Reviews

On perceived motion and figural organization by M Wertheimer, edited by L Spillmann; MIT Press, Cambridge, MA, 2012, $40.00 cloth (£27.95) ISBN 978 0 262 01746 6

There are some articles in the history of perception that are frequently cited but seldom sighted. This probably applies to Max Wertheimer’s (1912) long essay on perceived motion and to his (1923) article on figural organization. The first was published in Zeitschrift für Psychologie und Physiologie der Sinnesorgane, and it is taken as his major work; it describes his experiments on apparent motion using the method of experimental phenomenology, and it is also considered to be the founding document of the Gestalt movement. The second is the second of two articles on the laws of perceptual organization; it describes and illustrates the principles of perceptual grouping and it was published in the journal founded in 1922 as the voice of Gestalt psychology—Psychologische Forschung. The title pages of the two volumes containing the articles are shown in the illustration below, each of which is combined with a portrait of Wertheimer.

This book makes both articles available in English for the first time. Not only is this a fitting way to mark the centenary of Wertheimer’s interpretation of the relativity of perception but they were also translated by his relatives—his son (Michael Wertheimer) and his granddaughter (K W Watkins). Even they found the text difficult to translate at times, and they provide some useful additional markers concerning the unstated meaning in some of the passages. Care has been taken in redrawing the figures accurately and at the approximate scale of the originals, and there are many figures in both articles. In addition to the translations, there are erudite summaries of the papers by Victor Sarris and reflections on their contemporary significance by Robert Sekuler (perceived motion), and by Lothar Spillmann (figural organization). Finally, there are five appendices compiled mostly by Sarris listing Wertheimer’s chronology, publications, courses taught during the two periods at Frankfurt, and apparatus used in Frankfurt before his abrupt departure in 1933.
Many of the general aspects of apparent or stroboscopic motion had been described before Wertheimer addressed the phenomenon. As early as 1833, Joseph Plateau using a phenakistoscope indicated that there were three phases—simultaneity, succession, and optimal motion, and this is Wertheimer’s starting point. In 1875, Sigmund Exner explored the phenomenon by using light sparks produced by electrical discharges. The time interval and spatial separation between two sparks could be controlled, and Exner found that two slightly separated sparks, one appearing more than 50 ms after the other, appeared as a single light moving from one location to the other. On the basis of this observation, Exner contended that motion was a fundamental sensation that did not require combined elements of location and time. What Wertheimer added were subtle experiments and a novel interpretation of apparent motion. He built upon these phenomena of motion seen following successive stimulation of two spatially distinct stimuli. When the interval between the two stimuli was around 100 ms the motion was optimal. He proposed that the perceived motion was a Gestalt that could not be divided into smaller units. He considered a range of approaches to seen motion which he called sensation, afterimage, eye-movement, sensation-of-change and fusion theories. His preference was, of course, for the Gestalt, or complex-quality, theory.

The eye-movement theory will be taken as an example to give a flavour of the way Wertheimer presented arguments and experiments to reject their involvement in apparent motion. First, the duration of tachistoscopic exposure was shorter than that required to initiate an eye movement. Second, a fixation point remained stable during apparent motion; this applied to an afterimage, too. The strongest evidence derived from an experiment in which apparent motion was produced simultaneously in opposite directions. Wertheimer also demonstrated that there was no perceived distinction between apparent motion between two spatial locations and real motion.

The features of Wertheimer’s 1912 article that are not as widely known are his studies on the effects of brain injury on perceived motion and his analysis of spatial orientation. In the former, he examined a patient with damage to both occipital regions and established that she had difficulty in seeing apparent motion. In the latter, he described experiments involving a tilted room, examining judgements of the visual vertical and adaptation to the tilted world. He developed the concept of frames of reference that guide our perceptions in this and under normal conditions.

The second translated article from 1923, like the first, commences with a common observation—this time of a view through a window. Wertheimer ponders on how the objects in the scene are segregated from one another or grouped together, and goes on to describe the principles that could be operating. They are generally described as proximity, similarity, symmetry, and good continuation. These were illustrated with sets of figures consisting of filled and open dots arranged in patterns which demonstrated the grouping principles. However, Wertheimer gave a much more detailed account of perceptual organization incorporating Prägnanz, set, common fate and past experience as well as observations on vision in a Ganzfeld. Much of the subsequent attraction of Gestalt psychology lay in the power of their perceptual demonstrations, particularly those of figure–ground segregation and perceptual grouping. As Rock and Palmer (1990) noted: “Wertheimer’s laws of grouping have withstood the test of time. In fact, not one of them has been refuted” (page 50).

