
PREFACE

From the moment you awake in the morning until you nod off at night, you pursue a constantly changing range of diverse mental and physical activities. But one personal activity runs incessantly throughout your daily life: you're constantly dealing with the barrage of environmental information supplied by your senses. All your activities—driving, reading, eating, conversing, typing, exercising—everything you do is guided by what you see, hear, feel, touch, smell and taste. Perception, in other words, is an ability that is at once crucial and fundamental. But unlike many abilities that you work hard to master, perception comes naturally and effortlessly: everyone is a natural born perceptual genius. In fact, the ease and mindlessness of perception belies its complexity, and that is one reason teaching or writing about perception can be challenging: it is not immediately obvious that there is a problem to be explained. If you ask a friend how he or she goes about solving a jig-saw puzzle, they will be able to list the steps involved (turn all the pieces face-side up, arrange the pieces in piles according to color and so on). But if you ask any one student how he or she goes about reading the words on this page, the person will pause a moment, think, and then say something like, "I just point my eyes at the letters and read." The simplicity of perception belies its complexity.

Goals of this Textbook In writing a textbook on perception, one of our goals is to dramatize for students just how marvelously complex perception really is. Once we have made that point, we seek to introduce students to the

exciting behavioral and biological evidence about the nature of the processes underlying this remarkable accomplishment we call perceiving. In this respect, our aims have remained the same over four editions: *we have built on the cumulative successes of science to offer readers a new perspective on their own seeing, hearing, touching, smelling, and tasting*. Befitting any new revision of a textbook, this fourth edition of **Perception** reflects the many developments in the field. In addition, we have listened carefully to feedback from users of previous editions and have tried to accommodate their teaching needs. The result? A new edition that is substantively and stylistically different from previous ones. The following sections highlight the ways in which we've tried to improve this fourth edition of **Perception**.

Organization and Coverage The first chapter summarizes the motivations that inspire people to study perception, as well as the various approaches that such study takes. It also outlines the framework on which the entire text is constructed. Chapters 2 through 8 discuss seeing—the biological bases of vision and the perception of pattern, color, and depth. The treatment of seeing concludes in Chapter 9 with an essay on the perception of visual events, particularly visual motion. Chapters 10 and 11 provide a sweeping introduction to hearing, and its successors explore touch (Chapter 12) and smelling and tasting (Chapter 13). One chapter is new to this edition, and most chapters have been revised substantially in order to capture and communicate the accelerating pace of new discoveries. Just as importantly, material on cognitive influences on perception has been updated and integrated throughout the text, rather than concentrated in a separate chapter as done in the earlier edition. When it comes to methodological details, we continue to believe that this material is best introduced within the context of substantive problems. So readers will be exposed to techniques such as magnitude estimation, signal detection theory and multidimensional scaling within the body of the text. We do, however, offer more concentrated coverage of those techniques in Appendix A.

Special Features of the Fourth Edition This fourth edition of the book has several noteworthy features. As before, central topics are embedded in historical context, presenting today's perception research as the product of an unfolding intellectual process. At the same time, our source materials are strongly biased toward recently published material. Because we want students to appreciate developments at the frontiers of perception, we give thorough coverage to “hot,” rapidly developing topics, at the same time insuring that such coverage is closely integrated with its intellectual origins. For example, one chapter provides a comprehensive treatment of recent discoveries concerning visual agnosias; another highlights the amazing plasticity of sensory systems; and a third chapter details the latest thinking on genetic determinants of color vision. This special stress on the most recent work testifies that perception is a dynamic and growing field.

Illustration Program

The extensive program of more than 250 illustrations, many brand new or substantially revised for this edition, is another of this book's most important features. And the number of all-important color plates has doubled from the previous edition. Our own years of teaching experience, more than 50 years combined at last count, have taught us that readers don't always see in a diagram or graph exactly what was intended. In fact, the ability to read a graphic is a skill that, like any other skill, requires practice. So instead of merely directing student readers to look at the figure, we have crafted and coordinated the text, figures, and figure captions to ensure proper interpretation of the illustrative material. In addition, we have given extra care to the graphic presentation of complex ideas. Such ideas are often conveyed in this book by a short series of illustrations, with each illustration in a series introducing additional concepts. This approach enables every reader to get the point—even those who are novices at interpreting graphs and diagrams. Finally, illustrations that depict previously published experimental results have been adapted and redrawn to maximize clarity and consistency of presentation.

