

M.G.J. MINNAERT

Light
and
Color
in the
Outdoors



Springer-Verlag

Marcel Minnaert

Light and Color in the Outdoors

Translated and Revised
by Len Seymour

With 223 Figures and 49 Color Plates

308/3863 INSTITUT
FÜR METEOROLOGIE U. KLIMATOLOGIE
UNIVERSITÄT HANNOVER
HERRENHÄUSER STR. 2 - 30419 HANNOVER



Springer-Verlag

New York Berlin Heidelberg London Paris
Tokyo Hong Kong Barcelona Budapest

Contents

1	Light and Shadows	1
2	Reflection of Light	9
3	Refraction of Light	45
4	The Curvature of Light Rays in the Atmosphere	59
5	The Measurement of Intensity and Brightness of Light	95
6	The Eye	111
7	Colors	131
8	Afterimages and Contrast Phenomena	137
9	Judging Shape and Motion	161
10	Rainbows, Halos, and Coronas	185
11	Light and Color of the Sky	259
12	Light and Color in the Landscape	321
13	Luminous Plants, Animals, and Stones	371
	Appendix A. Measuring Angles out of Doors	377
	Appendix B. Photographing Natural Phenomena	379
	Appendix C. Further Notes and References	385
	Index	399