-9:05 Flexser (51)
9:10-9:25 Hunt (52)
9:30-9:40 Brown & Murphy (53)
9:45-10:00 Hanson & Feldman (54)
10:05-10:20 Snodgrass (55)

Touch (56-60), West Ballroom B

10:35-10:50 Sherrick, Cholewiak, & Collins (56)
10:55-11:10 Craig (57)
11:15-11:30 Cholewiak & Collins (58)
11:35-11:50 Easton (59)
11:55-12:10 Klatzky, Lederman, & Reed (60)

Motor Control (61-68), Aspen Room

8:00-8:10 Wallace & Weeks (61)
8:15-8:30 Zelaznik, Fischbach, & Talmadge (62)
8:35-8:50 Stelmach, Amrhein, & Goggin (63)
8:55-9:05 Knoll & Sternberg (64)
9:10-9:30 Guiard (65)
9:35-9:45 Kantowitz (66)
9:50-10:05 Winstein & Schmidt (67)
10:10-10:25 Gottsdanker & Perkins (68)

Problem Solving I (69-72), Aspen Room

10:40-11:00 Levine (69)
11:05-11:25 Frensch & Sternberg (70)
11:30-11:45 Cheng & Larkin (71)
11:50-12:05 Catrambone & Holyoak (72)

FRIDAY AFTERNOON

Connectionist Modeling (73-78), Grand Ballroom A

1:00-1:15 Seidenberg & McClelland (73)
1:20-1:40 Schneider & Detweiler (74)
1:45-2:05 McCloskey & Cohen (75)
2:10-2:30 Gluck & Bower (76)
2:35-2:55 Bharucha (77)
3:00-3:15 Cohen, Dunbar, & McClelland (78)

Letter/Word Processing II (79-84), Grand Ballroom A

3:30-3:50 McConkie, Kerr, Reddix, & Zola (79)
3:55-4:15 Morris, Rayner, & Pollatsek (80)

4:20-4:35 Shapiro & Ogden (81)
4:40-4:50 Jordan (82)
4:55-5:15 Frost & Katz (83)
5:20-5:40 Paap, Li, & Noel (84)

Developmental/Aging Processes I (85-92), Grand Ballroom B

1:00-1:15 Bartlett, Leslie, & Tubbs (85)
1:20-1:35 Till, Bartlett, & Sharps (86)
1:40-1:50 Rosenbaum, Klooz, Forsberg, & Henry (87)
1:55-2:10 Salthouse (88)
2:15-2:25 Basden, Basden, & Anders (89)
2:30-2:45 Dempster (90)
2:50-3:05 Hartley, Annon, Johnson, & Mushaney (91)
3:10-3:20 Reznick (92)

Human Cognition (93-99), Grand Ballroom B

3:35-3:50 Farah, Peronnet, & Weisberg (93)
3:55-4:10 Engle & Turner (94)
4:15-4:30 Shoben (95)
4:35-4:50 Homa & Dunbar (96)
4:55-5:10 Whitaker & Oatman (97)
5:15-5:25 Holding (98)
5:30-5:40 Suedfeld & Metcalfe (99)

Symposium: Behavior-Genetic Analysis with Phenotypes Involving Learning and/or Instinct (100-106), Grand Ballroom C

1:00-1:05 Hirsch (100)
1:05-1:25 Zawistowski (101)
1:30-1:50 Hirsch, Holliday, & Ricker (102)
1:55-2:15 Wahlsten (103)
2:20-2:40 Brush (104)
2:45-3:05 Wimer (105)
3:10-3:30 Harrington (106)

Attention I (107-111), Grand Ballroom C

4:00-4:15 Egeth & Folk (107)
4:20-4:40 Pylyshyn (108)
4:45-5:00 Green & Ash (109)
5:05-5:20 Klein, Brennan, & Gilani (110)
5:25-5:35 Giambra (111)

Laterality (112-119), West Ballroom A

1:00-1:15 Lockard, McFarlin, & Hawley (112)
1:20-1:35 Porac, Buller, & Harnadek (113)
1:40-1:55 Ward, Alvis, Sanford, & Dodson (114)
2:00-2:10 Crow, Quevedo-Converse, & Moorhead (115)
2:15-2:25 Whitman & Bookheimer (116)
2:30-2:45 Hellige, Kujawski, & Eng (117)
2:50-3:05 Boles (118)
3:10-3:20 Kee, Hellige, & Sergent (119)

Associative Learning I (120-125), West Ballroom A

3:35-3:55 Franchina & Dyer (120)
4:00-4:15 Riley & Olin (121)
4:20-4:35 Batsell, Jr. & Ludvigson (122)
4:40-5:00 Matzel & Miller (123)
5:05-5:15 Lundeen, Petree, & DeVietti (124)
5:20-5:35 Weiss, Panlilio, & Schindler (125)

Pattern Perception (126-132), West Ballroom B

1:00-1:20 Beck, Sutter, & Graham (126)
1:25-1:45 Ashby & Gott (127)
1:50-2:10 Palmer, Kube, & Kruschke (128)
2:15-2:30 King (129)
2:35-2:55 Zimmer (130)
3:00-3:20 Berbaum, Frankin, Jr., & Dorfman (131)
3:25-3:40 Keuss (132)

Perception I (133-137), West Ballroom B

3:55-4:10 Kennedy (133)
4:15-4:30 Cutting & Bruno (134)
4:35-4:50 Kellman & Shipley (135)
4:55-5:15 Jolicoeur & McMullen (136)
5:20-5:35 Redding & Wallace (137)

Ingestive Behavior (138-144), Aspen Room

1:00-1:15 Deich & Balsam (138)
1:20-1:30 Valle (139)
1:35-1:45 Bolles & Mehiel (140)
1:50-2:00 Ellins & Costantino (141)
2:05-2:20 Flaherty, Grigson, & Rowan (142)
2:25-2:40 Dess, Minor, Chapman, & Brewer (143)
2:45-3:00 Wetherington, Wachsman, Kautz, & Riley (144)

Repetition/Priming Effects II (145-150), Aspen Room

3:15-3:30 Columbo & Williams (145)
3:35-3:50 Lupker & Williams (146)
3:55-4:15 Snow & Neely (147)
4:20-4:40 Masson (148)
4:45-5:00 Bernstein, Vyas, Bissonnette, & Barclay (149)
5:05-5:25 Kontowicz, Dagenbach, & Carr (150)

SATURDAY MORNING

Language/Discourse Processing I (151-155), Grand Ballroom A

8:00-8:15 Gernsbacher (151)
8:20-8:40 Ratcliff, McKoon, & Gronlund (152)
8:45-9:00 Daneman, Collins, & Stainton (153)
9:05-9:20 Coltheart, Avons, & Trollope (154)
9:25-9:40 Rothkopf, Koether, & Bilington (155)

Developmental/Aging Processes II (156-162), Grand Ballroom A

9:55-10:10 Hartley, Kieley, & McKenzie (156)
10:15-10:30 Kellas, Simpson, & Ferraro (157)
10:35-1:55 Morrison (158)
11:00-11:15 Carey (159)
11:20-11:35 Gilinsky & Ehrlich (160)
11:40-11:55 Greenbaum & Graf (161)
12:00-12:15 Abrahamsen & Lamb (162)

Implicit Memory/Priming (163-168), Grand Ballroom B

8:00-8:20 Schacter & Graf (163)
8:25-8:40 Roediger, III, Weldon, & Stadler (164)
8:45-8:55 Lamberty, Petros, & Regan (165)
9:00-9:10 Donaldson & Wright (166)
9:15-9:30 Dosher & Rosedale (167)
9:35-9:50 MacLeod (168)

Letter/Word Processing III (169-175), Grand Ballroom B

10:05-10:25 Posner, Sandson, & Petersen (169)
10:30-10:45 Kluender, Walsh, & Gough (170)
10:50-11:05 Treiman & Danis (171)
11:10-11:25 Schwanenflugel (172)
11:30-11:45 Kirsner & Dunn (173)
11:50-12:00 Inhoff (174)
12:05-12:20 Gorfein, Bubka, & Cooper (175)

Human Learning/Memory II (176-182), Grand Ballroom C

8:00-8:10 Kroll & Schepeler (176)
8:15-8:30 Leonard & Ward (177)
8:35-8:50 Christianson, Loftus, & Nilsson (178)
8:55-9:10 Heuer & Reisberg (179)
9:15-9:35 Bradley, York, & Lang (180)
9:40-9:55 Hertel & Hardin (181)
10:00-10:20 Shimamura, Salmon, Butters, & Squire (182)

Spatial Cognition and Memory (183-188), Grand Ballroom C

10:35-10:45 Hirtle & Hudson (183)
10:50-11:05 Anooshian & Smyer (184)
11:10-11:20 Hollins & Goble (185)
11:25-11:40 Warren & Rossano (186)
11:45-11:55 Clayton (187)
12:00-12:15 Mather (188)

Perception II (189-196), Aspen Room

8:00-8:15 Cowan & Schoen (189)
8:20-8:35 Palmer & Krumhansl (190)
8:40-8:50 Halpern (191)
8:55-9:15 Deutsch (192)
9:20-9:35 Kelly & Freyd (193)
9:40-9:55 Allan, Siegel, & MacQueen (194)
10:00-10:15 Dykes & Potts (195)
10:20-10:40 Ramachandran (196)

Survey Research (197-200), Aspen Room

10:55-11:10 Martin & Dean (197)
11:15-11:30 Drewnowski, Larkin, & Metzner (198)
11:35-11:55 Clemmer (199)
12:00-12:15 Mingay & Jobe (200)

Animal Learning and Behavior I (201-207), East Ballroom

8:00-8:15 Domjan & Nash (201)
8:20-8:35 Bitterman, Papini, & Mustaca (202)
8:40-9:00 Hollis, ten Cate, & Bateson (203)
9:05-9:20 Pinel, Symons, Jones, & Tees (204)
9:25-9:45 Mineka & Cook (205)
9:50-10:05 Williams & Lierle (206)
10:10-10:30 Anderson, Hantual, Crowell, & Tolzman (207)

3-D/Movement Perception I (208-212), East Ballroom

10:45:11:00 Gilden & Proffitt (208)
11:05-11:20 Ono (209)
11:25-11:40 Braunstein & Tittle (210)
11:45-12:00 Kaiser, Grunwald, & Proffitt (211)
12:05-12:20 Cooper, Gibson, Mowafy, & Tataryn (212)

Information Processing I (213-217), West Ballroom

8:00-8:15 Thieman & Avant (213)
8:20-8:35 Nakamura & Mandler (214)
8:40-9:00 Reingold & Merikle (215)
9:05-9:25 Dickman & Meyer (216)
9:30-9:45 Campbell (217)

Animal Cognition II (218-224), West Ballroom

10:00-10:20 Gibbon, Meck, & Church (218)
10:25-10:40 Symons, Wilkie, & Tees (219)
10:45-11:00 Capaldi & Miller (220)
11:05-11:25 Zentall, Steirn, & Jackson-Smith (221)
11:30-11:50 Cohen & Burkhart (222)
11:55-12:10 Treichler (223)
12:15-12:25 Hogan & Priestle (224)

SATURDAY AFTERNOON

Human Learning/Memory III (225-230), Grand Ballroom A

1:00-1:20 Anderson (225)
1:25-1:45 Schvaneveldt (226)
1:50-2:10 Humphreys, Bain, & Pike (227)
2:15-2:35 Busemyer & Myung (228)
2:40-2:50 D'Ydewalle & Delhaye (229)
2:55-3:15 Riefer & Batchelder (230)

Attention II (231-236), Grand Ballroom A

3:30-3:45 Keele, Cohen, Liotti, Ivry, & Yee (231)
3:50-4:10 Logan (232)
4:15-4:30 Yee & Hunt (233)
4:35-4:55 Besner & Jolicoeur (234)
5:00-5:15 Mo (235)
5:20-5:30 Klapp, Netick, Kelly, & Fiori (236)

Associative Learning II (237-242), Grand Ballroom B

1:00-1:15 Bouton & Swartzentruber (237)
1:20-1:35 Balsam, Aronson, & Scopatz (238)
1:40-1:55 Williams (239)
2:00-2:15 Best & Patel (240)
2:20-2:35 Martin, Bechara, Gans, & van der Kooy (241)
2:40-2:55 Brandon & Bombace (242)

3-D/Movement Perception II (243-250), Grand Ballroom B

3:10-3:20 Ritter & Breitmeyer (243)
3:25-3:40 Lappin, Wason, & Akutsu (244)
3:45-4:00 Ebenholtz & Babler (245)
4:05-4:20 Ellis (246)
4:25-4:40 Ashmead, Rieser, Talor, & Youngquist (247)
4:45-4:55 Loomis, da Silva, & Marques (248)
5:00-5:10 Yonas & Hartman (249)
5:15-5:35 Bertenthal & Bai (250)

Picture Memory/Processing II (251-255), Grand Ballroom C

1:00-1:15 Goldstein & Chance (251)
1:20-1:35 Chance, Goldstein, & Otto (252)
1:40-1:55 Pezdek & Reynolds (253)
2:00-2:20 Rhodes, Brennan, & Carey (254)
2:25-2:40 Walls & Siple (255)

Symposium: Retention and Remembering: Perspectives on Memory from Animal Research (256-262), Grand Ballroom C

3:00-3:20 Tulving (256)
3:25-3:45 Balda & Kamil (257)
3:50-4:10 Church (258)
4:15-4:35 Roberts (259)
4:40-5:00 Wright (260)
5:05-5:25 Squire (261)
5:30-5:50 Crowder (262)

Behavioral Pharmacology (263-270), Aspen Room

1:00-1:15 Cunningham, Hawks, & Niehus (263)
1:20-1:30 McElroy & Neuringer (264)
1:35-1:55 Lett (265)
2:00-2:15 MacRae & Siegel (266)
2:20-2:35 Cole (267)
2:40-3:00 Minor, Insel, Wilkins, & Haracz (268)
3:05-3:25 Revusky, Davey, & Zagorski (269)
3:30-3:50 Fanselow, Helmstetter, & Calcagnetti (270)

Information Processing II (271-275), Aspen Room

4:05-4:20 Ballesteros, Gonzalez, & Labra (271)
4:25-4:35 Solso, Heck, & Mearns (272)
4:40-4:55 Sternberg, Turock, & Knoll (273)
5:00-5:15 Pashler & Johnston (274)
5:20-5:35 Wolford & Kim (275)

Problem Solving II (276-280), East Ballroom

1:00-1:15 Weber (276)
1:20-1:40 Kieras (277)
1:45-2:00 Klahr & Dunbar (278)
2:05-2:25 Hegarty, Just, & Morrison (279)
2:30-2:45 Baggett (280)

Vision (281-288), East Ballroom

3:00-3:20 Di Lollo & Clark (281)
3:25-3:40 Uhlarik & Yost (282)
3:45-4:05 Gilchrist (283)
4:10-4:20 Warm, Dember, Galinsky, Perry, Gluckman, & Dumais (284)
4:25-4:40 Meyer & Dougherty (285)
4:45-5:00 Bonnel, Possamai, & Scharf (286)
5:05-5:15 Purcell, Stewart, & Giacoletti (287)
5:20-5:30 Coren & Hakstian (288)

Psychophysics (289-296), West Ballroom

1:00-1:15 Link & Snodgrass (289)
1:20-1:35 Poltrock (290)
1:40-1:55 Hughes Zimba (291)
2:00-2:10 Lockhead & Gaylord (292)
2:15-2:30 Marks (293)
2:35-2:45 Schneider & Parker (294)
2:50-3:05 Corwin & Carlson (295)
3:10-3:20 Long & Tuck (296)

Judgment/Decision Making I (297-302), West Ballroom

3:35-3:50 Reyna & Brainerd (297)
3:55-4:15 Shaklee (298)
4:20-4:30 Arkes, Boehm, & Jacobsen (299)
4:35-4:55 Brooks & Norman (300)
5:00-5:20 Birnbaum, Mellers, & Coffey (301)
5:25-5:35 Wearing & MacKinnon (302)

SATURDAY EVENING

General Business Meeting, Grand Ballroom
6:10-7:00 Donald Blough, Chair

SUNDAY MORNING

Perception/Attention (303-311), Grand Ballroom A

8:00-8:20 Sperling & Parish (303)
8:25-8:40 Remez, Bressel, & Rubin (304)
8:45-9:00 Sawusch & Tsoi (305)
9:05-9:25 Divenyi & Oliver (306)
9:30-9:45 Ceraso & Monk (307)
9:50-10:00 Wolfe, Cave, & Franzel (308)
10:05-10:25 LaBerge & Brown (309)
10:30-10:40 Juola, Cooper, & Warner (310)
10:45-10:55 Goolkasian (311)

Problem Solving III (312-316), Grand Ballroom A

11:10-11:25 Revlin & Farris (312)
11:30-11:45 Finke (313)
11:50-12:05 Olson, Catrambone, & Soloway (314)
12:10-12:25 Stein (315)
12:30-12:45 Bloom, Fletcher, Reitz, & Shapiro (316)

Language/Discourse Processing II (317-323), Grand Ballroom B

8:00-8:20 Glucksberg (317)
8:25-8:45 Keenan, Potts, & Golding (318)
8:50-9:10 McKoon & Ratcliff (319)
9:15-9:30 Kellogg (320)
9:35-9:55 Tabossi (321)
10:00-10:15 Prinzo & Danks (322)
10:20-10:35 Jakimik & Glenberg (323)

Information Processing III (324-329), Grand Ballroom B

10:50-11:05 Nissen, Willingham, & Bullemer (324)
11:10-11:25 Dixon & Di Lollo (325)
11:30-11:45 Burrows (326)
11:50-12:00 Chastain, Boylan, Burton, & Fairless (327)
12:05-12:25 Schweickert, Townsend, & Fisher (328)
12:30-12:45 Whitney & Ferraro (329)

Autobiographical/Eyewitness Memory (330-336), Grand Ballroom C

8:00-8:15 Larsen (330)
8:20-8:35 Brewer (331)
8:40-8:50 Ornstein, Gordon, & Braddy (332)
8:55-9:10 Thompson, Skowronski, & Lee (333)
9:15-9:30 Smith (334)
9:35-9:55 Donders, Schooler, & Loftus (335)
10:00-10:15 Tversky & Tuchin (336)

Animal Learning and Behavior II (337-343), Grand Ballroom C

10:30-10:45 Daly (337)
10:50-11:10 Wynne & Staddon (338)
11:15-11:30 Mellgren & Elsmore (339)
11:35-11:45 Perkins (340)
11:50-12:00 MacDonall & Bach (341)
12:05-12:25 Reid, Mendez, & Martinez (342)
12:30-12:40 Mitchell, Kasper, & Martinez (343)

Human Learning/Memory IV (344-347), West Ballroom

8:00-8:10 Stone & Newman (344)
8:15-8:35 Resnick & Schneider (345)
8:40-8:55 Carroll & Bandura (346)
9:00-9:15 Penney (347)

Psycholinguistics II (348-356), West Ballroom

9:30-9:40 Carpenter & O'Connell (348)
9:45-10:00 Deffner, Ericsson, & Kempkensteffen (349)
10:05-10:20 Speer & Foss (350)
10:25-10:40 Peterson, Burgess, Dell & Eberhard (351)
10:45-11:05 McDonald & MacWhinney (352)
11:10-11:25 Swinney, Nicol, Ford, Fruenfelder, & Bresnan (353)
11:30-11:45 Kroll & Borning (354)
11:50-12:05 Feldman & Fowler (355)
12:10-12:30 Bever & Hanson (356)

Judgment/Decision Making II (357-363), East Ballroom

8:00-8:15 Lopes & Casey (357)
8:20-8:35 MacKinnon & Wearing (358)
8:40-8:55 Levin, Gaeth, Johnson, & Theeuwes (359)
9:00-9:15 Block & Harper (360)
9:20-9:35 Yates & Lee (361)
9:40-10:00 Mellers, Varey, & Birnbaum (362)
10:05-10:20 Phillips (363)

Judgment/Decision Making III (364-370), East Ballroom

10:35-10:55 Wallsten & Erev (364)
11:00-11:10 Noonan & Edgell (365)
11:15-11:25 Marshall & Badley (366)
11:30-11:45 Ferguson (367)
11:50-12:10 Fields (368)
12:15-12:30 Martin & Park (369)
12:35-12:50 Slowiaczek & Sherman (370)

Discrimination/Generalization: Animals (371-379), Aspen Room

8:00-8:20 Fetterman & Killeen (371)
8:25-8:35 Eisenberger, Masterson, & Johnson (372)
8:40-9:00 Thomas (373)
9:05-9:20 Couvillon & Bitterman (374)
9:25-9:35 McSweeney & Melville (375)
9:40-9:55 Nevin (376)
10:00-10:10 Hinson (377)
10:15-10:30 Malone & Cleary (378)
10:35-10:50 Gordon & Weaver (379)

Human Learning V (380-384), Aspen Room

11:05-11:20 Wallace (380)
11:25-11:40 Thomas, Howard, & Rullo (381)
11:45-12:05 Soraci, Jr., Franks, Bransford, & Chechile (382)
12:10-12:30 Manning & Koehler (383)
12:35-12:45 Carlson & Schneider (384)

Papers Presented at the 28th Annual Meeting of the Psychonomic Society
The Seattle Sheraton Hotel & Towers, Seattle, Washington
November 6, 7, 8, 1987

PSYCHOLINGUISTICS I
Grand Ballroom A, Friday Morning, 8:00-10:10

Chaired by Michael K. Tanenhaus, University of Rochester

8:00-8:15 (1)

Framing Sentences. KATHRYN BOCK, *Michigan State University*—Errors such as "The floods were roaded" suggest that an abstract syntactic plan—a frame—guides the production of sentences. Several hypotheses about the characteristics of this frame were tested with a syntactic priming paradigm, focusing on the impact of variations in thematic roles and in closed-class elements on the occurrence of structural persistence across sentences. The results support the view that some syntactic processes are relatively insulated from pragmatic and phonological factors.

8:20-8:40 (2)

Lexical Structure and Language Comprehension. MICHAEL K. TANENHAUS, JULIE BOLAND, & SUSAN M. GARNSEY, *University of Rochester*—By monitoring when subjects notice incongruities in sentences (e.g., "Which snake did the man force to hop past the rock?"), we traced the time course of the access and use of the verb-based lexical structure in comprehension. Our results challenge claims that the submodulator structure of syntactic processing delays use of some lexical knowledge. Rather, lexical knowledge is immediately accessed and it provides a framework that guides the conceptual and syntactic analysis of a sentence.

8:45-9:00 (3)

Planning and Prosodic Structure in Sentence Production. FERNANDA FERREIRA, *University of Alberta*, & CHARLES CLIFTON, JR., *University of Massachusetts* (read by Charles Clifton)—The pattern of initiation times, pause durations, and word lengths found in sentences uttered by subjects supported the existence of two distinct determinants of sentence rhythm. Initiation times and pauses primarily reflected planning, specifically the process of converting a syntactic structure into a prosodic structure. Word durations reflected properties of the prosodic structure but not the syntactic structure from which it was created.

9:05-9:20 (4)

Coarticulation is Largely Preplanned. D. H. WHALEN, *Haskins Laboratories*—Is coarticulation a reflection of planning an utterance or the automatic effect of producing speech? This question was examined by requiring speakers to begin reading aloud before seeing the entire utterance. Those segments known before articulation began exerted normal coarticulatory influences, whereas those seen after utterance onset usually did not, even when there was enough time for the speech organs to change trajectories appropriately. The results indicate that, for the most part, coarticulation is preplanned.

9:25-9:40 (5)

Syntax and Semantics in Space: Comprehension of Spatially Ambiguous Sentences. CHARLES A. PERFETTI, BEVERLY ADAMS, & LAURA BELL, *University of Pittsburgh*, & JULIA M. WEITZ, *Bloomsburg University*—Sentences expressing spatial relations allow unusually clear contrasts between syntactic and semantic processing principles in comprehension. In a series of studies of picture and sentence comparisons, we examined comprehension of double-preposition sentences such as "The pencil is on the tablet next to the watch." Such sentences allow two readings, one favored by syntactic simplicity and the other by semantic simplicity. Results suggest a prominent role for semantic simplicity in parsing and comprehension.

9:45-10:05 (6)

Psychological Phrase Structure in Children and Adults. DORIS AARONSON & BRIAN WATTS, *New York University*—Ten-year-olds' and adults' subjective linguistic divisions in sentences occurred either at constituent boundaries (hits) or within constituents (false alarms). Quantitative and processing models to predict these subjective boundaries and their intervening units hypothesize a building-up process, from words to phrases and clauses, and ultimately to integrated sentences. A complementary process breaks down sentences into component parts. The data and model parameters indicate that the former process is more important for adults, and the latter for children.

RECOGNITION/RECALL
Grand Ballroom A, Friday Morning, 10:20-12:15

Chaired by Alvin G. Goldstein, University of Missouri, Columbia

10:20-10:40 (7)

Causes of Forgetting in Recognition Memory. RICHARD SHIFFRIN, *Indiana University*—New items added to memory lower recall and recognition. Strengthening some items (extra study time or repetitions) lowers recall, but does *not* lower recognition of other items. Also, recognition of single items is not lowered by adding additional pairs of items as long as the total number of individual items is unchanged. These and some related results rule out many current memory models. A modified version of the SAM model is fit to the data.

10:45-11:00 (8)

Mirror Effect in Recognition Memory: Experiments and Theory. MURRAY GLANZER & JOHN K. ADAMS, *New York University*—If one of two classes of stimuli (e.g., pictures and words) is better recognized than the other, subjects are more accurate in responses to *both* the old *and* the new items of the favored set. Further experiments supporting and extending the effect are presented. One shows that not only stimulus classes but also experimenter-imposed operations that improve efficiency (e.g., Kolers-type transformations) will produce the mirror effect. Theoretical implications are discussed.

11:05-11:25 (9)

Memory for Scripts: Effects of Relevance and Expectancy. RUTH MAKI, *North Dakota State University*—Script actions that were rated as high, medium, or low in relevance were presented in generic form or with an expected or unexpected detail. Medium-relevance actions were recalled better than high- and low-relevance actions, and unexpected details were recalled better than expected details. Low- and medium-relevance actions were recognized better than high-relevance actions. Actions with unexpected details were recognized better than actions with expected details, which were recognized better than generic actions.

11:30-11:50 (10)

Item and Order Information are Independent in List Memory. H. L. ROITBLAT & MARK FRATZKE, *University of Hawaii*—Subjects studied and recalled lists of eight letters. They then recognized which of a pair of presented letters appeared earlier in the memorized list (PAIRS). Recall was scored according to the number of letters reproduced in the correct position (CICP) and the number of letters correctly reproduced regardless of position (ANYPOS). CICP performance was correlated with ANYPOS and with PAIRS performance. PAIRS performance, however, was uncorrelated with performance on ANYPOS.

Item and order information are represented separately. A PDP model for these results is described.

11:55-12:10 (11)

Functional Dissociation of Spacing and Lag Effects: Developmental Evidence. THOMAS C. TOPPINO & J. D. WILLETTS, *Villanova University*—Adults and sixth graders free recalled lists containing words repeated after various lags. Subjects were free to employ their own study strategies or were forced to use a rehearsal strategy characteristic of young children. Performance improved across short lags (spacing effect) in all conditions. Adults, but not sixth graders, showed improvement with longer lags (lag effect) in the free-study condition. However, neither age group exhibited the latter effect when using the immature strategy.

HUMAN LEARNING/MEMORY I
Grand Ballroom B, Friday Morning, 8:00-10:20

Chaired by Daniel Reisberg, Reed College

8:00-8:10 (12)

Subjective and Objective Assessment of Memory in Normal Young Adults. LINDA R. WARREN, *University of Alabama, Birmingham*—Undergraduates were administered a modified Wechsler Memory Scale and made a subjective evaluation of general memory functioning. Half were also asked to make predictions of performance on each Wechsler subtest based on normative information. Neither group's subjective evaluations correlated with actual performance. Subjective evaluation of general memory functioning was inflated, but subtest predictions underestimated actual performance. Results are discussed relative to metamemory processes generally and to problems in the assessment of memory impairment.

8:15-8:35 (13)

Context Reinstatement and Human Memory: A Theoretical Taxonomy of Empirical Effects. ROBERT A. BJORK & ALAN RICHARDSON-KLAVEHN, *University of California, Los Angeles*—Whether memory of a target event is enhanced by reinstating at test some aspect of the context in which the event was embedded at study depends on an interaction of the type of context reinstated and the way in which memory is measured. We present a taxonomy of such effects and noneffects in terms of (1) the difference between intraitem and extraitems aspects of context, (2) the difference between influential and incidental aspects of context, and (3) the difference between data-driven and conceptually driven processing.

8:40-8:55 (14)

Bilingual Memory. JUDITH P. GOGGIN & SYLVIA JURADO, *University of Texas, El Paso*—Spanish-English bilingual subjects answered questions regarding the physical, phonemic, or semantic characteristics of words. The original words or their translation equivalents were then presented in an unexpected recognition test. Recognition performance varied as a function of the correspondence between input and test language and type of orienting question. Results will be discussed in terms of their implications for the characteristics of the bilingual's language storage systems.

9:00-9:15 (15)

Evidence for Parallel Files in Memory. WILLEM A. WAGENAAR, *Leiden University, The Netherlands*—Many experimental studies have shown that post-event information is incorporated in representations in memory, with the effect that subsequent recall is altered. What happens to the old representations? In a sequence of new experiments it is now demonstrated that old and new representations coexist like parallel files, and that, through adroit cuing, each file can be accessed.

9:20-9:30 (16)

Spacing Effects in Memory: The Role of Rehearsal Strategies. ROBERT L. GREENE, *Case Western Reserve University*—Memory improves as a function of the spacing between repetitions. One theory attributes this effect to a rehearsal strategy that allots few rehearsals to items repeated in massed fashion. This account is tested by comparing intentional and incidental learning on a variety of memory tests (free recall, recognition, absolute frequency estimation, and relative frequency judgment). The results support a multiprocess account of spacing effects.

9:35-9:55 (17)

Retrieval Processes in Judgments of Memory Origin. JAN RABINOWITZ, *Barnard College*—Subjects read or generated words, and labeled whole pictures or generated labels for picture fragments. Subjects were tested with pictures or words, with whole or fragmented stimuli, and with or without the initial semantic encoding context. All these retrieval manipulations affected recognition, but not the accuracy of origin (whole or fragment) judgments. The results suggest that records of cognitive operations are an integral part of the memory trace and are accessible upon accessing the trace.