Another special feature that has been introduced in this edition is marginal icons. These icons are designed to highlight thematic links throughout every chapter to emphasize where material deals with a recurrent theme. A brief explanation of each icon is introduced at the end of Chapter One.

Vocabulary and Methods of Perceptual Research

Because the study of perception draws upon a number of disciplines—physics, chemistry, anatomy, psychology, computer science, and several branches of medicine, among others—its technical vocabulary incorporates the terminology of those disciplines. Beginning students of perception can become bewildered by the flood of new terms they must master. Recognizing this problem, we have introduced only those terms that are absolutely necessary to the discussion. Where it is likely to aid memory or understanding, we explain the term's origin. Also, each term is carefully defined when it is first used, and all these terms appear at the end of each chapter and in a Glossary at the back of the book.

We have kept detailed, abstract descriptions of research methods to a minimum. Where appropriate, we explain particular methods in enough detail that the student reader can appreciate the methods and whatever constraints they impose on results and conclusions. Various methods for studying perception are discussed within the context of the specific problems that they were designed to solve. By integrating methods and results, we hope to facilitate the reader's genuine appreciation of both.

An Appendix provides much additional information about conventional behavioral methods for studying perception. The Appendix also describes

contemporary variants of those methods: forced-choice procedures, sensory decision theory, and adaptive psychophysical methods. The Appendix grounds these methods in their historical context, enabling the student to understand not only the methods but also the reasons for their development.

Links to Everyday Life

In “Talks to Teachers” (1892), William James advised teachers how best to adapt psychology’s principles to the classroom. In one chapter, James urged teachers to recognize and exploit the natural interests that students bring to any topic. He suggested that abstract facts and new ideas are most readily assimilated when they have been linked to matters that students find inherently interesting, particularly matters that relate to their own lives. In our own classrooms and while writing this book, we have kept James’ good advice in mind. Perception is not just an abstract, scientific discipline, but an integral and fascinating part of everyday life. Recognizing this fact, our book consistently relates scientific research on perception to the reader’s own perceptual experiences. To underscore the relationship between science and everyday experience, we present many interesting demonstrations that readers can perform on their own with little or no equipment.

In order to anchor the discussion in the reader’s own experience, the text emphasizes the everyday behavioral needs that seeing, hearing, smelling, tasting, and touching are designed to satisfy—the functions of perception. This functional approach to perception is highlighted by the many discussions, throughout the text, of clinical disorders and their intriguing perceptual consequences. Some students will be interested in learning about these disorders for personal reasons; all students should find that the study of perceptual disorders provides insight into the nature of normal perception.

Integration

William James advised also that teachers take care to connect new ideas and facts with what students have already learned. Associate the new with the old in some natural and telling way, so that the interest, being shed along from point to point, finally suffuses the entire system of objects of thought. In his own textbook, “The Principles of Psychology,” James followed this counsel, to great success. As we wrote and revised this book, we thought of James’ advice and have attempted to make our treatment of perception an integrated one, in part by linking ideas across chapters. These linkages reflect the fact that different areas in perception often utilize similar techniques and related theoretical ideas. Our text is integrated in another way, blending anatomy, physiology, and psychophysics. The information and ideas from each of these three approaches have been carefully selected to ensure a coherent, complete presentation. Structure and function become

more comprehensible and memorable when they are integrated. We would like to think that James would approve.

Key Changes in this Edition Instructors who have used an earlier edition of this book will immediately notice that this edition looks and feels different: the page layout is snappier, the section headings are easier to follow and the art program much improved. At the same time, previous users will be pleased that this new edition adheres to the same general thematic approach and organization as earlier editions. As previously mentioned, one new feature designed to highlight thematic links throughout the book is the use of “icons” denoting places in the text where material deals with a given, recurrent theme. In addition, this new edition is chock full of updates and changes that provide a fresh, lively portrayal of the field of perception. You will find throughout the chapters, for example, important findings from studies that employ powerful, revealing new techniques of brain imaging. Also running throughout this major revision is more in-depth coverage of the “ecological” approach emphasizing the interrelationship of action and perception.

