Contents

List of contributors ix

Foreword xi

Section 1: Background and Context 1

1 Visual hallucinations: history and context of current research 3
   G.E. Berrios and Ivana S. Marková
   1.1 Introduction 3
   1.2 The construction of visual hallucinations 5
   1.3 Epistemology: dichotomies 11
   1.4 Research and its vicissitudes 15
   1.5 Bringing the history of visual hallucinations and research together 17
   1.6 Conclusions 18
   1.7 References 19

2 Defining and measuring hallucinations and their consequences – what is really the difference between a veridical perception and a hallucination? Categories of hallucinatory experiences 23
   Jan Dirk Blom
   2.1 What every student knows 23
   2.2 Suspended between realism and anti-realism 24
   2.3 Faith 26
   2.4 The philosophy of As If 28
   2.5 Visual hallucinations 28
   2.6 Visual illusions 30
   2.7 Metamorphopsias (visual distortions) 34
   2.8 Ways of measuring and quantifying positive disorders of vision 37
   2.9 Concluding remarks 38
   2.10 References 40

3 Hallucinatory aspects of normal vision 47
   Geraint Rees
   3.1 Introduction 47
   3.2 Gregory’s taxonomy 48
## CONTENTS

3.3 Blind spot and scotomas 49  
3.4 After-images and after-effects 50  
3.5 Perceptual ambiguity and multistable perception 51  
3.6 Illusory contours and surfaces 52  
3.7 Object perception and illusory vision 53  
3.8 Conclusion 55  
3.9 References 55  

4 Non-pathological associations – sleep and dreams, deprivation and bereavement 59  
*Armando D’Agostino, Anna Castelnovo, and Silvio Scarone*  
4.1 Introduction 59  
4.2 Visual hallucinations in the general population 60  
4.3 Visual hallucinations during sleep and sleep/wake transitions 67  
4.4 Trauma, grief and bereavement 74  
4.5 Sensory deprivation 83  
4.6 The Bayesian heuristic: a unifying model? 84  
4.7 Conclusions: the psychosis continuum 85  
4.8 References 86  

5 The clinical associations of visual hallucinations 91  
*Marco Onofri, Astrid Thomas, Giovanni Martinotti, Francesca Anzellotti, Massimo Di Giannantonio, Fausta Ciccocioppo, and Laura Bonanni*  
5.1 Introduction 91  
5.2 Describing hallucinations 93  
5.3 Visual hallucinations associated with visual loss 93  
5.4 Visual hallucinations in acute vascular or neoplastic lesions 94  
5.5 Visual hallucinations in neurodegenerative diseases 94  
5.6 Visual hallucinations associated with dementia 99  
5.7 Creutzfeldt-Jakob disease 101  
5.8 Visual hallucinations in psychosis 102  
5.9 Drug-induced hallucinations 104  
5.10 Delirium 105  
5.11 Epilepsy 105  
5.12 Migraine 107  
5.13 Inborn errors of metabolism 108  
5.14 Commentary 108  
5.15 References 110  

Section 2: Investigations and Data 119  

6 Hallucinogenic mechanisms: pathological and pharmacological insights 121  
*Simon J.G. Lewis, James M. Shine, Daniel Brooks, and Glenda M. Halliday*  
6.1 Introduction 121
CONTENTS

6.2 Societal impact 122
6.3 Misperceptions and hallucinations 122
6.4 Pathological findings in clinical disorders with high levels of hallucinations 125
6.5 Role of neurotransmitters in hallucinations 130
6.6 A common neural mechanism 132
6.7 Conclusion 138
6.8 References 139

7 Imaging in visual hallucinations 151
Anne Marthe Meppelink
7.1 Introduction 151
7.2 Imaging the hallucinator 152
7.3 Imaging the hallucination 158
7.4 References 163

8 EEG and transcranial magnetic stimulation. Changing and recording the dynamic flow of visual perception 167
Nicholas Murphy, Sara Graziadio, and John-Paul Taylor
8.1 Introduction 167
8.2 Electroencephalography 168
8.3 Transcranial magnetic stimulation 179
8.4 Future directions for the study of visual hallucinations using neurophysiological approaches 184
8.5 References 186

9 Neuropsychological approaches to understanding visual hallucinations 193
Jim Barnes
9.1 Introduction 193
9.2 Perceptual impairments 195
9.3 Misidentifications of internal images 196
9.4 Executive function 199
9.5 Attention and vigilance 201
9.6 Questions and future directions 204
9.7 References 210

Section 3: Models and Theories 217

10 Geometric visual hallucinations and the structure of the visual cortex 219
Jack D. Cowan
10.1 Introduction 219
10.2 A new mathematical formulation of V1 circuitry 228
10.3 Conditions for the loss of stability of the homogeneous state 232
10.4 Extensions of the model 238
CONTENTS

10.5 Summary and concluding remarks 
10.6 References

11 Thalamic and brainstem regulatory systems – why 
disturbances external to the visual system can cause 
hallucinations 255
René M. Müri
11.1 Introduction 255
11.2 Overview of the cases published with peduncular hallucinations 257
11.3 Aetiology and lesion localization contributing to peduncular hallucinations 269
11.4 Origin and mechanisms of peduncular hallucinations 270
11.5 References 275

12 The pathology of hallucinations: one or several points 
of processing breakdown? 281
Nico J. Diederich, Christopher G. Goetz, and Glenn T. Stebbins
12.1 Introduction 281
12.2 Requirements for an ideal model 282
12.3 Phenomenology – a clue to pathogenesis? 282
12.4 Early unimodal models of pathogenesis 283
12.5 Neuropathological findings 287
12.6 Interactive, multifactorial models 290
12.7 Conclusions and outlook 299
12.8 References 301

Section 4: New Directions 307

13 Future directions for research 309
Daniel Collerton, Urs Peter Mosimann, and Elaine Perry
13.1 Introduction 309
13.2 References 318

14 The treatment of visual hallucinations at present and in 
the future 321
Elaine Perry, Urs Peter Mosimann, and Daniel Collerton
14.1 Introduction 321
14.2 Excluding drugs that induce visual hallucinations 323
14.3 Drug treatment of visual hallucinations 327
14.4 Psychological interventions 332
14.5 Unexplored issues and other potential therapies 334
14.6 References 336

Index 343