CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

Contents

Preface to the second edition *page* xiii
Acknowledgments xvi

1 The evolution, development, and modification of behavior 1
Canalization 3
Explanation 4
Function, causation, and teleonomy 6
Evolution and development 9
Epigenesis and genetic assimilation 13
Lamarck, Darwin, and gemmules 17
Early environment 20
Summary 22

2 Variation and selection: kineses 24
Simple orienting mechanisms 24
Indirect orientation (kineses) 26
Neurophysiology and behavior 35

3 Reflexes 38
Volition and the mind-body problem 40
Sherrington's reflex 41
Individual reflexes 43
Threshold 43
Latency 44
Refractory period 45
Temporal summation 45
Spatial summation 46
Momentum (after discharge) 47
Habituation 47
Rate sensitivity 48
Reflex interaction 52
Reciprocal inhibition (competition) 53

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

Cooperation 54
Successive induction 55
Averaging 61
Inhibition and reflex strength 62
Summary 66

4 Direct orientation and feedback 67
Taxes 67
Klinotaxis 67
Tropotaxis 70
Light-compass reaction 73
Telotaxis 74
Feedback analysis 75
Dynamic analysis 78
Frequency analysis 80
Three simple feedback responses 85
When is feedback useful? 88
Behavioral integration and the role of variability 90
The nature of explanation 95
The meaning of "black-box" analysis 95
Purpose, teleology, and mechanism 96
Summary 98
Appendix A4.1 99
Linear systems analysis 99

5 Operant behavior 102
Operant behavior and B. F. Skinner 102
Causal and functional analysis of operant behavior 104
Parallel models 108
Operant behavior and learning 112
Information theory 115
Operant and classical conditioning: overview 116
Habituation 116
Sensitization 118
Pseudoconditioning 118
Classical conditioning 119
Operant conditioning 120
Generalization and discrimination 122
The logic of historical systems 124
Finite-state systems 125
Equivalent histories and the experimental method 127
Between-groups experiments: averaging data 128
Within-subject method 131

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

Memory 132
Summary 133

6 Reward and punishment 135
Reinforcement and the law of effect 137
Experimental methods 142
The Skinner box 144
Response- and time-based schedules of reinforcement 146
Equilibrium states 151
Classical conditioning 154
Contingency and feedback functions 156
Contingency space 161
Temporal and trace conditioning 163
Response contingencies and feedback functions 165
Feedback functions for common schedules 168
Ratio schedules 168
Interval schedules 168
Interlocking schedules 169
Escape, avoidance, and omission schedules 171
Shock postponement 171
Detection of response contingency 172
Summary 174

7 Feeding regulation: a model motivational system 175
Reinforcement and homeostasis 175
Obesity and schedule performance: a static analysis 179
The meaning of brain lesion experiments 181
The effects of hypothalamic lesions on eating 182
A regulatory model 185
Finickiness 191
Response to dilution of diet 191
Weak defense of settling weight 192
Improved defense of low settling weights 194
Poor adaptation to work requirements 194
Effects of taste and body weight on work schedules 197
Other motivational effects 198
Limitations of the linear model 199
Human obesity 200
Derivations 202
Summary 203

8 The optimal allocation of behavior 205
Time constraints and behavioral competition 206

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

Rate and time measures 206
The allocation of behavior 209
Income and substitution effects 211
Value, reinforcement, and Darwinian fitness 214
Optimal allocation 215
The minimum-distance model 218
Prediction of response functions 223
Bliss point and characteristic space 225
Substitutability and indifference curves 226
Marginal value and substitutability 229
Experimental applications 231
Reinforcement constraints 235
Summary 240

9 Choice: dynamics and decision rules 242
Real time: the cumulative record 244
Choice dynamics and the law of effect 244
Random-ratio choice 247
Identical random ratios 249
Concurrent variable-interval schedules 257
Optimal choice 259
Probability learning 260
Delayed outcomes: "self-control" 263
Temporal discounting 266
Variable outcomes: risk 268
Human choice, risk, and behavioral economics 269
Matching and maximizing 276
Marginal value and momentary maximizing 277
Concurrent VI–VI 278
Momentary maximizing 280
Concurrent VI–VR 285
Summary 286

10 Foraging and behavioral ecology 287
Diet selection and functional response 287
Functional response 288
Diet choice 290
Switching 292
1. Absolute density changes 293
2. Nonrandom spatial distribution 294
3. Changes in profitability with experience 294
4. Changes in effective density with experience 295
Search image 296

