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JAMES T. McILWAIN
Brown University



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To my teachers

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PREFACE

This textbook is an attempt to answer a question: What would I want a student to know about the visual system before beginning work in my laboratory? Draft versions have been used for several years in an undergraduate course at Brown University. Inevitably, the content and approach of the book have been colored by my expectations of students in that course and by my own particular interests. It is assumed that students will have had an introductory course on the nervous system and will be acquainted with the fundamentals of cellular neurophysiology and the general organization of the vertebrate central nervous system. Minimal knowledge of physics is assumed, so some time will be spent on the elementary principles of optics as they apply to visual systems. Although the book is intended primarily for undergraduates, it can provide useful background for beginning graduate students if supplemented by material from the research literature.

The text is organized into three parts. Part I treats the eye as an image-forming organ and provides an overview of the projections from the retina to key visual structures of the brain. Part II examines the functions of the retina and its central projections in greater detail, building on the introductory material of Part I. Part III treats certain special topics in vision that require this detailed knowledge of the structure and properties of the retina and visual projections. Each chapter ends with a list of additional readings selected principally from reviews and monographs. These will

provide access to the primary literature for the student who wishes to pursue a subject in greater depth.

The emphasis here is on the vertebrate visual system, although examples from the invertebrate world are introduced whenever contrast and comparison are instructive. This bias flows from the conviction that most undergraduate college students are interested primarily in their own brains and visual systems and that the riches of the invertebrate world seem remote and exotic. Because invertebrate approaches to the exploitation of light are in many ways more interesting than the vertebrate pattern, it is hoped that some students, at least, will be stimulated to pursue a more systematic study of invertebrate vision.

I have benefited greatly from comments on various chapters offered by Vivien Casagrande, Michael Rowe, Leslie Welch, Billy Wooten, and Anita Zimmerman. Katherine Fite read the entire manuscript and contributed valuable suggestions on content and presentation. Ellen Grass, AstroMed Inc., and Trudy Nicholson, the artist, graciously gave permission to use the drawing of a bush baby that appears on the cover. Errors and omissions remain the responsibility of the author, as he will doubtless be reminded.