10:00-10:15 (18)

Hypermnesia: Output Interference and Forgetting. STEVEN M. SMITH & EDDIE VELA, *Texas A&M University*—By manipulating intervals between multiple recall tests, we found independent and systematic effects of interval duration and interval task activity on hypermnesia. Hypermnesia increased with interpolated activity in the intervals as compared with unfilled intervals. The interval durations at which hypermnesia peaked appeared to depend upon the recall test duration. The results are explained by a combination of effects of output interference, context-dependent forgetting, and time-dependent forgetting.

PICTURE MEMORY/PROCESSING I
Grand Ballroom B, Friday Morning, 10:30-12:15

Chaired by Benjamin Wallace, Cleveland State University

10:30-10:50 (19)

The Roles of Attention and Context in Picture Perception. ALEXANDER POLLATSEK, JOHN HENDERSON, SUSAN J. BOYCE, & KEITH RAYNER, *University of Massachusetts*—In one series of experiments involving arrays of objects, extrafoveal vision was constrained by a number of experimentally defined "windows." The displays were processed most efficiently when the picture about to be fixated and the one just fixated were both present. In a second series of experiments involving scenes, background context was shown to have an effect on object identification that was not attributable to diagnostic objects' being present.

10:55-11:10 (20)

Wide-Angle Memories of Close-Up Scenes. HELENE INTRAUB & MICHAEL RICHARDSON, *University of Delaware*—Memory for pictures was tested using a drawing task (Experiment 1) and a modified recognition task (Experiment 2). Subjects consistently erred by overextending the pictures' boundaries. In drawing, subjects completed objects that had been only partially visible within the boundaries of the picture and added background. Similarly, in the recognition test, they accepted wide-angle foils as old pictures, and ranked old pictures as being "closer up." Relation of the memory results to picture perception will be discussed.

11:15-11:30 (21)

Visual Imagery: Effects and Fate of Induced Size. GERHARD STEINER, ROLF KELLER, & KLAUS BISCHOF, *University of Basel, Switzerland*—Visual images were learned from slide pictures. Projected items varied in category (objects vs. animals), factual size (small vs. large), and projection size (20°, 40°, 60°). Three types of data were obtained from both good and bad imagers: (1) image generation and recognition times, (2) image size and vividness ratings, and (3) recognition hit probabilities. Results show specific effects depending on all three independent variables, indicating a significant trend toward an image size of approximately 40°, corresponding to factual rather than learned (induced) size.

11:35-11:50 (22)

Can Group Theory Map the False Recognition of Related Patterns? JAMES J. JENKINS & J. TERRELL TUTEN, III, *University of South Florida*—When sets of related pictorial or graphic stimuli are used in a recognition task, high false recognition rates are observed for materials that "belong" to the sets even though these particular stimuli were not seen in the acquisition phase. It has been suggested that related acquisition materials serve as "group generators" in the mathematical sense. Several experiments will be reported that are compatible with this suggestion.

11:55-12:10 (23)

Imagery and the Perception of Subjective Contours. BENJAMIN WALLACE, MARY W. PERSANYI, & BARBARA GERBOC, *Cleveland State University*—Subjects, judged high or low in imaging ability, were asked to observe stimuli that, when combined, produced the perception of a subjective contour. Stimulus combining was accomplished with either imagery or direct perception. Imagery was generally not found to be equivalent to perception when reporting on subjective contours. However, for subjects who had a history of childhood eidetic abilities, some evidence for an apparent equivalence was found.

COMPREHENSION/REASONING
Grand Ballroom C, Friday Morning, 8:00-10:15

Chaired by Earl Hunt, University of Washington

8:00-8:10 (24)

Finding Meaning in Random Analogies. MICHAEL G. JOHNSON & TRACY B. HENLEY, *University of Tennessee*—Subjects solved randomly generated four-term analogies under various conditions. All such randomly generated analogies are solvable, but the question is how is this accomplished? One possible answer is to be found in subjects' verbal explanations of their solutions: A relatively small number of relations account for almost all of the solutions. These relations are perceptual or experiential in nature, and suggest that meaning is "found in" or generated out of perceptual/experiential primitives.

8:15-8:30 (25)

Using Analogies to Improve Comprehension and Recall of Scientific Passages. CAROL C. HANSEN & DIANE F. HALPERN, *California State University, San Bernardino* (read by Diane F. Halpern)—Analogies from near and far knowledge domains were presented with three different scientific passages. A no-analogy condition served as a control. Subjects who read passages with a distant-domain analogy listed more facts in free recall and cued recall tests and answered correctly more questions that required inferences or comprehension of a novel analogy. Before/after placement of the analogy was a nonsignificant variable. There were no differences between near-domain analogies and the no-analogy control.

8:35-8:50 (26)

Reading Factual Errors and Intersentence Inconsistencies: Eye Movement Analysis of Age Differences. JAMES R. ANTES & MARK GRABE, *University of North Dakota*—Adults and sixth-grade children read paragraphs that were correctly written or altered to contain either factual errors or intersentence inconsistencies. Error detection and eye movement analyses indicated that the adults were sensitive to both types of errors but that the children responded only to internal inconsistencies.

8:55-9:10 (27)

Judging the Quality of Answers to Why and How Questions. ARTHUR C. GRAESER, JONATHAN M. GOLDING, & KEITH K. MILLIS, *Memphis State University*—College students read short narrative passages and subsequently judged whether particular answers were appropriate answers to particular *why* questions and *how* questions. We assessed whether the subjects' goodness-of-answer judgments (*good* vs. *bad* answer) and judgment latencies could be explained by a model of question answering. Key components of the model involve (1) legal paths of arcs between queried nodes and answer nodes, (2) distance between nodes, and (3) intersection of nodes from different knowledge structures.

9:15-9:30 (28)

"Reason," Attitude, and Knowledge as Predictors of Assertion Agreement. JAMES F. VOSS, REBECCA FINCHEL-KIEFER, & LAURIE NEY, *University of Pittsburgh*—In a study of argument generation, individuals scored for knowledge of and attitude toward the Soviet Union made "agree"-"disagree" judgments regarding 20 statements about the Soviet Union. Subsequently they generated pro and con arguments for each item and weighted each argument for its strength of support. Regression analysis of items indicated that "agree"-"disagree" scores were predictable by pro and con measures, with attitude being a relatively strong and knowledge a relatively weak predictor.

9:35-9:45 (29)

Do You Know When You Know the Meaning of a Word Learned in Context? EUGENE B. ZECHMEISTER & ERNIE J. HILL, *Loyola University of Chicago*—Critics of context theories of vocabulary acquisition suggest that context produces confusion, only a rough idea, or the wrong idea about a word's meaning. In the present experiments, college students derived the meanings of unfamiliar words when given different amounts of context (e.g., sentence, paragraph) and then rated their confidence in knowing the meanings. Learning a word's meaning was influenced by the context manipulation, and students generally knew when they knew.

9:50-10:10 (30)

Class Inclusion: A Mathematical Model. F. MICHAEL RABINOWITZ, MARK L. HOWE, & JOAN A. LAWRENCE, *Memorial University of Newfoundland*—A four-parameter mathematical model of class inclusion was developed. Two parameters relate to the manner in which subjects code task-relevant information. The remaining parameters are estimates of the subjects' understanding of subclass-class relationships. Subjects are assumed to interpret class-inclusion questions in one of three ways: idiosyncratically, as subclass-subclass comparisons, or as subclass-class comparisons. The model is applied to developmental data on four types of class-inclusion questions.

LETTER/WORD PROCESSING I
Grand Ballroom C, Friday Morning, 10:25-12:20

Chaired by David LaBerge, University of California, Irvine

10:25-10:35 (31)

Word Superiority in Detection of Letter Repetition: The FREDDY Phenomenon. LESTER E. KRUEGER, *Ohio State University*—If words tend to conceal their component letters (word unitization hypothesis), then tasks emphasizing letter processing ought to be performed better with nonwords than with words. Contrary to the word unitization hypothesis, intraword and interword letter repetition were detected faster and just as accurately with words as with nonwords. Other evidence indicated that word unitization, although not a predominant factor, did play some role.

10:40-11:00 (32)

The Effects of Training on Letter Detection. ALICE F. HEALY & DAVID W. FENDRICH, *University of Colorado*, & JANET D. PROCTOR, *Auburn University*—With a consistent-mapping procedure, subjects were trained for zero to four sessions at detecting the letter *h* in displays containing random letters. Performance improved and in some cases became more automatic with training, and the performance level was maintained over a 1-month retention interval. When subjects were tested with a prose passage, the high error rate on the word *the* was eliminated after training and after the retention interval, regardless of the amount of training.

11:05-11:20 (33)

Conversion of Nonwards to Words in RSVP. MARY C. POTTER & AUDRA NOEL, *Massachusetts Institute of Technology*—With RSVP (rapid serial visual presentation) at 100 or 150 msec/item, nonwords that differ from words by only one vowel are compellingly perceived as words, whereas words are perceived veridically. This phenomenon is explored with word lists and with sentences biased toward one or another word. Implications for interactive versus modular models of word perception will be discussed.

11:25-11:40 (34)

Developmental Investigation of Reading Unit Size. ALICE F. HEALY, *University of Colorado*, THOMAS F. CUNNINGHAM, *St. Lawrence University*, & LYNNE CHIZZICK, *University of Colorado* (read by Thomas F. Cunningham)—First-, second-, and fourth-grade children circled the letter *t* while reading a prose passage. All children but the poor readers in the first grade made more errors on the common word *the* than on other words and on correctly spelled than on misspelled words. The effect of misspelling the other words increased with age, suggesting that reading unit size increases as children become more familiar with the visual configurations of words.

11:45-12:00 (35)

A Clear View of Word Identification Through Haziness and Fuzziness. GREGG C. ODEN, *University of Wisconsin*, & THOMAS SANOCKI, *University of South Florida*—The continuous variation of letter features discriminating between contrastive word pairs was com-

bined with a continuous mask removal procedure that controlled the pixel-wise predictability of stimuli. This provided a view of the character of fuzzy featural integration over the course of the accrual of feature information.

12:05-12:15 (36)

Reading Development: Does Ontogeny Recapitulate Phylogeny? GEORGE MARSH & PETER DESBERG, *California State University, Dominguez Hills*—According to a theory of reading development proposed by the authors, children go through several major levels of knowledge restructuring about the writing system while learning to read. This paper considers the hypothesis that children's ontogenetic development recapitulates the cultural history of the development of writing systems. Evidence for this hypothesis will be presented in a study on the ability of children to synthesize (blend) units of these three levels.

PSYCHOBIOLOGY
West Ballroom A, Friday Morning, 8:00-10:00

Chaired by Anthony L. Riley, The American University

8:00-8:20 (37)

Artificial Morning Light Makes It Easier to Get Up. SETH ROBERTS, *University of California, Berkeley*—Four adults, aged 25-64, were exposed to artificial light early in the morning (e.g., 3 a.m.) while asleep in their own bedrooms. The light, which was the intensity of room light, made it easier to get up (three cases), made the person get up earlier (three cases), and made the person get to work earlier (two cases). Most of the effects depended on the time that the light began.

8:25-8:40 (38)

Unfamiliar Environments Impair Sensory Information Processing in the Rat. BYRON A. CAMPBELL & RICK RICHARDSON, *Princeton University*—Information processing in the rat, as measured by both behavioral and cardiac responses to punctate distal stimuli, is impaired following placement in an unfamiliar (presumably fear-arousing) environment. Further analysis suggested that limitations in attentional capacity and not arousal level are responsible for the failure of the orienting response to occur when an animal is first placed in an unfamiliar test chamber.

8:45-9:05 (39)

Strain Development and Conditionability Studies of Selectively Bred Taste-Aversion Prone and Resistant Rats. RALPH L. ELKINS, *Augusta VA Medical Center & The Medical College of Georgia*, STEPHEN H. HOBBS, *Augusta College*, & G. F. CARL & DIANA L. WALLS, *Augusta VA Medical Center & The Medical College of Georgia*—Successful bidirectional selective breeding across 18 generations is producing taste-aversion (TA) prone and TA resistant rat strains for use in studies of biological contributions to individual differences in TA conditionability. Strain differences in learning to date have been highly specific to TA phenomena. Amino acid differences between strains are consistent with neurotransmitter hypotheses of TA learning propensities.

9:10-9:30 (40)

Do Multiple Neurobehavioral Systems Underlie Serial-Pattern Learning? STEPHEN B. FOUNTAIN, *Northeastern Ohio Universities College of Medicine*—Neurobehavioral evidence indicates that rat serial-pattern learning is subserved by two or more dissociable neurobehavioral systems. The evidence to be discussed parallels results from conceptually analogous cognitive tasks in monkeys and humans, suggesting that rat serial-pattern learning can be used as an animal model for addressing several current issues in the field of cognitive neuroscience. The multiple-systems view also provides a potential rapprochement of currently conflicting models of rat serial-pattern learning.

9:35-9:55 (41)

Characterization of the Antinociceptive and Cardiovascular Effects of D-Ala^2-Methionine Enkephalinamide. ALAN RANDICH & TIM J. NESS, *University of Iowa*, PAUL HOFSTADTER, *University of Colorado*, & GERALD F. GEBHART, *University of Iowa*—Four studies characterized the antinociceptive and cardiovascular actions of i.v. administration of D-Ala^2-methionine enkephalinamide (DALA) in the rat. These studies addressed the issues of conscious versus pentobarbital-anesthetized preparations; the effects of subdiaphragmatic versus cervical vagotomy; vagal afferent nerve activity and the effects of naloxone; and inhibition of heat-evoked responses of lumbar spinal dorsal horn neurons and the effects of cervical vagotomy.

ANIMAL COGNITION I
West Ballroom A, Friday Morning, 10:10-12:15

Chaired by E. J. Capaldi, Purdue University

10:10-10:25 (42)

Perceptual Organization of Complex Acoustic Stimuli in Budgerigars. ROBERT J. DOOLING, *University of Maryland*—Operant conditioning, multidimensional scaling, and cluster analysis were used to study the perception of complex acoustic stimuli by budgerigars (parakeets). Not surprisingly, budgerigars group these species-specific stimuli according to functional and acoustic categories. Budgerigars reared in isolation also show similar groupings for these complex acoustic stimuli. Budgerigars tested on contact calls from three different avian species group calls by species. These results demonstrate that natural perceptual categories for some vocal signals in budgerigars are innate.

10:30-10:45 (43)

Coding Absolute Pitch by European Starlings. SUZANNE PAGE & STEWART H. HULSE, *Johns Hopkins University*—Evidence to date suggests that songbirds (European starlings) may use absolute pitch to code complex acoustic patterns. We tested this proposition directly. Birds were trained in a 2AFC task to classify a set of high and a set of low sinetones. They coded the absolute frequencies of the tones by their choices. We will describe the contribution of absolute pitch perception to their performance.

10:50-11:10 (44)

Absolute and Relative Pitch in the Coding of Conspecific Song. RON WEISMAN & LAURENE RATCLIFFE, *Queen's University*—In chickadee songs, the initial note (fee) varies among individuals over a 500-Hz range, whereas the tonal frequency of the second note (bee) remains a constant fraction of the first. Two song-recognition experiments presented arrangements of normal and altered song components and observed the resultant social vocalizations of males. The results suggest that chickadees represent both absolute and relative frequency information about conspecific song.

11:15-11:30 (45)

Categorization and Second-Order Concepts in the African Grey Parrot. IRENE M. PEPPERBERG, *Northwestern University*—An African Grey parrot, previously taught to categorize objects with respect to color and shape, was trained to comprehend abstract categories of "same" and "different." Our subject can respond with the correct English label ["color," "shape," or "mah-mah" (matter)] when asked either "What's same?" or "What's different?" for any combination of attributes. His accuracy is ~70% for novel combinations of training exemplars, and ~80% for objects, colors, shapes, and materials not used in training.

11:35-11:50 (46)

Determinants of Categorization in Pigeons. ROBERT G. COOK, *Tufts University*, ANTHONY A. WRIGHT, *University of Texas Health Science Center at Houston*, & DONALD F. KENDRICK, *Middle Tennessee State*—Six pigeons were trained in a go/no go procedure to discriminate line drawings of birds and mammals. Transfer tests with novel exemplars showed a correspondence with human typicality ratings. Further tests examined the features of the stimuli controlling performance. The results indicated a basic similarity between pigeons and humans in the perception and transfer of learned nonsemantic natural object categories.

11:55-12:10 (47)

Acquisition and Generalization of a Four-Category Discrimination by Pigeons. R. S. BHATT & E. A. WASSERMAN, *University of Iowa* (read by E. A. Wasserman)—A four-key choice procedure and a four-ply multiple fixed ratio schedule procedure were used to train pigeons concurrently to classify color slides depicting natural (cats and flowers) and human-made (cars and chairs) objects. Acquisition with 10 slides per category was successful under each procedure. So, too,

was generalization with 10 new slides per category. Nevertheless, the pigeons' categorization performance was more discriminative on the training stimuli than on the generalization stimuli.

REPETITION/PRIMING EFFECTS I
West Ballroom B, Friday Morning, 8:00-10:25

Chaired by Michael E. J. Masson, University of Victoria

8:00-8:10 (48)

Role of Familiarity and Prime Validity on Visual Classification. SCOTT WEISGERBER & PEDER J. JOHNSON, *University of New Mexico* (read by Peder J. Johnson)—The effects of prime validity and character familiarity were investigated using a classification RT task. The results showed (1) that the magnitude of identity priming effects increased when predictive validity exceeded chance by .04; (2) that unfamiliar stimuli are subject to identity priming; and (3) that response competition from an incompatible prime interacted with category familiarity and the nature of the contrasting category.

8:15-8:30 (49)

Type of Encoding and Commensurability in Judgments of Relative Frequency. DOUGLAS L. HINTZMAN & ANN HARTRY, *University of Oregon*—According to one class of models, frequency judgments are based on values falling along a single underlying dimension (strength, familiarity, or echo intensity). Thus, frequency discrimination is poorer following "shallow" than following "deep" processing because the former produces lower values on this dimension. This implies that frequency discrimination percentages for deep-shallow pairs, deep-deep pairs, and shallow-shallow pairs should yield to a single one-dimensional scaling solution. An appropriate experiment is described.

8:35-8:45 (50)

Locus of Priming Effects in a Word-Retrieval Paradigm. NANCY L. BOWLES, *VA Outpatient Clinic, Boston*—Two experiments were carried out requiring retrieval of target words in response to stimulus definitions preceded by priming stimuli. These experiments addressed the problem of separating effects on reading time from those on word-retrieval time in this paradigm. Results demonstrated that priming effects resided in retrieval time measured from the onset of the final word read and not in overall reading time. Adult age differences in priming patterns across experiments were observed.

8:50-9:05 (51)

Effects of Orthographic Set Size and Congruency on Word-Fragment Completion and Recognition. ARTHUR J. FLEXSER, *Florida International University*—Subjects were presented with study lists in which words appeared in either of two typefaces, one of which was used more frequently than the other. Effects of this orthographic set size variable, as well as typeface congruency between study and test, are discussed in relation to word-fragment completion and recognition memory tasks given immediately and after 7 days.

9:10-9:25 (52)

Fragment Completion and Free Recall: Concepts and Data. R. REED HUNT, *University of North Carolina, Greensboro*—Dissociations between tests of word-fragment completion (WFC) and free recall have been attributed to differences between data-driven and conceptually driven processing. Guided by this distinction, the present study examined memory for words varying in orthographic distinctiveness and associative meaningfulness. Substantial and comparable effects of meaning and orthographic distinctiveness obtained in both WFC and free recall. Plausible interpretation of these results using the data-driven/conceptually driven distinction seriously weakens the utility of the distinction itself.

9:30-9:40 (53)

Cryptomnesia: Delineating Unconscious Plagiarism. ALAN S. BROWN & DANA R. MURPHY, *Southern Methodist University*—Cryptomnesia, or unconscious plagiarism, was experimentally examined. Small groups of subjects ($N=4$) were required to generate category exemplars orally, taking turns. After this, subjects recalled their own items as well as new items from each category. There was evidence of cryptomnesia in all three tasks. The most likely source person for plagiarized responses was the one preceding the subject in the generation series. Long-term priming probably accounts for such inadvertent repetitions.

9:45-10:00 (54)

Influences of Prior Acquisition of ASL on Lexical Organization of English. VICKI L. HANSON, *IBM Watson Research Center and Haskins Laboratories*, & LAURIE BETH FELDMAN, *University of Delaware and Haskins Laboratories*—In a lexical decision task, deaf signers (college students) were no better at recognizing printed English words having a common American Sign Language (ASL) morpheme than they were at recognizing words without this common morpheme, despite the finding in a second experiment that performance was affected when performing ASL judgments about the same stimuli. This pattern of results is inconsistent with the notion that the prior acquisition of ASL influences the lexical organization of English.

10:05-10:20 (55)

Sources of Learning in the Picture-Fragment Completion Task. JOAN GAY SNODGRASS, *New York University*—Subjects show impressive savings in identifying a fragmented picture when they have been previously trained on an identical fragmentation series. This "perceptual" learning is undoubtedly supported in part by both skill and episodic learning. Results of four experiments in which training conditions were manipulated reveal the relative importance of these two sources on perceptual learning. Recall and perceptual learning are sometimes dissociated and sometimes not. The implications of these findings for the separate memories hypothesis are discussed.

TOUCH
West Ballroom B, Friday Morning, 10:35-12:15

Chaired by Carl E. Sherrick, Princeton University

10:35-10:50 (56)

Effect of Stimulus Frequency on Localization of Vibratory Stimuli. CARL E. SHERRICK, ROGER W. CHOLEWIAK, & AMY A. COLLINS, *Princeton University*—Vibratory frequencies of 250 Hz appeal most readily to the Pacinian corpuscles, which are deep-lying receptors with large receptive fields. Stimuli at these frequencies should not be localized as well as are low-frequency stimuli, which appear to recruit superficial receptors with small receptive fields. The present study tests the hypothesis that the low-frequency stimulus is better localized than the high by dissociating the receptors by mechanical and psychophysical means.

10:55-11:10 (57)

Localization of Tactile Stimuli: The Effect of a Masking Stimulus. JAMES C. CRAIG, *Indiana University*—Subjects attempted to localize tactile stimuli presented to the left index fingerpad. The target stimuli, which could occupy one of six locations on the fingerpad, were either preceded or followed by other tactile stimuli that served as maskers. Masking stimuli presented either to the same location as the target or to a different location interfered in target localization. Masking declined as the temporal separation between target and masker increased.

11:15-11:30 (58)

Vibrotactile Pattern Discrimination and Communality at Several Body Sites. ROGER W. CHOLEWIAK & AMY A. COLLINS, *Princeton University*—The degree of "overlap" between two spatial patterns defines their communality. When pairs of spatially distributed vibrotactile patterns are compared in a discrimination task, performance is directly proportional to communality. A series of studies using tactile arrays on the thigh, arm, palm, and fingertip shows that the form of the function comparing performance and communality is independent of body site and number of pattern elements.

11:35-11:50 (59)

Kinematic Versus Dynamic Control of Haptics During Visual Dominance. RANDOLPH D. EASTON, *Boston College*—Using a finger-pressure transduction technique, three experiments explored the nature of changes of processing in the haptic system as a function of the dominating effect of visual information. Visual dominance of both haptic size and shape were studied. Results indicated that finger pressure was not the result of vision's controlling limb movement in terms of absolute spatial coordinates. Rather, vision controlled limb move-

ment in terms of setting finger-pressure parameters as goals to be achieved.

11:55-12:10 (60)

Haptic Categorization of Objects by Multiple Dimensions. ROBERTA KLATZKY, *University of California, Santa Barbara*, SUSAN LEDERMAN, *Queen's University*, & CATHERINE REED, *University of California, Santa Barbara*—Objects varying in shape, hardness, and surface texture were haptically categorized by one to three of those dimensions. Adding a second, redundant dimension speeded the response, but categorization by three correlated dimensions was no faster than by two. Analysis of hand movements indicated that participants performed "exploratory procedures" that were optimal for encoding category-defining dimensions. Compatibility of such procedures constrains how object dimensions are processed together.

MOTOR CONTROL

Aspen Room, Friday Morning, 8:00-10:30

Chaired by Howard N. Zelaznik, Purdue University

8:00-8:10 (61)

Coordination of Transport and Manipulation Components in Prehensive Movement. STEPHEN A. WALLACE & DOUGLAS L. WEEKS, *University of Colorado*—An experiment was performed to determine whether the duration or movement time (MT) of discrete grasping movement affected the functional association between the transport and manipulation components. Subjects were trained to move at slow (800-msec), medium (600-msec), and fast (300-msec) MTs. MT affected both maximum aperture and the within-trial correlations between aperture and wrist velocity. These results support the view that the degree of coupling between the two components may be determined, in part, by MT.

8:15-8:30 (62)

Acceleration Patterns of Aimed Hand Movements: Effects of Gravitational Orientation. HOWARD N. ZELAZNIK, EPHRAIM FISCHBACH, & CARRICK TALMADGE, *Purdue University*—Theories of the linear speed-accuracy trade-off require that aimed hand movements exhibit time rescalability, a property not observed in recent research. The present work examined the acceleration patterns as a function of movement direction, gravitational orientation, and movement time. Movements made in a downward direction exhibited strong time rescalability, whereas all other movements did not. These results support a "thruster" model for acceleration patterns of aimed hand movements.

8:35-8:50 (63)

Aging and the Time Course of Motor Plan Restructuring. GEORGE E. STELMACH, PAUL C. AMRHEIN, & NOREEN L. GOGGIN, *University of Wisconsin, Madison*—In two experiments, aging and the time course of motor plan restructuring were studied. A reaction time paradigm was used in which a precue indicated the target response on 75% of the trials. On remaining trials, the precue incorrectly specified target response with respect to arm and/or direction parameters. Elderly, but not young, subjects lost direction preparation 250 msec after precue, but both groups maintained arm preparation. Thus, aging alters motor plan maintenance differently for specific parameters.

8:55-9:05 (64)

Local Invariance in Hierarchical Models of Sequence Production. RONALD L. KNOLL, *AT&T Bell Laboratories*, & SAUL STERNBERG, *University of Pennsylvania and AT&T Bell Laboratories* (sponsored by Saul Sternberg)—Most models of sequence production termed "hierarchical" (including tree-traversal models) have a property of local invariance: The timing of some subsequences is invariant with changes in the nature or number of noncontiguous context elements. For sequences of distinct keystrokes, an analysis of interresponse time distributions based on the local-invariance property provides a critical test of hierarchical models.

9:10-9:30 (65)

Hand/Voice, Left/Right Cooperation in Music Performance: Analogous Asymmetries. YVES GUIARD, *CNRS-Marseille, France* (sponsored by Bertram Scharf)—The general view that man tends to form cooperative structures by flexibly assembling organs *in series* (the kinematic chain theory) was tested in the context of music performance. Subjects better performed a bimanual task consisting of tapping a regular beat and a more complex rhythm with the beat assigned to the left hand and the rhythm to the right than vice versa. Similar (up/down) asymmetries occurred in voice/hand coordination for rhythm and music.

9:35-9:45 (66)

Production of Scalar and Vector Isometric Forces. BARRY H. KANTOWITZ, *Battelle Memorial Institute, Seattle*—Subjects matched vertical lines of five possible amplitudes by exerting pressure on an isometric force transducer. Responses either were constrained to fall on the vertical line (scalar mode) or were unconstrained in the two-dimensional display space (vector mode). For both modes movement time increased with display amplitude while reaction time (RT) decreased with amplitude. RT did not vary with amplitude set size.

9:50-10:05 (67)

Relative Frequency of Knowledge of Results and Complex Motor Skill Learning. C. J. WINSTEIN & R. A. SCHMIDT, *University of California, Los Angeles* (read by R. A. Schmidt)—For a complex movement task, with the total number of practice trials fixed, we manipulated the relative frequency of knowledge of results (KR) at 100% or 50%. The 50% group had KR "faded" (i.e., high frequency in early practice, low frequency later) and performed more effectively than the 100% group on a no-KR retention test both after 5 min and after 1 day. That fewer KR presentations can lead to greater retention is interpreted in terms of our guidance hypothesis for KR.

10:10-10:25 (68)

Testing Donders's Subtraction Method with Nonaging Precue-To-Stimulus Intervals. ROBERT GOTTSDANKER & TIM PERKINS, *University of California, Santa Barbara*—In a choice reaction-time experiment with 4 young adults, nonaging precue-to-stimulus intervals were used to obtain tighter evidence on the validity of Donders's subtraction method than had been obtained in an earlier study with blocked intervals. It was clearly demonstrated that a sustained −1 slope of RT against interval is obtainable with nonaging intervals, indicative of a delayed effect of the imperative aspect of a choice stimulus, which is inherent in Donders's formulation.

PROBLEM SOLVING I

Aspen Room, Friday Morning, 10:40-12:15

Chaired by David Kieras, University of Michigan

10:40-11:00 (69)

Prescriptive Principles of Problem Solving. MARVIN LEVINE, *State University of New York, Stony Brook*—The distinction is made between descriptive principles (those that tell us about the strategies that people in fact use when solving problems) and prescriptive principles (those that specify the strategies that people *should* use in solving problems). Prescriptive principles serve to help people overcome their own limitations as problem solvers. These limitations may be motivational (inhibitions or anxiety), attentional (cf. Einstellung), or cognitive. Two such principles, intimate engagement and look for special features, will be described.

11:05-11:25 (70)

Expertise and Knowledge Modification: When Bridge Isn't Bridge Anymore. PETER FRENSCH & ROBERT J. STERNBERG, *Yale University* (read by Robert J. Sternberg)—Expert-novice studies have generally compared expert versus novice problem solving in already acquired skills. Our study, in contrast, investigated expert-novice differences in the *acquisition* of partially unfamiliar knowledge. Thirty expert and novice bridge players bid 40 openings and played 12 computerized bridge games under both normal and systematically modifed conditions. We found that surface versus deep structural changes in the game differentially affected experts' and novices' bridge playing, but not their bidding.

11:30-11:45 (71)

Teaching General Strategies and Domain-Specific Concepts in Physics. PATRICIA W. CHENG, *University of California, Los An-*

geles, & JILL H. LARKIN, *Carnegie-Mellon University*—We tested two hypotheses concerning problem solving in physics. The first hypothesis is that teaching college students general problem-solving strategies will improve their performance on solving physics problems. These strategies—decomposition and invariance—are frequently used by experts, but are almost never explicitly taught in physics textbooks. The second hypothesis is that teaching explanations of concepts in physics will improve performance. Such explanations are typically included in physics textbooks, but are not necessary for solving most textbook-type problems.

