CONTENTS

Preface *page xii*

Chapter 1 Passive vision and active vision *page 1*

1.1 Introduction *page 1*
1.2 Passive vision *page 1*
1.3 Visual attention *page 3*
1.4 Active vision *page 4*
1.5 Active vision and vision for action *page 6*
1.6 Outline of the book *page 7*

Chapter 2 Background to active vision *page 9*

2.1 Introduction *page 9*
2.2 The inhomogeneity of the visual projections *page 10*
  2.2.1 Introduction *page 10*
  2.2.2 Physiology of the visual projections *page 11*
  2.2.3 Psychophysical performance in peripheral vision *page 14*
  2.2.4 Comparison of psychophysical and physiological measures *page 16*
2.3 Parallel visual pathways *page 17*
  2.3.1 Magnocellular and parvocellular systems *page 17*
  2.3.2 Visual processing in the cortex *page 19*
2.4 The oculomotor system *page 21*
  2.4.1 The muscles of the eye *page 21*
  2.4.2 Classification of eye movements *page 22*
2.5 Saccadic eye movements *page 25*
  2.5.1 Characteristic of saccades *page 25*
  2.5.2 Combining saccadic movements with pursuit and vergence *page 29*
  2.5.3 Saccadic suppression *page 31*
  2.5.4 Physiological pathways for saccadic eye movements *page 32*
2.6 Summary *page 34*

Chapter 3 Visual selection, covert attention and eye movements *page 35*

3.1 Covert and overt attention *page 35*
3.2 Covert spatial attention *page 36*
  3.2.1 Spotlights *page 38*
  3.2.2 Zoom lens accounts of attention *page 39*
  3.2.3 Late vs. early selection models of attention *page 40*
  3.2.4 The visual benefits of covert spatial attention *page 41*
3.3 The relationship between covert and overt attention *page 42*
  3.3.1 Klein's independence account *page 42*
  3.3.2 The sequential attentional model *page 43*
  3.3.3 The pre-motor theory of attention *page 44*
3.4 Speed of attention *page 46*
3.5 Neurophysiology of attention *page 48*
3.6 Non-spatial attention *page 50*
  3.6.1 Attention to objects *page 50*
  3.6.2 Attention to visual properties *page 52*
3.7 Active vision and attention *page 52*
3.8 Summary *page 54*

Chapter 4 Visual orienting *page 55*

4.1 Introduction *page 55*
4.2 What determines the latency of orienting saccades? *page 56*
  4.2.1 Target properties *page 56*
  4.2.2 The gap effect *page 57*
  4.2.3 The remote distractor effect *page 59*
  4.2.4 Express saccades *page 60*
  4.2.5 Variability in latencies *page 61*
4.3 Physiology of saccade initiation *page 62*
  4.3.1 Burst and pause cells in the reticular formation *page 62*
  4.3.2 Fixation, burst and buildup neurons in the superior colliculus *page 65*
  4.3.3 Variability of saccade latencies *page 68*
4.3 What determines the landing position of orienting saccades? *page 68*
  4.4.1 Corrective saccades *page 69*
  4.4.2 The double step paradigm *page 69*
  4.4.3 The double target paradigm *page 72*
  4.4.4 Parallel processing of saccades *page 73*
  4.4.5 Antisaccades *page 74*
4.5 Physiology of the WHERE system *page 75*
  4.5.1 Spatial coding and the saccadic system *page 77*

