the photo-transduction cascade are especially useful. In addition, the author’s love of morphology and of the retina can be savored through his fabulous original illustrations. The descriptions of these illustrations are woven into the text so that each drawing or diagram can be appreciated as the story is read. Finally, the topical chapters at the end of the text provide useful information on the biochemical cascades, as well as quantitative descriptions that involve radiometry and photometry.

Those readers, however, who are looking for a detailed account of how vision will be disappointed. The book is idiosyncratic in its selection of topics, coverage, emphasis, and presentation. For example, although the dynamic nature of vision is emphasized and the importance of vestibular and other extra-retinal signals is discussed, no mention is made of the well-known brain-stem circuitry or cortical brain areas (for example, the middle temporal visual area or frontal eye fields) that control saccadic eye movements. Instead, the book digresses to the tangentially related topic of directionally selective rabbit retinal ganglion cells. In fairness to the author, the former issues are really beyond the first section of the brainstem circuitry or cortical brain areas (for example, the middle temporal visual area or frontal eye fields) that control saccadic eye movements. Instead, the book digresses to the tangentially related topic of directionally selective rabbit retinal ganglion cells. In fairness to the author, the former issues are really beyond the first steps in seeing. Although other central brain areas, such as the primary visual cortex, are mentioned, no details are provided about dynamic organization of this area or the existence of other important visual cortical areas to which the primary visual cortex connects. Overall, the rationale for selection of topics to be included in the book is unclear. Even at the level of the retina, coverage is uneven and many important topics are either not discussed or current views are not included. For example, important aspects of retinal adaptation are not considered, and the views of ganglion-cell physiology and receptive-field function are most issues are explained as if the ideas presented were established facts, rather than simply a favored perspective. The chapters Looking and Seeing are especially disappointing as one never learns much about how visual signals are processed. The serious reader will be frustrated by the lack of references; citations are mostly relegated to the very end of the book under ‘Notes’. Side bars discuss the Latin or Greek origins of words used, but mention nothing about leading figures in the field or alternative hypotheses for the views discussed. Unorthodox exposition of familiar information also is confusing for example, the use of frequency instead of wavelength to represent the visible spectrum. Topics such as ganglion-cell classes and organization of the lateral geniculate nucleus, among others, are presented in dogmatic frameworks, which miss the ongoing debates that characterize current understanding. The epilogue entitled ‘Ignorance’ is limited and inappropriate, given that some of the ideas mentioned are not covered adequately earlier in the book.

In summary, this is a beautifully illustrated work that provides a detailed overview of the psychophysical and morphology of the retina. The emphasis is on what is covered rather than simply a favored perspective. I would recommend this book to scientists and lay persons alike with an interest in the organization and the anatomy of the primate retina.

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Reference

Methods in Neuronal Modeling (2nd edn)

Methods in Neuronal Modeling concentrates on the type of modeling approach formulated by Willard Rall in the 1960s to simulate a single neuron behavior on a computer by slicing the neuron’s continuous membrane into compartments. The substantial difference between this edition and the first edition is reflected by the inclusion of seven completely new chapters, which is appropriate for passive dendrites, although it is not clear how these methods can be extended to explore other network and integration properties in active dendrites. While this section does provide a reasonable introduction to related issues it has been further developed in the rest of the book, it would have been interesting if some complementary approaches, such as tapered dendritic representations, and the equivalent cables, which are based on the Laczos method, had been included. One of the limitations of the compartmental model, the discussion of which forms the cornerstone of this book, is that it suffers from too many degrees of freedom and in most instances requires an ‘educated guess’ for the many unknown parameters required to model the neuron with sufficient accuracy. Another limitation that is not addressed but is clearly evident from Fig. 3.3, is structural realism or the lack of it. Without the angles between individual branch segments, compartmental models leave a one-dimensional caricature of the neurons, which, though suitable for the compartmental approaches covered in the book, is not enough for accurately investigating alternative effects, such as potential field interactions, spatial coverage and mapping of receptive fields. The book also includes the membrane biophysics of a space-clamped neuron but this topic remains largely similar to that discussed in the first edition with some additional references. It would have been more useful to include this in the beginning of the book or to combine it with the chapter on CA1 dynamics in single neurons. As little is known about CA1 channels and their dynamic properties, these two subjects represent some of the most interesting and important contributions to the whole book.

The use of the compartmental model to simulate pyramidal neurons with active dendritic ion channels is dealt with in Chapter 5. This is a ‘hot’ topic in neuroscience but is covered relatively scantily using a meager four equations. Although the authors continue to argue that a method must be sought for constraining the parameters by matching simulations to experimental recordings, and then proceed to propose a trial-and-error approach, it would have been more interesting to use data on conduction velocities that are now available through optical recording and the application of a pharmacological agent to determine the optimum density of specific ion channels on the basis of Hodgkin’s approach to Na+ channels. ‘Analysis of the Neural Excitability and Oscillations’ is left relatively untouched from the first edition, although there is an expanded section on bursting, that focuses on a hybrid between the FitzHugh–Nagumo and Hodgkin–Huxley models known as the Morris–Lecar model. This chapter seems to set the pace for biologically realistic neuronal networks as ‘point’ neurons that reinforce the idea of computational neuroscience complementing the vast literature on artificial neural networks and, hence, biological cybernetics. Indeed, a completely new chapter is devoted to the possibility of using very large-scale integration (VLSI) technology for implementing more-realistic silicon neurons that incorporate various biophysical features based on the Hodgkin–Huxley model and complementary metal-oxide silicon VLSI technology. The book also provides a reasonably up-to-date survey on the modern and relevant issue of neural spike-train analysis. After motivating the subject in terms of the temporal coding...
The role of neurons in these computations has evolved conceptually from that of a simple integrator of synaptic inputs until a threshold is reached and an output pulse is initiated, to a much more sophisticated processor with mixed analog-digital logic and highly adaptive synaptic elements. Neurons as point-like, linear threshold units in 1943, McCullough and Pitts showed how a collection of simple, interconnected neuron-like units could process information. The earliest originated in the early years of the 20th century, far before the biophysics of action potentials was understood, as integrate-and-fire neurons. Multiplying in single neurons multiplication is both the simplest and one of the most widespread of all nonlinear operations in the nervous system. Biophysics and Computations of the Cerebellar Purkinje Neuron. Forrest, M. D., Wall, M. J., and Press, D. A. (2009). The sodium-potassium pump controls the intrinsic firing of the cerebellar Purkinje neuron, in Poster Session Presented at: 16th International Conference on Neural Information Processing (ICONIP 09), (Bangkok). Google Scholar. Forrest, M. D., Wall, M. J., Press, D. A., and Feng, J. (2012). Citation: Forrest MD (2014) The sodium-potassium pump is an information processing element in brain computation. Front. Physiol. Biophysics of Computation: Information Processing in Single Neurons challenges this notion, using richly detailed experimental and theoretical findings from cellular biophysics to explain the repertoire of computational functions available to single neurons. The author shows how individual nerve cells can multiply, integrate, or delay synaptic inputs and how information can be encoded in the voltage across the membrane, in the intracellular calcium concentration, or in the timing of individual spikes.