11:50-12:05 (72)

Procedural Variability and Transfer in Problem Solving. RICHARD CATRAMBONE, *University of Michigan*, & KEITH J. HOLYOAK, *University of California, Los Angeles* (read by Keith J. Holyoak)—Example problems in quantitative courses such as physics and statistics often teach students a series of mathematical operations for solving certain types of problems, but fail to teach the underlying subgoals and methods. In three studies students in probability classes studied training problems concerned with the Poisson distribution. Subjects who received training problems with varied subgoal orders and methods solved novel problems more successfully than did subjects who received training problems that used a constant method and subgoal order.

CONNECTIONIST MODELING
Grand Ballroom A, Friday Afternoon, 1:00-3:20

Chaired by Michael S. Humphreys, University of Queensland, Australia

1:00-1:15 (73)

A Distributed, Developmental Model of Visual Word Recognition and Naming. MARK S. SEIDENBERG, *McGill University*, & JAMES L. McCLELLAND, *Carnegie-Mellon University*—We describe a new model of visual word recognition and pronunciation that provides a detailed account of naming and lexical decision performance, including effects of word structure and frequency. "Syllabic" effects emerge from the system despite the absence of an explicit syllabic level of representation or syllabification rules. Training with a smaller number of hidden units produces output characteristic of poor readers. When "lesioned," the model produces errors observed in cases of surface dyslexia.

1:20-1:40 (74)

A Connectionist/Control Architecture for Working Memory and Attention. WALTER SCHNEIDER & MARK DETWEILER, *University of Pittsburgh*—A connectionist/control architecture and simulation of working memory is presented. Knowledge is stored in fast- and slow-learning connection weights. Control processing modulates message transmissions and connection changes. There are three levels of description in the model: micro (neural network), macro (levels and buffers), and system (regions and control). Simulations and interpretations of release from proactive interference, the magic number 4, acoustic confusions, elaborative coding, episodic/semantic memory, interference effects, long-term recency effects, and working memory load are provided.

1:45-2:05 (75)

The Sequential Learning Problem in Connectionist Modeling. MICHAEL McCLOSKEY & NEAL COHEN, *Johns Hopkins University*—In connectionist modeling all items to be "learned" by a network are typically included in a single training set that is presented repeatedly until a desired performance level is attained. Human learning is usually more sequential. For example, in learning arithmetic, children typically learn addition facts before multiplication facts, and "small' facts (e.g., 2+3) before "large" facts (e.g., 8+9). When connectionist networks are trained sequentially, significant problems are encountered, as we illustrate in several domains.

2:10-2:30 (76)

Selective Attention and Hypothesis Testing in Adaptive Network Models of Learning. MARK A. GLUCK & GORDON H. BOWER, *Stanford University* (read by Gordon H. Bower)—We have extended our previous network model to deal with some attentional effects in human discrimination learning and with some classic results on the difficulty of learning differing types of classifications. The successes of this simple adaptive network (or "connectionist") model indicate the explanatory power of the Rescorla-Wagner/least-mean-squares algorithm over earlier conditioning rules.

2:35-2:55 (77)

A Connectionist Model of Musical Harmony: Evidence from Priming. JAMSHED J. BHARUCHA, *Dartmouth College*—The proposed model is constrained by data from subjective ratings and memory confusions. The model predicts patterns of expectancies for chords following a musical context. These predictions were tested using a priming task: reaction times were faster for more highly activated chord units in the network. Priming was observed even when acoustic similarities between prime and target (shared harmonics) were eliminated. Expectancies must therefore be generated by activation spreading at a cognitive level.

3:00-3:15 (78)

Automatic Processes in the Stroop Effect: A Parallel Distributed Processing Account. JONATHAN COHEN, JAMES L. McCLELLAND, & KEVIN DUNBAR, *Carnegie-Mellon University* (read by James L. McClelland)—We describe a PDP approach to automaticity and apply it to the Stroop effect. We treat automaticity as a matter of degree, resulting from connection strengthening through practice. Attention inhibits task-inappropriate pathways strongly but not absolutely. Stronger connections (for word reading) influence performance that depends on weaker connections (for color naming), even when attention inhibits the stronger pathway. The model captures basic and subtler aspects of the Stroop effect, including differential interference versus facilitation and practice effects.

LETTER/WORD PROCESSING II
Grand Ballroom A, Friday Afternoon, 3:30-5:45

Chaired by Rebecca Treiman, Wayne State University

3:30-3:50 (79)

Eye Movement Control During Reading: Initial Fixations on Words. GEORGE W. McCONKIE, PAUL W. KERR, MICHAEL D. REDDIX, & DAVID ZOLA, *University of Illinois, Urbana-Champaign*—From an analysis of data on 40,000 eye fixations made during reading, we conclude that the location of the first fixation on a word is determined primarily by four factors: a natural target side within a perceptual unit, a range effect in oculomotor control, a decreasing influence of the range effect with longer eye fixation time, and random error in oculomotor control. Locations of initial fixations on a word are more constrained than previously reported.

3:55-4:15 (80)

Eye Movement Control in Reading: The Role of Parafoveal Information. ROBIN K. MORRIS, KEITH RAYNER, & ALEXANDER POLLATSEK, *University of Massachusetts* (read by Keith Rayner)—Subjects read text as their eye movements were monitored. Changes were made in the type of parafoveal information presented (spaces between words or specific letters) and when that information became available to the reader. When and how readers are able to utilize these different types of information were investigated. The results enabled us to determine more precisely the role parafoveal information plays in reading. Implications for models of eye guidance will be discussed.

4:20-4:35 (81)

Temporal Processing in Dyslexia. KIMRON SHAPIRO & NANCY OGDEN, *University of Calgary* (sponsored by Jane Raymond)—The temporal processing capabilities of dyslexic versus both age- and reading-matched controls in a reading-related task were studied in children. Short and long words were displayed at durations of either 100 or 300 msec. Results showed evidence of decreased word identification by the dyslexic children as word length and display duration increased. A second study ruled out differences in eye movement behaviors that could account for the effects observed in the first study.

4:40-4:50 (82)

Identification Times for Misoriented Words. KEVIN JORDAN, *San Jose State University*—Word identification times were measured as a function of orientation (0° to 330° in 30° increments) and practice. The time to identify a word increased with deviations from "nor-

mal" orientation up to 210°, beyond which identification times decreased. Additionally, practice did not decrease this orientation effect on identification time. The lack of both symmetry around 180° and the practice effect distinguish these data from those often reported using a mental rotation task.

4:55-5:15 (83)

Interactive Processes in Visual and Auditory Word Perception. RAM FROST, *Hebrew University, Jerusalem, Israel*, & LEONARD KATZ, *University of Connecticut* (sponsored by Leonard Katz)—The ability to restore degraded speech from print or degraded print from speech was investigated in deep and shallow orthographies. English and Serbo-Croatian speakers matched clear or degraded verbal stimuli presented simultaneously in both the visual and the auditory modalities. The effects of degradation, visual or auditory, were found to be greater in English than in Serbo-Croatian. The results suggest that the phonologic and orthographic systems interact differently in different orthographies.

5:20-5:40 (84)

Word Recognition: Is the Sky Falling on Top-Down Processing? KENNETH R. PAAP, CHEN LI, & RONALD NOEL, *New Mexico State University*—In days gone by, investigating word recognition was exciting as we sought to discover the mechanisms by which familiarity and context guide recognition. Words were where the action was! This blush of energy and excitement pales as current views hold that the processes underlying lexical access are either cognitively impenetrable or simply inscrutable. These issues will be discussed and some new data presented (e.g., LDT and naming yield equivalent frequency effects with Chinese characters).

DEVELOPMENTAL/AGING PROCESSES I
Grand Ballroom B, Friday Afternoon, 1:00-3:25

Chaired by Doris Aaronson, New York University

1:00-1:15 (85)

Aging and Memory for Pictures of Faces. JAMES C. BARTLETT, JODIE LESLIE, & ANN TUBBS, *University of Texas, Dallas*—To assess age differences in visual memory, we had young and elderly adults (1) recognize pictures of previously viewed faces, and (2) detect changes in expression, pose, or lateral orientation. There were only minimal age differences in recognizing old faces and judging *whether* faces had been changed. However, the elderly made more false alarm errors and were deficient in specifying *how* faces had been changed. There appear to be age differences in accessing pictorial details from memory.

1:20-1:35 (86)

Age Differences in Memory for Orientation and Location of Repeated Pictures. ROBERT E. TILL, *University of North Dakota*, JAMES C. BARTLETT, *University of Texas, Dallas*, & MATTHEW J. SHARPS, *University of Colorado*—Unlike some recent studies of aging and picture memory, our study demonstrates that age differences are large when (1) memory is based on detailed visuospatial information and (2) memory requires retrieval of information about a particular study episode. With complex scenic pictures presented and tested repeatedly, we found age differences in memory for these repeated pictures' left-right orientation and spatial location on their most recent presentations. These data suggest real age differences in visuospatial memory.

1:40-1:50 (87)

Lateralized Cognitive Functions in Normal Aging. GERALD ROSENBAUM, NANCY KLOOZ, LINDA FORSBERG, & ROLANDO HENRY, *Wayne State University*—Learning and memory tasks assessing verbal versus visuospatial components of both crystallized and fluid intelligence were studied in 80 adults in the 6th through 9th decades. Motor skill indices of lateralization were also obtained. Both verbal and visuospatial measures of fluid new learning abilities showed a monotonic decline with age, whereas crystallized verbal and visual memory functions declined *only* in the 9th decade. Lateralized motor skill measures declined and showed diminished lateralization with normal aging.

1:55-2:10 (88)

Aging Effects in Mental Synthesis. TIMOTHY A. SALTHOUSE, *Georgia Institute of Technology*—Groups of young and old adults attempted to recognize multisegment patterns when the line segments making up the to-be-remembered patterns were presented in temporally successive frames. The two groups had equivalent sensitivity to varying numbers of line segments in the composite patterns, but older adults were impaired more than young adults as the number of to-be-integrated frames increased. Processing resource and memory interference interpretations of this phenomenon will be discussed.

2:15-2:25 (89)

Are There Age Differences in Development of Organization? BARBARA H. BASDEN, DAVID R. BASDEN, & JANET ANDERS, *California State University, Fresno*—In Experiment 1, recall of unrelated words was better with "simple" learn instructions than with more elaborate encoding instructions. This difference occurred for college students but not for third graders or the elderly. In Experiment 2, recall of categorized words was also better with "simple" learn instructions, but this time the difference occurred for both college students and the elderly. "Generate" instructions produced the poorest recall for college students, but not for the elderly.

2:30-2:45 (90)

Nature and Course of Short-Term Forgetting in Children and Adults. FRANK N. DEMPSTER, *University of Nevada, Las Vegas*—The relative contributions of two potential sources of short-term forgetting were estimated in second graders and adults. Procedures designed to minimize the confounding effects of encoding differences, distractor difficulty, and so forth, were used. The data from two experiments suggested that decay is a less potent source of forgetting than is interference and that childrens' short-term memories are more fragile (i.e., more susceptible to retroactive interference) than are those of adults.

2:50-3:05 (91)

Speed of Sentence Processing in Young and Old Adults. JOELLEN T. HARTLEY, TERRY A. ANNON, CARRIE JOHNSON, & THOMAS J. MUSHANEY, *California State University, Long Beach*—In two experiments, the basic speed of processing of simple sentences was measured in a variant of a psychophysical threshold task. Do older adults require more time to process these sentences for immediate recall than do younger adults? Are basic processing speeds related to memory for a longer text? Are there other systematic, age-related differences in information processing speeds that predict sentence processing times? The respective answers appear to be yes, no, and maybe.

3:10-3:20 (92)

Assessing Early Language: A Multiple-Form Word Production Checklist. J. STEVEN REZNICK, *Yale University* (sponsored by William Estes)—Five equivalent word lists were developed to assess word production of children in their second year. The words on each list do not overlap, but are comparable in difficulty. A validation study on 25 infants suggests that the five lists produce comparable mean production scores, reflect differences in age, and preserve individual differences in total production and relative production of linguistic categories such as nouns, verbs, and open and closed class items.

HUMAN COGNITION
Grand Ballroom B, Friday Afternoon, 3:35-5:40

Chaired by Susan Carey, Massachusetts Institute of Technology

3:35-3:50 (93)

Brain Activity Underlying Mental Imagery: An ERP Study. MARTHA J. FARAH, *Carnegie-Mellon University*, FRANK PERONNET, *INSERM Unit 280, France*, & LAUREN WEISBERG, *Carnegie-Mellon University*—Does visual mental imagery involve activity in the visual

areas of the brain? We compared event-related potentials to words when subjects were asked to read the words and when subjects were asked to read them and form mental images of the words' referents. Imagery caused a slow, late positivity, maximal at the occipital regions of the scalp, relative to the comparison condition. This implicates the use of cortical visual processing areas in mental imagery.

3:55-4:10 (94)

Is Working Memory Capacity Task Specific? RANDALL W. ENGLE, *University of South Carolina*, & MARILYN L. TURNER, *Wichita State University*—In a series of studies, we investigated the nature of working memory (WM) in general and individual differences in WM capacity specifically. Measurements of WM span obtained while the subject was performing arithmetic problems correlated just as highly with tests of reading comprehension as did a span measured while the subject was reading. Variations in the difficulty of the arithmetic task showed the same pattern of correlations with comprehension as did variations in the difficulty of the reading task.

4:15-4:30 (95)

Serial Position Effects in Comparative Judgments. EDWARD J. SHOBEN, *University of Illinois, Urbana-Champaign*—It has often been observed that items near the middle of a magnitude scale are more difficult to discriminate than items near the ends of a scale. In comparative judgment tasks in which subjects determine the larger of two objects, these serial position effects are usually thought to be artifactual. Several comparative judgment experiments indicate that this serial position effect is not an artifact and in fact places important constraints on models of relational information.

4:35-4:50 (96)

Role of Feedback and Frequency in Category Abstraction. DONALD HOMA & SHERRY DUNBAR, *Arizona State University*—Ill-defined category learning and transfer were evaluated in three experiments. In Experiments 1 and 2, a fivefold increase in exemplar frequency during learning had little effect on subsequent generalization, regardless of category size and old-new similarity; in Experiment 3, erroneous feedback during learning degraded transfer performance for small, but not large, categories. These results are discussed in terms of exemplar-based and prototype-based models of classification.

4:55-5:10 (97)

Multiple-Column Mental Addition: Where is the Carrying Cost? LESLIE A. WHITAKER, *Klein Associates*, & LYNN C. OATMAN, *U.S. Army Human Engineering Laboratory*—Response latency of mental addition may include costs for number of digits to be added *plus* a cost for each carrying operation (Ashcraft & Stazyk, 1981). We tested this prediction by requiring subjects ($n=20$) to complete addition tasks that ranged in difficulty from two one-digit addends (e.g., 2+4) to three three-digit addends (e.g., 241+396+103). Analyses of mean response times indicated that there was no measurable increment attributable to the carrying operation necessary with two- and three-digit addends.

5:15-5:25 (98)

Verbal Processes in Chess Skill. DENNIS H. HOLDING, *University of Louisville*—Above-average players were asked to analyze chess positions, while either remaining silent or counting backward by threes. The move search could be represented internally, or else externally by manipulating the pieces. The inhibition of verbal processing by counting produced a marked drop in search size (maximum depth, episodes, total moves) and move quality, whereas external representation yielded deeper searches with fewer branches. Chess skill apparently depends only partially on spatial and pattern-recognition processes.

5:30-5:40 (99)

Enhancing Scientific Creativity by Flotation REST. PETER SUEDFELD, *University of British Columbia*, & JANET METCALFE, *Indiana University*—Members of a university psychology department recorded research-related ideas after spending each of six 1-h sessions sitting in their offices and the same number of sessions floating in a restricted environmental stimulation (REST) tank. There was no significant difference in the number of ideas or proportion of novel ideas generated; however, self-ratings of the creativeness of the ideas recorded after flotation was significantly higher. The results extend previous findings and theories concerning the effects of REST on cognition.

SYMPOSIUM: BEHAVIOR-GENETIC ANALYSIS WITH PHENOTYPES INVOLVING LEARNING AND/OR INSTINCT

Grand Ballroom C, Friday Afternoon, 1:00-3:50

Chaired by Jerry Hirsch, University of Illinois

The methods of behavioral genetics are being used to elucidate the psychobiological mechanisms underlying a variety of behaviors in a number of genera and species. This symposium illustrates the utility of such an approach and provides examples of several behavior-genetic methods as they have been applied to various animal models of learned and/or instinctive behaviors.

1:00-1:05 (100)

Introduction. JERRY HIRSCH, *University of Illinois*.

1:05-1:25 (101)

Experience-Mediated Changes in the Courtship of *Drosophila*. STEPHEN ZAWISTOWSKI, *St. John's University*—Early studies of *Drosophila* courtship paid scant attention to the role of experience. However, more recent efforts have demonstrated that the mating behavior of both male and female *Drosophila* can be modified by experience. Processes identified with these changes include sensitizaton, habituation, and associative learning. Mutants identified using other learning procedures have been used in the analysis of these courtship modifications. In addition, other studies have questioned the role of these modifications in the natural history of *Drosophila*.

1:30-1:50 (102)

Instinct, Conditioning, Individual Differences, and the Behavior-Genetic Component Analysis of Diptera. JERRY HIRSCH & MARK HOLLIDAY, *University of Illinois*, & JEFFRY RICKER, *Arizona State University*—Our research has substantive and methodological goals. Our analyses of relations between heredity and behavior traits (tropisms, courtship, feeding), that is, genotype-phenotype correlations, are revealing how, in principle, to analyze the genetic correlates of behavior traits in many species. Hybrid-correlational analyses combine classical Mendelian crosses and trait (phenotype-phenotype) correlations to gain access to the genetic system in order to reveal independence or (genotype-genotype) correlations between gene correlates (mechanisms) of behavior traits.

1:55-2:15 (103)

Motivation and Associative Learning Ability: Are These Genetically Independent Processes? DOUGLAS WAHLSTEN, *University of Waterloo*—Genetic analysis can only inform us about differences between individuals, but, given this limitation, it can help to assess the relations among components of the learning process using selective breeding or single-gene analysis. However, further progress in this endeavor requires more reliable and better standardized tests of psychologically interesting processes, such as motivation and associative learning ability.

2:20-2:40 (104)

Correlates of the Phenotypic Difference in Avoidance Learning in SHA and SLA Rats. F. ROBERT BRUSH, *Purdue University*—Selective breeding for good and poor shuttlebox avoidance learning has resulted in two strains that also differ in a number of other characteristics. These phenotypic correlates are described and lead to the conclusion that the difference in avoidance learning is attributable to differences in motivation or emotionality, not learning per se. The implications of this finding for the evolution of the neural substrates of learning are explored.

2:45-3:05 (105)

Behavioral Associations of Hereditary Variations in Morphology of the Rodent Hippocampus. RICHARD E. WIMER, *Beckman Research Institute of the City of Hope*—Genetically associated variations in density of the granule cells of the dentate, and in the distribution of their axonal synapses upon target neurons in hippocampal region inferior, have been identified. Associations of these variations, some of them very strong, with learning performance in the shuttlebox have been found. These studies, along with others establishing hippocampal sex dimorphisms, offer both the possibility of accounting for individual differences in learning and an alternative approach to studying brain function.

3:10-3:30 (106)

Discussion of the Papers. GORDON M. HARRINGTON, *University of Northern Iowa and Wayne State University.*

3:35-3:50

Open Discussion.

ATTENTION I

Grand Ballroom C, Friday Afternoon, 4:00-5:40

Chaired by Saul Sternberg, University of Pennsylvania and AT&T Bell Laboratories

4:00-4:15 (107)

Does Feature Identification Really Require Serial Processing? HOWARD E. EGETH & CHARLES L. FOLK, *Johns Hopkins University*—Discrimination of simple features is frequently found to be independent of the number of stimuli in a display, a result consistent with a parallel processing model. Sagi and Julesz (1985) have reported data from a variation of the standard discrimination task in which stimuli must presumably be identified; the results were interpreted to mean that serial processing is required in these circumstances. Our further research with this task indicates that a parallel model is more appropriate.

4:20-4:40 (108)

Tracking Multiple Independent Targets: Serial and Parallel Stages. ZENON PYLYSHYN, *University of Western Ontario*—Although certain aspects of attention require serial scanning, indexing and tracking several objects in a display may be carried out in parallel. Subjects can accurately track a subset of up to five objects in a field of identical randomly moving objects, distinguishing a change in a target from a change in a distractor, even when the speed and distance parameters of the display are designed to prevent a serial scanning algorithm from being used.

4:45-5:00 (109)

Visual Search: Detection, Recognition, and Localization. MARC GREEN & DAN ASH, *University of Louisville*—In two experiments, observers searched for a diagonal target amid varying numbers of vertical distractors. The first showed that detection and orientation recognition (+45° vs. −45°) performance were similar. The second found that observers were equally accurate in detecting the target and reporting its location in the visual field. the most striking finding on all tasks, however, was *improved* accuracy with *greater* numbers of distractors. These results conflict with current models of visual search.

5:05-5:20 (110)

Covert Cross-Modal Orienting of Attention in Space. RAYMOND KLEIN, MONIQUE BRENNAN, & AARON GILANI, *Dalhousie University*—Uninformative auditory tones from speakers about 30° to the left or right of straight ahead produce rapid shifts of visual attention, as measured by luminance detection latencies. The cuing effect (for location stimulated) is still present at the shortest SOA even when a tone on one side predicts (80% validity) a light on the opposite side. Thus, a localized auditory event functions like a peripheral visual cue, rapidly and reflexively attracting visual processing resources.

5:25-5:35 (111)

Task-Unrelated Thought Frequency During Vigilance. LEONARD M. GIAMBRA, *National Institute On Aging*—Task-unrelated thoughts (TUTs) represent shifts of attention away from the task at hand to internal information sources. TUT frequency was studied during a vigilance task. The effects of event rate, signal rate, and pretask activity were investigated in a 3×2×2 repeated measures design. An ANOVA (N=26) yielded significant effects ($p < .05$) due to event rate and signal rate. TUT frequency increased with decreased event and signal rates. No significant interactions occurred.

LATERALITY

West Ballroom A, Friday Afternoon, 1:00-3:25

Chaired by Pierre L. Divenyi, VA Medical Center, Martinez, California

1:00-1:15 (112)

Hand/Limb Laterality in Lowland Gorillas. JOAN S. LOCKARD, TRACY L. McFARLIN, & MARGUERITE A. HAWLEY, *University of Washington*—Hand/limb laterality in a group (N=9) of captive lowland gorillas (*Gorilla gorilla gorilla*) was studied in a seminatural environment of the Woodland Park Zoological Gardens, Seattle. Focal-animal observations of left- or right-side hand/limb use from 1981 to 1987 were gathered during daily social, environmental, and self-directed activities. Laterality data on 4 adults, 2 subadults, and 3 infants revealed hand/limb preferences that were familial as well as idiosyncratic. The preferences were consistent with gorilla foraging strategies and social structure.

1:20-1:35 (113)

Hand Preference Change as a Result of Hand Injury. CLARE PORAC & TERRI BULLER, *University of Victoria*, & MICHAEL HARNADEK, *University of Windsor*—We surveyed approximately 400 individuals who had suffered hand injuries as adults. We asked them to describe their hand use before, during, and after injury, using 20 items that covered four categories of hand preference functions. The data show that injury to the preferred hand results in temporary hand use change. These data provide the first evidence of the plasticity of adult handedness patterns and are relevant to environmental theories of hand preference formation.

1:40-1:55 (114)

Qualitative Differences in Tactuospatial Learning by Left- and Right-Handed Subjects. JEANETTE P. WARD, GERI ALVIS, CAROLINE SANFORD, & DEANNA DODSON, *Memphis State University*—A finger maze was used to study tactuospatial capacity as a function of handedness of subjects and hand employed in learning and transfer. Dextral and sinistral subjects were trained with dominant or nondominant hand. Transfer hand was tested in the identical maze or a lateral mirror-image version. Fewer trials were required in acquisition by all subjects using the left hand. Transfer performance gave evidence of different right and left hemisphere strategies for encoding tactuospatial information.

2:00-2:10 (115)

Alcohol Effects on the Variability of Responses to Monaural and Binaural Stimulation. LOWELL T. CROW, YOLANDA G. QUEVEDO-CONVERSE, & EVELYN M. MOORHEAD, *Western Washington University*—Thirty-six students were given a simple timing task after a 30-min ingestion period of 0.4 g/kg of alcohol. Differing intertone time intervals to be matched were presented either monaurally or binaurally through headphones. Alcohol was found to reduce response variability (latency variances) when tones were presented to both ears and to eliminate a differential response variability found to exist in control subjects (N=41) between the monaural and binaural presentation conditions.

2:15-2:25 (116)

Individual Differences in Lateral Preference: Relationship to Dichotic Listening Performance and Spatial Skills. R. DOUGLAS WHITMAN, *Wayne State University*, & SUSAN BOOKHEIMER, *New Haven VA*—Sex, handedness, spatial and verbal skills, and lateralized performance on four dichotic tasks (free, cued, ordered, and delayed cue recall) were examined. Females were likely to show a left-ear advantage, right-handed males showed an extreme right-ear advantge, and left-ear-advantage subjects were superior on both spatial tasks. These results suggest that subjects have habitual styles of processing that are consistent across and within tasks, reflecting lateralized brain mechanisms.

2:30-2:45 (117)

Hemispheric Biases in Processing CVC Nonsense Syllables. JOSEPH B. HELLIGE, ANNETTE T. KUJAWSKI, & TAMI LEE ENG, *University of Southern California*—CVC nonsense syllables were identified more accurately when projected to the RVF or to both visual fields (LVF+RVF) than when projected to the LVF. Visual field differences in the nature of errors suggested linguistic processing by the left hemisphere and letter-by-letter processing by the right hemisphere for virtually all subjects. However, subjects differed in which strategy dominated on LVF+RVF trials, on which both hemispheres received the same stimulus information.

2:50-3:05 (118)

Individual Differences in Reaction Time Asymmetry. DAVID B. BOLES, *Rensselaer Polytechnic Institute*—Differences between right and left handers were investigated using bilateral presentations of word numbers and bar graphs. Overall, the expected RVF advantage for words

and LVF advantage for bar graphs were obtained. Group differences were usually nonsignificant but near-universal trends indicated that left handers were "less" than right handers in overall asymmetry, the correlation between VF asymmetries, test-retest reliabilities, and handedness strength. A "weak hemisphericity" or "shift" model of hemispheric asymmetry was supported.

3:10-3:20 (119)

Lateralized Finger-Tapping Interference: Unimanual Versus Bimanual Comparison. DANIEL W. KEE, *California State University, Fullerton*, JOSEPH B. HELLIGE, *University of Southern California*, & VICKI SERGENT, *California State University, Fullerton*—Unimanual versus bimanual repetitive finger tapping was compared in a dual-task study of language asymmetry. College-aged subjects performed the tapping tasks and on some trials were required to recite a rhyme. Tapping was faster with the right hand and on the unimanual task. Lateralized interference indicative of left-hemisphere language involvement was observed only on the unimanual task. Results from a follow-up experiment which manipulated task priority (verbal vs. manual) will also be reported.

ASSOCIATIVE LEARNING I

West Ballroom A, Friday Afternoon, 3:35-5:40

Chaired by Karen L. Hollis, Mount Holyoke College

3:35-3:55 (120)

Reduction of Preexposure Effects to Visual Stimuli Following Flavor Cue Presentation in Compound Aversion Conditioning. JOSEPH J. FRANCHINA & ANTOINETTE B. DYER, *Virginia Polytechnic Institute and State University*—Presentation of a flavor cue (4.0% vinegar) in compound conditioning with a red visual cue (hence, red vinegar paired with LiCl) curtailed the extent to which preconditioning access to the red cue (one or five preexposures) decreased aversion effects to the red cue alone. In Experiment 2, variation of the concentration of vinegar (0.5%, 1.5%, or 4.0%) in compound conditioning with the red cue enhanced aversion effects to the latter only for the 4.0% concentration.

4:00-4:15 (121)

Effects of Taste Aversion Conditioning on Delayed Taste Discrimination Learning. ANTHONY L. RILEY & DEBORAH A. OLIN, *The American University*—Following the demonstration that rats could use a conditioned aversive taste as a discriminative stimulus for a water reinforcer in an operant taste discrimination (Experiment 1), the effect of taste aversion conditioning on delayed taste discrimination was assessed (Experiment 2). There was no effect of aversion conditioning on the delays over which the discrimination could be maintained, suggesting that changes in the associability of a stimulus may be reinforcer specific.

4:20-4:35 (122)

Aversive Conditioning of Naturally Produced Reward and Nonreward Odors in Rats. W. ROBERT BATSELL, JR., & H. WAYNE LUDVIGSON, *Texas Christian University* (read by H. Wayne Ludvigson)—When encountering reward (R) or nonreward (N) consequences, rats emit differential odors (R odor or N odor, respectively). The present study exposed subjects to previously donated R or N odor followed by lithium-mediated toxicosis. Subjects that were aversively conditioned to either R or N odor drank significantly less than did controls, and evidenced discrimination between odors. The role of these odors in a foraging situation will be discussed.

4:40-5:00 (123)

Information Content of Simultaneous and Backward Associations. LOUIS D. MATZEL & RALPH R. MILLER, *State University of New York, Binghamton* (read by Ralph R. Miller)—A major failure of contiguity theory is that it incorrectly predicts optimal conditioned responding with simultaneous CSs and USs, and equal responding with forward and backward pairings. Using rats in a conditioned suppression preparation, we employed a sensory preconditioning paradigm with forward S1-S2 pairings in Phase 1 and forward, simultaneous, or backward S2-US pairings in Phase 2. Relative to appropriate controls, responding to S2 occurred only in the forward condition, but robust and equal responding to S1 was seen regardless of the stimulus order in Phase 2. This suggests that simultaneous and backward conditioning readily occurs, but the temporal relationship between stimuli is encoded in the association.

5:05-5:15 (124)

Effect of CS-US Interval in a Lick Suppression Task. VIRGINIA LUNDEEN, ALLEN PETREE, & TERRY L. DeVIETTI, *Central Washington University* (read by Terry L. DeVietti)—Manipulation of CS-US intervals from short through long in different groups results in an inverted-U function of conditioned performance in a variety of aversive tasks. Previously, in a lick suppression task, we failed to obtain such a function with ISIs ranging between 1 and 15 sec, obtaining instead undifferentiated conditioned performance. The apparent incongruity between these data and the existing literature was resolved by simply extending the ISIs in the present study.

