

CONTENTS

Preface to the first edition xi

Preface to the second edition xiii

Part I: The Physiological Basis of Visual Perception

1 Light and Eyes 1
Light and the Information it Carries 2
The Evolution of Light-Sensitive Structures 7
The Adaptive Radiation of the Vertebrate Eye 16
Conclusions 28

2 The Neurophysiology of the Retina 31
The Retina of the Horseshoe Crab 31
The Vertebrate Retina 36
The Output of the Retina 38
Retinal Mechanisms 45
Conclusions 48

3 Visual Pathways in the Brain 49
The Visual Cortex 52
The Functions of the Visual Pathway 60
Beyond the Striate Cortex 65
Conclusions 72

Part II: Processing Retinal Images

4 Introduction: Approaches to the Psychology of Visual Perception 73
Overview of Marr's Theory of Vision 78

5	The Raw Primal Sketch	81
	The Marr-Hildreth Algorithm	87
	Other Routes to the Raw Primal Sketch	94
	Conclusions	103
6	Perceptual Organisation	105
	Ambiguous Pictures	106
	Gestalt Laws of Organisation	110
	Recent Approaches to Perceptual Organisation	115
	Concealment and Advertisement	121
	Perceptual Organisation in Other Species	125
	Why do the Gestalt Laws Work?	127
	Artificial Intelligence Approaches to Grouping	128
	Conclusions	139
7	Perceiving Depth and Movement	141
	Perceiving the Third Dimension	141
	Observer Movement and Object Motion	159
	Marr's Theory of the 2½D Sketch	168
	Integrating Information from Successive Fixations	170
8	Object Recognition	175
	Simple Mechanisms of Recognition	177
	More Complex Recognition Processes	179
	Marr and Nishihara's Theory of Object Recognition	190
	Beyond Generalised Cones	196
	Conclusion	202
9	Connectionist Models of Visual Perception	203
	Satisfying Constraints—Marr and Poggio's (1976) Algorithm	204
	Mapping Between Coordinate Systems	206
	Learning to Recognise Patterns	211
	Concluding Remarks	219

Part III: Detecting Information in the Transforming Optic Array

- 10 Introduction to the Ecological Approach to Visual Perception 223**
J. J. Gibson's Theory of Perception 224
- 11 Visual Guidance of Animal Locomotion 241**
How Animals Move About 241
How Insects Steer a Straight Course 243
Detecting Surfaces 251
Detecting Distance 255
Conclusions 265
- 12 Visual Guidance of Human Action 267**
Postural Adjustments 268
Walking, Running and Jumping 272
Driving Cars 278
Ball Games: Catching and Hitting 282
- 13 The Computation of Image Motion 287**
Early Motion Computation 289
The Integration of Motion Measurements 298
More Complex Properties of Optic Flow 305
Conclusions 309
- 14 Theories of the Control of Action 311**
The Optomotor Response 312
The Control of Human Action 314
Conclusions 320
- 15 Event Perception 321**
The Perception of Relative Motion 321
Biological Motion 327
The Perception of Causality 333
Perception and Attribution 338

16 Perception of the Social World	343
Perceiving Other Animals' Behaviour	344
Recognition of Individuals	357
Human Face Perception	360
Concluding Remarks	374

Part IV: Conclusions

17 Contrasting Theories of Visual Perception	375
The Nature of the Input	376
Direct and Indirect Theories of Perception	377
Concluding Comments	389

References	393
-------------------	------------

Glossary	413
-----------------	------------

Author Index	419
---------------------	------------

Subject Index	425
----------------------	------------