



The Optics of Life: A Biologist's Guide to Light in Nature

By Sönke Johnsen

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Optics--a field of physics focusing on the study of light--is also central to many areas of biology, including vision, ecology, botany, animal behavior, neurobiology, and molecular biology. *The Optics of Life* introduces the fundamentals of optics to biologists and nonphysicists, giving them the tools they need to successfully incorporate optical measurements and principles into their research. Sönke Johnsen starts with the basics, describing the properties of light and the units and geometry of measurement. He then explores how light is created and propagates and how it interacts with matter, covering topics such as absorption, scattering, fluorescence, and polarization. Johnsen also provides a tutorial on how to measure light as well as an informative discussion of quantum mechanics.

The Optics of Life features a host of examples drawn from nature and everyday life, and several appendixes that offer further practical guidance for researchers. This concise book uses a minimum of equations and jargon, explaining the basic physics of light in a succinct and lively manner. It is the essential primer for working biologists and for anyone seeking an accessible introduction to optics.

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Editorial Review

Review

The book reminds me of Richard Feynman's *QED: The Strange Story of Light and Matter*, from which you can learn a lot with good explanations and a few figures. Science writing does not get any better than *The Optics of Life*, and I highly recommend this enjoyable and enlightening book to a broad audience from freshmen to graybeards.

--Curtis Mobley, *American Journal of Physics*

I really enjoyed the explanations of how we see and perceive the world around us. I will watch twilight with a new perspective now.

-- Joseph Ferrara, *Crystallography Times*

One of Choice's Outstanding Academic Titles for 2012

"Because of its emphasis on correctly approaching the way physical measurements should be made, *The Optics of Life* has something to offer anyone whose research directly or tangentially involves light. More than a biologist's guide to light in nature, this book is a guide for any scientist interested in optics and the world around us."--*Physics Today*

"Johnsen has written an excellent, readable, practical, and greatly entertaining introductory book on light and its applications in the biological sciences, including ecology. . . . Johnsen takes the point of view that some aspects of light are best described using the ideas from wave mechanics while other aspects are best addressed using particle mechanics."--*Choice*

"This book is written in an entertaining style so it is a pleasure to read. Each chapter starts with a thought-provoking quote, and ends with an amusing and interesting anecdote or reverie. My favorite chapters contain illuminating discussions on scattering, scattering with interference, absorbance, and transparency."--**John E. Steffen, *Integrative and Comparative Biology***

"[V]isual ecology and physiology have become significantly productive subdisciplines in biology. . . . Sönke Johnsen serves as a conduit between these two fields, as he gracefully presents the physical principles of optics in a simplifying manner that makes the reader want to apply new found knowledge to their own research."--**John E. Steffen, *Integrative and Comparative Biology***

"Anyone interested in this subfield who lacks a background in the subject would be well-advised to read this book first. Johnsen masterfully guides the reader through a fascinating area of applied optics which has been very active in recent decades. It contains many useful examples drawn from nature and everyday life. It will be of interest to a variety of readers, from undergraduate students in biology to curious researchers looking for a greater understanding of nature."--**Christian Brosseau, *Optics & Photonics News***

"I am grateful to this book for forcing me to come to terms with a number of aspects of light that I had been delinquent enough to ignore, and in a way that was a pleasure--like a long walk in hilly country."--**Michael F. Land, *Current Biology***

"[W]hat Johnsen knows and communicates clearly is fundamental and important to life. It seems to me that ornithologists who read this book and master this material will be well poised to make the next generation of discoveries about the Optics of Ornithology."--**Richard O. Prum, *Wilson Journal of Ornithology***

"Johnsen has provided a veritable mine of information. . . . [T]he feel of the book: detailed, indepth and precise; not for the beginner."--**Peter Thomas, *Bulletin of the British Ecology Society***

"I recommend Johnsen's account of light in nature to one group of readers in particular: those about to embark on a textbook of their own. From the first sentence . . . this is a model of how to infuse high-level scientific information with colour, humanity and even humour."--**Bernard Dixon, *Biologist***

From the Back Cover

"This book provides just about everything one needs to know about biological optics, from the nature of light and its transmission to intensity, color, and polarization properties and their consequences. It is informal yet detailed, and will be easily accessible to anyone interested in biological optics, environmental optics, and animal or human vision. I highly recommend it."--**John A. Endler, professor of sensory ecology and evolution, Deakin University**

"*The Optics of Life* provides a user-friendly introduction to the physics and measurement of light. From plant physiologists working on photosynthesis to visual scientists stimulating eyes with light, many biologists will benefit greatly from the wisdom and insight provided in this book. *The Optics of Life* is a major contribution to the field, and will no doubt become a classic."--**Eric Warrant, Lund University, Sweden**

"This is a gem of a book. It's the one I wish I had when I was starting out in photoecology--it would have saved me a lot of pain. The style is very entertaining and the material is wonderfully practical and down-to-earth. Every biologist should read it."--**Edith A. Widder, CEO and senior scientist, Ocean Research and Conservation Association**

About the Author

Sonke Johnsen is professor of biology at Duke University.

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