4.6 The Findlay and Walker model *page 77*
4.7 Development and plasticity *page 79*

Chapter 5 Visual sampling during text reading *page 83*

5.1 Introduction *page 83*
5.2 Basic patterns of visual sampling during reading *page 84*
5.3 Perception during fixations in reading *page 87*
5.3.1 Gaze-contingent methodologies *page 87*
5.3.2 Measurement of the perceptual span *page 89*
5.3.3 Preview benefit *page 90*
5.4 Language processing *page 91*
5.4.1 Lexical access: influences on the speed of word recognition *page 91*
5.4.2 Optimal viewing position *page 93*
5.5 Control of fixation duration *page 94*
5.6 Control of landing position *page 95*
5.6.1 Skipping words *page 97*
5.6.2 Can linguistic variables influence landing position within words? *page 98*
5.7 Theories of eye control during reading *page 99*
5.7.1 Models emphasizing non-cognitive factors *page 99*
5.7.2 Models driven by the lexical access process *page 100*
5.7.3 Evaluation *page 101*
5.8 Practical aspects of eye control in reading *page 102*
5.8.1 Reading and the physical characteristics of the text *page 102*
5.8.2 Dyslexia *page 102*
5.9 Overview *page 103*

Chapter 6 Visual search *page 105*

6.1 Visual search tasks *page 105*
6.2 Theories of visual search *page 106*
6.2.1 Feature integration theory *page 106*
6.2.2 Guided search *page 108*
6.2.3 A late-selection model of visual search *page 108*
6.2.4 Overview of the models *page 109*
6.3 The need for eye movements in visual search *page 109*
6.3.1 Search without eye movements *page 110*
6.3.2 Visual search and the conspicuity area or visual lobe *page 111*
6.4 Eye movements in visual search *page 112*
6.4.1 Saccades in parallel and serial visual search *page 112*
6.4.2 Processing within an eye fixation during visual search *page 113*
6.4.3 Guidance of saccades in visual search *page 115*
6.4.4 Saccades in visual search: latencies and fixation durations *page 116*
6.4.5 Saccades in visual search: landing positions *page 117*

6.5 Ocular capture in visual search *page 119*
6.6 Saccades in visual search: scanpaths *page 120*
6.7 Physiology of visual search *page 124*
6.8 Summary *page 126*

Chapter 7 Natural scenes and activities *page 129*

7.1 Introduction *page 129*
7.1.1 Early studies of picture scanning *page 130*
7.1.2 Average characteristics of eye movement patterns during picture viewing *page 132*
7.1.3 Scanpaths *page 133*
7.1.4 The gaze selects informative details *page 134*
7.2 Analytic studies of scene and object perception *page 135*
7.2.1 Scenes and objects *page 135*
7.2.2 Theories of object perception and scene perception *page 135*
7.2.3 Are eye movements necessary for scene and object perception? *page 137*
7.2.4 Object perception in peripheral vision *page 139*
7.2.5 Scene context and object perception *page 140*
7.2.6 Change blindness *page 143*
7.3 Dynamic scenes and situations *page 145*
7.3.1 Deictic vision *page 145*
7.3.2 Vision supporting everyday actions *page 147*
7.4 Summary *page 149*

Chapter 8 Human neuropsychology *page 151*

8.1 Blindsight *page 152*
8.2 Neglect *page 155*
8.3 Balint's syndrome and dorsal simultanagnosia *page 159*
8.4 Frontal lobe damage *page 160*
8.5 Orienting without eye movements *page 162*
8.5.1 Peripheral neuropsychology *page 163*
8.5.2 Reading without eye movements *page 164*
8.5.3 Saccadic head movements *page 165*
8.6 Summary *page 167*

Chapter 9 Space constancy and trans-saccadic integration *page 169*

9.1 The traditional approach: 'compensatory taking into account' *page 169*
9.2 Trans-saccadic integrations *page 171*
9.2.1 Detection of displacement during saccades *page 171*
9.2.2 Trans-saccadic fusion *page 172*

9.2.3 Localisation of peri-saccadic probes *page 172*
9.2.4 Memory guidance of saccades *page 174*
9.3 Resolution of the conflicting results *page 175*
9.3.1 Target displacements during saccades can be detected under some circumstances *page 175*
9.3.2 A revised theory of space constancy and trans-saccadic integration *page 176*
9.3.3 The neurophysiology of trans-saccadic processes *page 178*
9.4 Conclusion: The Active Vision Cycle *page 178*
9.5 Future directions *page 180*

References *page 181*

Index *page 215*