There are many more insightful studies, speculations and observations in the articles, and they often carry contemporary resonances. Perhaps the greatest import of Wertheimer’s studies is in championing the method of experimental phenomenology. This is contrasted starkly with the more elemental approaches that held sway in his day and have their contemporary equivalents. In the second article, Wertheimer wrote: “In going from the top down as sketched here, from the conditions of the whole to the subwholes and parts, the individual parts ("elements") do not come under consideration primarily as pieces in an “and”-sum. Rather, from the outset they are parts of their wholes” (page 181). The availability of the whole translations of these articles will open the eyes of many to the wide-ranging significance of Wertheimer’s Gestalt programme.

Nicholas J Wade
School of Psychology, University of Dundee, Dundee DD1 4HN, Scotland, UK;
E-mail: n.j.wade@dundee.ac.uk

Reference
Rock I, Palmer S, 1990 “The legacy of Gestalt psychology” Scientific American 263(6) 48–61
From perception to consciousness: Searching with Anne Treisman 
edited by J Wolfe, L Robertson; 
Oxford University Press, Oxford, 2012, £95.00 cloth, ISBN 978 0 19 973433 7

As I picked up this book and went through preface and introduction, the first thought coming to mind was that this was like a “novel for neuroscientists”. I didn’t make this connection because of the contents of this book, but because of the feelings awoken by the realisation that a lifetime of research unfolds within its pages. As you flick through the pages of a novel, you start to identify with one of the characters, either because you think you are, or wish you could be, in their place. And the latter is what happened to me when reading the “story” of Anne Treisman known to any Perception reader as one of the most influential and resourceful scientists, whose work profoundly influences and even shaped whole branches of cognitive neuroscience. Reading this book removes the blinkered approach to research in any student: as one gets a glimpse of Anne Treisman’s career path, the fixation on becoming an expert in a really narrow field slowly dissolves and is substituted by a holistic and coherent view of what a single scientist is able to achieve, how enormous her/his contributions to science can be.

This book effectively and concisely depicts the ‘backstage’ of each milestone in the career of Anne Treisman. It reveals the inventive utilisation of paradigms to substantiate hypotheses, where stimuli vary from carefully controlled and targeted to less laboratory-based, though not less well-designed, suited for the investigation of natural scene perception. Most importantly, emphasis is given to the fact that Anne Treisman is a scientist who has throughout her career given equal attention to the selection of paradigms as to the observations and experience of her participants. This skill in paying particular notice to the participants’ views and reports is important as it may provide insight from all angles and enrich the way of thinking. This book further demonstrates that an inquisitive mind goes beyond utilising a broad array of experiments to test hypotheses, attempting to find a balance between explicitly constructing a theoretical model, and being courageous enough to elaborate on topics as yet outside the realm of testability and current data.

The book contains seventeen of Anne Treisman’s articles, ranging from the most seminal ones to ones less well known and overshadowed by her other research; a collection that every neuroscientist would long to add in their library. However, this book is more than a collection of well-placed, carefully selected articles. As the synopsis of the book proclaimed, it encloses commentary from not only colleagues and people that Anne Treisman has mentored, but also from people that strived to extend and elaborate her original theoretical model and concepts, such as Jeremy Wolfe who initially “entered the field of visual attention in order to do battle with Anne Treisman” (p. 102). The scientists commenting on each of her publications were well chosen, and in most cases provide what one would hope for: not only a discussion of the influential contribution of each article, but also acknowledgment and assessment of the impact that article had on their own work and the broader field. To me at the beginning of my academic career, this is what makes the book particularly valuable.

The book highlights Anne Treisman’s well-known and innovative work on attention, having far-reaching influences as “questions about attention serve as bridge between perception and cognition” (comment by Kyle Cave, p. 139). At the same time, the book unveils her more informal contributions to several other fields, such as on Balint’s Syndrome (Robertson et al 1997), the role of attention in ensemble perception (Chong and Treisman 2003), on visual learning and memory and their impact on perception and performance, and contributions that raised discussions of possible interactions between perception and reflection (Musen and Treisman 1990; Wheeler and Treisman 2002).