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

Receiver operating characteristic (ROC) analysis 297
Ecological implications 302
Nutrient constraints and sampling 305
Natural feedback functions 307
Summary 309
Appendix A10.1 310
The effect of prey density on prey risk 310
Appendix A10.2 311
Switching and functional response 311
Appendix A10.3 312
Foraging in a repleting food source 312

11 Stimulus control and cognition 313
Discriminative and eliciting stimuli 314
Stimulus equivalence and data structure 316
Analog versus digital coding 318
Psychophysics and similarity 319
Measuring stimulus control 320
Stimulus generalization 323
Generalization gradients 323
Compounding of elements 325
Stimulus control and reinforcement: variation and attention 326
Attention 328
Attention to different dimensions 329
Similarity 334
Maps 337
Multidimensional scaling 340
Spatial representation as a data structure 341
Summary 343

12 Stimulus control and performance 345
Inhibitory and excitatory control 345
Feature effects 346
Behavioral contrast and discrimination performance 348
Schedule-induced behavior 351
Intertemporal effects 353
Inhibitory generalization gradients 356
Conjoint stimulus control and peak shift 359
Historical Note: Spence's Theory of Transposition 366
Transitive Inference 367
Dynamic effects in multiple schedules 369
Stimulus effects 374
Summary 375

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

13 Molar laws 377
Matching and optimality 377
Matching and minimum distance 378
Contrast and matching 379
1. Simple VI (single-response case) 380
2. Concurrent VI–VI (two-response case) 380
3. Multiple VI–VI 381
Boyle and the molar law 384
Historical review 384
Resistance to change 387
A continuous model 390
Multiple VI–VI 391
Multiple VI–VI–VT 391
CMP Model: Conclusion 393
Problems 393
Summary 397

14 Time and memory, I 398
Temporal control 398
The reinforcement omission effect 400
Excitatory and inhibitory temporal control 403
Conditions for temporal control 405
Timing and fixed-ratio schedules 408
Characteristics of the time marker 409
Overshadowing 415
Conclusion: the discrimination of recency 415
Time estimation 416
Proaction and retroaction 418
Summary 419

15 Time and memory, II 421
Discrimination reversal and learning set 423
Reversal learning in human infants 426
The serial position effect (SPE) 428
Learning set 428
Learning dynamics 429
Memory and spatial learning 430
The radial-arm maze 431
Radial-maze performance 431
A two-part code 433
Spatial code 433
Temporal code 433

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

Response rule 434
Spatial effects 435
Temporal effects 437
Other spatial situations 438
The route finder 441
Summary 443

16 Template learning 445
Imprinting 446
Song learning 451
Summary 455

17 Learning, I 457
Bees 458
Learning as program assembly 459
Reinforcement and learning 460
Latent learning 461
Inference 463
Partial reinforcement 465
Bayes' rule 466
Taste-aversion learning 467
Delay-of-reward gradient 471
The order of learning 472
What is learned? 473
Surprise 473
Methodology 477
Expectation and classification 478
Learning and classification 479
Recognition and expectation 483
Summary 484

18 Models of classical conditioning 486
Inference and classical conditioning 486
Contingency space 487
Blocking 488
Conditioning to novel tastes 488
Latent inhibition 488
Preexposure to the US 488
Models for conditioning 490
New learning model 496
Conclusion: trial-level models 499
Temporal variables 500

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-107-44290-0 — Adaptive Behavior and Learning
J. E. R. Staddon
Table of Contents
More Information

19 Learning, II 501
Classical conditioning and the origins of operant behavior 503
The "superstition" experiment 506
Behavioral variation: the origins of operant behavior 511
Inference, action, and operant conditioning 512
Misbehavior 514
Behavioral variation and sampling 515
The guidance of action 516
Initial state 516
Selection rules 519
Response–reinforcer contiguity 519
Shaping 523
Feedback function 525
Schedule-induced behavior 526
Conclusion: operant learning 529
Summary 529

20 Learning, III: procedures 532
Conditioned reinforcement 532
Concurrent chained schedules 536
On the virtues of optimality analysis 539
Quasi-reinforcement 539
Second-order schedules 541
Conditioned emotional response 542
Anxiety? 543
Avoidance and escape 544
Limits to variation: response-produced shock and "learned helplessness" 548
Learned helplessness (LH) 550
Sampling versus exploitation 551
Extinction 554
Summary 561

21 Comparative cognition 563
Insight 564
Fast mapping 567
Metacognition 569
The logic of metacognition 572
Summary 577

Index 579

© in this web service Cambridge University Press www.cambridge.org