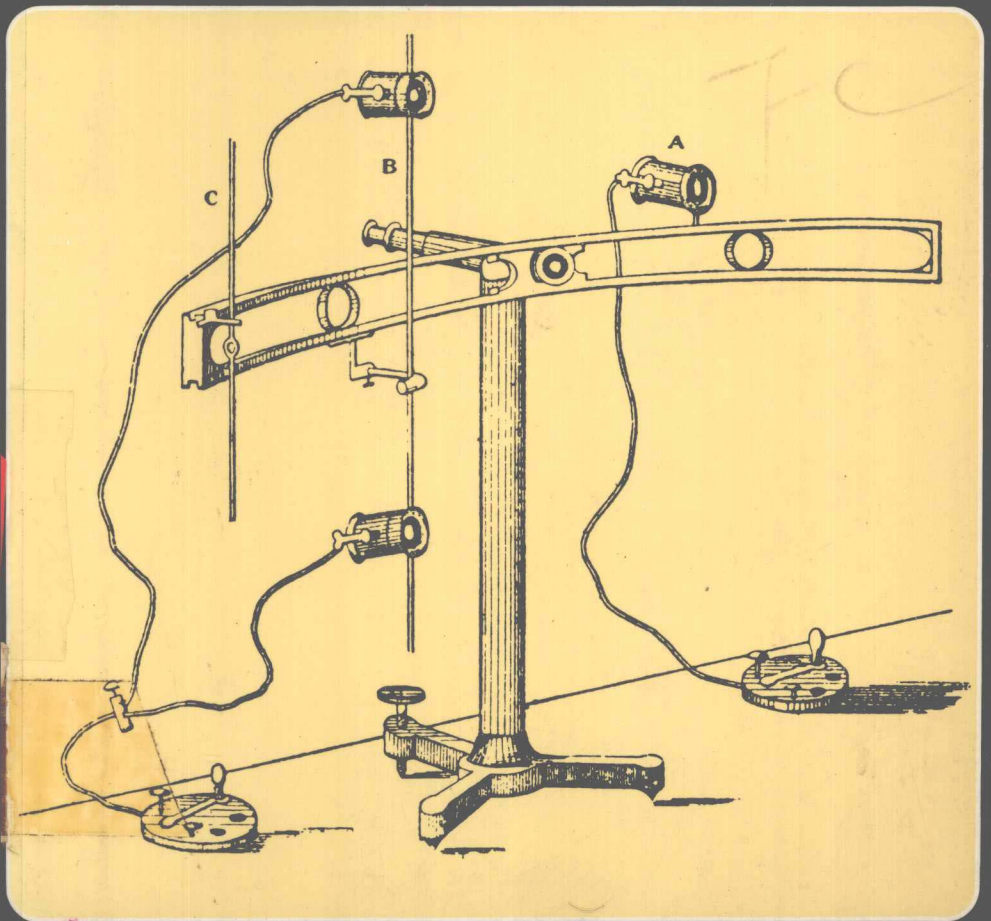


# REVISION CLINICAL OPTICS

MONTAGUE RUBEN  
E GEOFFREY WOODWARD



3 /  
**REVISION CLINICAL  
OPTICS** /

① / Montague Ruben  
and  
E. Geoffrey Woodward /

Drawings by  
Terry Tarrant

**M**

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# Preface

This text was first published almost twenty years ago by the Institute of Ophthalmology, London, for the use of postgraduate students taking the D.O. course. Prof. Montague Ruben selected and designed the drawings, which were drawn by Mr T. Tarrant.

A second edition some years later included a short text for each drawing, but it has long since been out of print.

The present text is designed as a revision text to supplement courses on ophthalmic optics and does not pretend to replace textbooks recommended by teachers. It may be of use to the student who is preparing for examinations in ophthalmology, optometry or orthoptics, and provides a quick method of revision; in particular it will enable the student to discover areas where further tutorials, or the reading of larger texts, are required. The new text has been co-authored by Dr Geoffrey Woodward, thus combining the attitudes of ophthalmologist and optometrist. The text has been enlarged and revised by including physiological optics and most instruments in current use.

*London, 1982*

M.R.  
E.G.W.

# Acknowledgements

We have been fortunate in obtaining once again the services of Mr Terry Tarrant who has done all the drawings.

The diagrams on pp. 149 to 151 were prepared with the help of Dr M. Guillén, PhD, FBOA.

The authors wish to thank the Institute of Ophthalmology for permission to use the original drawings of *Diagrammatic Outline of Clinical Optics*, by M. Ruben and T. Tarrant, second edition, 1966.