In considering the range and selection of the articles, the book unquestionably depicts Anne Treisman’s approach to research which encapsulates the utilisation of various experimental paradigms, including illusory conjunctions, visual search, and texture segregation, to evidently test a theoretical concept. With respect to the book itself, the presentation of experimental stimuli involving colour, such as figures used in investigating binocular vision, is quite unsatisfactory. Considering the price of the book (£95.00), the quality of paper used is disappointing, and the presentation of figures in colourful format within the actual article, and not in the middle of the book without page numbers, would be expected. Similarly, the book encloses material that shouldn’t be in there, such as a call for editorship nominations for the years 1990–95 on page 138.
The effort to edit a book that involves original articles embedded in a current and meticulous commentary is undoubtedly large. However, the balance between presenting an original article in the way it was published, and tailoring it so as to be included in a book, could have been more proficiently achieved. Moreover, although the articles and individual commentaries are skilfully placed, the table of contents fails to guide you through the book in an effortless way. Nonetheless, the high quality of the content clearly surpasses the presentation format and quality.

Due to the range of topics and experimental data included, this book appeals to readers from various fields. The audience could range from researchers in the field of cognitive and affective neuroscience to computer vision, but most certainly entails any reader of Perception, not just those interested in visual attention. This book could also be recommended to undergraduate students who have an interest in perception and attention, and crave to take a closer look at and appreciate a striking career path. It is not common to come across articles where the abstract begins with such powerful words: “A new hypothesis about the role of focused attention is proposed. The feature-integration theory of attention suggests that attention ...” (Treisman and Gelade 1980, p. 97). Not only does the book contain an assortment of articles—which clearly wouldn’t make it worth having in a time where these can all easily be accessed—but within its pages a reader can decipher the way of a fruitful and creative scientific research career. Apart from including her most cited published work on attention, the book also demonstrates the diversity of experiments Anne Treisman conducted, and how these relate to current imaging, and electrophysiological and neuropsychological experiments. Most importantly, the book is about a courageous scientist that investigated daunting issues, such as the binding problem, and who figures as a scientific idol, inspiring others to follow in her footsteps.

Maria Tziraki
School of Experimental Psychology, University of Bristol, 12a Priory Road, Bristol, UK; e-mail: mariatz.2011@my.bristol.ac.uk

References
Chong S C, Treisman A, 2003 “Representation of statistical properties” Vision Research 43 393–404, doi:10.1016/S0042-6989(02)00596-5
Musen G, Treisman A, 1990 “Implicit and explicit memory for visual patterns”. Journal of Experimental Psychology: Learning, Memory, and Cognition 16 127–137, doi:10.1037/0278-7393.16.1.127
Robertson L, Treisman A, Friedman-Hill S, Grabowecky M, 1997 “The interaction of spatial and object pathways: Evidence from Balint’s Syndrome” Journal of Cognitive Neuroscience 9 295–317, doi:10.1162/jocn.1997.9.3.295
Treisman A M, Gelade G, 1980 “A feature-integration theory of attention” Cognitive Psychology 12 97–136, doi:10.1016/0010-0278(80)90005-5
Wheeler M E, Treisman A M, 2002 “Binding in short-term visual memory” Journal of Experimental Psychology: General 131 48–64, doi:10.1037/0096-3445.131.1.48

Perceiving in depth by I P Howard, B J Rogers; Oxford University Press, Oxford, 2012, 1720 pages (3-volume set), £340.00, ISBN10: 019976414X, 0199764158, 0199764166

This three-volume set from Ian Howard, with Brian Rogers in volume 2, provides an up-to-date, hugely extensive, yet often detailed survey of our knowledge of perception of the three-dimensional (3-D) world. This is an updated and extended version of their two-volume 2002 Seeing in Depth (itself an extension of the 1995 Binocular Vision and Stereopsis), which has been considered to be the ‘bible’ of the depth perception research community for the last decade. The set provides an encyclopedic review of the field, but also includes the authors’ interpretation of the current state of each area.

These are a set of reference books, providing both introductory material (a little like a high-level postgraduate style textbook) and detailed descriptions and discussion about almost every topic in depth perception that has been scientifically studied. It is hard to compare this work with equivalents in other areas of vision, psychology, or neuroscience, because there are so few. The approach is akin to the more general topics covered in books such as Principles of Neural Science (Kandel et al 2012) or the Encyclopedia of the Eye (Dartt et al 2010). However, Perceiving in Depth is more detailed, because the books cover one specific area of vision science (which would earn just a chapter or two in most vision textbooks). The authors not only deliver detailed description of what is known (including
reference to thousands of published scientific papers), but they also lay out current controversies, and voice opinion on how to interpret bodies of research evidence. This makes this compendium rare, if not unique, in the vision and neuroscience areas. The work showcases the intense dedication and perseverance that the two authors, both with many decades of expertise in this area, have shown in giving us such a comprehensive review.