5:20-5:35 (125)

Selective Attention and Hedonics: The Stimulus-Reinforcer Interaction Reevaluated. STANLEY J. WEISS & LEIGH V. PANLILIO, *The American University*, & CHARLES W. SCHINDLER, *Addiction Research Center*—One group of rats barpressed for food in tone-plus-light (T+L Preferred). Another group's barpresses (T+L Nonpreferred) eliminated T+L, and a differential-reinforcement-of-other-behavior schedule supplied all food in T+L absence. Significantly more element responses were emitted to light by T+L Preferred (64.3%) than T+L Nonpreferred (39.8%). This interaction resembles those reported when food and shock avoidance, respectively, maintained T+L responding. It suggests that preference (hedonics) may be more fundamentally responsible for selective attention than class or reinforcer in stimulus-reinforcer interactions reported to date.

PATTERN PERCEPTION

West Ballroom B, Friday Afternoon, 1:00-3:45

Chaired by Diana Deutsch, University of California, San Diego

1:00-1:20 (126)

Two Types of Contrast: Lightness and Texture Segregation. JACOB BECK & ANNE SUTTER, *University of Oregon*, & NORMA GRAHAM, *Columbia University*—Experiments indicate that there are two types of contrast in vision. One type of contrast is relevant for lightness perception. For a background of higher intensity, the relevant stimulus is the luminance ratio of a target to the background. A second type of contrast is relevant for texture segregation. The relevant stimulus is the luminance increment ratio of a target to the background. This is consistent with the computations carried by simple-cell-like mechanisms.

1:25-1:45 (127)

Decision Rules in the Perception and Categorization of Multidimensional Stimuli. F. GREGORY ASHBY, *University of California, Santa Barbara*, & RALPH E. GOTT, *Ohio State University*—Decision processes in the perception and categorization of stimuli constructed from one or more components are studied. A general perceptual theory is used to formally characterize decision models according to the type of decision boundary they predict in a multidimensional space. An experimental technique is developed to estimate a subject's decision boundary in a categorization task. Several experiments are reported. Results indicate that subjects often employed deterministic decision rules that were nearly optimal.

1:50-2:10 (128)

Testing the Low Spatial Frequency Conjecture for a Gestalt Effect. STEPHEN E. PALMER, PAUL KUBE, & JOHN K. KRUSCHKE, *University of California, Berkeley*—Ginsburg's conjecture that Gestalt effects can be accounted for by low spatial frequency (LSF) power was tested using the paradigm of configural effects on perceived pointing of ambiguous triangles. Janez's mathematical formulation was quantitatively inadequate when a large set of diverse stimuli was examined. Qualitative predictions of the LSF conjecture also proved inadequate in experiments concerning the effect of pairs of sinusoidal gratings, the effect of high-pass filtering configurations, and the effect of perceived depth.

2:15-2:30 (129)

A Size Interference Effect with Adjacent Small and Large Rectangles. DONALD L. KING, *Howard University*—Small-large and large-small pairs of rectangles produced slower identifications of the

small but not the large rectangle and slower responses on an acuity-like task than large-large and small-small pairs. When the large rectangle's lines were minimally rearranged, there was no slowdown. Perhaps the large rectangle was perceived as a large object whole (Gestalt), thereby commanded attention, and hence delayed the perception of the small rectangle.

2:35-2:55 (130)

Perceptual Processing of Different Kinds of Symmetry. ALF C. ZIMMER, *University of Regensburg, Federal Republic of Germany*—Patterns that differ in kind of symmetry, in orientation, and in amount of distortion lead to systematic differences in decision times. The variance of these differences depends mostly on the kind of symmetry; orientation and distortion play a minor role. A further analysis leads to the interpretation that only bilateral symmetry is picked up directly. The additional processing time for the other kinds of symmetry is in line with the group-theoretic structure of symmetric patterns.

3:00-3:20 (131)

Tentative Diagnoses Facilitate the Detection of Diverse Lesions in Chest Radiographs. KEVIN S. BERBAUM, E. A. FRANKEN, JR., & D. D. DORFMAN, *University of Iowa*—Detection of diverse radiographic abnormalities was tested, and the influence of clinical history was conceptualized as suggesting a tentative diagnosis. Categorical prompts that were correct for specific abnormalities resulted in detection superior to that with unprompted reading. Prompts that were plausible but incorrect for abnormal and normal cases led to reports as accurate as in unprompted reading. It is concluded that appropriate clinical history results in improved perceptual performance rather than simply improved decision making.

3:25-3:40 (132)

Sound Facilitates Visual Pattern Recognition. P. J. G. KEUSS, *Free University, Amsterdam*—In addition to producing a general activating effect, noninformative sound of low to moderate intensities (30-80 dB) progressively improves the visibility of degraded signals, as punctate signs in dot matrix form. Visual stimuli of low luminance and contrast (clarity) do not benefit from the sound, however. This outcome reveals the proper role of activation, whose influence is assumed to extend to brain mechanisms underlying the process of stimulus identification and not to the peripheral functioning of the optic nerve that is responsible for the processing of visual intensity and contrast.

PERCEPTION I

West Ballroom B, Friday Afternoon, 3:55-5:40

Chaired by Lorraine G. Allan, McMaster University

3:55-4:10 (133)

Outline, Positives, and Negatives: Which Least Shows Object in Chiaroscuro? JOHN M. KENNEDY, *University of Toronto*—High-contrast positives (showing shadowed and illuminated regions of objects), high-contrast negatives (showing the positives reversed), and outline drawings (with lines traced along the contours of the positives and negatives) were tested. Outlines have no trouble showing relief edges to the eye, but fail to show chiaroscuro edges so badly that negatives are recognized more readily, even though negatives are providing wrong information, and outlines faithfully replicate accurate optic structure.

4:15-4:30 (134)

Minimodularity and Visual Information About Depth. JAMES E. CUTTING & NICOLA BRUNO, *Cornell University*—Four sources of information about depth—relative size, height in plane, occlusion, and motion parallax—were varied orthogonally to generate a set of stimuli. In both direct and indirect scaling tasks, these sources were found to be used by viewers in an additive fashion, without interaction. These results, in conjunction with others, suggest a minimodularity in vision: that salience in percepts is built up by adding (weighted) combinations of available information.

4:35-4:50 (135)

Interpolation Processes in Visual Object Perception: Evidence for a Discontinuity Theory. PHILIP J. KELLMAN, *Swarthmore College*, & THOMAS F. SHIPLEY, *University of Pennsylvania*—Kellman and Loukides (1987) proposed a discontinuity theory of object perception. Here we report tests of three predictions of this theory: (1) partly occluded objects and subjective figures are perceived via the same unit formation process; (2) local discontinuities in retinal edges initiate the process; and (3) retinally separated edges are perceived as the same object edge only if they can be monotonically connected with no discontinuity in between. Results were largely supportive of the discontinuity theory and incompatible with existing alternatives.

4:55-5:15 (136)

What's Up in Visual Cognition? PIERRE JOLICOEUR & PATRICIA McMULLEN, *University of Waterloo*—Stimulus-orientation effects were measured in head-upright and head-tilted conditions to discover whether the frame of reference used is aligned with retinal or environmental/gravitational directions. The tasks were normal-mirror discrimination on alphanumeric characters, left-right pointing direction discrimination on line drawings of objects, object identification, curve tracing, and mental extrapolation. Tasks involving explicit discriminations between left and right were predominantly environmental/gravitational, whereas the others were predominantly retinal. The default frame of reference for object identification was predominantly retinal.

5:20-5:35 (137)

Concurrent-to-Terminal Exposure and Components of Prism Adaptation. GORDON M. REDDING, *Illinois State University*, & BENJAMIN WALLACE, *Cleveland State University*—As the view through displacing prisms decreased from the arm (concurrent exposure), to the hand, to two joints of the finger, to first joint of the finger (terminal exposure), visual shift (VS) and proprioceptive shift (PS) changed in a graded but opposite manner such that PS > VS after concurrent exposure but VS > PS after terminal exposure. Results support a model in which direction of coordinative linkage between sensorimotor systems determined locus of discordance and adaptation.

INGESTIVE BEHAVIOR

Aspen Room, Friday Afternoon, 1:00-3:05

Chaired by Michael R. Best, Southern Methodist University

1:00-1:15 (138)

The Ontogeny of Eating in the Ring Dove: Contributions of Learning. JAMES D. DEICH & PETER D. BALSAM, *Barnard College* (sponsored by Peter D. Balsam)—The ontogeny of the ring dove's eating was examined observationally and with a system that continuously transduces the extent of beak opening. Evidence supports a role for Pavlovian learning in the redirection of a squab's pecking from the parent's beak during regurgitative feeding to grain during independent feeding. Furthermore, concurrent operant effects appear to contribute to the form of the beak's gaping motion, and to its coordination with neck movement in producing an independent food peck.

1:20-1:30 (139)

Satiating Effects of Sucrose: Sweet Water Versus Sweet Food. FRED P. VALLE, *University of British Columbia*—If sucrose, instead of water, is available with meals, food intake is seriously reduced in meal-fed rats. The present results show that only sucrose in solution (7%) reduces food intake; sucrose in food itself (25%) does not. The ingestion of sucrose solutions may produce satiation not because of post-ingestive consequences of sucrose per se, but because the hedonic properties of such solutions drive the ingestion of large amounts of liquid in hungry rats.

1:35-1:45 (140)

Taste Preference Conditioning Depends Upon the Predictiveness of the Taste. ROBERT C. BOLLES & RONALD MEHIEL, *University of Washington*—Rats were given water and sugar solution for several days. Different groups had different degrees of contingency between a distinctive taste and the sugar solution. Subsequent preference testing showed a strong effect of the strength of the contingency.

1:50-2:00 (141)

The Liver as a Mediator in Taste Aversion Conditioning. STUART R. ELLINS & CONSTANCE COSTANTINO, *California State University, San Bernardino*—This experiment investigated the effect of partial excision of the liver on taste aversion conditioning. Partially hepatectomized and intact rats were administered lithium chloride after drinking a novel saccharin solution. All rats were then tested in extinction trials

for amount of time spent licking. The hepatectomized rats drank significantly longer than did the controls, suggesting that the liver may be instrumental in mediating neurovascular stimulation of the brain emetic center as a result of gastrointestinal malaise.

2:05-2:20 (142)

Anticipatory Contrast: Role of Response Contingency and Competing Responses. CHARLES FLAHERTY, PATRICIA GRIGSON, & GRACE ROWAN, *Rutgers University*—A contrast effect in saccharin consumption and in latency to initiate saccharin intake occurs if access to the saccharin is followed, in brief daily pairings, by access to a 32% sucrose solution. The contribution of response contingency and competing responses to this constrast effect will be considered in terms of different associative structures that underlie consummatory and latency measures of contrast.

2:25-2:40 (143)

Effects of Quinine on Ingestion Following Inescapable Shock in Rats. NANCY K. DESS, *Occidental College*, & THOMAS R. MINOR, CLINTON D. CHAPMAN, & JOHN BREWER, *University of California, Los Angeles* (sponsored by Thomas R. Minor)—Ingestion, with and without quinine adulteration, was studied in rats exposed to inescapable shock. Recovery of home-cage feeding after inescapable shock was retarded by daily stress reinstatement and quinine adulteration. Drinking was reliably suppressed among inescapably shocked rats (but not escapably shocked or restrained rats) only when the water was adulterated by quinine. These results bear on theories of "appetitive helplessness," animal models of eating disorders, and clinical screening for stress and depression.

2:45-3:00 (144)

Interaction of Taste Aversions and Schedule-Induced Polydipsia: A Microanalysis. CORA LEE WETHERINGTON, *National Institute On Drug Abuse*, ASHLEY M. WACHSMAN, MARY A. KAUTZ, & ANTHONY L. RILEY, *The American University*—Rats injected with LiCl following schedule-induced consumption of saccharin eventually decreased consumption. This reduction was effected by a change in the duration of post-pellet licking and not bout initiation. Bout length was reduced with little effect on licking immediately following pellet delivery. These differential effects of conditioned taste aversion (CTs) on schedule-induced polydipsia are consistent with the differential effects of CTAs on individual components of other elicited behaviors.

REPETITION/PRIMING EFFECTS II
Aspen Room, Friday Afternoon, 3:15-5:30

Chaired by Keith Clayton, Vanderbilt University

3:15-3:30 (145)

Processing of Semantic Information. LUCIA COLUMBO & JOHN WILLIAMS, *Universita Degli Studi di Padova, Italy* (sponsored by Sergio Cesare Masin)—We examined priming of different types of semantic relations in sentence context. In a cross-modal paradigm, lexical decision on a target word was facilitated only when the semantically related prime included in a neutral sentence context was a synonym. Other types of prime-target relationships (e.g., antonyms or event-related relationships) did not produce any priming effects when the prime was in a sentence context, whereas they did when it was in isolation. Effects of higher order (sentence) constraints on semantic processing are discussed.

3:35-3:50 (146)

When Do Rhyming Primes Inhibit Target Processing? STEPHEN J. LUPKER & BONNIE A. WILLIAMS, *University of Western Ontario*—Although phonetically/orthographically related primes typically facilitate target processing, Columbo (1986, *JEP:HPP*) reported large inhibition effects for high-frequency targets. Columbo suggested that high-frequency cohorts of the prime are necessarily inhibited in order to complete word recognition. This frequency × relatedness interaction in word recognition was investigated in a series of experiments. Results suggest that high-frequency targets are not generally inhibited, indicating that this inhibition is not a mandatory component of the word recognition process.

3:55-4:15 (147)

Reduction of Semantic Priming From Inclusion of Physically or Nominally Related Prime-Target Pairs. NANCY SNOW & JAMES H. NEELY, *Purdue University* (read by James H. Neely)—Semantic priming of lexical decisions diminished as the proportion of physically or nominally identical prime-target pairs increased. This diminution of priming occurred to the same degree at 80-, 200-, and 1,000-msec prime-target stimulus onset asynchronies. These results demonstrate a levels-of-processing effect on semantic priming and have implications for automatic activation and "location-shifting" accounts of semantic priming.

4:20-4:40 (148)

A Distributed Memory Model of Context Effects in Word Identification. MICHAEL E. J. MASSON, *University of Victoria*—Recent results have challenged some assumptions of the theory of automatic spreading activation that are fundamental in accounting for lexical priming effects. A distributed memory model is described that accounts for these results and that provides an alternative view of lexical activation. In contrast to spreading activation theory, this model accurately predicts the outcome of new experiments on the influence of an unrelated word that intervenes between a related prime and target.

4:45-5:00 (149)

Semantic Priming: Subliminal Perception or Context? IRA H. BERNSTEIN, AVNI VYAS, VIC BISSONNETTE, & PAM BARCLAY, *University of Texas, Arlington*—Some semantic priming studies assert that the prime has automatic effects upon a target not requiring conscious awareness. The evidence is that (1) the prime is not recognized when presented alone, yet (2) reactions to the target are influenced by the prime. We suggest an alternative explanation: the supraliminal target provides a context that differs dramatically from presentation of the prime by itself, reducing the number of stimulus alternatives. Results consistent with this interpretation are presented.

5:05-5:25 (150)

Failed Semantic Retrieval Experiments. ANNELISE KONTOWICZ, *Michigan State University*, DALE DAGENBACH, *Millersville University*, & THOMAS H. CARR, *Michigan State University* (read by Thomas H. Carr)—Previous research suggests the existence of strategy-related inhibition effects on subthreshold priming. Current studies confirm this effect and explore possible mechanisms related to failure of attempts to retrieve semantic codes into consciousness. Further studies attempt to extend the inhibition effect to suprathreshold processing in which similar semantic retrieval failure is involved.

LANGUAGE/DISCOURSE PROCESSING I
Grand Ballroom A, Saturday Morning, 8:00-9:45

Chaired by Ernst Z. Rothkopf, Columbia University Teachers College

8:00-8:15 (151)

Mechanisms that Control Referential Access. MORTON A. GERNSBACHER, *University of Oregon* (Sponsored by Wayne Wickelgren)—Most models of anaphoric reference propose that comprehending a pronoun such as *she* in the sentence "Betty passed the basketball to Karen and then she . . ." requires searching for and then reactivating the appropriate antecedent. However, our data suggest that in such sentences, both potential antecedents (e.g., Karen or Betty) are already activated, and the process requires suppressing the unintended antecedent. Syntactic position, gender cuing, and pragmatic context affect the extent and time course of this suppression process.

8:20-8:40 (152)

Nonmonotonic Response Signal Functions for Item and Relational Information. ROGER RATCLIFF, GAIL McKOON, & SCOTT GRONLUND, *Northwestern University*—Subjects studied active or passive versions of sentences (John hit Bill) and were tested for sentence recognition. In a response signal procedure, at short lags, subjects could discriminate old sentences from sentences with new words, but only later in processing (700 msec) could they discriminate relationally correct from incorrect (Bill hit John) sentences. Similar results were obtained in word-pair discrimination. Thus, item and relational information are available at different points in the time course of processing.

8:45-9:00 (153)

Phonological Processes During Reading and Proofreading. MEREDYTH DANEMAN, JOAN COLLINS, & MURRAY STAIN-

TON, *University of Toronto*—Naturalistic comprehension monitoring tasks with homophonous versus nonhomophonous errors were used to investigate whether phonological processing occurs during reading. Readers were less likely to detect the incorrect word in "You vile villain to steel my gold" than in "You vile villain to steam my gold," but only if familiarized with error-free versions beforehand. These results were compared with findings for tasks containing pseudohomophone errors. The nature of phonological processes during test comprehension is discussed.

9:05-9:20 (154)

Articulatory Suppression and Phonological Coding in Sentence Comprehension. VERONIKA COLTHEART, *Macquarie University*, & S. E. AVONS & JULIE TROLLOPE, *City of London Polytechnic*—In speeded sentence comprehension, adults erroneously accept printed sentences that sound correct (e.g., "He wood like to go home"). How does articulatory suppression affect the phonological code causing these errors? Articulatory suppression abolished both the word length effect in serial recall (Experiment 1) and the phonological effect in sentence comprehension (Experiment 2). The implications for theories of working memory and sentence comprehension are considered.

9:25-9:40 (155)

Further Evidence that Reading Can Interfere with Visual Thinking. ERNST Z. ROTHKOPF, *Columbia University Teachers College*, & MARY E. KOETHER & M. J. BILLINGTON, *AT&T Bell Laboratories*—We performed three experiments in which subjects were required to mentally construct a figure composed of simple geometric elements. Directions to do this were given, one element at a time, either in written or spoken form. The figures were more accurately reproduced from memory when descriptive information was originally acquired by listening rather than reading. Our results suggest that information modality represents a cost for mental processes that heavily involve representations from that modality.

DEVELOPMENTAL/AGING PROCESSES II
Grand Ballroom A, Saturday Morning, 9:55-12:20

Chaired by Stuart Offenbach, Purdue University

9:55-10:10 (156)

Allocation and Reallocation of Attention in Young and Elderly Adults. ALAN HARTLEY, *Georgia Institute of Technology*, JAMES KIELEY, *Claremont Graduate School*, & CRAIG McKENZIE, University of California, Irvine—Results from a series of experiments show that, once differences in visual acuity have been taken into account, young and elderly adults are very similar in the allocation and reallocation of visual attention. There are substantial age differences, however, in the processing that occurs after attention has been brought to bear.

10:15-10:30 (157)

Aging: Attentional Allocation and Fluctuation in Visual Word Recognition. GEORGE KELLAS, GREG B. SIMPSON, & F. RICHARD FERRARO, *University of Kansas* (read by Greg B. Simpson)—Younger and older adults responded to auditory probes while making lexical decisions to ambiguous and unambiguous words. Less attention was required for recognizing ambiguous than unambiguous words, which required less than pseudowords. However, a subgroup of elderly did not show this difference, and had probe responses faster than those of young adults. This result suggests the existence of a group of "expert" elderly, whose word recognition processes are more automatized than those of college students.

10:35-10:55 (158)

Making the Cut: Contrasting Developmental Versus Learning Influences on Cognitive Growth. FREDERICK J. MORRISON, *University of Alberta*—Research on schooling and on specialized expertise has rekindled awareness of the importance of specific learning experiences (vs. general developmental change) in cognitive growth. A natural experiment has been discovered for comparing the two influences that circumvents subject-selection confoundings in other procedures. In this manipulation, one group of children is provided a culturally valued experience, whereas another group (almost exactly the same age) is systematically denied the experience.

11:00-11:15 (159)

Induction and Conceptual Change. SUSAN CAREY, *Massachusetts Institute of Technology*—A ubiquitous form of inductive inference is the projection of a property of a given object (or objects) to other objects. Adults' intuitive theories constrain such similarity-based inductive projection. Data will be presented that show that intuitive theories constrain inductive projection by 2- and 3-year-olds as well. Furthermore, changing patterns of inductive projection will be shown to reflect reorganizations of intuitive theories in two domains: an intuitive biology and an intuitive theory of matter.

11:20-11:35 (160)

Conflict Between Logic and Belief in the Aged. ALBERTA GILINSKY, *University of Bridgeport*, & MARIE-FRANCE EHRLICH, *Laboratoire Psychologie Cognitive de la Communication, Paris*—Experiments compared the effects of belief-bias on syllogistic reasoning in young and older adults. Both groups endorsed arguments whose conclusions they believed and rejected arguments whose conclusions they disbelieved, regardless of their logical validity or complexity. Belief-bias was more marked in the aged and on invalid than on valid conclusions. Results throw light on the relation between logical capacity and working memory.

11:40-11:55 (161)

The Development of Explicit and Implicit Memory in Preschoolers. JULIA L. GREENBAUM, *University of Toronto*, & PETER GRAF, *University of British Columbia* (read by Peter Graf)—An experiment with 3-, 4-, and 5-year-old preschoolers examined memory for picture stimuli in two situations, one that *did* and one that *did not* require intentional, explicit recollection. Explicit recollection was indexed by free recall of the picture names; performance increased with increasing age of subjects. Unintentional or implicit memory was assessed by requiring subjects to produce words in response to category label cues, such as *types of clothing*. All age groups showed similar effects on this test.

12:00-12:15 (162)

Modality-Specific Language Delay in Down's Syndrome. ADELE ABRAHAMSEN & MAUREEN LAMB, *Georgia State University*—Children with Down's syndrome are particularly delayed in their acquisition of speech. Six such children under 5 years of age were provided with daily sessions over 4-26 months with unbalanced bimodal input (speech-dominant input with manual signs accompanying target words). The toddlers acquired signs on a timetable that was appropriate for their DA (1 year or ½ years at onset). Hence, their delay in speech was modality specific, not indicative of a general incapacity for language. There are implications for the account of language onset in general.

IMPLICIT MEMORY/PRIMING
Grand Ballroom B, Saturday Morning, 8:00-9:55

Chaired by Daniel L. Schacter, University of Arizona

8:00-8:20 (163)

Implicit Memory for New Associations: Elaboration Dependent and Modality Specific. DANIEL L. SCHACTER, *University of Arizona*, & PETER GRAF, *University of British Columbia*—We demonstrated previously that associative priming effects on a word completion task require semantic study elaboration. The present experiments show that these elaboration-dependent effects are attenuated significantly by study/test modality shifts. In addition, visual preexposure to word pairs later studied auditorily, involving either actual presentation of pairs or imagery of them, eliminated modality effects on the completion test. The results suggest that implicit memory for semantic information is modality specific.

8:25-8:40 (164)

Direct Comparison of Two Implicit Measures of Retention. HENRY L. ROEDIGER, III, MARY S. WELDON, & MICHAEL A. STADLER, *Purdue University*—Effects of three study variables were examined on two implicit memory tests: completion of word stems or word fragments. Similar patterns of effect were obtained on both tests. Words produced more priming than did pictures, but neither intention to learn nor levels of processing affected priming for words. A different pattern of results was obtained when the same stems and fragments

were given as explicit retrieval cues, indicating that explicit retrieval strategies are not used on implicit tests.

8:45-8:55 (165)

Naming and Word Stem Completion as Measures of Implicit Memory. GREGORY J. LAMBERTY, THOMAS V. PETROS, & SANDRA REGAN, *University of North Dakota* (read by Thomas V. Petros)—The performance of skilled and less skilled college readers was compared on two tests of implicit memory and one test of explicit memory. Reading ability, word frequency, and level of processing manipulations all produced significant effects on recognition memory performance. Significant effects of word frequency and reading ability were observed for word naming, but not for word stem completion. Results suggest that these implicit memory tasks differ in their sensitivity to individual differences in activation efficiency.

9:00-9:10 (166)

Changes on Two Tests of Implicit Memory Over Short Retention Intervals. WAYNE DONALDSON & JOAN WRIGHT, *University of New Brunswick*—Following visual or auditory word list presentation, implicit memory was measured on visual stem completion and perceptual recognition tests. Both tests were administered immediately and again following a 20-min delay. Test order was counterbalanced across subjects. Immediate test performance declined from the first to the second administered test. No further decline occurred on the delayed test. Performance on the two different tests was not stochastically independent. Beyond a main effect presentation, modality was irrelevant.

9:15-9:30 (167)

Priming as Cue Combination in Associative Memory. BARBARA ANNE DOSHER & GLENDA ROSEDALE, *Columbia University*—Episodic priming of associative memory judgments is measured using speed-accuracy trade-off and reaction time. One word of a learned triple primes retrieval dynamics of association recognition for the other two words, although final accuracy is unaffected. Spurious relation (*overlap*) between the prime and one of the members of an incorrect association is completely ignored. A cue combination priming mechanism can account for the results, whereas spreading activation mechanisms cannot.

9:35-9:50 (168)

Directed Forgetting Affects Both Direct and Indirect Tests of Memory. COLIN M. MacLEOD, *University of Toronto, Scarborough*—In two experiments, subjects were instructed during study to forget half of a list and then were given two memory tests, one direct—requiring conscious recollection—and the other indirect. In Experiment 1, subjects recognized more words (direct test) and completed more word fragments (indirect test) for *remember* than for *forget* items on both immediate and delayed tests. In Experiment 2, subjects showed superior recall (direct test) and greater repetition priming in lexical decision (indirect test) for *remember* than for *forget* items. These results conflict with the view that direct tests, but not indirect tests, are influenced by postpresentation processing.

LETTER/WORD PROCESSING III

Grand Ballroom B, Saturday Morning, 10:05-12:25

Chaired by Mark Seidenberg, McGill University

10:05-10:25 (169)

The Anatomy of Task-Specific Interference in Lexical Access. MICHAEL I. POSNER, *Washington University and University of Oregon*, & JENNIFER SANDSON & STEVEN E. PETERSEN, *Washington University*—Shadowing and visual lexical decisions use different input and output systems. Shadowing reduces semantic priming but not physical priming. Studies of regional blood flow show anatomically separate systems related to visual word forms and semantics. A combined cognitive-anatomical analysis suggests that physical priming occurs in the occipital lobe but semantic priming occurs in anterior areas with closely integrated visual and auditory input. These findings encourage a combined anatomical-cognitive approach to lexical access.

10:30-10:45 (170)

Lexical Stress Influences Naming Latencies for Disyllabic Words. KEITH R. KLUENDER, MARGARET A. WALSH, & PHILIP B. GOUGH, *University of Texas, Austin* (read by Philip B. Gough)—Lexical stress may influence the time course of visual lexical access. In a naming task, subjects saw two-syllable (CVCCVC) words with either the first or second vowel deleted and replaced with a blank. Subjects took longer to name the word when the vowel of the stressed syllable was deleted for both first and second syllable-stress targets. Implications for models of lexical access will be discussed.

10:50-11:05 (171)

Syllabification of Intervocalic Consonants. REBECCA TREIMAN & CATALINA DANIS, *Wayne State University*—Two tasks were used to study the syllabification of intervocalic consonants like the /l/s of *melon* and *collide*. In an oral task, subjects reversed the syllables in words; in a written task, they selected between alternative syllabifications. Responses were affected by whether subjects spelled the critical intervocalic consonant with one or two letters, by the stress pattern of the word, and by the type of intervocalic consonant. The results are discussed in relation to theories of syllabification.

11:10-11:25 (172)

Semantic Relatedness and the Processing of Upcoming Words in Sentences. PAULA J. SCHWANENFLUGEL, *University of Georgia*—Three experiments examined the joint influence of sentence constraint and semantic relatedness on lexical decisions for upcoming words in sentences. Low-constraint sentences facilitated lexical decisions for expected completions and semantically related words, but not for unrelated congruous words. High-constraint sentences facilitated lexical decisions for expected words only. Thus, the scope of facilitation is wider for high- than for low-constraint sentences but never includes unrelated, although acceptable, sentence completions. These findings are consistent with the view that more featural restrictions are generated as sentence constraint increases.

11:30-11:45 (173)

Representation: Explicit and Implicit Contributions to the Perceptual Record. KIM KIRSNER & JOHN DUNN, *University of Western Australia*—According to the analytic view of stimulus identification, extensive abstraction occurs during word recognition, and a detailed description of the original stimulus does not survive. According to the nonanalytic view, little abstraction occurs, but a detailed record of the stimulus is preserved. We argue that (1) extensive analytic processing occurs during word recognition, (2) the products of these processes are preserved, and (3) the resulting perceptual record includes both explicit stimulus properties (e.g., contour) and implicit structure (e.g., morphology). Experiments with physically different but structurally related stimuli will be described.

11:50-12:00 (174)

Causal and Hierarchical Factors in the Comprehension of Narratives. PAUL VAN DEN BROEK, *University of Minnesota* (sponsored by Robert F. Lorch, Jr.)—Story statements were orthogonally varied in their position in a hierarchy of episodes, and in their number of causal connections to other story statements. Subjects judged the importance of goal and outcome statements. Causal connectivity influenced the importance of statements, whereas hierarchical position tended to do so only when covarying with connectivity. Causal connections between episodes were also found to influence the importance of pivotal statements such as failed outcomes, settings, and initiating events.

12:05-12:20 (175)

Heterophonic Entries in the Lexicon. DAVID S. GORFEIN, ANDREA BUBKA, & ELIZABETH A. COOPER, *Adelphi University*—Heterophones (nonhomophone homographs) were studied in three primary tasks: lexical decision including repetition effects, ambiguity decision, and related decision. Performance on these items was compared to homographs of equal polarity in order to elucidate the process of ambiguity resolution. The data indicate higher stability levels for heterophone items than their matched homographs. A theoretic explanation is offered.