Chapter Specific Changes

- In **Chapter 1** the main change is a new discussion of computational approaches to various areas of perception. Our aim in reworking Chapter 1 was to establish the principle that, whatever their diversity, all areas of perception draw upon shared principles and face common challenges. In this spirit, some of the philosophical material in Chapter 1 has been revised to give a stronger and clearer treatment of these important foundational issues.
- **Chapters 2 and 3** retain the successful features and organization established in previous editions, however they integrate important new references and figures.
- In its expanded treatment of multiple visual representations, or maps, within the brain, **Chapter 4** gives new emphasis to the advantages and difficulties created by distributed neural representations.
- **Chapter 5** has been substantially revised and updated to incorporate the latest thinking on the role of visual analysis at multiple spatial scales; many of the figures have been completely reworked, and the material on the Gestalt principles of perception has been updated and improved.
- Building on the material presented in Chapter 5, this new edition now includes a completely new **Chapter 6** devoted to object recognition. Here, among other things, students will be exposed to the latest work on perception of environmentally relevant objects including faces and text.
- **Chapter 7**, on color vision, is enhanced by new ideas on the genetics and evolution of color vision, and the number of color plates illustrating principles of color perception has doubled.

- **Chapter 8** goes into more detail on some of the so-called monocular depth cues, particularly those cues that are of great interest to researchers probing machine vision. This chapter also now includes discussion of the perception of visual direction, and it provides a number of stereo pictures along with instructions to students about how to view them.
- The chapter on motion perception, **Chapter 9**, now includes coverage of the latest work on the cortical regions that play special roles in the analysis of global motion. The treatment of eye movements has been sharpened, and discussions of reafference and of structure from motion have been improved by suggestions from instructors and student readers.
- **Chapter 10**, the first of two chapters on hearing, boasts a strengthened treatment of masking and critical bands and coverage of new discoveries on the biophysics of signal transduction in the cochlea.
- Based on reader feedback, we have modified **Chapter 11** by replacing some of the older studies on deafness with new work on cochlear implants. The discussion of loudness in Chapter 11 has also been modified to stress ecologically important roles for loudness perception including judgments of the distance of sound sources. Chapter 11 also takes greater notice of the important role of perceptual organization in hearing. In particular, we have strengthened the discussion of how the auditory system picks out, from the entire acoustic environment, those acoustic features that arise from a single event; additional material on speech perception now appears in this chapter.
- **Chapter 12** on touch perception, which made its debut in the second edition, attracted much favorable comment from readers. For the current edition, we expanded this chapter by adding important new material on haptics, the coordinated interaction between touch and active exploration of the near-environment. Also, the treatment of plasticity in the somatosensory system has been expanded.
- **Chapter 13** on taste and smell integrates new findings on the basis of olfactory transduction and the behavioral consequences of taste disorders. We are confident that readers will find the new material on the genetics of taste and smell as interesting and exciting as we did.
- **The Appendix**, on behavioral methods, now notes the utility of theoretical, “ideal” observers that can provide benchmarks for real, human performance. The special-topics boxes are considerably reduced in number, with some of their material now integrated into the text itself.

We have mentioned just some of the additions and revisions in this fourth edition. Scrutiny of the reference list reveals that some 500 references are new to this edition (nearly 200 references from the last edition have been eliminated as outmoded or superseded). Most of the new references represent contributions that were published in the last three years.

Supplements

Instructor's Manual/Test Bank

This combination Instructor's Manual/Test Bank provides many useful tools to enhance your teaching. For each chapter, a general overview and set of learning objectives, detailed chapter outline, Teaching Tips and Activities, and Summary boxes are provided. This manual also includes Test Bank questions for each chapter that include: 10 matching, 20 multiple choice, 15 True/False, and 5 Essay questions.

Computerized Test Bank

The questions in the *IM/TB* are also available on *MicroTest III*, a powerful but easy-to-use test-generating program by Chariot Software Group. MicroTest is available for both PC and Mac users on a cross-platform CD. With MicroTest, instructors can easily select questions from the Test Bank and print tests and answer keys. Instructors can also customize questions, headings, and instructions; add or import their own questions; and print tests in a choice of printer-supported fonts.

Interactive Study Guide CD-ROM

This *new* CD-ROM to accompany *Perception, 4e*, gives students a variety of opportunities to test their comprehension of the course material. The CD-ROM opens with a Learning Style/Study Skills questionnaire that students can complete to help them identify how they best study. Also included are practice tests that cover topics in the perception course, an internet primer, a statistics primer, and a careers appendix.

Website

The custom crafted website to accompany *Perception, 4e*, includes a number of resources for instructors and students to enhance their teaching and learning experience in Perception. For the Instructor, this web site includes an image gallery, web icons, and PowerPoint presentations. The student portion of the site includes practice quizzes, web links, demonstrations, and other interactive exercises.