This authoritative reference will be useful for anyone wanting either to dip into the large body of academic research in this area, to look up a specific topic, or to obtain an overview of any of the covered areas. The coverage of the literature, from historic (the oldest references go back to the Greek Ionian Period, in the 6th century BC) to the present day, is exhaustive. If a reader wants to know about research on some topic involving 3-D perception, there will be a section on it somewhere in these volumes, with enough overview and references to get a handle on our current state of knowledge. This work will perhaps be of most interest to the new graduate student or postdoc, exploring the area of depth perception for the first time. Many of the sections provide essential reading for starting scientists in the area, and could even be suitable for the bright undergraduate, perhaps researching an area for a project or dissertation. More senior colleagues will be thrilled to have such a comprehensive reference at hand to help in training students, but most will also find many of the sections interesting and educational. The volumes will additionally be useful for scientists moving into this area, or for more clinical colleagues wanting to get a feel for the blue-skies research that underlies our current knowledge base. I challenge anyone, apart from the authors themselves, to know of all the published research covered in these three volumes.

The style throughout is clear and precise, with very careful definition of terms and cross-referencing to other areas of the text. There is full use of figures to illustrate specific principles, stimuli, and important results from the literature discussed. If you are a younger scientist and you notice your Principal Investigator has a copy on his or her shelf, you may want to investigate the ‘Portrait Index’. Each chapter of the books contains several portrait photographs of key investigators in the areas under discussion in that section. Is this a little self-indulgent? Possibly. But it provides a human touch, illustrating that the names behind the research are real people.

To summarise such a comprehensive work is hard. Volume 1 covers historical background to the field and some of the basics of sensory system coding, physiology, development and the eyes. In volume 2, the focus is on binocular vision, exploring how having two eyes enhances perception of the 3-D world. Volume 3 covers ‘the rest’ of our knowledge of human and animal processing of the third dimension, exploring all the other cues to depth and distance, and our interactions with the 3-D world through our own mobility and the motion of other things in our world.

Readers familiar with Seeing in Depth will be wanting to know if they should upgrade to the new set. They probably should: there’s a lot more material covered, justifying the addition of a new volume. In general, the work has been broadened to include coverage of perceptual (not just visual) function, with more material on non-visual distance perception. Volume 1 is an updated version of the same volume of the Seeing in Depth series, with some change of emphasis. There is more analysis of our knowledge of temporal coding in sensory systems, of attention in sensory coding, and emphasis on the power of psychophysical methods to provide a probe of the site and order of sensory processing. There have been updates on sensory development, including neural activity and gene expression.

The new volume 2 is dedicated to stereoscopic vision: how the small differences between the two eyes’ views of the world are used for depth perception. There are updates on how the use of modern imaging techniques has furthered our knowledge of the pathways and networks that support stereopsis. The sections on binocular rivalry have been extended to include the effects of motion and temporal factors, eye versus stimulus rivalry, and cognitive effects. There are extended sections on binocular masking that include the physiology of summation and masking, and on recent advances in understanding Da Vinci stereopsis, and other phenomena related to monocular regions in binocular vision. This volume contains several sections with emphasis on topics not covered in detail before, including how attention impacts on stereoscopic vision, and the role of perceptual learning in stereoscopic phenomena.

Volume 3 provides an extensive review of the aspects of depth perception that do not require stereopsis. Some of this material was covered in Seeing in Depth, including the perception of motion-in-depth, depth from motion parallax, and from accommodation and vergence. These and other sections
Reviews

have been updated. What is novel here is the extra emphasis on depth perception in other animals, and a new chapter on animal navigation. Also completely new are chapters on auditory distance perception and on interaction with the 3-D world through reaching and movement.

In sum, this is a hugely valuable review of the state of academic knowledge on the perception of depth. It is an essential reference for any vision group and for universities with substantial investment in teaching perception. Retailing at over £350, it does not represent a cheap investment, but it does deliver good value and is likely to rapidly become a classic read, as its earlier instantiations have done.