HUMAN LEARNING/MEMORY II

Grand Ballroom C, Saturday Morning, 8:00-10:25

Chaired by Judith Goggin, University of Texas, El Paso

8:00-8:10 (176)

The Bizarre Long-Term Effects of Bizarre Mnemonics. NEAL E. A. KROLL & EVA M. SCHEPELER, *University of California,*

Davis—Although mnemonists argue that bizarre imagery improves memory, experiments are largely unsupportive. For free recall, bizarre sentences are remembered better than common ones in mixed lists, but pure lists of common sentences are remembered better than bizarre lists. We found (1) these differences increase with longer retention intervals (i.e., pure bizarre lists are forgotten faster than common lists) and (2) a strong correlation between extraversion and relative memory for bizarre over common sentences in mixed lists.

8:15-8:30 (177)

Bizarre Imagery Can Have an Effect. S. DAVID LEONARD & JULIE N. WARD, *University of Georgia*—Most studies have found bizarre imagery to be no more effective than common imagery when controls for intralist cues, distinctiveness, and within-list procedures are employed, yet practitioners of memory skills recommend bizarre images. It was found that when the same task that confronts practitioners is used (i.e., learning a number of lists over a period of time), bizarre imagery produced later recall that was superior to that produced by common imagery.

8:35-8:50 (178)

Memory for Emotional Events. SVEN-ÄKE CHRISTIANSON, *University of Umeå, Sweden*, ELIZABETH F. LOFTUS, *University of Washington*, & LARS GÖRAN NILSSON, *University of Umeå, Sweden* (sponsored by Elizabeth F. Loftus)—Do people remember details from emotional events differently than details from neutral events? Some new data from subjects who were presented with emotional or neutral events confirm that emotional details are remembered less well. Is this impairment simply due to the unusual nature of the emotional event? We present new data that bear on this question.

8:55-9:10 (179)

Vivid Memories of Emotional Events: The Accuracy of Remembered Minutiae. FRIDERIKE HEUER & DANIEL REISBERG, *Reed College* (read by Daniel Reisberg)—The literature contains contradictory assertions about emotional arousal's effects on long-term memory. In "flashbulb" memories, emotion is alleged to create highly detailed, accurate recollection. In contrast, some researchers claim that emotion narrows the subject's attention, resulting in impoverished memory records. We report evidence that emotional arousal widens the deployment of attention, leading to accurate memory both for central information and minutiae. Emotion elicits reconstructive errors, but of a distinguishable type, overlaid on an accurately remembered base.

9:15-9:35 (180)

A Psychophysiological Approach to Mood and Memory. MARGARET M. BRADLEY, DAVID YORK, & PETER J. LANG, *University of Florida* (read by Peter J. Lang)—Slides depicting negative, positive, and neutral objects were used to create an affective context within which words were encoded and retrieved. An auditory, continuous word recognition task was conducted concurrently with slide viewing. Heart rate, monitored continuously, demonstrated sensitivity in level and waveform to the emotional valence of the slides. Memory performance was affected by similarities in perceptual and emotional context at encoding and retrieval. Implications for Lang's (1984) bioinformational theory of emotion are discussed.

9:40-9:55 (181)

Remembering Without Awareness in a Depressed Mood. PAULA T. HERTEL, *Trinity University*, & TAMMY HARDIN, *University of Texas*—Subjects who were induced to feel depressed and those in a neutral mood showed comparable evidence of remembering without awareness in a spelling task (cf. Jacoby & Witherspoon, 1982). The spelling performance of the depressed subjects was independent of their performance in recognition; however, subjects in a neutral mood profited from exposure to the targets on the spelling task and showed superior recognition. We relate the results to a proposed depressive deficit in processing initiative.

10:00-10:20 (182)

Lexical and Semantic Priming Impairment in Alzheimer's Disease. ARTHUR P. SHIMAMURA, *VA Medical Center and University of California, San Diego*, DAVID P. SALMON, *University of California, San Diego*, & NELSON BUTTERS & LARRY R. SQUIRE, *VA Medical Center and University of California, San Diego*—We gave tests of word completion and free association priming to patients with Alzheimer's disease, patients with Huntington's disease, patients with Korsakoff's syndrome, and healthy control subjects. Although all patient groups exhibited verbal memory impairment, only patients with Alzheimer's disease exhibited marked impairment on tests of word completion and free association priming. The findings are consistent with the view that Alzheimer's disease produces an impairment in the activation of semantic representations.

SPATIAL COGNITION AND MEMORY
Grand Ballroom C, Saturday Morning, 10:35-12:20

Chaired by Linda Anooshian, Trinity University

10:35-10:45 (183)

The Acquisition of Spatial Knowledge. STEPHEN C. HIRTLE, *University of Pittsburgh*, & JUDITH HUDSON, *Rutgers University*—Subjects were taught the location of landmarks by presentation either of a route through slides or of the entire configuration through a map. Subjects in the map condition performed more accurately on tasks requiring configurational knowledge, whereas subjects in a slide condition performed more accurately on tasks requiring only route knowledge. In addition, ordered trees based on a free-recall task were used to classify individuals according to how they represented spatial relations.

10:50-11:05 (184)

Cognitive Mapping: Landmark, Sequence, Procedural, and/or Configurational Knowledge? LINDA J. ANOOSHIAN, *Trinity University*, & ROXANE SMYER, *University of Texas, Austin*—A total of 144 college students walked a route that connected 18 simulated landmarks. During this initial exposure, subjects were instructed either to anticipate landmark names or to turn correctly. Two days later, we assessed landmark, sequence, turn, and configurational knowledge with testing conditions that varied in similarity to encoding conditions. Results are discussed in terms of the conditions most likely to yield integrated versus independent processing of different types of spatial information.

11:10-11:20 (185)

The Perception of Walked Distance. MARK HOLLINS & ALAN K. GOBLE, *University of North Carolina, Chapel Hill*—In a cue-rich environment, subjects walked a prearranged path divided into segments of various lengths. At the beginning of each segment, a subject was asked to walk at one of four speeds (very slow, slow, medium, fast), and, at the end of the segment, to estimate its length in feet. For segments of a given length, estimates tended to decrease with increasing walking speed. Variations in walking speed could thus introduce error into cognitive maps.

11:25-11:40 (186)

Contra-Aligned Maps Produce Lawful Errors. DAVID H. WARREN & MATT ROSSANO, *University of California, Riverside*—Levine and others have reported large errors on map tasks when a map is contra-aligned to its represented space. In two such tasks, one involving actual travel and the other using a pointer apparatus, we found that errors fit lawful categories, such as mirror images and 180° reversals. This approach is a useful tool for evaluating the nature of the cognitive manipulation that a subject uses in attempting to realign a map with its represented space.

11:45-11:55 (187)

Does Spatial Priming Depend on Assessing Location Information? KEITH CLAYTON, *Vanderbilt University*—Subjects classified words as (1) a state *or* a nonstate, or (2) a state nearer Seattle *or* either a nonstate or a state nearer Miami. The spatial priming effect (faster classification of a state primed by a nearby than by a distant state) was found only in the latter task. The results suggest that spatial priming depends on accessing location information, consistent with a model that segregates spatial and nonspatial memories.

12:00-12:15 (188)

The Effect of Naming on Spatial Memory. JENNIFER A. MATHER, *University of Lethbridge*—Subjects were tested on spatial memory for 16 small items as a single task or when they were also asked to encode and recall item names. When the items were familiar ones, the verbal manipulation interfered with spatial memory. In contrast, when

the items were abstract figures, naming assisted subjects in remembering spatial locations. The effect of this manipulation on the spatial memory of elderly subjects was also studied.

PERCEPTION II
Aspen room, Saturday Morning, 8:00-10:45

Chaired by F. Gregory Ashby, University of California, Santa Barbara

8:00-8:15 (189)

Recognition of Transformed Musical Phrases. THADDEUS M. COWAN & LAWRENCE SCHOEN, *Kansas State University*—A replication of Dowling's experiment on the recognition of musical transformations was run but with control over the frequency pattern of the phrases. The phrases were four notes in length and the following patterns were used: rise and level, rise and peak, peak and level. The transformations of inversion, retrograde, and inverse retrograde were recognized better with some patterns than with others.

8:20-8:35 (190)

Metrical Representations of Temporal Patterns. CAROLINE PALMER & CAROL L. KRUMHANSL, *Cornell University* (read by Carol L. Krumhansl)—The representation of meter (periodic accent structure) was studied with isochronous temporal contexts. Listeners rated how well a probe beat fit with each of four meter-defining contexts. Rating profiles revealed multileveled hierarchies of representation; musicians' profiles contained more hierarchical levels than did nonmusicians' profiles. A frequency count of beat distributions in excerpts from Western music revealed the same profiles, suggesting that distributions of metrical accents induce cognitive reference points in listeners' metrical representations.

8:40-8:50 (191)

Mental Scanning in Auditory Imagery for Songs. ANDREA R. HALPERN, *Bucknell University* (sponsored by Douglas Candland)—In tasks similar to those used in mental imagery, subjects verified whether two lyrics were from the same tune or mentally compared pitches of notes corresponding to song lyrics. In both tasks, reaction time increased as a function of the "distance" in beats between the two lyrics in the actual song, and sometimes with the starting beat of the earlier lyric. The results suggest that song representations have temporal-like characteristics.

8:55-9:15 (192)

Some New Musical Paradoxes. DIANA DEUTSCH, *University of California, San Diego*—A pattern of tones is first demonstrated that possesses some remarkable properties. It is heard as ascending when played in one key, and as descending when played in a different key. As a further paradox, the pattern in any given key is heard as ascending by some listeners, but as descending by others. Related paradoxical patterns are also demonstrated, and the implications of this new class of musical paradoxes are discussed.

9:20-9:35 (193)

Representational Momentum in Memory for Pitch. MICHAEL H. KELLY, *University of Pennsylvania*, & JENNIFER J. FREYD, *University of Oregon* (read by Jennifer J. Freyd)—A series of tones changing in pitch distort memory for the pitch of the final tone in the direction established by the series. As with visual transformations, the auditory momentum effects are influenced by implied velocity and final retention interval. The implications of these results for mental representation are discussed.

9:40-9:55 (194)

Color Contingent on Words. LORRAINE G. ALLAN, SHEPARD SIEGEL, & GLENDA MacQUEEN, *McMaster University*—During an inspection period, we presented a pair of anagrams, one member in green alternating with the other in magenta. We then evaluated, using a number of psychophysical procedures, the appearance of these anagrams when presented achromatically. We found that the anagram that was green during inspection appeared pinkish and the anagram that was magenta during inspection appeared greenish. The theoretical implications of a color aftereffect contingent on words will be discussed.

10:00-10:15 (195)

Local and Global Processing. JIM DYKES, *University of Texas, San Antonio*, & BONNIE POTTS, *Yale University*—Navon-type stimuli were studied in Garner classification tasks. At both the local and global levels, the stimuli could differ in shape (bracket or brace) or direction (left or right). Stimuli differing on positively correlated dimensions were classified faster than univariate stimuli (redundancy gain). Variations on an irrelevant dimension slowed reaction times (orthogonal interference). Using four binary stimulus dimensions helped distinguish between competing explanations of redundancy gain and orthogonal interference. Observers simultaneously processed local and global information.

10:20-10:40 (196)

Shape-From-Shading and Illusory Contours as Textons. V. S. RAMACHANDRAN, *University of California, San Diego*—We found that complex stimulus features such as shape-from-shading, illusory contours, and occluded or "amodal" contours can serve as "textons" and provide tokens for apparent motion. Also, the derivation of three-dimensional shape from shading is strongly influenced by two factors: (1) the object's two-dimensional outline and (2) the assumption that there is only a single light source in the entire image. The paradoxical implication is that even "global" operations can define a texton.

SURVEY RESEARCH
Aspen Room, Saturday Morning, 10:55-12:20

Chaired by Clessen J. Martin, U.S. Army Research Institute, Behavioral and Social Sciences

10:55-11:10 (197)

Less Pain More Gain: Quality of Motivation Predicts Marital Satisfaction. R. CHRIS MARTIN & MELANIE DEAN, *University of Missouri, Kansas City*—Quality of Motivation theory assumes that positive and negative motivation are orthogonal. Fifty married couples completed a motivation profile (MMP), a motivational skills questionnaire (MSQ), and a marital satisfaction index (MSI). Results supported the theory in that positive motivation scores predicted different marital satisfaction scores (money and sex) and different motivation skills than did negative motivation scores (global distress and problem solving). Results are discussed in terms of predictive validity and applications to marital therapy.

11:15-11:30 (198)

Cognitive Aspects of Dietary Recall: Applications to Food Frequency Questionnaire. ADAM DREWNOWSKI, FRANCES LARKIN, & HELEN METZNER, *University of Michigan*—Large-scale nutritional surveys typically rely on a food frequency questionnaire (FFQ) as the chief instrument of dietary recall. FFQs consist of three basic parts: a list of foods, estimate of portion size, and a set of frequency response options. Each one is subject to cognitive biases that may differ, moreover, as a function of dieting or body weight. Our study shows how cognitive psychological techniques can be applied to construction and validation of a new FFQ and to research in nutritional epidemiology.

11:35-11:55 (199)

Emotions and Attitudes About AIDS: Rock Hudson and Other Effects. EDWARD J. CLEMMER, *Emerson College*—Surveys were completed by 267 adults, ranging from 17 to 85 years in age, from northeastern Indiana in November 1985. The equally divided single/married sample was mostly heterosexual (97%) and female (65%). Six factored emotions (terror, contempt/disgust, joy, amazement/vigilance, adoration/acceptance, and anticipation) were associated with subjects' sexual, religious, and political values; beliefs regarding persons at risk for AIDS, AIDS transmission, and disease characteristics of AIDS; and stated AIDS-related social behaviors.

12:00-12:15 (200)

Taking a Cognitive Approach to the Collection of Health Survey Data. DAVID J. MINGAY & JARED B. JOBE, *National Center for Health Statistics* (sponsored by E. J. Shoben)—Although both survey researchers and cognitive psychologists are concerned with the manner in which individuals process information, there has been little interaction between the disciplines. Recently, however, the National Center for Health Statistics has begun a program utilizing the theories and methods of cognitive psychology in developing questioning procedures that improve the accuracy of respondents' answers. This paper describes several projects in this program that were conducted by psychologists in universities and research institutes.

ANIMAL LEARNING & BEHAVIOR I
East Ballroom, Saturday Morning, 8:00-10:35

Chaired by E. A. Wasserman, University of Iowa

8:00-8:15 (201)

Role of Learning in the Control of Sexual Behavior by Species-Specific Stimuli. MICHAEL DOMJAN & SUSAN NASH, *University of Texas, Austin*—Male Japanese quail discriminate male versus female conspecifics on the basis of sexually dimorphic feathers of the head and neck. These species-specific stimuli do not gain differential control of social/sexual behavior merely through gonadal maturation. However, a discrimination between male and female conspecifics develops if adult males are provided with copulatory experience and exposure to male and female birds. These results implicate learning processes in species-specific behavior systems.

8:20-8:35 (202)

Successive Negative Contrast in the Consummatory Responding of Marsupials. M. E. BITTERMAN, *University of Hawaii*, & MAURICIO R. PAPINI & ALBA E. MUSTACA, *University of Buenos Aires*—Successive negative contrast was demonstrated in two opossum species. Half the subjects of each species were trained with a preferred food and shifted to a less-preferred food, and the rest served as controls, being trained throughout with the less-preferred food. The results fit the hypothesis based on comparative work with descendants of older vertebrate lines that the mechanism of successive negative contrast evolved in a common reptilian ancestor of birds and mammals.

8:40-9:00 (203)

Learning Theory and Natural Behavior: Models of Stimulus Representation. KAREN L. HOLLIS, *Mount Holyoke College*, CAREL TEN CATE, *University of Groningen*, & PATRICK P. G. BATESON, *University of Cambridge*—Is compound summation the same as double imprinting? Although Pavlovian conditioning and sexual imprinting are treated as very different types of learning phenomena, all learning requires that multiple elements of stimulus information be represented in memory. Recent imprinting studies reveal interesting parallels among learning phenomena in the way stimulus information is represented. The convergence of psychological, ethological, and neurophysiological models of stimulus representation suggests that diverse forms of learning probably utilize the same mechanism.

9:05-9:20 (204)

Development of Defensive Burying in Rats: Effects of Deprivation. J. P. J. PINEL, L. SYMONS, C. JONES, & R. C. TEES, *University of British Columbia*—A defensive burying test was administered to adult rats reared from birth on bedding material or wire mesh. Several wire-mesh-reared subjects displayed defensive burying sequences despite never having interacted with particulate matter before the test. However, more bedding-reared than wire-mesh-reared subjects buried, they buried longer, and their movements were more productive. Defensive burying sequences develop without practice, but interaction with an appropriate substrate is necessary for their full expression.

9:25-9:45 (205)

Selective Associations in the Observational Conditioning of Fear. SUSAN MINEKA, *Northwestern University*, & MICHAEL COOK, *University of Wisconsin*—Observer monkeys watched one of four kinds of videotape: (1) and (2) model monkeys reacting fearfully to fear-relevant stimuli (1: snakes, or 2: lizards) and nonfearfully to fear-irrelevant stimuli (1: flowers, or 2: rabbits); (3) and (4) model monkeys reacting fearfully to fear-irrelevant stimuli and nonfearfully to fear-irrelevant stimuli. Observers in the first two groups acquired fear only of the fear-relevant stimuli; observers in the last two groups did not acquire fear of either stimulus.

9:50-10:05 (206)

Repeated Colony-Intruder Defeat Disrupts Subsequent Exploration and Escape Learning. JON L. WILLIAMS & DEAN M. LIERLE, *Kenyon College*—Male rats, repeatedly defeated as intruders (DI) by aggressive colonies, displayed more defense and were bitten more frequently than nonaggressive-colony intruders (NI). DI subjects subsequently showed less open-field activity when colony odors were present; and later colony reexposure, without defeat, decreased the activity of only DI subgroups. Finally, both groups showed comparable FR1 escape performance in a shuttlebox with colony odors present, but DI rats failed to learn an FR2 (double-crossing) schedule.

10:10-10:30 (207)

Feedback, Interpolated Shock, and Bivalent Alteration of Inescapable Shock-Treatment Effects. D. CHRIS ANDERSON, D. HANTUAL, CHARLES R. CROWELL, & KARI TOLZMAN, *University of Notre Dame*—Movement and basal skin resistance during 30-sec, fixed-duration shocks (30FDSs) were greater when each was followed by a feedback (fb) stimulus. Study 2 revealed that the effects of these 30FDSs on both movements during shock treatment and on subsequent delayed shock-escape testing were eliminated with fb, whether or not the latter was accompanied by a delayed or nondelayed, interpolated 0.5-sec shock. However, these short shocks intensified the effects of the 30FDS treatment when fb was not given.

3-D/MOVEMENT PERCEPTION I
East Ballroom, Saturday Morning, 10:45-12:25

Chaired by Stephen E. Palmer, University of California, Berkeley

10:45-11:00 (208)

Heuristical Reasoning in Judgments Under Certainty. DAVID L. GILDEN & DENNIS R. PROFFITT, *University of Virginia* (read by Dennis R. Proffitt)—Subjects judged the relative mass of balls after observing them collide. It was found that subjects based their decisions on, at most, one variable in each event: angle or velocity. These variables are not interpreted within a natural physical model, but rather are processed heuristically by such rules as "after a collision, the faster moving ball is lighter." In other words, people do not extract mass ratio invariants by implementing internalized conservation laws.

11:05-11:20 (209)

Optic Flow as Reafference and Exafference. HIROSHI ONO, *York University*—Dynamic occlusion and motion parallax were linked to head movement (reafference) in one condition and presented without head movement (exafference) in another condition. The reafference led to perception of stationary surfaces in depth; the exafference led to perception of moving surfaces in depth. The results indicate that the distinction between the two types of afferences should be kept clear in empirical or theoretical work in space perception.

11:25-11:40 (210)

Motion Parallax Without Head Motion or Display Motion. MYRON L. BRAUNSTEIN & JAMES S. TITTLE, *University of California, Irvine*—Rogers and Graham (1979) found that relative depth can be recovered from motion parallax when a depth-ambiguous flow field is moved relative to an observer. We found that any flow field producing the same velocities relative to an observer, whether the entire field moves or only the individual optic elements move, produces equally reliable motion parallax effects. Motion of an observer or of an external display is not necessary for motion parallax.

11:45-12:00 (211)

Kinematic and Kinetic Appreciations of Angular Systems. MARY K. KAISER, *NASA/Ames Research Center*, ARTHUR J. GRUNWALD, *Technion, Haifa, Israel*, & DENNIS R. PROFFITT, *University of Virginia*—Previous studies have demonstrated that observers can extract kinetic as well as kinematic information from linear systems. In several studies, we investigated perceptual competence for angular systems. We found that, whereas observers demonstrate high sensitivity to kinematic properties (e.g., optimal rotational trajectories), they show no more than a qualitative appreciation of angular kinetics (e.g., conservation of angular momentum). This suggests a distinction between observers' perceptual competence with linear (i.e., particle) and angular (i.e., extended body) systems.

12:05-12:20 (212)

Mental Extrapolation of Perceptually Driven Spatial Transformations. LYNN A. COOPER, BRADLEY S. GIBSON, LYN MOWAFY, & DOUGLAS J. TATARYN, *University of Arizona*—Observers viewed

perspective drawings of three-dimensional objects undergoing a specified continuous spatial transformation at a constant rate. At an unpredictable point in the transformational trajectory, an interruption occurred. Observers judged whether the point of reappearance of the object was at the correct or at an incorrect position in the trajectory of motion. Factors affecting the accuracy of extrapolation are described. Results of these experiments are compared with those obtained when static displays are used to imply motion along a trajectory.

INFORMATION PROCESSING I
West Ballroom, Saturday Morning, 8:00-9:50

Chaired by Lester E. Krueger, Ohio State University

8:00-8:15 (213)

Threshold Setting Procedures in Studies of Perception Without Awareness. ALICE A. THIEMAN, *Briarcliff College*, & LLOYD L. AVANT, *Iowa State University* (Read by Lloyd L. Avant)—Holender (1986), Duncan (1985), and Merikle and Cheeseman (1986) focused considerable debate on threshold setting procedures in studies of visual perception without awareness. Following Duncan (1985), this study compared three forced-choice procedures: (1) presence/absence detection with single inputs, (2) stimulus detection with paired stimulus/blank inputs, and (3) stimulus identification. Exposure durations for chance-level performance differed among the tasks; *aware* and *unaware* have multiple meanings.

8:20-8:35 (214)

Relations Between Objective and Subjective Thresholds. YOSHIO NAKAMURA & GEORGE MANDLER, *University of California, San Diego* (read by George Mandler)—Cheeseman and Merikle's (1984) distinction between subjective and objective thresholds (ST and OT) was explored for perception of single letters across presentation times from 5 to 40 msec. OTs were obtained on each trial by discrimination among five alternatives. STs were obtained from reports of material perceived. When both ST and OT were obtained on every trial, ST was enhanced, and subjective reports were more likely when the objective discrimination was correct.

8:40-9:00 (215)

Duration of Judgment as a Measure of Unconscious Perception. EYAL REINGOLD & PHILIP M. MERIKLE, *University of Waterloo* (read by Philip M. Merikle)—Avant (1985) claims that judgment of apparent visual duration is a more sensitive indicator of perception than are direct reports. In a series of experiments, the relative sensitivity of presence/absence, word/nonword, and visual duration decisions was compared under identical stimulus presentation conditions. Contrary to Avant's claim, the results indicate that the direct measures, presence/absence, and word/nonword decisions are more sensitive indicators of perception than is the indirect duration judgment measure.

9:05-9:25 (216)

Impulsivity and Speed-Accuracy Trade-offs in Rapid Information Processing. SCOTT J. DICKMAN, *University of Texas, Austin*, & DAVID E. MEYER, *University of Michigan* (read by David E. Meyer)—Our research demonstrates systematic relationships between self-report personality measures of impulsivity and individual differences in subjects' performance of rapid information-processing tasks. These differences are manifested through characteristics of reaction-time data and speed-accuracy trade-off curves. Additive-factor analyses of the results reveal details regarding the locus of impulsivity effects in the human information-processing system.

9:05-9:45 (217)

Impulsivity and Task Performance. JOHN B. CAMPBELL, *Franklin & Marshall College*—A diverse sample of 100 people aged 18-68 completed a computerized battery of six personality tests all measuring impulsivity. Subjects subsequently completed time interval estimates and a computerized visual inspection task. In a pattern generally consistent with past results, high-impulsive subjects both overestimated time intervals and responded more rapidly but less accurately on the visual inspection task.

ANIMAL COGNITION II
West Ballroom, Saturday Morning, 10:00-12:30

Chaired by Herbert L. Roitblat, University of Hawaii

10:00-10:20 (218)

Implications of the Break-Run-Break Pattern in the Peak Procedure. JOHN GIBBON, *New York State Psychiatric Institute, Columbia University*, WARREN H. MECK, *Columbia University*, & RUSSELL M. CHURCH, *Brown University*—The peak procedure is a discrete-trial, fixed-interval procedure in which some (peak) trials last a long time without reinforcement. Individual peak trials showed a break-run-break pattern with a high, constant rate during a central portion of the trial. The trial-by-trial data showed a low correlation between the center and spread of the high rate portion—unlike the high correlation between these measures when time of reinforcement is changed. Variance and covariance patterns of start and stop times eliminated some classes of scalar timing models.

10:25-10:40 (219)

Some Effects of Intertrial Reinforcers on Rats' Timing Behavior. L. A. SYMONS, DONALD M. WILKIE, & R. C. TEES, *University of British Columbia* (read by D. M. Wilkie)—Intertrial reinforcers equally disrupted rats' discrimination of 2 and 8 sec of light. Discrimination was more disrupted on trials preceded by intertrial reinforcers than on trials preceded by an empty intertrial interval, although performance on the latter trials was still impaired. Disruption was not due to changes in motivation. Disruption was correlated with choice latency. Implications will be discussed.

10:45-11:00 (220)

Rats Employ Number Cues Associated with Successively Presented Nonreinforcements. E. J. CAPALDI & DANIEL J. MILLER, *Purdue University*—Recent discrimination learning data from this laboratory indicate that rats enumerate or count successively presented food reinforcers. We now report five discrimination learning experiments indicating that rats utilize number cues associated with successively presented nonreinforcements. The numerical assumptions required to explain the present discrimination learning data have previously been employed to explain the effects of various reinforcement schedules or extinction. Counting reinforcements and nonreinforcements may be at the basis of many learning phenomena.

11:05-11:25 (221)

Spatial Learning in the Pigeon: An Operant Analog of the Radial-Arm Maze. THOMAS R. ZENTALL, JANICE N. STEIRN, & PAMELA JACKSON-SMITH, *University of Kentucky*—In an operant analog of a radial-arm maze, pigeons' completion of a fixed ratio to any of five keys was reinforced, providing the key had not been selected already on that trial. We examined the effect on performance of (1) visual distinctiveness of the keylights (all same vs. all different colors), (2) spatial distinctiveness of the keys (linear vs. "X" arrangement), (3) effort/time to choose (FR requirement), and (4) delays inserted selectively between choices.

11:30-11:50 (222)

Effects of Chunking on Rats' Spatial Working Memory. J. S. COHEN & P. BURKHART, *University of Windsor*—An experimental group of rats (chunking group) learned to run through a radial-arm maze by first choosing a subset of arms before choosing the remaining arms based on an intramaze floor texture cue. A control group did not have to use this sequential choice task to run through the maze. Manipulations designed to increase errors in working memory for extramaze spatial cues affected performance more for the control than for the experimental group.

11:55-12:10 (223)

List Length Contrast Effects on Concurrent Discriminations by Monkeys. F. ROBERT TREICHLER, *Kent State University*—Rhesus monkeys were trained on a counterbalanced series of concurrent, two-choice, object discrimination tasks that provided varied list lengths for the combinations of correct and incorrect alternatives. Comparisons of tasks with small, large, or infinite lists of correct or incorrect objects indicated that monkeys could choose efficiently on the basis of proper-

ties other than simple intratrial physical differences between objects. Speculatively, monkeys used relative frequency of appearance as an abstract cue for discrimination.

12:15-12:25 (224)

Observational Learning of a Visual Discrimination by Pigeons. DAVID E. HOGAN & STEPHEN PRIESTLE, *Northern Kentucky University*—Pigeons observed a conspecific demonstrator peck location A when locations A and B were simultaneously illuminated with red light, and peck location B when both locations were green. During a transfer-of-training phase, observers learned the same task significantly faster than the reverse task. The amount of positive and negative transfer was predicted by a measure of strength of observation of the demonstrator's choice response.

HUMAN LEARNING/MEMORY III
Grand Ballroom A, Saturday Afternoon, 1:00-3:20

Chaired by Slater Newman, North Carolina State University

1:00-1:20 (225)

A Rational Analysis of Human Memory. JOHN R. ANDERSON, *Carnegie-Mellon University*—It will be argued that human memory can be understood as an optimal solution to the information processing demands facing humans. Using concepts from the literature on information retrieval systems, we will show that many features of human memory can be predicted, including the retention function, the effects of repetition, priming effects, context effects, and interference (fan) effects.

1:25-1:45 (226)

Proximities, Networks, and Schemata. ROGER SCHVANEVELDT, *New Mexico State University*—This paper examines the representation of schemata in networks (weighted graphs) and the use of activation to instantiate the schemata in particular contexts. The following questions are of interest: (1) Can direct judgments of co-occurrence provide the basis for such networks? (2) Are the (nearly) complete networks of the connectionist variety essential, or will sparse networks such as Pathfinder networks suffice? (3) How critical are the particular concepts included and the particular activation procedures?

1:50-2:10 (227)

A Theory for Episodic and Semantic Memory. MICHAEL S. HUMPHREYS, JOHN D. BAIN, & RAY PIKE, *University of Queensland, Australia*—A distributive associative memory model provides a framework for including episodic and semantic phenomena within a unitary memory system. It is argued that context is a cognitive concept of the learning situation and that, in order to recognize a word in context or to learn a list of crossed associates, context and the list cue must be combined multiplicatively. Cues may be used singly or additively for familiarity ratings and free association.

