

CONTENTS

<i>Preface</i>	xii
----------------	-----

Chapter 1. Introduction

I. Lens Design	2
----------------	---

A. Lens Aberrations	4
B. The Petzval Sum	4
C. Remounting a Lens	6

II. A Brief Historical Survey	7
-------------------------------	---

A. 1840 to 1866	7
B. 1866 to 1890	8
C. 1890 to 1914	8
D. Interwar Period, 1918 to 1940	8
E. The Post World War II Period	9

III. Lens Markings	9
--------------------	---

A. Aperture Control Devices	10
B. Aperture Designation	12
C. Focusing Devices	13

IV. Identifying a Given Lens	14
------------------------------	----

V. Some Recent Developments	15
-----------------------------	----

A. Aspheric Surfaces	15
B. Antireflection Coatings	16

C. Computers	17
D. Gradient Index Material	18
VI. Lens Patents	18
VII. References	19
A. Books Dealing with Photographic Lenses	19
B. Articles	20
 <i>Chapter 2. Meniscus Landscape Lenses</i>	 23
I. The Wollaston Simple Meniscus	23
II. The Achromatic Landscape Lens	26
III. Other Modifications of the Landscape Lens	28
A. The Grubb Aplanat	28
B. Dallmeyer's Rapid Landscape Lens	29
C. Distortionless Landscape Lenses	30
D. The Front Meniscus Lens	30
 <i>Chapter 3. Portrait Lenses</i>	 33
I. Chevalier's Photographe	33
II. The Petzval Portrait Lens	35
A. The Cône Centralisateur Lens	38
B. The Grün Liquid Lens	39
C. The Reversing Prism	40
III. Other Portrait Lenses	40
A. The Dallmeyer Patent Portrait Lens	40
B. The Voigtländer Lens of 1878	41
C. The Steinheil Portrait Antiplanet	42
D. The Kodak $f/1.9$ Cine Lens	43
E. The R-Biotar	43
IV. Curved-Field Lenses	44
V. The Field Flattener	45

<i>Chapter 4. Early Double Objectives</i>	49
I. The Advantages of Symmetry	49
II. Early Symmetrical Lenses (Not Spherically Corrected)	50
A. The Sutton Panoramic Lens	50
B. The Globe Lens	52
C. The Pantoskop	53
D. The Periskop	53
E. The Hypergon	54
F. Wollensak Portrait Lenses	56
III. Unsymmetrical Doublets (Not Spherically Corrected)	56
A. Early Experiments	56
B. The Ross Doublet	56
C. Hemisymmetrical Doublets	57
IV. Symmetrical Doublets (Spherically Corrected)	58
A. Achromatized Periscopic Type	58
B. The Rapid Rectilinear or Aplanat	59
C. The Gundlach Rectigraphic Lens	62
V. Unsymmetrical Doublets (Spherically Corrected)	62
A. Morrison's Lenses	63
VI. Airspaced Triple Combinations	63
A. Dallmeyer's Triple Achromatic Lens	64
B. The Abbe-Rudolph Apochromatic Triplet	65
VII. The Steinheil Antiplanets	65
<i>Chapter 5. Optical Glass</i>	69
I. Early History of Optical Glass	69
II. Optical Properties of Glass	71
III. The Schott Glass Works	72
IV. The Lanthanum Crowns	77
V. Optical Plastics	77

VI. Other Materials	79
References	80
Chapter 6. The First Anastigmats	81
I. New-Achromat Doublets	81
II. The Zeiss Anastigmats	82
III. The Aldis Stigmatic Lenses	84
IV. The Unar and Tessar	86
A. Modifications of the Tessar	89
V. Symmetrical Anastigmats	90
A. The Dagor Lens	90
B. The Orthostigmat and Collinear	92
C. The Airspaced Dagor Type	94
D. Quadruple Cemented Lenses	96
E. Airspaced Quadruplets	98
F. Quintuple Double Anastigmats	98
VI. The Dialyte Type	100
VII. Unsymmetrical Double Anastigmats	102
Chapter 7. The Triplet Lens and Its Modifications	103
I. The Cooke Triplet	103
II. The Heliar and Its Variations	106
III. The Speedic Type	108
IV. The Ernostars and the Sonnars	110
V. Modified Triplets by Leitz	113
VI. The Wray High-Aperture Radiographic Lens	115
Chapter 8. Meniscus Anastigmats	117
I. The Double-Gauss Lens	117
II. The Zeiss Planar Lens	121

III. Unsymmetrical Double-Gauss Lenses	122
IV. Five-Element Gauss Lenses	126
V. Hybrid Types	127
<i>Chapter 9. Telephoto Lenses</i>	131
I. The Petzval Orthoskop	132
II. The Dallmeyer and Miethe Telephotos	133
III. Self-Contained Telephotos	135
IV. Modern Telephoto Zoom Lenses	139
<i>Chapter 10. Reversed Telephoto Lenses</i>	141
I. Advantages and Applicatons	141
II. Fish-Eye or Sky Lenses	145
III. The Biogon Type	150
<i>Chapter 11. Varifocal and Zoom Lenses</i>	153
I. Introduction	153
II. Historical	155
III. Zoom Lens Types	159
A. The Two-Component Zooms	159
B. Zoom Lenses Depending on the Donders Principle	161
C. Modern Complex Designs	168
D. Macro Zooms	169
IV. Optically Compensated Zoom Lenses	170
<i>Chapter 12. Catadioptric (Mirror) Systems</i>	175
I. Catoptric Systems	175
II. Catadioptric Systems	176
A. Single-Mirror Systems	176
B. Two-Mirror Systems	178

<i>Chapter 13. Lens Attachments</i>	181
I. Front Attachments	181
A. Filters	181
B. Diffusion Disks	182
C. Diopter Lenses	182
D. Afocal Attachments	182
E. Anamorphic Attachments	184
F. Deep-Field Lenses	187
II. Interchangeable Front Components	188
III. Rear Attachments	190
A. The Field Flattener	190
B. Telenegative Attachment Lenses	191
<i>Chapter 14. Brief Biographies</i>	192
<i>Appendix: A Glossary of Optical Terms</i>	315
<i>Lens Names Index</i>	323
<i>Index</i>	327