Julie Harris
School of Psychology & Neuroscience, University of St Andrews, Westburn Lane, St Andrews KY16 9JP, Scotland, UK; e-mail: jh81@st-andrews.ac.uk

References
Dartt D, Besharse J C, Dana R (Eds), 2010 Encyclopedia of the Eye 1st edition (4 volumes) (London: Academic Press)
Howard I P, Rogers B J, 1995 Binocular Vision and Stereopsis (New York: Oxford University Press)
Howard I P, Rogers B J, 2002 Seeing in Depth 2 volumes (Toronto, ON: I Porteous)
Kandel E R, Schwartz J H, Jessell T M, Siegelbaum S A, 2012 Principles of Neural Science 5th edition (Maidenhead, Berks: McGraw-Hill Medical)

Face perception by V Bruce, A Young; Psychology Press, Hove, Sussex, 2012, 500 pages, £42.00, ISBN 978 184698786

This book represents an excellent update of the seminal model by Vicki Bruce and Andy Young (1986) on face perception. The authors review an astonishing range of behavioural and cognitive neuroscience studies and provide an integrative perspective that expands the readers’ horizon on two key questions in research on faces: which are the pivotal factors that allow encoding of different aspects of facial information, and how are they decoded in the perceiver’s brain?

The book has the potential to become the benchmark for researchers and students working in the field of face perception, but importantly goes well beyond that audience. The authors’ systematic approach to understanding the biological foundation of distinct facial signals will serve as a pathway for research communities working in related fields, such as the cognitive neurosciences more generally or fields such as voice perception more specifically.

In the first part of the book the authors examine the face as a whole and its various anatomical parts (eg eyes, mouth, nose) in its biological and evolutionary context. We learn about distinctive facial features and their violations, leading towards the perception of faces as normal or abnormal. In addition, an excellent overview on the location as well as the organisation of the brain structures that respond preferentially to faces is given. Novel findings are discussed within the framework of the model by James Haxby et al (2000), hypothesising a core and extended system of brain areas for face perception.

The authors emphasise the importance of converging evidence obtained across different approaches for making solid inference in psychology, and thus dedicate their second chapter to strengths and weaknesses of different methods employed in research on face perception. They discuss different techniques including classical psychological paradigms that examine reaction times, errors, priming, and interference in healthy and brain-injured persons and how we can transfer these methods to brain imaging studies, including functional magnetic resonance imaging as well as electroencephalography and magnetoencephalography.

In the core part of the book the authors investigate recent advances within the distinctive areas of face perception, with a particular focus on socially relevant traits including age, sex, race, and attractiveness and how this information is used to make more complex social inference. The authors highlight recent work by Alexander Todorov and colleagues (2008) who succeeded in disambiguating a number of these traits using principle component analyses as well as establishing their neurobiological substrates in the brain. Moreover, the authors summarise recent work on dynamic facial signals that rely on facial movements, such as emotional facial expressions and lip movements. In this chapter they clearly go beyond the domain of face perception and provide inspiring theories regarding when and where audiovisual fusion might occur. Another important cue regarding changeable aspects in human
faces is gaze, which provides a wealth of information allowing us to make prediction on intentions, attitudes, and future actions of other people. Potential mechanisms that explain how gaze grabs our attention and which neural structures are implicated in social cognition of eye movements are provided. Finally, the authors discuss models on face recognition, an ability in which we are very skilled and on which we most strongly rely to make inference on the identity of other people. We apprehend the distinctive cues that enable this classification process, that can even result in face caricatures if overemphasised, and that interact with other factors, such as race, age, and movement. Again, the authors bridge the gap between the neighbouring fields of research that enable person identification, such as voice perception and name retrieval. The last chapter sheds light on the intriguing question of how humans manage to obtain their sophisticated abilities for interpretation of facial information. The developmental studies discussed by the authors provide insight into the complex interplay of genetic and experience-related factors underlying acquisition of these perceptual skills.

In summary, this book covers all important aspects of face perception, is a joy to read, and will attract attention of scientists beyond its field, including psychologists working in related areas of research, neuroanatomists, neurophysiologists, and even philosophers.

Thomas Ethofer
Clinic for Psychiatry and Psychotherapy/Department for Biomedical Resonance, University of Tübingen, 72076 Tübingen, Germany; e-mail: Thomas.Ethofer@med.uni-tuebingen.de

References
Bruce V, Young A, 1986 “Understanding face recognition” British Journal of Psychology 77 305–327
Haxby J V, Hoffman E A, Gobbini M I, 2000 “The distributed human neural system for face perception” Trends in Cognitive Sciences 4 223–233
Todorov A, Said C P, Engell A D, Oosterhof N N, 2008 “Understanding evaluation of faces on social dimensions” Trends in Cognitive Sciences 12 455–460

All books for review should be sent to the publishers marked for the attention of the reviews editor. Inclusion in the list of books received does not preclude a full review.