2:15-2:35 (228)

New Method for Investigating Prototype Learning. JEROME R. BUSEMYER & IN JAE MYUNG, *Purdue University*—In prototype learning, subjects categorize exemplars constructed from different prototypes. This procedure is less than ideal because learning must be inferred from the percentage of correct categorizations pooled across many trials and/or subjects. An alternative is that subjects are asked to reproduce their estimate of the prototype on each trial, thereby providing trial-by-trial information about changes in the estimated prototype. This procedure provides straightforward tests of distributed memory models and multiple trace models of prototype learning.

2:40-2:50 (229)

Modeling of the Levels of Processing Approach. GÉRY D'YDEWALLE & PATRICK DELHAYE, *University of Leuven, Belgium*—The superior retention of *yes* words in a typical experiment on levels of processing is explained from a well-defined architecture of human cognitive functioning. A knowledge representation system is presented in which the activation of existing ISA-links between words and their superordinate categories plays a dominant role in the answering of questions and their subsequent retention. New experiments were carried out to test some aspects of the model. Although the findings support the model, there are still some gaps in the details of the model preventing it from covering all the data.

2:55-3:15 (230)

Further Tests of a Model for Measuring Storage and Retrieval. DAVID M. RIEFER, *California State University, San Bernardino*, & WILLIAM H. BATCHELDER, *University of California, Irvine* (read by William H. Batchelder)—Two free recall experiments are reported that further test Batchelder and Riefer's multinomial model for separately measuring storage and retrieval processes in human memory. As predicted, the model reveals that presentation rate primarily affects the storage of items, whereas cued recall facilitates item retrieval. The validity and usefulness of the model for exploring storage-retrieval issues is discussed. Also discussed are the general advantages of multinomial models over other methods of mathematical modeling.

ATTENTION II
Grand Ballroom A, Saturday Afternoon, 3:30-5:35

Chaired by Howard Egeth, Johns Hopkins University

3:30-3:45 (231)

Tests of a Temporal Theory of Attentional Binding. STEVEN W. KEELE & A. COHEN, *University of Oregon*, M. LIOTTI, *University of Parma, Italy*, & RICHARD IVRY & P. YEE, *University of Oregon*—If different brain regions code different features, how does attention operate to bind together the features that emanate from the same object? By one proposal, attention modulates the input from a particular location, and such modulation simultaneously influences all the downstream codes activated by the object. The temporal synchronicity is the essential binding cue. A series of studies provided no evidence for temporally based binding.

3:50-4:10 (232)

Toward an Instance Theory of Automatization. GORDON D. LOGAN, *University of Illinois, Urbana-Champaign*—I will present a theory in which automatization reflects a transition from processing based on a general domain-specific algorithm to memory for specific past solutions. The theory accounts quantitatively for the power-function speed-up and the reduction in variability that accompany automatization, and for many qualitative properties. It departs from previous approaches to automaticity in assuming that novice performance is limited by a lack of knowledge rather than a lack of resources.

4:15-4:30 (233)

Individual Differences in Managing Simultaneous Activities. PENNY L. YEE & EARL HUNT, *University of Washington* (read by Earl Hunt)—Does there exist a unique ability to coordinate two simultaneously executed tasks? Performance was measured on a sentence verification task and a spatial-visual reasoning task, done both singly and together. Individual differences in the ability to do the combined task could not be completely predicted from performance in the single-task conditions. This indicates that there is an ability to coordinate two tasks, beyond the ability to execute each component task.

4:35-4:55 (234)

Selection from Previewed Displays: The Early Bird Gets the Worm? DEREK BESNER & PIERRE JOLICOEUR, *University of Waterloo*—Several experiments are reported in which subjects previewed displays, and then identified one of the elements. Interactions between contrast level (dim, bright) and cue delay (early, late) appear in a number of conditions. These results contrast with those of Pashler (1984), who found additive effects of these factors in a number of experiments. Late birds sometimes get worms.

5:00-5:15 (235)

Foreperiod Effect on Concurrent Estimation of Duration and Length of Line. SUCHOON S. MO, *University of Southern Colorado*—Following a variable foreperiod of 1, 3, or 5 sec, concurrent estimation of duration and length of tachistoscopically presented straight horizontal lines was made. Duration estimation was an increasing function

foreperiod duration. Length estimation was unaffected by foreperiod. Expectancy originating from foreperiod appears to be more "temporal" than "attentional" in nature, and interacts with hemispheric laterality.

5:20-5:30 (236)

Tracking Hesitations May Represent a Single-Channel Limit in Response Programming. STUART KLAPP, ALLAN NETICK, PATRICIA KELLY, & SANDRA FIORI, *California State University, Hayward*—Subjects tracked a continuously moving visual target with the right hand, and made occasional responses to auditory stimuli with the left hand. Hesitations in right-hand tracking were associated with these left-hand responses. The hesitations may be due to a single-channel limit in response programming because they started before the left-hand response, occurred only for the left-hand GO stimulus in a GO-NOGO paradigm, and were reduced when preprogramming was possible.

ASSOCIATIVE LEARNING II
Grand Ballroom B, Saturday Afternoon, 1:00-3:00

Chaired by Ralph R. Miller, State University of New York, Binghamton

1:00-1:15 (237)

Mechanisms of Slow Reacquisition Following the Extinction of Conditioned Suppression. MARK E. BOUTON & DALE SWARTZ-ENTRUBER, *University of Vermont*—After extended extinction training, reacquisition during resumed CS-US pairings is slower than initial acquisition. Slow reacquisition occurs despite evidence that the CS retains residual excitation following extinction. It is due primarily to the extinction trials, rather than the original acquisition trials, and depends on extinction and reacquisition training occurring in the same context. We contrast the context's possible influences on encoding and retrieval and relate the results to other interference effects in Pavlovian conditioning.

1:20-1:35 (238)

Learning and Performance Effects of Nondifferential CS/US Presentation. PETER BALSAM, *Barnard College, Columbia University*, LYNN ARONSON, *Columbia University*, & ROBERT SCOPATZ, *New York City Department of Traffic*—Direct and indirect measures of CS-US associations provided no evidence of conditioning during nondifferential autoshaping procedures. Even after extinction of the context alone, no excitation was observed. However, exposure to nondifferential procedures produced an effect on asymptotic response rates during subsequent CS-US pairings not attributable to an influence of context-US associations on learning. Hence, the path independence assumption of most conditioning models does not allow for a complete account of performance.

1:40-1:55 (239)

Backward Reinforcement and Invariance in Reinforcements to Acquisition. BEN A. WILLIAMS, *University of California, San Diego*—When animals are presented an S+/S− discrimination in which S+ trials are partially reinforced, the number of reinforcers to acquisition is approximately constant across all percentages. This effect was replicated using a new procedure. In addition, free reinforcement was presented during the ITI, which reduced the rate of acquisition approximately equally for all percentage-reinforcement conditions. The effects of the free reinforcement are contrary to the predictions of comparator models of conditioning.

2:00-2:15 (240)

Taste-Mediated Context Potentiation: The Importance of CS Onset. MICHAEL R. BEST & HEMLATA PATEL, *Southern Methodist University*—Lithium-induced conditioning is greater when a distinct taste is consumed in this context during conditioning. Although simultaneous presence of the taste/context compound during conditioning is necessary for this type of potentiation, it is not a sufficient condition. The present experiments document the importance of CS/CS onset and US dose factors in the production of taste-mediated context potentiation.

2:20-2:35 (241)

Differential Representations of Morphine as a Pavlovian Occasion Setter and Pavlovian Excitor. GERARD M. MARTIN, *Memorial University of Newfoundland*, & TONY BECHARA, MAJA GANS, & DEREK VAN DER KOOY, *University of Toronto*—Rats rapidly learn to avoid vinegar on morphine days and to drink vinegar on saline days, when LiCl injections follow vinegar consumption on morphine days but not on saline days. Morphine suppresses consumption of other solutions, but does not block the formation of an association between saccharin and LiCl. Opposite results in these suppression and blocking tests are shown by animals trained without fluid consumption between the morphine and LiCl pairings.

2:40-2:55 (242)

Modulation of Conditioned and Unconditioned Rabbit Eyeblink by Pavlovian "Occasion-Setters." S. E. BRANDON, *Yale University*, & JOAN C. BOMBACE, *Quinnipiac College* (sponsored by Allan R. Wagner)—In a series of studies employing rabbits and the eyeblink response, conditioned, unconditioned responding were modulated by differentially trained contextual stimuli. Thirty-second auditory stimuli, in the presence of which paraorbital shocks had been either programmed, or prevented, increased and decreased, respectively, the amplitude of CRs and URs to discrete elicitors. The findings are discussed in relation to phenomena of "occasion setting," and in terms of an affective extension of Wagner's SOP theory (ÆSOP).

3-D/MOVEMENT PERCEPTION II
Grand Ballroom B, Saturday Afternoon, 3:10-5:40

3:10-3:20 (243)

Effects of Dichoptic Viewing on Bistable Motion Percepts. ALYSIA B. RITTER & BRUNO G. BREITMEYER, *University of Houston* (read by Bruno Breitmeyer)—Prior reports of absence of element and presence of group motion under dichoptic viewing supported the hypothesis that the two percepts rely on dichotomous peripheral and central processes, respectively. However, conditions that optimize pattern persistence yield substantial dichoptic element motion. These findings and the relative attenuation of dichoptic element motion are related to differences in pattern persistence and metacontrast between the two viewing conditions.

3:25-3:40 (244)

Visual Detection of Common Motion of Spatially Separate Points. JOSEPH S. LAPPIN, *Vanderbilt University*, Thomas D. Wason, *Allotech, Inc.*, & HIROMI AKUTSU, *Vanderbilt University*—How visible is the "common fate" of spatially separate moving points? Contemporary theories of optic flow and motion perception emphasize local visual measures of optical motion over "short" ranges of space and time. Using displays of only three equally separated points whose positions were rapidly displaced by small distances in randomly changing directions, we have found very accurate discriminations of globally correlated versus uncorrelated displacements among even widely separated ($> 20°$) points.

3:45-4:00 (245)

Illusory Motion, Vection, and Orientation Inhibition with an Oscillating Frame Display. SHELDON M. EBENHOLTZ, *Institute for Vision Research, State University of New York, College of Optometry*, & TIM BABLER, *University of Wisconsin*—A luminous frame projecting 60° arc side^{-1} oscillated at five frequencies from .013 to .213 Hz. Continuous apparent oscillation was induced in a thin luminous line, about 8° arc in length, about the axis of frame rotation. Three of 9 subjects reported oscillatory roll-vection. A thin circumscribing luminous circle eliminated vection and significantly decreased the amplitude of illusory target movement. Vection proclivity was associated with velocity to real line movement.

4:05-4:20 (246)

Egocentric and Exocentric Direction Judgment. STEPHEN R. ELLIS. *NASA Ames Research Center and University of California, Berkeley*—Previous reports showed that subjects have a "telephoto bias" in exocentric-direction estimates when judging target direction on three-dimensional maps presented in perspective. Three new experiments using egocentric direction estimates examined components of this judgment. Results show that previous small errors arise from compensating error patterns. Overall pattern of direction error may be caused by binocular

picture-surface cues conflicting with the picture's virtual space. This conflict may be incorporated into familiarity-cue models of spatial orientation.

4:25-4:40 (247)

Perception of Egomotion While Walking Without Vision to Previously Seen Targets. D. H. ASHMEAD, J. J. RIESER, C. R. TALOR, & G. A. YOUNGQUIST, *Vanderbilt University* (read by J. J. Rieser)—Subjects viewed targets at 2-22 m in an open field, closed their eyes, and walked to them immediately or after 8 sec, as in Thomson (1983). Precision of responding (VEs) was a linear function of distance with a small constant effect of delay. Perception of self-target distance while walking (CEs) was a negatively accelerated function, and the time delay doubled the rate of negative acceleration. The perception of egomotion in this situation involves the coupling of perception and action, and is influenced by visual perception, locomotor perception, representation, and their spatio-temporal integration.

4:45-4:55 (248)

Visual Matching of Spatial Intervals and Visually Directed Walking: A Comparison. JACK M. LOOMIS, *University of California, Santa Barbara*, JOSÉ A. DA SILVA & SUSI L. MARQUES, *University of São Paulo, Ribeirõ Preto, Brazil*—Subjects performed two tasks involving binocular viewing of targets ranging from 4 to 12 m. In the first task, subjects perceptually matched depth intervals (at ground level) to frontoparallel intervals while viewing from a fixed location. In the second task, subjects viewed a target and then, with eyes closed, walked to it. Interval matching indicates substantial foreshortening of depth, with foreshortening increasing with absolute distance. In sharp contrast, walking is accurate (and thus linear) over the same range.

5:00-5:10 (249)

Five-Month-Old Infants Do Not Reach for the Moon. ALBERT YONAS & BRENDA HARTMAN, *Institute of Child Development, University of Minnesota*—The purpose of this study was to investigate the development of infants' knowledge of the likelihood that a reach will result in contact with a desired object. This likelihood is determined by the position of the object, the length of the infant's reach, and the infant's ability to lean forward. Five-month-old, leaning and nonleaning, infants showed impressive knowledge of these factors by rarely initiating a reach for an object placed beyond reach.

5:15-5:35 (250)

Infants' Postural Compensations Induced by Central Versus Peripheral Optical Flow. BENNETT I. BERTENTHAL & DINA L. BAI, *University of Virginia*—Infants between 2 and 18 months of age were tested for postural compensations induced by optical flow presented centrally, peripherally, or globally. In general, infants showed greater compensations to peripheral than to central stimulation; although, prior to 9 months of age, they were responsive only to global stimulation. These findings reveal that infants perceive self-motion from optical flow; moreover, this process appears to be spatially distributed on the retina by the age that infants begin locomoting.

PICTURE MEMORY/PROCESSING II
Grand Ballroom C, Saturday Afternoon, 1:00-2:45

Chaired by James C. Bartlett, University of Texas, Dallas

1:00-1:15 (251)

Enhanced Face Recognition Memory After Distributed Viewing. ALVIN G. GOLDSTEIN & JUNE E. CHANCE, *University of Missouri, Columbia*—Distributed practice has repeatedly been demonstrated to enhance learning. Would faces and scenes viewed intermittently be better retained than if viewed continuously for the same period of time? Different subjects saw two faces and two scenes either for 15 sec continuously or for three 5-sec episodes separated by several minutes or by 1 to 2 h. Testing 1 week later found better recognition and more subjective confidence among subjects who viewed stimuli intermittently.

1:20-1:35 (252)

Memory Load and Visual Memory for Faces, Scenes, and Animals. JUNE E. CHANCE, ALVIN G. GOLDSTEIN, & JILL OTTO, *University of Missouri, Columbia*—Recognition memory for faces, scenes, and animals was tested varying the number of items to be learned, that is, the memory "load." College students and 8-year-olds saw either 2 or 12 target faces, scenes, and animals for 3-4 sec each. Subjects were tested 7 days later using either 2 or 12 sets of four-photo arrays. Recognition accuracy was decreased by increasing load among both children and adults.

1:40-1:55 (253)

Facial Recognition Memory. KATHY PEZDEK & J. KIRKLAND REYNOLDS, *Claremont Graduate School*—The relative memorability of six facial features is examined as a function of study time and test delay. Memory for Identi-Kit constructions of faces was tested with a same-changed recognition test. The distractor test faces were "old" faces, each with a change in one facial feature—hairline, chin, eyes, mouth, nose, or eyebrows. This study tested the hypothesis that although faces are holistically processed, with increased study time and shorter test delay, the overall hit rate and correct rejection rate increase, and the *relative* memorability of specific facial features remains constant.

2:00-2:20 (254)

Memory For Faces: Are We Natural Caricaturists? GILLIAN RHODES, *University of Otago, New Zealand*, SUSAN BRENNAN, *Stanford University*, & SUSAN CAREY, *Massachusetts Institute of Technology* (sponsored by Susan Carey)—We have shown that computer-generated line-drawing caricatures of familiar faces are identified twice as quickly as veridical (uncaricatured) drawings and four times as quickly as anticaricatures (in which distinctive information is reduced). These results suggest that distinctive information is coded, and may be exaggerated, in long-term memory. Results on recognition of unfamiliar faces suggest that perceptual and short-term memory representations are not caricatured.

2:25-2:40 (255)

Similarity Effects on Semantic Activation by Pictures and Words. WAYNE F. WALLS, *Hughes Aircraft*, & PATRICIA SIPLE, *Wayne State University*, (read by Patricia Siple)—Previously, we demonstrated that the physical similarity of objects affected response time for category decisions about pairs of pictures of objects and for the words naming those objects (Siple & Walls, 1985). In the present study, similar results obtained for mixed (picture-word and word-picture) pairs. These results provide further support for the conclusion that physical information about objects resides in semantic memory and is accessed with category information by both pictures and words.

SYMPOSIUM: RETENTION AND REMEMBERING: PERSPECTIVES ON MEMORY FROM ANIMAL RESEARCH
Grand Ballroom C, Saturday Afternoon, 3:00-5:55

Chaired by Anthony A. Wright, University of Texas Health Science Center at Houston, Graduate School of Biomedical Sciences

3:00-3:20 (256)

Do Animals Have Autobiographical Memory? ENDEL TULVING, *University of Toronto*—Introductory remarks, including a tentative answer to the question posed in the title.

3:25-3:45 (257)

Natural History, Food-Storing Ecology, and Spatial Memory in Birds. RUSSELL P. BALDA, *Northern Arizona University*, & ALAN C. KAMIL, *University of Massachusetts*—Clark's nutcrackers bury thousands of pine seeds each fall and recover them months later. Laboratory studies show that spatial memory plays an important role in cache recovery. Comparative studies of several avian species in cache recovery situations, radial-arm maze analogs, and operant spatial delayed nonmatching-to-sample have found species differences, and suggest the existence of multiple memory systems. A comparative approach based upon natural history can produce new insights into learning and memory.

3:50-4:10 (258)

Biological Basis of the Remembered Time of Reinforcement. RUSSELL M. CHURCH, *Brown University*—The remembered duration of

an event is related to the activity of the cholinergic nervous sytem at the time of information storage. Examples will be given from studies of temporal discrimination by rats with pharmacological and surgical alterations of cholinergic activity and with normal variation in cholinergic activity due to individual differences and aging. The central tendency and the variance structure of the content of reference memory will be analyzed in terms of scalar timing theory.

4:15-4:35 (259)

Comparative Studies of Picture Memory: Function, Structure, and Content. WILLIAM A. ROBERTS, *University of Western Ontario*—Recent experiments on picture memory in squirrel monkeys and people indicate similarities and differences in the function and content of human and nonhuman primate memory. Experiments using delayed matching-to-sample will be used to discuss serial-position effects, rehearsal, and directed forgetting. Research on memory for picture fragments and concept learning will provide evidence regarding the comparative structure and content of human and monkey memory.

4:40-5:00 (260)

Memory Processing of Serial Lists by Monkeys and People. ANTHONY A. WRIGHT, *University of Texas Health Science Center at Houston*—Monkey and human list memory was tested by varying viewing time and interstimulus interval. Category matches were required in some experiments with monkeys. Naming of kaleidoscope pattern stimuli was required in some experiments with humans. Collectively, these results in conjunction with those from retention interval effects on the serial position function have implications for rehearsal in animal and human memory, serial position effects, and short- and long-term memory.

5:05-5:25 (261)

Neural Substrates of Memory in Humans and Nonhuman Primates. LARRY R. SQUIRE, *VA Medical Center, University of California, San Diego*—Recent studies of human amnesia and animal models of amnesia in the monkey have improved our understanding of the organization and neural foundations of memory. Recent work has illuminated (1) the relationship between fact memory, source memory, and metamemory abilities; (2) the nature of memory consolidation; and (3) the role of the hippocampus in memory.

5:30-5:50 (262)

Retention and Remembering: Comments on the Presentations. ROBERT G. CROWDER, *Yale University*—The symposium presentations are discussed, with special emphasis on the distinction between retention and conscious recollection, the generality of laws on memory across species, the processing of temporal information, and the likelihood of a new convergence between human and animal research.

BEHAVIORAL PHARMACOLOGY

Aspen Room, Saturday Afternoon, 1:00-3:55

Chaired by Alan Randich, University of Iowa

1:00-1:15 (263)

Role of Body Temperature in Ethanol-Induced Conditioned Taste Aversion. CHRISTOPHER L. CUNNINGHAM, DENISE M. HAWKS, & DOUGLAS R. NIEHUS, *Oregon Health Sciences University*—Exposure to a warm environment reduces ethanol-induced hypothermia, but enhances the drug's sedative/hypnotic effects. Rats receiving saccharin-ethanol (1.5 g/kg i.p.) pairings followed by 6 h of exposure to a 32° C environment developed weaker saccharin aversion than did rats maintained at room temperature. These data suggest that ethanol-induced hypothermia may play a role in determining strength of conditioned taste aversion and thus may be involved in the regulation of oral ethanol intake in rats.

1:20-1:30 (264)

Effects of Ethanol Injections on Fixed Versus Variable Response Patterns in Rats. ELIZABETH McELROY & ALLEN NEURINGER, *Reed College* (ready by Allen Neuringer)—Six "fixed-pattern" rats received food rewards for LLRR patterns of left (L) and right (R) barpresses. Six "variable-pattern" rats were rewarded for variable patterns, that is, four-response patterns of L and R that differed from each of the last five trials. Baseline accuracies were approximately equal across groups. Injections of 0.75 g/kg ethanol caused significant decrements in fixed-pattern accuracy but had no effect on variable-pattern accuracy. Thus, reinforced fixed and variable behaviors are differentially affected by ethanol.

1:35-1:55 (265)

Repeated Exposures Increase Rather Than Diminish the Rewarding Effect of Drugs. BOW TONG LETT, *Memorial University of Newfoundland*—It is commonly believed that repeated exposures diminish the rewarding effect of drugs, and hence that pleasure must have only a minor, transient role in addiction. The contrary evidence reported here is that in rats repeated exposures to amphetamine, morphine, or cocaine produced sensitization and cross-sensitization to the rewarding effect as measured by conditioned place preference. These findings suggest that addiction occurs because drug taking produces a progressively greater reinforcing effect with each experience.

2:00-2:15 (266)

Different Effects of Morphine in Self-Administering and Yoked-Control Rats. JAMES MacRAE & SHEPARD SIEGEL, *McMaster University* (read by Shepard Siegel)—Intraveneously cannulated rats self-administered morphine by pressing a lever. These leverpresses by experimental rats also delivered morphine to yoked partners. Although the groups did not differ in schedule of morphine administration, they differed dramatically in response to termination of morphine availability. Withdrawal behaviors were much more pronounced in experimental than in yoked subjects. The results suggest that interoceptive signals of a drug, incidental to voluntary self-administration, influence the magnitude of withdrawal symptoms.

2:20-2:35 (267)

Reversal of Chlordiazepoxide-Induced Discrimination Impairment by Ro 15-1788. SHERWOOD O. COLE, *Rutgers University, Camden*—Chlordiazepoxide (19 mg/kg), administered on eight successive trials, impaired the acquisition of a light-cued, successive discrimination in male Sprague-Dawley rats. The benzodiazepine receptor antagonist Ro 15-1788 (10 mg/kg) reversed the discrimination impairment when coadministered with chlordiazepoxide but produced a mild agonistic-like action when given alone. These results suggest that the impairment of successive discrimination by chlordiazepoxide is mediated by central benzodiazepine receptor sites and that Ro 15-1788 may have some intrinsic action of its own.

2:40-3:00 (268)

Pituitary-Adrenal Activity Following Inescapable Shock: Effects of Dexamethasone. THOMAS R. MINOR, *University of California, Los Angeles*, THOMAS INSEL, *National Institute of Health*, JEFFREY WILKINS, *University of California, Los Angeles, School of Medicine*, & JOHN HARACZ, *Indiana University*—Rats received an injection of saline or dexamethasone (DEX) 2 h before exposure to escapable, yoked inescapable, or no shock. DEX was relatively ineffective in suppressing plasma corticosterone immediately after the session only in inescapably shocked rats. A similar outcome was obtained when rats were reexposed to reinstating shocks 24 h after the stress session. Preliminary observations suggest that DEX nonsuppression of corticosterone is correlated with an increase in brain and pituitary CRF receptors.

3:05-3:25 (269)

Heart Rate Conditioning When Pentobarbital Injections Are Paired with Amphetamine Injections. SAM REVUSKY, VALERIE DAVEY, & MICHAEL ZAGORSKI, *Memorial University of Newfoundland*—Pentobarbital was injected into rats 20 min after they were placed in an apparatus where heart rates were recorded. Amphetamine was injected after they were removed from the apparatus 29-30 min later. A Pavlovian CR began after three of four such trials, in the form of a failure of conditioned rats to show the same decline in heart rate obtained among controls after the pentobarbital injection. The conditioning exhibited characteristics of Pavlovian delay conditioning.

3:30-3:50 (270)

Fear in a Bottle: Generation of SSDRs by β-carbolines. MICHAEL S. FANSELOW, FRED J. HELMSTETTER, & DANIEL

J. CALCAGNETTI, *Dartmouth College*—β-carbolines, such as DMCM, are purported to elicit anxiety. Does DMCM generate the same aversively motivated behaviors that are provoked by Pavlovian fear cues and innate predators? DMCM-treated rats showed decreased line crossings and increased freezing in an open field. In a small chamber, DMCM. elevated freezing and suppressed formalin-induced recuperation. DMCM delivered into the cerebral ventricles elevated lick latencies on a hot plate. These findings suggest that DMCM produces a fear-like state characterized by defensive behaviors and analgesia.

INFORMATION PROCESSING II
Aspen Room, Saturday Afternoon, 4:05-5:40

Chaired by Raymond Klein, Dalhousie University

4:05-4:20 (271)

The Perceived Structure of Form and Size Dimensions. S. BALLESTEROS & M. J. GONZALEZ LABRA, *Universidad Nacional de Education a Distancia, Spain*—The relation between metric and perceptual properties of 16 multidimensional stimuli was examined within the Additive Difference Measurement Model and the integral-separable paradigm using a dissimilarity judgment task. Parametric, nonparametric, and multidimensional scaling procedures showed that form and size were not psychologically independent dimensions. The interactions produced were analyzed, and asymmetric effects were found. These results converge with those obtained using speeded-classification and restricted-classification tasks.

4:25-4:35 (272)

Prototype Formation in Very Short-Term Memory (VSTM). ROBERT L. SOLSO, MATHEW HECK, & CURT MEARNS, *University of Nevada, Reno*—The present research examined prototype formation of numbers in a high-speed visual search paradigm ("Sternberg" paradigm). Stimuli consisted of two- or three-digit numbers that were derived from a "base" digit. The results indicated that subjects tended to respond with a false alarm on the prototype digit. The data are discussed in terms of their implication for an information processing model and short-term memory.

4:40-4:55 (273)

An Empirical Evaluation of Robust Regression Applied to Reaction-Time Data. SAUL STERNBERG, *University of Pennsylvania and AT&T Bell Laboratories*, & DAVID L. TUROCK & RONALD L. KNOLL, *AT&T Bell Laboratories*—How can we reduce the sensitivity of reaction-time analyses to aberrant observations? Robust methods are inviting, but poorly understood. We approached the problem of method selection empirically, by making explicit some criteria commonly used in choosing among alternative experimental procedures, and then using these criteria to evaluate the characterizations of a large data set produced by two regression methods. Results favor Huber's iteratively reweighted least squares method (which also doubles efficiency) over ordinary least squares.

5:00-5:15 (274)

Interference and Response Grouping in Temporally Overlapping Tasks. HAROLD PASHLER, *University of California, San Diego*, & JAMES C. JOHNSTON, *NASA Ames Research Center* (read by James C. Johnston)—Dual-task response delays have been attributed to (1) postponement of critical processing stages or (2) capacity sharing. Two experiments, with instructions encouraging or discouraging grouping of responses, confirmed detailed factor-interaction predictions from a postponement model that assumes single-channel central processing. Both data sets fit a model with the same central postponement, but different response emission strategies. The results support the attribution of first-task slowing in dual-task experiments to grouping rather than capacity sharing.

5:20-5:35 (275)

The Role of Attention in Visual Learning. GEORGE WOLFORD & HAW-YOUNG KIM, *Dartmouth College*—Two years ago, we documented the robust practice effects that obtain in backward masking paradigms. This year, we show the important role that attention plays in eliciting the practice effect. We used a cuing paradigm in which a fixation cue informed the subject of the likely location of target and mask. Learning only occurred on valid trials (i.e., trials on which the target was presented at the expected location).

PROBLEM SOLVING II
East Ballroom, Saturday Afternoon, 1:00-2:50

Chaired by Russell Revlin, University of California, Santa Barbara

1:00-1:15 (276)

A Theory of Invention. ROBERT J. WEBER, *Oklahoma State University*—Based on interviews with inventors, a theory of invention is put forth. Invention stages range from intuitive to complex. At each stage various processes are identified. At the higher stages a family of powerful heuristics is identified and described. Together, the stages and heuristics suggest a normative theory of invention.

1:20-1:40 (277)

Supporting Mental Model Reasoning with a Diagram Display. DAVID E. KIERAS, *University of Michigan*—Knowledge of the internal structure and function of a simple device improves performance in interacting with the device. Providing a computer-generated display of the device structure in diagram form, along with current internal-state information, further improves performance, apparently due to the elimination of several specific inference processes otherwise required to interact with the device. The results have both theoretical and practical implications for the relations between diagrams and mental models for devices.

1:45-2:00 (278)

Searching the Experiment Space in a Scientific Reasoning Task. DAVID KLAHR, *Carnegie-Mellon University*, & KEVIN DUNBAR, *McGill University*—This study isolates the experimental design phase of a simulated scientific reasoning task. Subjects were provided with specific hypotheses (rather than formulating their own) about the workings of novel function on a complex device. Their task was to design a series of experiments to evaluate the hypothesis. Subjects' experiments and verbalizations were analyzed in terms of our model of scientific discovery as dual search. The results enabled us to further specify the model's details.

2:05-2:25 (279)

Individual Differences in Mental Models of Machines. MARY HEGARTY & MARCEL ADAM JUST, *Carnegie-Mellon University*, & IAN MORRISON, *Acquired Intelligence* (read by Marcel A. Just)—By analyzing psychometric test performance, we identified rules of inference about mechanical systems that accounted for performance of subjects who differ in mechanical ability. A simulation model demonstrates the sufficiency of the rules by producing the same kinds of responses as given by the subjects. Three factors underlie individual differences in performance: (1) ability to correctly identify relevant attributes of mechanical systems, (2) ability to use rules consistently, and (3) ability to quantitatively combine information.