# Contents

|                         |    |
|-------------------------|----|
| <i>Preface</i>          | v  |
| <i>Acknowledgements</i> | vi |

## SECTION I PHYSIOLOGICAL OPTICS

|   |    |
|---|----|
| Absolute Threshold  | 3  |
| Definition  | 3  |
| Transmittance of Cornea   | 5  |
| Lattice Theory  | 6  |
| Transmittance of the Human Lens at Various Ages                     | 7  |
| Transmittance of Ocular Media                                       | 8  |
| The Stiles-Crawford Effect  | 9  |
| Adaptation  | 10 |
| Definition  | 11 |
| Cone (foveal) dark adaptation                                       | 11 |
| Rod (peripheral) dark adaptation                                    | 11 |
| Cone and rod combined to produce a typical<br>dark adaptation curve | 12 |
| Factors which slow adaptation                                       | 12 |
| Method of measurement (Goldman adaptometer)                         | 12 |
| Rise in Dark Adaptation Threshold in Vitamin A Starvation           | 13 |
| Dark Adaptation of Different Parts of the Retina                    | 14 |
| Purkinje Shift  | 15 |
| The Pulfrich Phenomenon   | 16 |
| The Critical Frequency of Flicker                                   | 17 |

|   |    |
|---|----|
| After-Images  | 18 |
| Saccadic Suppression  | 19 |
| Field of Vision — Isopters  | 20 |
| Traquair's Island   | 21 |
| Field Analyser (Goldman Type)   | 22 |
| Colour Vision   | 23 |
| The CIE chromaticity diagram  | 23 |
| The anomaloscope (Nagel)  | 24 |
| Colour-vision tests   | 26 |
| Visual Acuity   | 28 |
| Resolution  | 28 |
| The Snellen system of recording visual acuity   | 30 |
| Visual acuity and level of illumination   | 31 |
| Variation of visual acuity across the retina  | 33 |
| Relationship between threshold visual angle and<br>diopres of spherical error of refraction | 34 |
| Optokinetic drum  | 35 |

## SECTION II

### BASIC OPTICS

|   |    |
|---|----|
| Sign Convention   | 39 |
| Diffraction of Light                                    | 40 |
| Interference and Wave Motion                            | 41 |
| Diffraction from a Thin Film                            | 42 |
| Polarisation  | 43 |
| Polariser Prism   | 44 |
| Reflection of Light                                     | 45 |
| The Law of Refraction (Snell's Law)                     | 48 |
| Reduced vergence  | 51 |
| The critical angle                                      | 52 |
| Refraction by a prism                                   | 53 |
| Prism Diopetre  | 55 |
| Refraction at a Curved Surface                          | 56 |
| Change of Vergence at a Curved Surface                  | 57 |
| Principal rays, focal points and other conjugate points | 58 |

|                              |    |
|------------------------------|----|
| The Lens                     | 59 |
| Image formation              | 60 |
| Rays from extra-axial points | 61 |
| The cylindrical lens         | 62 |
| The sphero-cylinder          | 64 |
| Stürm's conoid               | 65 |
| Thick lens principal points  | 66 |

### SECTION III

### CLINICAL OPTICS

|  |    |
|--|----|
| Back Vertex Power                                      | 69 |
| Thick Lens Shapes or Forms                             | 70 |
| Toric Surfaces and Lenses                              | 71 |
| Prism-Induced Effect                                   | 72 |
| Thin Lens Forms  | 73 |
| Positive lenses  | 73 |
| Negative lenses  | 74 |
| Refraction by a Lens                                   | 75 |
| Using the principles of tangents and prisms            | 75 |
| Refraction by two lenses                               | 76 |
| Magnification of Objects                               | 77 |
| Simple microscope                                      | 77 |
| Image Formation with a Negative Lens                   | 78 |
| Reflection   | 79 |
| From a curved convex surface                           | 79 |
| From a curved concave surface                          | 81 |
| From the eye's curved surfaces                         | 82 |
| Aberrations  | 84 |
| From curved surface refraction — spherical aberrations | 84 |
| From lenses  | 85 |
| Oblique astigmatism                                    | 86 |
| Magnification distortion                               | 87 |
| Prism aberration                                       | 88 |
| Effective Power  | 89 |
| Power in different planes                              | 89 |
| Power of a lens  | 90 |



|  |     |
|--|-----|
| Near and Distance Fixation and Ocular Refraction | 91  |
| Myopia   | 91  |
| Hyperopia  | 92  |
| Multivision Spectacle Lenses                     | 93  |
| Bifocals   | 95  |
| Multifocals                                      | 100 |
| Fitting  | 102 |

## SECTION IV

### VISUAL OPTICS

|   |     |
|---|-----|
| The Schematic (Average) Eye                           | 105 |
| The Emmetropic and Ametropic Eye                      | 106 |
| Ametropia   | 107 |
| Correction of ametropia                               | 109 |
| Correction of hyperopia                               | 111 |
| Ocular Astigmatism                                    | 112 |
| Retinal Image Size (R.I.S.) (Spectacle Magnification) | 113 |
| Axial Myopia and Magnification of Image               | 114 |
| Relative Magnification and Myopia                     | 115 |
| Magnification of Images in Myopia                     | 116 |
| Aphakia   | 117 |
| Temporary aphakia spectacles                          | 118 |
| Magnification with correction                         | 118 |
| Aphakia and Retinal Image Magnification               | 120 |
| Pseudo-lens plastic implant                           | 121 |
| Pseudo-lens implant powers                            | 122 |
| Fixation Axis Relationship to Optic Axis              | 123 |
| Accommodation   | 124 |
| Accommodation and Hyperopia                           | 125 |
| Depth of Focus  | 126 |

## SECTION V

### INSTRUMENTS

|  |     |
|--|-----|
| Focimeter to Measure Lens Power (The Lensometer) | 131 |
| