

# Contents

LIST OF CONTRIBUTORS . . . . .	v
PREFACE . . . . .	vii
CONTENTS OF VOLUMES II-V . . . . .	xiii

## CHAPTER 1

### **Photometry**

*Ray P. Teele*

I. INTRODUCTION . . . . .	1
II. NOMENCLATURE AND UNITS . . . . .	1
III. STANDARDS . . . . .	9
IV. BASIC PRINCIPLES OF PHOTOMETRY . . . . .	10
V. PHOTOMETERS . . . . .	18
VI. METHODS OF MEASUREMENT . . . . .	25

## CHAPTER 2

### **Light Sources for Optical Devices**

*F. E. Carlson and C. N. Clark*

I. INTRODUCTION . . . . .	44
II. THE SUN . . . . .	44
III. TUNGSTEN FILAMENT LAMPS . . . . .	45
IV. THE CARBON ARC . . . . .	68
V. COMPACT-SOURCE ARC LAMPS . . . . .	73
VI. OTHER LIGHT SOURCES FOR OPTICAL DEVICES . . . . .	90

## CHAPTER 3

### **Filters**

*Philip T. Scharf*

I. DEFINITION OF TERMS AND UNITS . . . . .	111
II. FILTER SPECIFICATIONS . . . . .	113
III. FILTER CLASSIFICATION . . . . .	115

## CHAPTER 4

**Atmospheric Effects***Harold S. Stewart and Robert F. Hopfield*

I. INTRODUCTION . . . . .	127
II. ATMOSPHERIC REFRACTION . . . . .	127
III. ABSORPTION IN THE ATMOSPHERE . . . . .	131
IV. SCATTERING IN THE ATMOSPHERE . . . . .	131
V. SKY BACKGROUNDS . . . . .	141
VI. NOISE IN THE SKY . . . . .	144
VII. OPTICAL CHARACTERISTICS OF LIQUID WATER . . . . .	147
VIII. REFLECTIVITY OF THE EARTH'S SURFACE . . . . .	152

## CHAPTER 5

**Optical Materials***Norbert J. Kreidl and Joseph L. Rood*

I. OPTICAL GLASS . . . . .	153
II. OPTICAL CRYSTALS . . . . .	180
III. OPTICAL PLASTICS . . . . .	181
IV. FILTER GLASSES . . . . .	184
V. OPTICAL MATERIALS FOR THE INFRARED . . . . .	190
VI. OPTICAL MATERIALS FOR THE ULTRAVIOLET . . . . .	197
VII. OPTICAL MATERIALS FOR NUCLEAR APPLICATIONS . . . . .	197
VIII. MATERIALS, IN BRIEF . . . . .	198

## CHAPTER 6

**Basic Geometrical Optics***Rudolf Kingslake*

I. REFLECTION, REFRACTION, AND IMAGES . . . . .	201
II. PARAXIAL PROPERTIES OF AN OPTICAL SYSTEM . . . . .	208
III. LIMITATION OF RAY BUNDLES . . . . .	228
IV. THE SIMPLE MAGNIFIER, OR LOUPE . . . . .	232
V. THE COMPOUND MICROSCOPE . . . . .	235
VI. THE SIMPLE TELESCOPE . . . . .	236
GENERAL REFERENCES . . . . .	244

## CHAPTER 7

**Diffraction***Adriaan Walther*

I. INTRODUCTION . . . . .	245
II. HUYGENS–FRESNEL THEORY . . . . .	246
III. COHERENCE . . . . .	250
IV. APPLICATIONS . . . . .	251
V. IMAGE FORMATION . . . . .	269
VI. COHERENT IMAGE FORMATION . . . . .	278

## CHAPTER 8

**Interference, and Optical Interference Coatings***P. Baumeister*

I. INTRODUCTION: CLASSES OF INTERFERENCE . . . . .	285
II. INTERFERENCE BY DIVISION OF WAVE FRONT . . . . .	286
III. INTERFERENCE BY DIVISION OF AMPLITUDE . . . . .	292
IV. OPTICAL INTERFERENCE COATINGS . . . . .	299
V. MANUFACTURE OF MULTILAYER COATINGS . . . . .	301
VI. ANTIREFLECTION COATINGS . . . . .	304
VII. PROPERTIES OF THE QUARTER-WAVE STACK . . . . .	312
VIII. BAND-PASS FILTERS . . . . .	313
IX. BEAM SPLITTERS . . . . .	316
X. SEMITRANSSPARENT MIRRORS . . . . .	318
XI. NARROW BAND-PASS FILTERS . . . . .	318
XII. REFERENCES FOR FURTHER STUDY . . . . .	323

## CHAPTER 9

**Polarization***Robert J. Meltzer*

I. THE NATURE OF POLARIZED LIGHT . . . . .	326
II. THE PRODUCTION OF POLARIZED LIGHT . . . . .	327
III. THE INTERFERENCE OF POLARIZED LIGHT . . . . .	337
IV. ANISOTROPIC MEDIA IN POLARIZED LIGHT . . . . .	342
V. OPTICAL ACTIVITY . . . . .	345
VI. THE SENSITIVITY OF DETECTORS TO POLARIZED LIGHT . . . . .	347
VII. MEASUREMENT AND DETECTION OF POLARIZED LIGHT . . . . .	348

VIII.	THE POLARIZING MICROSCOPE . . . . .	352
IX.	POLARIMETRY . . . . .	357
X.	METALLIC REFLECTION . . . . .	362
XI.	CHEMICAL STRUCTURE ANALYSIS WITH POLARIZED LIGHT . . . . .	364
XII.	LIGHT CONTROL . . . . .	367
XIII.	PHOTOELASTICITY . . . . .	369

## CHAPTER 10

### Projection Screens

*R. E. Jacobson*

I.	INTRODUCTION . . . . .	373
II.	TYPES OF SCREEN SURFACES . . . . .	373
III.	IDEAL SCREEN SURFACE . . . . .	377
IV.	MEASUREMENT OF SCREEN CHARACTERISTICS . . . . .	381
V.	MECHANICAL DESIGN OF PROJECTION SCREENS . . . . .	384

## CHAPTER 11

### Precision and Accuracy

*Ralph D. Geiser*

I.	DEFINITIONS . . . . .	389
II.	TYPES OF ERRORS . . . . .	390
III.	WEIGHT OF AN OBSERVATION . . . . .	391
IV.	RELATIVE ACCURACIES . . . . .	392
V.	METHODS OF LINEAR MEASUREMENT . . . . .	393
VI.	METHODS OF ANGULAR MEASUREMENT . . . . .	399
AUTHOR INDEX . . . . .		411
SUBJECT INDEX . . . . .		415