2:30-2:45 (280)

How People Use a Multimedia Computer System for Interactive Procedural Instructions. PATRICIA BAGGETT, *University of Michigan*—We have implemented and are testing a prototype videodisc-based "tutoring" system for assembly, repair, and understanding of real physical objects. We discuss the implementation's knowledge representation (derived partially from subjects' data), problems with putting video into a database, and preliminary data about how people use the system when given various tasks and free access to complex material, via touch screen and typing.

VISION
East Ballroom, Saturday Afternoon, 3:00-5:35

Chaired by James F. Juola, University of Kansas

3:00-3:20 (281)

Separating Visible Persistence from Retinal Afterimages. VINCENT DI LOLLO & CRAIG D. CLARK, *University of Alberta*—Visible persistence (i.e., the continued visibility of a brief display for a short

period after stimulus termination) has sometimes been described as a weak, short-lived retinal afterimage. We show that visible persistence and retinal afterimages are separate phenomena, having different rates of decay, and responding differently to changes in duration and in intensity of inducing stimuli.

3:25-3:40 (282)

Does Emmert's Law Hold for Pictures? JOHN UHLARIK & ROBERT YOST, *Kansas State University*—Emmert's law holds that the apparent size of a retinal afterimage should increase in direct proportion to apparent distance. Experiments were conducted to explore the extent to which Emmert's law maintains in two-dimensional pictorial arrays. Various cues, including stereopsis, were sufficient to produce increases in apparent size of afterimages while retinal size remained constant. However, none of the conditions evoked changes in apparent size approaching those produced by viewing equivalent three-dimensional scenes.

3:45-4:05 (283)

Edge Intersections Contain Lightness Information. ALAN L. GILCHRIST, *Rutgers University*—Whenever an illumination edge crosses a reflectance edge, the resulting intersection has the property of ratio invariance; the luminance *ratio* along either edge is unchanged by the crossing. When two illumination edges cross, edge ratios are changed, but the luminance *difference* along each edge is preserved. Observers were shown, and described, patterns of overlapping patches of light, shadow, and paper to test how well these invariances constrain the perceptual classification of illumination and reflectance edges.

4:10-4:20 (284)

Target Luminance and the Visibility of Subjective Contours. JOEL S. WARM, WILLIAM N. DEMBER, TRACI L. GALINSKY, ANTHONY R. PERRY, & JONATHAN GLUCKMAN, *University of Cincinnati*, & SUSAN T. DUMAIS, *Bell Communications Research*—Luminance reductions either enhance the visibility of subjective contours or leave their visibility relatively unchanged. The present study resolves this conflict in the nature of the luminance function by showing that the enhancement effect is dependent upon the presence of an immediate standard for reference. The study also shows the enhancement effect to be robust; it is observable when the luminance of either the standard or the comparison stimulus (both subjective) is reduced.

4:25-4:40 (285)

Sawtooth Pac People and the Realization of Illusory Edges: Computational, Cognitive, and Utilitarian Implications. GLENN E. MEYER, *Lewis and Clark College*, & THOMAS J. DOUGHERTY, *Claremont Graduate School*—Sawtooth Pac people induce only fuzzy illusory edges, contrary to cognitive predictions. Flickering sawtooths induce interposition so sawtooths are amodally present but not seen. Awareness of the edges' presence is insufficient to produce visible realization. Using sawtooth edges for inner angles of Kanizsa's Geneva cross display induces illusory edges where there are usually none. Despite the perceived interposition, illusory edges remained fuzzy. Rotating subjective contours induce powerful size illusions; however, sawtooth contours are not affected.

4:45-5:00 (286)

Spatial Allocation of Attention: Line Length Discrimination Versus Luminance Detection. ANNE-MARIE BONNEL & CAMILLE-AIMÉ POSSAMAI, *Laboratoire de Neurosciences Fonctionnels, CNRS*, & BERTRAM SCHARF, *Laboratoire de Mécanique et d'Acoustique, CNRS* (sponsored by Jean Requin)—A previous study that directly manipulated allocation of attention supported a sensory-tuning hypothesis. When discriminating line length, subjects precisely shared processing resources between two pairs of lines presented to the left and right of fixation. In a close replication requiring the detection of luminance increments instead of line-length differences, subjects were unable to follow instructions and allocate attention differentially. Analogous results in audition suggest that capacity limitations may vary according to task requirements.

5:05-5:15 (287)

The Object Detection Effect. DEAN G. PURCELL, *Oakland University*, ALAN L. STEWART, *Stevens Institute of Techology*, & ANGELA M. GIACOLETTI, *Oakland University*—We extend the generality of the object superiority effect by demonstrating that the identification threshold for target lines is lower for lines in three-dimensional figures than for those in two-dimensional figures. Furthermore, under backward masking, the detection threshold for the whole three-dimensional target figure is lower than for a two-dimensional target figure. These findings parallel those found when comparing normal and distorted faces.

5:20-5:30 (288)

Assessing Visual Acuity Without Technical Equipment or Visual Optotypes. STANLEY COREN & A. RALPH HAKSTIAN, *University of British Columbia*—A technique to assess visual acuity, without the use of technical equipment or optotypes, and suitable for group administration, was developed using a sample of 182 subjects. The resultant 10-item self-report inventory was then cross-validated on a sample of 570 subjects and shown to correlate 0.82 with best eye acuity, with reliability of 0.94. Procedures for converting inventory scores to Snellen equivalents and the expected accuracy of classification will be discussed for this simplified acuity-assessment procedure.

PSYCHOPHYSICS

West Ballroom, Saturday Afternoon, 1:00-3:25

Chaired by Thomas R. Corwin, New England College of Optometry

1:00-1:15 (289)

Relative Judgment Theory and Numerical Comparisons by Children. STEPHEN LINK, *McMaster University*, & JOAN GAY SNODGRASS, *New York University*—Relative judgment theory (RJT) provides an excellent account of the mental process used by adults to compare two-digit numbers (Link, 1984, 1986). To extend these results, children in grades 3, 5, and 7 compared randomly selected two-digit numbers against a fixed standard of 55. Both the psychometric (Urban, 1908) and chronometric (Link, 1984) functions are compatible with the predictions of RJT. However, the children are distinguished by greater accuracy and faster responding as the grade level increases.

1:20-1:35 (290)

Random Walk Model of Digit Comparison: Speed-Accuracy Trade-offs. STEVEN E. POLTROCK, *MCC, Austin*—A random walk model of digit comparison accounts for general features of the relationship between response time, accuracy, and digit values. To test the model, subjects were instructed to respond at one of three target times. For each target time, the quantitative relationship between response time, accuracy, and digit value was in accord with the model. A guessing strategy is proposed, however, to account for systematic changes in response biases that increase when target times decrease.

1:40-1:55 (291)

Attention and Measures of Perceptual Latency. HOWARD C. HUGHES & LYNN D. ZIMBA, *Dartmouth College*—Temporal order judgments (TOJs) have been used to demonstrate that attended events receive "prior entry" to subsequent processes through variations in sensory latency. We will report findings indicating that the use of TOJs as a measure of visual latency is flawed by a susceptibility to decision biases, and will present data using a 2AFC paradigm which produces more consistent results. The issue of prior entry was examined using the 2AFC procedure, and pertinent data will be presented.

2:00-2:10 (292)

The Formation of Natural Categories. GREGORY R. LOCKHEAD & SUSAN A. GAYLORD, *Duke University*—In each of several studies, people generated the stimulus value perceived as *just* or as *just not* categorized with other stimuli. These *just noticeable boundaries* (JNBs) for categories are analogous to Weber's *just noticeable differences* (JNDs) for magnitudes. JNBs, their variabilities, and the time taken to produce them all increased proportionally with stimulus variability. These proportions in judgments may reflect perceptual or memory systems that also function proportionally.

2:15-2:30 (293)

Cross-Modal Similarity: Multidimensional Scaling. LAWRENCE E. MARKS, *John B. Pierce Foundation Laboratory*—Multidimensional scaling of similarity ratings of homomodal and heteromodal stimulus pairs (tones varying in frequency and intensity; lights varying in luminance) yielded a two-dimensional solution. One dimension sorted tones by loudness, the other by pitch; brightness of lights was common to both dimensions. Individual differences in relative weightings on the two dimensions correlated with differences in a cross-modal matching

task. Results support the conception of multidimensional multimodal representation of perceptual attributes.

2:35-2:45 (294)

Intensity-Difference Thresholds for Tones in Notched and Broadband Noise. BRUCE SCHNEIDER, *University of Toronto*, & SCOTT PARKER, *The American University*—Surrounding a 1-kHz tone with notched noise (notch width = octaves; tone level 35 dB above noise spectrum level) reduces tonal loudness and raises the tone-intensity just noticeable difference (jnd). We compared tone-intensity jnds for tones masked by notched and by broadband noise at three tone levels for each of 6 subjects. Filling in the notch (using broadband rather than notched noise) rarely further raises the jnd but rather may lower it.

2:50-3:05 (295)

An Improved Method of Threshold Measurement. THOMAS R. CORWIN & NANCY B. CARLSON, *New England College of Opotometry*—Visual thresholds are normally measured by varying a *dependent* stimulus dimension at fixed values of an *independent* dimension. In 18 normal observers, we measured flicker-fusion or flash-duration thresholds by varying both dependent and independent dimensions between trials. Under most conditions, this method yielded more precise thresholds, for the same number of trials, than varying only one stimulus dimension.

3:10-3:20 (296)

Reliabilities of Various Measures of Contrast Sensitivity Functions: II. GERALD M. LONG & J. PORTER TUCK, *Villanova University*—Extending the research reported last year, we investigated the reliabilities and intercorrelations of contrast sensitivity scores obtained by several popular psychophysical methods. The Békésy tracking method again exhibited low reliablity and low intercorrelations with other procedures. Contrast scores from the method of adjustment and the method of increasing contrast looked much more promising. Test-retest reliabilities ranged from .7 to .9, and intermethod correlations were highly significant. Results were not altered when 4-Hz flickering gratings were used.

JUDGMENT/DECISION MAKING I
West Ballroom, Saturday Afternoon, 3:35-5:40

Chaired by Stephen E. Edgell, University of Louisville

3:35-3:50 (297)

On the Relationship Between Memory and Judgment in Opinion Change. VALERIE F. REYNA & CHARLES J. BRAINERD, *University of Arizona* (read by Charles J. Brainerd)—The advantage of case histories over statistics in judgment is widely supposed to be a memory-based phenomenon. We explore different memorial loci for this effect by exploiting such concepts as effort, encoding, retrieval, storage failure, and capacity. Our results show that memory differences do not inevitably lead to judgment differences, and reconstructive processes vie with verbatim traces for control of judgments.

3:55-4:15 (298)

Estimating Cumulative Risk: Flood and Contraceptive Failure. HARRIET SHAKLEE, *Eugene Research Institute*—Some risks in life are relatively low with each exposure but, over repeated exposures, represent a substantial cumulative likelihood. We investigated people's understanding of cumulative risk in two content domains: flood and contraceptive failure. Subjects learned the likelihood of a given outcome for a 1-year interval and estimated the likelihood of the same outcome for longer time periods. Subjects' judgments showed serious biases in their understanding of the rate of risk accumulation over time.

4:20-4:30 (299)

Repetition Increases the Rated Validity of Statements in Areas of High or Moderate Expertise. HAL R. ARKES, LARRY BOEHM, & BETH JACOBSEN, *Ohio University*—Ten statements were generated in each of seven categories: food, literature, science, art, history, entertainment, and sports. Students first ranked these categories according to their presumed expertise in each and then rated the 10 sentences in each category for validity. A week later some of the sentences were presented again amidst an equal number of new sentences. Repeated sentences in the high- or moderate-expertise categories increased in rated validity over the 1-week interval.

4:35-4:55 (300)

A Case of Independence Between Category Structure and Improvable Error in Medical Expertise. LEE R. BROOKS, *McMaster University*, G. R. NORMAN, *McMaster University Medical Center*—Diagnosticians of three levels of expertise diagnosed pictures of dermatological disorders. Item typicality and average item-difficulty effects were independent of expertise, despite experts' error rate being only one third that of residents. Thus, the source of improvable error across expertise was independent of the source of typicality and average item-difficulty effects. This suggests the insufficiency of improving feature weights (regression or prototype models) or increasing stored instances to account for accuracy improvements across expertise.

5:00-5:20 (301)

Preference Order and the Decision Maker's Point of View. MICHAEL H. BIRNBAUM, *California State University, Fullerton*, BARBARA A. MELLERS, *University of California, Berkeley*, & GREGORY COFFEY, *California State University, Fullerton*—In four experiments, subjects judged the value of lotteries from different points of view: the most a buyer should pay, the least a seller should accept, and the "fair" price. The rank orders changed, in accord with Birnbaum and Stegner's configural-weight theory, a form of Luce and Narens's dual bilinear theory. Configural weighting may explain otherwise perplexing decision phenomena, but it poses new issues in the measurement of utility and the rationalization of behavior.

5:25-5:35 (302)

Look-Ahead Capability and Sequential Decision Making. A. J. WEARING & A. J. MACKINNON, *University of Melbourne, Australia*—We examined the effect of variation in look-ahead capability on performance in a sequential decision making task, and asked which of three models (expected value, probability, and value) best accounts for the data. Subjects usually look no more than two steps ahead and conform to no one particular model, either between or within individuals. Implications of the findings are discussed, and a theoretical account of them is sketched.

PERCEPTION/ATTENTION
Grand Ballroom A, Sunday Morning, 8:00-11:00

Chaired by Marc Green, University of Louisville

8:00-8:20 (303)

Efficiency of Human Letter Recognition. GEORGE SPERLING & DAVID H. PARISH, *New York University*—In what range of spatial frequencies are letters best recognized? When viewing letters that have been bandpass filtered or perturbed by noise or both, letter recognition results from the combined effects of objectively available information and the observer's ability to utilize it (efficiency). The performance of an ideal observer characterizes presence of information; the comparison of human to ideal performance defines efficiency. Recognition efficiency for filtered letters in noise was highest at 2 cycles per letter, independent of viewing distance.

8:25-8:40 (304)

Perceptual Organization of the Speech Signal: A Dichotic Sentence Test. ROBERT E. REMEZ & RACHEL S. BRESSEL, *Barnard College*, & PHILIP E. RUBIN, *Haskins Laboratories*—Why do the diverse acoustic components of the speech signal cohere? Although principles akin to the laws of form have been offered to account for auditory organization, speech signals often violate these criteria, yet cohere nonetheless. Organization may depend on orderly though complex time-varying properties of the signal, on the evidence of dichotic perceptual tests employing sinusoidal analogs of natural speech. The results may warrant a reconceptualization of organization in the perception of speech.

8:45-9:00 (305)

Auditory Memory and Contrast Effects Around the Vowel Space. JAMES R. SAWUSCH & KAM CHEONG TSOI, *State University of*

New York, Buffalo—Since the first perceptual studies with synthetic speech, contrast effects have been reported in vowel identification. Explanations of these effects in terms of phonetic features, normalization processes, and auditory memory have been proposed and found to be inadequate. The studies to be reported manipulated the temporal interval between vowels using synthetic series from around the English vowel space. The pattern of contrast effects and its relationship to models of vowel identification will be discussed.

9:05-9:25 (306)

Right-Field or Left-Field Advantage for Speech? PIERRE L. DIVENYI & SUSAN K. OLIVER, *VA Medical Center, Martinez, California*—Using a method for generating simulated auditory space through earphones (J. Blauert [1984], *Spatial Hearing*, MIT Press), we obtained stimuli that were ecologically valid analogs to the ubiquitous dichotically presented speech sounds. With this method and an adaptive psychophysical procedure, we measured auditory spatial resolution in the horizontal half-plane for pairs of spatially distributed synthesized speech and nonspeech sounds. Our results suggest the existence of a small but reliable right-field advantage for speech sounds.

9:30-9:45 (307)

A Difference in Processing Between Similar Stimuli. JOHN CERASO & GABRIEL MONK, *Rutgers University, Newark*—When a colored line describes a shape (form/color), the two properties are apprehended concurrently. When a form is described by a repeated smaller form (form/mode), the two properties are apprehended successively. Experiments suggest that the reason for this difference is that form and mode are both shapes, whereas form and color are in different dimensions. It is possible, then, that one cannot process two properties in the same dimension at the same time.

9:50-10:00 (308)

Parallel Visual Search for Conjunctions of Form and Color. JEREMY M. WOLFE, KYLE R. CAVE, & SUSAN L. FRANZEL, *Massachusetts Institute of Technology*—With naive observers, we replicated Treisman's finding that in searches for conjunctions of color and form, reaction time (RT) increases with number of distractors, suggesting serial search. However, after 1,000 trials, RTs for 2 observers were independent of the number of distractors, indicating that they could perform parallel searches for conjunctions. In a search for "triple conjunctions" of color, form, and size, we again found that naive observers conduct serial searches, whereas practiced observers search in parallel.

10:05-10:25 (309)

Comparison of Moving-Spotlight and Gradient Models of Attention. DAVID LaBERGE & VINCENT BROWN, *University of California, Irvine*—Probes were presented with flankers of varied similarity to the probe at and away from center of the visual field. To separate experimentally attention effects from eccentricity effects on reaction time (RT), subjects first identified a single letter or a nine-letter word (which varied attention width). Both statistical and mathematical analyses of RT slopes supported a gradient model over a moving-spotlight model. A theory of attention is proposed in which the gradient is connected to a filter.

10:30-10:40 (310)

Relative Effectiveness of Size and Distance Cues in Visual Attention. JAMES F. JUOLA, ERIC COOPER, & BRUCE WARNER, *University of Kansas*—Displays contained eight letters arranged into an X pattern that contained one R or one L. Response times to the critical letter were influenced by valid and invalid cues of letter size (small or large), letter location (inside or outside a preexposure circle of 1.6° radius), or both. Both types of cues affected response times, and additivity suggested that location cues influence a prestimulus preparation stage of attention, whereas size cues influence a poststimulus selection stage.

10:45-10:55 (311)

Illusory conjunctions in the Processing of Clock Time. PAULA GOOLKASIAN, *University of North Carolina, Charlotte*—This study used a search task to investigate illusory conjunctions among clock times. At issue was the question of whether times are processed holistically, or whether they could be formed from hour and minute components presented concurrently in different stimuli. Clear and consistent differences were obtained between control and conjunction displays, whether the distractor display contained times in the same format (either digits or words) or in a different format. These results are consistent with feature-integration theory.

PROBLEM SOLVING III
Grand Ballroom A, Sunday Morning, 11:10-12:50

Chaired by Gary M. Olson, University of Michigan

11:10-11:25 (312)

Hypothesis Testing: Confirmation Bias or Counterfactual Reasoning. RUSSELL REVLIN & HILARY FARRIS, *University of California, Santa Barbara*—Hypothesis testing is the business of scientists, yet scientists (and students) in rule discovery tasks appear to seek *confirmation* of their hypotheses rather than a critical test of them. The present study traces the strategies of undergraduates in hypothesis testing and rule discovery tasks. Results suggest that students' decisions are far from biased and reflect rational inference processes, including counterfactual reasoning, which superficially resembles confirmation bias.

11:30-11:45 (313)

Visual Discoveries During an Unconstrained Mental Synthesis. RONALD FINKE, *State University of New York, Stony Brook*—A novel experimental procedure reveals that people can often discover recognizable patterns during an imagined synthesis in which the component parts are randomly chosen and are provided without specific instructions as to how they might be assembled. Many of these mentally synthesized patterns were strikingly creative, and few could be predicted in advance simply from knowing what the parts were. These findings demonstrate that mental imagery can be used to make genuine visual discoveries.

11:50-12:05 (314)

A Failure to Transfer from Computer Programming to Algebra Word Problems. GARY M. OLSON & RICHARD CATRAMBONE, *University of Michigan*, & ELLIOT SOLOWAY, *Yale University*—Some have claimed that learning to program a computer will facilitate general problem solving skills. University students taking beginning programming were tested on algebra word problems at the beginning and end of the semester, and compare to comparable students taking a control class. No evidence of transfer was found.

12:10-12:25 (315)

The Effect of Set Size on Spontaneous and Informed Transfer. BARRY S. STEIN, *Tennessee Technological University*—The effect of set size on the transfer of previously presented clues to a problem solving task was investigated. Increasing set size significantly decreased transfer when people were given hints to use information presented earlier in the experiment for the problem solving task, but did not significantly affect transfer when people were uninformed about the relevance of previously presented clues. The findings indicate potential differences in the constraints governing informed and spontaneous transfer tasks.

12:30-12:45 (316)

An On-Line Assessment of Causal Reasoning in the Comprehension of Narrative Texts. CHARLES P. BLOOM, CHARLES R. FLETCHER, LAURA REITZ, & BRIAN SHAPIRO, *University of Minnesota* (sponsored by J. Bruce Overmier)—An experiment provides an on-line assessment of causal reasoning influence on the comprehension of narrative text. A working memory allocation strategy proposed by Fletcher and Bloom (in press) assumes that the most likely causal antecedent to the next sentence is always kept active in working memory. Hypotheses concerning how several text characteristics predicted by this strategy should influence on-line processing were tested. Reading time data from eight texts are presented in support of these hypotheses.

LANGUAGE/DISCOURSE PROCESSING II
Grand Ballroom B, Sunday Morning, 8:00-10:40

Chaired by Joellen T. Hartley, California State University, Long Beach

8:00-8:20 (317)

Understanding Metaphors: Beyond Similarity. SAM GLUCKSBERG, *Princeton University*—According to standard theory, metaphors

are implicit similes. I argue that this view is incorrect. Metaphors are actually true class-inclusion statements. Saying "my job is a jail" assigns "my job" to a newly created class of unpleasant, confining, and so forth, situations. The metaphor vehicle "jail" is used to refer to that class. This new theory explains important metaphor phenomena, and also clarifies why people often use metaphors instead of similes.

8:25-8:45 (318)

Methods for Assessing the Occurrence of Elaborative Inferences. JANICE M. KEENAN & GEORGE R. POTTS, *University of Denver*, & JONATHAN M. GOLDING, *Memphis State University*—One method for determining whether readers make elaborative inferences is to assess activation levels of inference concepts using either recognition, lexical decision, or naming tasks. Results from these tasks are compared for inferences about predictable consequences of events (e.g., death when someone falls from the 14th story). Recognition and lexical decision suggest such inferences are drawn; naming suggests that they are not, unless required for coherence. Lexical decision and recognition may reflect processes occurring during testing rather than reading.

8:50-9:10 (319)

Semantic Association and Inference Processes. GAIL McKOON & ROGER RATCLIFF, *Northwestern University*—The role of semantic associative information in inference processing was investigated with on-line recognition and delayed primed recognition. In both cases, strong semantic associations supported inference processes, as would be expected because semantic associative information is sharply focused and quickly available.

9:15-9:30 (320)

Knowledge and Strategy in Writing. RONALD T. KELLOGG, *University of Missouri, Rolla*—The potential interaction of knowledge and strategy was examined in a thinking task, namely, informative writing. Subjects showed either high or low levels of verbal knowledge and used either an outline, a cluster, or no prewriting strategy. Knowledge and strategy independently influenced document quality and writing efficiency, with no observed interactions.

9:35-9:55 (321)

Context Type Determines Whether Lexical Access is Exhaustive or Selective. PATRIZIA TABOSSI, *University of Bologna, Italy* (sponsored by Thomas Bever)—Several cross-modal lexical decision experiments suggest that lexical access during sentence comprehension is selective or exhaustive, depending on the kind of preceding context. Sentence contexts were designed that either made implausible the subordinate meaning of an ambiguous word, or emphasized a feature of its dominant meaning. Subordinate-implausible contexts facilitated lexical decisions to following targets related to both meanings of the ambiguous word. Feature-priming contexts facilitated targets related to the dominant meaning only.

10:00-10:15 (322)

On-Line Processing of Preexisting Knowledge Misconceptions and Text-Based Inconsistencies. O. VERONIKA PRINZO, *Oberlin College*, & JOSEPH H. DANKS, *Kent State University* (read by Joseph H. Danks)—Comprehension processes operating at the propositional level and situation model were investigated. Subjects read a five-page text containing sentences that were either consistent or inconsistent with the preceding sentence (propositional representation) or with their preexisting knowledge (situation model). On-line reading-time measures indicate that construction of a propositional text base is disrupted by text-based inconsistencies. Information inconsistent with preexisting knowedge had no apparent effect on situation model formation.

10:20-10:35 (323)

Verbal Learning Meets Psycholinguistics. JOLA JAKIMIK & ARTHUR GLENBURG, *University of Wisconsin, Madison* (read by Arthur Glenberg)—In list-learning experiments, coding of temporal order is better for auditory than for visual stimuli. When comprehending discourse, will order of mention of referents be better preserved when passages are heard or read? Subjects attempted to resolve temporal anaphors (former, latter) and semantic anaphors. Performance on temporal anaphors was better when passages were heard, demonstrating superior temporal coding for audition. Performance on semantic (nontemporal) anaphors was equivalent for the modalities. The effects show convergence between verbal learning and language processing.

INFORMATION PROCESSING III

Grand Ballroom B, Sunday Morning, 10:50-12:50

Chaired by Barry H. Kantowitz, Battelle Memorial Institute, Seattle

10:50-11:05 (324)

On the Nature and Specificity of Procedural Learning. MARY JO NISSEN, *University of Minnesota*, DANIEL WILLINGHAM, *Harvard University*, & PETER BULLEMER, *University of Minnesota*—Nonamnesic subjects showed by their reaction times that they learned a repeating spatial sequence even though they were unaware of the sequence and were subsequently at chance in generating it. This implicit procedural learning is neither solely perceptual nor solely motoric; instead, it comprises a sequence of production rules required for response generation. The learning is highly task specific, showing minimal transfer to a situation employing the same motoric sequence. Explicit declarative knowledge may facilitate such transfer.

11:10-11:25 (325)

Visible and Informational Persistence in Iconic Memory. PETER DIXON & VINCENT DiLOLLO, *University of Alberta*—A variety of discrepant results on iconic memory can be explained by assuming that different tasks tap either the *visible* persistence of the stimulus or (nonvisible) *informational* persistence. In the present experiment, we show that both types of persistence can contribute to performance in a bar-probe task. The data can be accurately described by assuming that visible persistence depends on SOA, that informational persistence depends on ISI, and that the two are independent.

11:30-11:45 (326)

Remembering as the Reencoding of Previously Presented Information. DAVID BURROWS, *Skidmore College*—Remembering is considered as the reencoding of previously encoded information. Memory accuracy results from the successful regeneration of information during reencoding. Successful regeneration occurs when operations involved in encoding an item overlap with encoding operations from a previous encoding of that item. Factors leading to stability of encoding will enhance memory accuracy. The role of context in reencoding is considered, along with effects of retention interval, ensemble set size, and levels of processing.

11:50-12:00 (327)

Order of Character Analysis and Parafoveal Identification Asymmetry. GARVIN CHASTAIN, ANNE BOYLAN, BYRON BURTON, & KELLI FAIRLESS, *Boise State University*—A parafoveally presented target character usually is identified more accurately when flanked by a nontarget character to its foveal side than when flanked by one to its peripheral side. An outside-in analysis process produced by uncertainty about the target's position could contribute to this asymmetry. Current results revealed a greater asymmetry with relative target position blocked than with it mixed over trials, suggesting that target position uncertainty leads to inside-out, rather than outside-in analysis.

12:05-12:25 (328)

Simple Tests Distinguishing Sequential and Concurrent Processes in Task Networks. RICHARD SCHWEICKERT & JAMES T. TOWNSEND, *Purdue University*, & DONALD L. FISHER, *University of Massachusetts* (read by James T. Townsend)—Suppose there are two experimental factors, each affecting a different process in a network. Processes are assumed to have random durations. Simple patterns in the reaction times distinguish sequential and concurrent processes. For example, concurrent processes yield underadditive interactions monotonically decreasing with the factor levels. These patterns have been verified with computer algorithms and simulations. The predicted patterns have been found in a double stimulation experiment by Marilyn C. Smith.

12:30-12:45 (329)

Semantic Access and Individual Differences in Reading Ability. PAUL WHITNEY, *Washington State University*, & F. RICHARD FERRARO, *University of Kansas*—A variable SOA matching paradigm was used to obtain semantic encoding functions for adult readers of varying ability levels (as determined by Nelson-Denney scores). Regression analyses indicated that the often obtained correlation between speed of semantic processing and measures of verbal ability is based on the unique con-

tribution of two components of matching tasks: semantic access and decision processes. Implications for an isolable subprocesses view of reading ability will be discussed.

AUTOBIOGRAPHICAL/EYEWITNESS MEMORY
Grand Ballroom C, Sunday Morning, 8:00-10:20

Chaired by Peter A. Ornstein, University of North Carolina, Chapel Hill

8:00-8:15 (330)

Remembering Autobiographical and Nonautobiographical Events. STEEN F. LARSEN, *University of Aarhus, Denmark* (sponsored by Eugene Winograd)—Two experiments using a diary method compared remembering of autobiographical (self-experienced) events with events known from others' reports (e.g., news). Experiment 1 studied students' free recall of their diaries of 1 week's events after 2-3 weeks. Experiment 2 studied my own cued recall and dating of events recorded through 6 months with 1-11 months retention. Both experiments showed that nonautobiographical events were less well remembered and dated than were autobiographical ones. Forgetting curves were parallel and almost linear.

8:20-8:35 (331)

Cued Recall of Randomly Sampled Autobiographical Events. WILLIAM F. BREWER, *University of Illinois, Urbana-Champaign*—A beeper was used to gather randomly sampled events from the lives of naive subjects. The events recorded by the subjects were tested with a cued-recall technique. Examination of the characteristics of the initial events showed that infrequent events and infrequent locations led to accurate recalls. Comparison of recalled events with initial events showed many omissions and retrieval errors, but few reconstructive errors. Subjects reported strong visual imagery during successful recall of autobiographical events.

8:40-8:50 (332)

Children's Memory for Visits to the Doctor. PETER A. ORNSTEIN, BETTY N. GORDON, & DEANNA M. BRADDY, *University of North Carolina, Chapel Hill*—Children at ages 3 and 6 were seen by their pediatricians for a normal checkup and then probed immediately for the details of the physical examination. Independent groups of subjects were retested at intervals of 1 and 3 weeks. Age-related differences in initial and delayed recall are related to children's abilities to provide testimony concerning the details of salient, personally experienced events.

