
THE OPTICS OF LIFE

A Biologist's Guide to Light in Nature

Sönke Johnsen

PRINCETON UNIVERSITY PRESS

PRINCETON AND OXFORD

CONTENTS

<i>Acknowledgments</i>	ix
CHAPTER ONE Introduction	1
CHAPTER TWO Units and Geometry	8
CHAPTER THREE Emission	31
CHAPTER FOUR Absorption	75
CHAPTER FIVE Scattering	116
CHAPTER SIX Scattering with Interference	151
CHAPTER SEVEN Fluorescence	181
CHAPTER EIGHT Polarization	203
CHAPTER NINE Measuring Light	237
CHAPTER TEN What Is Light, Really?	271
APPENDIX A Converting Spectral Irradiance to Lux	287
APPENDIX B Calculating the Absorbance Spectrum of a Visual Pigment	290
APPENDIX C Refractive Indices of Common Substances	292
APPENDIX D Optical Properties of Very Clear Water	293
APPENDIX E Optical Properties of Natural Waters	295
APPENDIX F Useful Formulas	297
APPENDIX G Equipment and Software Suppliers	302
<i>Bibliography</i>	307
<i>Index</i>	319