8:55-9:10 (333)

Telescoping in Dating Naturally Occurring Events. CHARLES P. THOMPSON, *Kansas State University*, JOHN J. SKOWRONSKI, *Ohio State University*, & D. JOHN LEE, *Tabor College*—Telescoping effects in date estimation were examined in four diary studies. The data show that substantial telescoping can begin as soon as 8 weeks after an event occurs. The data also show that telescoping cannot be attributed to the clarity-of-memory hypothesis proposed by Bradburn, Rips, and Shevell (1987) or to an artifact produced by guessing. An implicit strategy involving estimation of the number of intervening events is proposed to account for the results.

9:15-9:30 (334)

Eyewitness Memory of Children: Video Versus Live Presentation of Stimuli. MARILYN C. SMITH, *University of Toronto*—Can children's eyewitness testimony be relied upon with regard to suggestibility and accuracy for factual events? Some studies indicate relatively poor performance for children; others show children to be as good as adults. The discrepancy may relate to whether the witnessed event was seen live or presented via video. Subjects in Grade 3, Grade 6, or college witnessed video or live presentations of the identical event. Tests administered immediately and 1 week later indicated poorer performance by children with video presentation.

9:35-9:55 (335)

Troubles with Memory. KAREN A. DONDERS, *University of Leiden, Netherlands*, JONATHAN W. SCHOOLER, *University of Pittsburgh*, & ELIZABETH F. LOFTUS, *University of Washington* (read by Elizabeth F. Loftus)—Subjects saw a naturalistic event, and then read a postevent narrative that included neutral or misleading information about critical details. Finally, they took a recognition test. Reaction times were measured. Even when subjects were accurate about the original details, misinformation caused trouble for memory performance, as evidenced by longer reaction times.

10:00-10:15 (336)

Memory Impairment by Misleading Postevent Information: A Reconciliation. BARBARA TVERSKY & MICHAEL TUCHIN, *Stanford University*—Subjects viewed slides depicting a theft and then read a narrative describing the event containing one item of misleading information. In a subsequent yes/no recognition test, subjects tended to incorrectly reject the viewed information and to incorrectly accept the read information, but to correctly reject a similar but new item. The results can be reconciled with those of Loftus et al. and of McCloskey and Zaragoza. Memory and confidence data support an interference interpretation.

ANIMAL LEARNING AND BEHAVIOR II
Grand Ballroom C, Sunday Morning, 10:30-12:45

Chaired by Joan S. Lockard, University of Washington

10:30-10:45 (337)

Preference for Unpredictability Reversed When Nonreward is Aversive: A Review of Data and Theory. HELEN B. DALY, *State University of New York, College at Oswego*—What do small rewards, immediate rewards, high percentage of rewarded trials, caffeine, and alcohol have in common? Nonreward is not aversive, and rats prefer unpredictable reward situations. What do large rewards, delayed rewards, low percentage of rewarded trials, high motivation level, and ingestion of toxic Lake Ontario salmon have in common? Nonreward is aversive, and rats prefer predictable reward situations. DMOD, a mathematical/computer simulation model, predicts that an underlying preference for unpredictability is reversed when unpredictable nonreward is aversive.

10:50-11:10 (338)

Linear Waiting: A Simple Rule for Behavior in Periodic Food Situations. C. L. WYNNE & J. E. R. STADDON, *Duke University*—Pigeons wait for a time proportional to the expected time to food in periodic food situations such as fixed interval schedules (*linear waiting*). We show in three experiments that they follow this rule even if it fails to maximize food rate, and under two positive-feedback schedules, both of which permit very high food rate, waiting time either converges or diverges, depending upon the "gain," as predicted by a quasi-dynamic waiting theory. Linear waiting may underlie most of the regularities of reinforcement schedule performance.

11:15-11:30 (339)

A Model of the Extinction of Behavior. ROGER L. MELLGREN, *University of Oklahoma*, & TIMOTHY F. ELSMORE, *Walter Reed Institute of Research*—A model of extinction based on foraging processes was developed using computer-generated "statrat" data to compare with real data. The model integrates both discrete trial-runway data and free operant data by assuming underlying processes consistent with the effects seen in both situations. Manipulations of the parameters of the model representing underlying processes produced statrat data comparable to real data when density of reinforcement was varied prior to extinction. The model is useful in clarifying the relationship between discrete trial-runway and free operant effects.

11:35-11:45 (340)

The Effects of Presenting Common Environmental Conditions at Different Times in Delayed Reward Procedures. CHARLES C. PERKINS, *Kansas State University*—Pigeons served in a series of delayed reward experiments designed to clarify the effect of common environmental conditions (CECs) occurring at different points in delayed reward procedures. If all CEC presentations exceed 10-sec duration, birds failed to fully discriminate between prereward and postreward delay CECs or between CECs during food reward. Results of several delayed reward experiments require reinterpretation in view of our demonstration of generalization of secondary reinforcing value across CECs.

11:50-12:00 (341)

Magnitude of Reinforcement and Extended Chain and Tandem Schedules. JAMES S. MacDONALL & MARY E. BACH, *Fordham*

University—Rats were exposed to various reinforcement magnitudes while exposed to extended chain and tandem schedules. For both schedules, a U-shaped function related reinforcement magnitude and response latencies, and an inverted U-shaped function related reinforcement magnitude to response and running rates. We found, as have others, that performance was poorly maintained on chain but not on tandem schedules at small reinforcer magnitudes. However, at larger magnitudes performance was well maintained by both schedules.

12:05-12:25 (342)

Schedule Entrainment: Substitutability Between Activities. ALLISTON K. REID, *Eastern Oregon State College*, & GUSTAVO BACHA MENDEZ & CONCEPCIÓN MORAN MARTINEZ, *Universidad Nacional Autónoma de México*—Various theories of schedule-induced behavior imply that an organism's internal state is modulated within interfood intervals on periodic schedules. We manipulated the cost associated with schedule-induced activities to examine the degree to which (1) the temporal distributions of activities within the interfood interval are fixed or can be temporally displaced, (2) rats can reallocate activities across different interfood intervals, and (3) scheulde-entrained activities can substitute for schedule-induced activities.

12:30-12:40 (343)

The Role of Habituation in Goldfish Schooling. DENIS MITCHELL, STEVE KASPER, & CAMILO MARTINEZ, *University of Southern California*—Goldfish (*Carissius auratus*) were housed in stable, unchanging environments in sets of 6 fish for either 2 or 4 weeks, and then tested for 6 h in a novel environment on 2 consecutive days. Schooling propensity, defined as the reciprocal of the mean interfish distance, showed habituation, sensitization, and spontaneous recovery for both housing conditions, but the fish housed together for 4 weeks showed more robust schooling than those in the 2-week condition.

HUMAN LEARNING/MEMORY IV
West Ballroom, Sunday Morning, 8:00-9:20

Chaired by Peter Graf, University of British Columbia

8:00-8:10 (344)

Learning Alphabets for the Blind: Effects of Information about Structure. CHARLOTTE V. STONE & SLATER E. NEWMAN, *North Carolina State University* (read by Slater E. Newman)—Subjects (N=96) visually studied the Braille or the Fishburne alphabet for 4 or 8 min and were then tested for recall of the letter names. Half of those in each treatment were informed before the study period about the structure of the alphabet to be studied; the rest received no such information. Facilitation occurred only for those who studied the Fishburne alphabet. Some proposals for explaining these results will be discussed.

8:15-8:35 (345)

Practice, Representation, and Strategy in Acquiring Arithmetic Knowledge. LAUREN B. RESNICK & WALTER SCHNEIDER, *University of Pittsburgh*—Acquisition of arithmetic knowledge is reproduced in adults in an artificial "alphamath" task, with letters arbitrarily assigned to digits. Addition facts are extremely difficult to learn when associations are practiced without representational meaning for the letters. Prepractice on successor relations between the letters and strategies such as using fingers to keep track of position make the task manageable. Successful subjects develop mental representations of the alphamath space that resemble children's earliest representations of numbers. Implications for learning interrelated knowledge sets are described.

8:40-8:55 (346)

Cognitive Determinants of Observational Learning: A Causal Analysis. WAYNE R. CARROLL, *University of Arizona*, & ALBERT BANDURA, *Stanford University*—This experiment provided a stringent test of the role of cognitive guidance of action production in observational learning. Subjects viewed an action pattern either two or eight times with or without verbal coding describing the structure of the component actions. Increasing number of model presentations and providing verbal coding enhanced accuracy of reproducing the modeled actions. A causal analysis revealed that the effects of these factors were entirely mediated by changes produced in cognitive representation.

9:00-9:15 (347)

A Beneficial Effect of Part-List Cuing with Unrelated Words. CATHERINE G. PENNEY, *Memorial University of Newfoundland*—Previous experiments have found no beneficial effect of providing some list items as retrieval cues for other words in the list. Support was found for the hypothesis that intralist cues would increase recall when the following conditions were met: (1) subjects form integrated subjective units during learning, (2) not all of these units are recalled in the absence of cues, and (3) appropriate retrieval cues are selected to access these units.

PSYCHOLINGUISTICS II
West Ballroom, Sunday Morning, 9:30-12:35

Chaired by Daniel C. O'Connell, Loyola University of Chicago

9:30-9:40 (348)

Some Variables Affecting Speech Pause Reports. SUSAN CARPENTER, *Georgetown University*, & DANIEL C. O'CONNELL, *Loyola University of Chicago* (read by Daniel C. O'Connell)—Native speakers of French and of English listened to a French poem read by a professional actor, reported occurrence of pauses, and estimated their duration. Occurrence was underestimated, and 38% of reported pauses did not correspond to actual pauses. Duration was also underestimated. Only 2.5% of all shorter pauses ($\leq$0.30 sec) were reported, but even the longest pause (1.30 sec) in the poem was not always reported.

9:45-10:00 (349)

Speech Rate and Duration of Pauses During Thinking Aloud. GERHARD DEFFNER, *University of Hamburg, Federal Republic of Germany*, K. ANDERS ERICSSON, *University of Colorado*, & JURGEN KEMPKENSTEFFEN, *University of Hamburg, Federal Republic of Germany* (sponsored by K. Anders Ericsson)—Verbal protocols collected on two types of tasks were analyzed with respect to their temporal structures. Speech rate and pauses were related to categories of verbalizations reflecting differential amounts of information processing required for their production. After an unsuccessful attempt to find such relations for the first task, the much bigger second body of data provided evidence that will be presented and discussed within the framework of the Ericsson-Simon model of concurrent thinking aloud.

10:05-10:20 (350)

Syntactic and Thematic Contributions to Sentence Complexity: Locatives. SHARI R. SPEER & DONALD J. FOSS, *University of Texas, Austin* (read by Donald J. Foss)—Last year we presented data indicating that both syntactic phrase structure and subcategorization information associated with the verb influence on-line sentence comprehension difficulty. The two experiments presented here replicate and extend the previous work. Subjects were given sentences of the form S V NP PP in visual (self-paced reading) or auditory (phoneme monitoring) tasks. Results indicate faster times for simpler (minimally attached) syntactic structures, but also show that nonpreferred thematic relations increase processing time .

10:25-10:40 (351)

Syntactic Analysis During Idiom Processing. ROBERT R. PETERSON, CURT BURGESS, GARY S. DELL, & KATHY EBERHARD, *University of Rochester* (read by Gary S. Dell)—Syntactic processing of idioms was investigated using a syntactic priming methodology. Subjects named target words that were either syntactically appropriate or inappropriate completions of semantically unrelated sentence contexts. Sentences ended with an incomplete idiom (*kick the*...), and were biased for either a literal (*ball*) or idiomatic (*bucket*) completion. Syntactically appropriate completions were named faster than inappropriate completions for both contextual biases, suggesting that syntactic analysis occurs for both idiomatically and literally interpreted phrases.

10:45-11:05 (352)

The Time Course of Competition for Anaphoric Reference. JANET L. McDONALD & BRIAN MacWHINNEY, *Carnegie-Mellon University* (read by Brian MacWhinney)—Subjects listened to auditorily presented sentences containing two possible referents (either of the same or the opposite gender) followed by an anaphoric pronoun. Subjects were

visually probed with one of the referents at one of four points in each sentence. Results show that the first noun is generally more available than the second at all points, and that significant processing occurs at the pronoun only when there is a gender contrast.

11:10-11:25 (353)

The Time Course of Co-Indexation During Sentence Comprehension. DAVID A. SWINNEY, *Graduate Center, City University of New York*, JANET NICOL, *Massachusetts Institute of Technology*, MARILYN FORD, *Griffith University, Australia*, ULI FRUENFELDER, *Max Planck Institute, Holland*, & JOAN BRESNAN, *Stanford University*—An examination of the nature and time course of co-indexation during sentence comprehension is presented. An on-line cross-modal priming technique is used to examine when and how coreference is established between linguistic gaps (traces) and their antecedents, and between overt pronouns and their antecedents, during sentence processing. It is demonstrated that antecedents for traces are (re)activated upon encountering the verb governing those traces. Occurrence of a pronoun triggers an immediate antecedent-finding process.

11:30-11:45 (354)

Shifting Language Representations in Novice Bilinguals: Evidence from Sentence Priming. JUDITH F. KROLL & LISA BORNING, *Mount Holyoke College*—English-Spanish bilinguals performed a sentence priming task in which sentence fragments in English preceded target words in English or Spanish for lexical decision. All subjects were faster to accept related than unrelated English targets. In Spanish, however, the pattern depended on the subject's level of fluency, with only more fluent subjects producing significant priming. These data support the hypothesis that bilinguals switch from a representation that is initially lexically mediated to one that is conceptually mediated.

11:50-12:05 (355)

Morphemic Segments Shift Faster than Nonmorphemic Controls. L. B. FELDMAN, *University of Delaware and Haskins Laboratories*, & C. A. FOWLER, *Dartmouth College and Haskins Laboratories*—Subjects shifted morphemic and nonmorphemic endings of Serbo-Croatian primes onto compatible target words and named the affixed target aloud. Segment types were matched for phonemic structure. Results indicated a significant effect of morphemic status such that target words whose endings functioned morphemically on the prime were named faster than their nonmorphemic controls.

12:10-12:30 (356)

Learning to Map Both Ways Facilitates Structure Acquisition. THOMAS BEVER & RALPH HANSON, *University of Rochester*—Subjects learned to map phrase-structure-defined strings onto geometric figure arrays. "String-generation" subjects produced symbol strings corresponding to arrays; "string-interpretation" subjects constructed arrays corresponding to strings. "Mixed" subjects alternated between these tasks. Subjects' knowledge of symbol sequence acceptability was periodically probed. Mixed subjects learned the structure dramatically faster than did other subjects. This suggests that natural acquisition of structure underlying symbol-world mapping systems such as language depends on multidirectional mapping experiences.

JUDGMENT/DECISION MAKING II
East Ballroom, Sunday Morning, 8:00-10:25

Chaired by A. J. Wearing, University of Melbourne, Australia

8:00-8:15 (357)

Tactical and Strategic Responsiveness in Risk Taking. LOLA L. LOPES & JEFF T. CASEY, *University of Wisconsin*—In separate sessions, subjects played both offensive and defensive roles of a computerized board game. The game was designed so that subjects were best off if they chose risky moves on offense and conservative moves on defense. Results indicated that subjects' choices in both roles were tactically responsive to whether they were in good or poor game position, but few subjects were strategically responsive to the different requirements of the two roles.

8:20-8:35 (358)

Cognitive Control of a Second-Order System. A. J. MacKINNON & A. J. WEARING, *University of Melbourne, Australia* (sponsored by A. J. Wearing)—Previous research in dynamic decision making has focused on first-order task systems. A number of experiments are reported in which subjects were required to control a second-order task system. This small increase in complexity dramatically reduced performance compared with performance in previous studies. The strategies used by subjects are discussed. It is suggested that human memory limitations are partly responsible for poor performance.

8:40-8:55 (359)

Information Framing Effects: Their Robustness and Interpretation. IRWIN P. LEVIN & GARY J. GAETH, *University of Iowa*, RICHARD D. JOHNSON, *University of Alberta*, & JAN THEEUWES, *Rheinisch-Westfälische Technische Hochschule, Aachen, Federal Republic of Germany*—A series of experiments demonstrates the information framing effect with a variety of stimulus dimensions, presentation modes, and response requirements. The effect is shown to be relatively invariant across manipulations, such as on-line versus memory-based judgments, degree of personal involvement, and individual versus group decisions. An "anchoring and adjustment" model is proposed, in which the anchor is determined by the framing label (e.g., loss or gain) and the adjustment by the modifier (e.g., probability).

9:00-9:15 (360)

Explicit Anchoring Reduces Overconfidence in Estimation. RICHARD A. BLOCK, *Montana State University*, & DAVID R. HARPER, *Bowling Green State University*—Tversky and Kahneman have proposed that overconfidence in the estimation of unfamiliar quantities is a result of the implicit use of a heuristic involving anchoring and insufficient adjustment. However, our data show that forcing subjects to give an explicit anchoring value reduces overconfidence in 50% confidence intervals. A second experiment shows that this reduction in overconfidence is a result of processes involved in generating the anchor, not merely the presence of an anchoring value.

9:20-9:35 (361)

Subjective Judgment with Multiple Versus Single Cues. J. FRANK YATES & JU-WHEI LEE, *University of Michigan*—Inherent predictability (e.g., for productivity) cannot be worse with multiple than single cues (e.g., applicant characteristics). However, previous work has indicated that subjective judgment is sometimes superior and sometimes inferior with multiple cues. New analyses show and explain how conclusions about cue multiplicity effects depend on the accuracy measure employed (i.e., r_a vs. *MSE*). Preliminary results also implicate the influence of dual-cue judgment policies being biased toward information presented to subjects when making single-cue judgments.

9:40-10:00 (362)

A Theory of Subjective Proportions. BARBARA MELLERS & CAROL VAREY, *University of California, Berkeley*, & MICHAEL BIRNBAUM, *California State University, Fullerton*—To examine operations that underlie judgments of proportions, we asked subjects to judge ratios, differences, and proportions of black dots relative to white dots. Results show that the ratio and proportion judgments produce one rank ordering, and difference judgments produce another. The data are consistent with the theory that subjects use the operation instructed with the same scale values across all tasks. In addition, judgments of proportions vary systematically with the context.

10:05-10:20 (363)

Utility-Based Scaling of Verbal Phrases Associated with Probabilities. JAMES L. PHILLIPS, *Oklahoma State University*—Subjects were asked to state prices for which they would buy and sell various lotteries, specified by winning dollar value and by probability of winning. The probabilities were given by various verbal phrases (e.g., *somewhat likely*). Based on mean buying and selling prices, the verbal phrases were scaled along the zero to one interval. The expected (and observed) risk aversion effect was represented with an exponential function of utility in dollars.

JUDGMENT/DECISION MAKING III
East Ballroom, Sunday Morning, 10:35-12:55

Chaired by Hal R. Arkes, Ohio University

10:35-10:55 (364)

Choosing Between Verbal and Numerical Lotteries. THOMAS S. WALLSTEN & IDO EREV, *University of North Carolina, Chapel*

Hill—Subjects chose between lotteries (aW0) and (ap0), in each case winning a if a spinner landed on white and 0 otherwise. In one lottery the spinner p was displayed; in the other it was described by a phrase W, whose meaning was independently quantified as a membership function. For each W, choice probabilities as a function of p depended on a. A model is tested for predicting psychometric from membership functions for each subject.

11:00-11:10 (365)

The Effect of Cue Saliency in Probability Learning Paradigms. THOMAS K. NOONAN & STEPHEN E. EDGELL, *University of Louisville* (read by Stephen E. Edgell)—It was found that one of two abstract cue dimensions in a probability learning environment was much more highly utilized when it was relevant than the other was when it was relevant. This was robust to separating or integrating the cue dimensions and unaffected by their order when separated. These unexpected findings have consequences for research in decision making using a probability learning environment and indicate another flaw in people's ability to process probabilistic information.

11:15-11:25 (366)

Effectiveness of Explicit Counting on Keeping Track of Event Frequency. PHILIP H. MARSHALL & JOSEPHINE BADLEY, *Texas Tech University*—By reporting aloud, subjects kept track of the frequency of occurrence of sequentially presented individual letters. We varied the presentation rate (3 or 6 sec), frequency range (up to 4, 5, 6, 7, or 8), and number of letter instances at each frequency level (1, 2, or 3). Thus, the total letter range was 4-24, and total event range was 10-108. Data are presented on accuracy of keeping track, and on subsequent frequency judgments.

11:30-11:45 (367)

Position and Location Judgments: Motivation, Task, and Visual Field Effects. EVA DREIKURS FERGUSON, *Southern Illinois University, Edwardsville*—Motivation and visual fields affect acquisition of sequential position and spatial location information. Task (testing) characteristics are crucial. Three experiments compared judgment of word (order) position and viewing location (left-right viewed parafoveally, center viewed foveally). Hungry and satiated subjects received five study and test trials. Test order was constant or varied, free recall or paired recall. Depending on testing, motivation significantly affected position judgments, and viewing fields affected location judgments. In all experiments, position and location were processed differently.

11:50-12:10 (368)

Equivalence Class Formation: Effect of Class Structure on Stimulus Function. LANNY FIELDS, *College of Staten Island, City University of New York*—Equivalence class structure is determined by the number of class stimuli that are nodes. To study nodality effects, five-member classes were established by training AB, BC, CD, and DE, bidirectionally. B, C, and D were nodes. Such training induces derived relations separated by one node (AC, DB, CE), two nodes (AD, BE), and three nodes (AE). The strength of derived relations was inversely related to number of nodes separating stimuli in derived pairs. Thus, the structure of an equivalence class influences the functional properties of derived relations that emerge.

12:15-12:30 (369)

Validation of the Computerized Adaptive Armed Services Vocational Aptitude Battery. CLESSEN J. MARTIN & RANDOLPH K. PARK, *U.S. Army Research Institute, Behavioral & Social Sciences*—The Department of Defense is considering the implementation of computerized adaptive testing (CAT) to replace paper-and-pencil (P&P) versions of the Armed Services Vocational Aptitude Battery (ASVAB). The purpose of this research was to examine how well the experimental CAT-ASVAB predicts training performance of 250 army recruits. Results demonstrated at both the subtest level and the composite level that CAT-ASVAB yielded validities higher than those for the P&P-ASVAB.

12:35-12:50 (370)

Biases in Information Seeking and Decision Making. LOUISA M. SLOWIACZEK, *Loyola University of Chicago*, & STEVEN J. SHERMAN, *Indiana University*—We examined the questions subjects chose when testing hypotheses and the confidence in making predictions based on answers to those questions. Question choices suggest biases toward asking questions that (1) are diagnostic, (2) will result in a "yes" answer for the hypothesis rather than the alternative, and (3) are extremely likely or unlikely for the hypothesis. Confidence ratings revealed that the diagnosticity of answers to questions was not taken into account. This led to biases in judgment of sample size. The combination of these biases leads subjects to believe that their hypotheses are confirmed.

DISCRIMINATION/GENERALIZATION: ANIMALS
Aspen Room, Sunday Morning, 8:00-10:55

Chaired by Thomas R. Zentall, University of Kentucky

8:00-8:20 (371)

Short Timing by Pigeons. J. GREGOR FETTERMAN & PETER R. KILLEEN, *Arizona State University*—Pigeons were trained to discriminate short (standard) from long (comparison) time intervals, with the value of the comparison adjusted to maintain 75% accuracy. Standard durations varied over a hundredfold range, between 50 and 5,000 msec, and Weber fractions were approximately constant over this range. In Experiment 2, probe intervals were introduced to generate psychometric functions for time at these brief durations. The psychometric data confirm and extend the earlier results.

8:25-8:35 (372)

Generalized Self-Control of Effort and Stress. ROBERT EISENBERGER, FRED A. MASTERSON, & FRANCES JOHNSON, *University of Delaware*—Different groups of rats received food for each round trip or every fifth round trip in a runway. In one experiment, the rats next chose between pressing a heavy lever for a large food reward and pressing a light lever for a small reward. In another experiment, rats next chose between food plus electric shock and the absence of both food and shock. Required high runway effort increased both types of generalized self-control.

8:40-9:00 (373)

Factors Affecting Conditional Discrimination Learning in Pigeons. DAVID R. THOMAS, *University of Colorado*—A conditional discrimination identifies a four-term contingency in which an operant response (1) is reinforced (2) only in the presence of a particular discriminative cue and (3) only when another (conditional) cue (4) is present. The definition does not specify which stimuli serve conditional or discriminative roles. In a series of experiments with pigeons, we have varied temporal parameters of training, response classes, and stimulus characteristics in an attempt to devise rules determining which function(s) a given stimulus will serve.

9:05-9:20 (374)

Conditional Discrimination of Colors and Odors by Honeybees. P. A. COUVILLON & M. E. BITTERMAN, *University of Hawaii*—Honeybees were trained to discriminate between color-odor compounds, choosing one of two colors on the basis of a common odor, or one of two odors on the basis of a common color. The results could be simulated accurately with a continuity model on the assumption of compound-unique components, which (like all other components) function in accordance with the independence and summation rules.

9:25-9:35 (375)

Behavioral Contrast: Varying Component Duration for Keypecking and Treadlepressing. FRANCES K. McSWEENEY & CAM L. MELVILLE, *Washington State University*—The functions relating multiple-schedule behavioral contrast to component duration are different for keypecking and treadlepressing. The present experiments ruled out procedural problems and physical interactions among responses as explanations for these differences. The results question whether contrast occurs in the same way for all responses; they support the use of a new contrast procedure; and they show that the decrease in keypeck contrast with increases in component duration is robust.

9:40-9:55 (376)

Local Contrast in a Closed Economy. JOHN A. NEVIN, *University of New Hampshire*—Pigeons obtained all their food on variable-interval (VI) schedules in closed sessions. Signaled schedule components alternated every 7 days. Response rates were enhanced for 24-48 h after transition from VI 5-min to VI 1-min reinforcement, and depressed for 24 h after transition from VI 1-min to VI 5-min reinforcement. These local contrast effects are functionally similar to those observed for 15-30 sec in conventional daily sessions with short multiple-schedule com-

ponents, suggesting that contrast processes may expand in proportion to the time available.

10:00-10:10 (377)

Discrete and Continuous Measures of Dimensional Contrast. JOHN HINSON, *Washington State University*—Pigeons were trained to discriminate multiple positive and negative values of a visual flicker-rate continuum for food reinforcement. In various conditions of the experiment, discrimination performance was assessed with discrete-trial and free-operant procedures. Reliable dimensional contrast effects readily appeared with continuous response measures, but not with discrete response measures. These results indicate that dimensional contrast effects may be due to increased variability in discrimination criteria.

10:15-10:30 (378)

Sequential Effects and Stimulus Generalization. JOHN C. MALONE & TIMOTHY L. CLEARY, *University of Tennessee, Knoxville*—Several different sequences of line-orientation stimuli comprising maintained generalization gradients were presented to different groups of pigeon subjects. Occasional food was available for responses to the two extreme orientations, vertical and horizontal. "Steady-state" gradients differed among groups. Sequential interactions that appear only early in training, before final gradient form is evident, may both predict and determine subsequent gradient form.

10:35-10:50 (379)

Contextual Control of Latent Inhibition. WILLIAM C. GORDON & MELANIE S. WEAVER, *University of New Mexico*—Rats were preexposed to a tone in a particular context (A). Later, the rats received tone-food pairings either in Context A or a novel context (B), and activity in the presence of the tone was measured. Latent inhibition effects were found only when tone preexposures and conditioning occurred in the same context. However, latent inhibition did occur in Context B if rats were reminded of the preexposures in that context before conditioning.

HUMAN LEARNING V

Aspen Room, Sunday Morning, 11:05-12:50

Chaired by Diane F. Halpern, California State University, San Bernardino

11:05-11:20 (380)

Properties of Generated Ballads: Evidence of Knowledge that Constrains Recall and Stabilizes Memory. WANDA T. WALLACE, *Duke University* (sponsored by David C. Rubin)—To assess singers' knowledge of ballad characteristics, eight traditional ballad singers were asked to generate a ballad from a newspaper article. They produced novel ballads of about 15 lines in about 12 min and showed knowledge of both poetic and meaning structures that are typically found in ballads. The results indicate that singers are aware of characteristics that tend to stabilize the ballad tradition by constraining recall.

11:25-11:40 (381)

Overt Versus Covert Responding and the Size of the Generation Effect. MARGARET H. THOMAS, LoJUAN HOWARD, & JoANN RULLO, *University of Central Florida*—In experiments investigating the generation effect, subjects are usually required to write or say aloud both the read and generated items during list presentations. We found the well-known recall advantage of generated over read words to be reduced when subjects processed the items silently and without writing them. These results support the hypothesis that read items are subject to less consistent semantic processing than are generated items.

11:45-12:05 (382)

A Multiple-Cue Model of Generation Activity. SAL A. SORACI, JR., JEFFREY J. FRANKS, & JOHN D. BRANSFORD, *Vanderbilt University*, & RICHARD A. CHECHILE, *Tufts University* (read by Richard A. Chechile)—Although there have been numerous instantiations of the generation effect with a wide range of encoding rules, most explanations of this phenomenon have focused on "effort" interpretations involving enhanced elaboration, integration, and so forth. A delineation of this effortful processing is important in understanding generation activity per se. Research reported here suggests that a series of semantic and episodic linkages are established via the generation of multiple cues, and that these generated cues are critical in facilitating free recall and recognition.

12:10-12:30 (383)

Modality Effects in Recoded Stimuli. SUSAN KARP MANNING & LAURA KOEHLER, *Hunter College, City University of New York*—Normal subjects learned English translations of ASL signs and pronounceable nonwords presented graphemically and auditorily. In written recall of the English words, standard recency and suffix effects appeared with auditory but not with visual presentation conditions. Thus ASL, contradicting prior findings, "acts visual" with hearing subjects. Standard modality effects occur when translation is forced regardless of presentation modality, thus casting doubt on both changing-state and primary-linguistic theories of recency and suffix effects.

12:35-12:45 (384)

Failure of Knowledge Composition and Use of Working Memory in Procedural Skill. RICHARD A. CARLSON, *Pennsylvania State University*, & WALTER SCHNEIDER, *University of Pittsburgh* (sponsored by David Palermo)—Subjects in several experiments received extensive practice judging outputs of digital logic components. Subjects also made judgments in the retention interval of task-relevant or -irrelevant working memory loads. Results indicate that these causal judgments are not composed as would be predicted by Anderson (1983) even after extensive practice. The use of working memory to assemble information for judgments shows little change with practice. Implications for theories of skill acquisition and working memory are discussed.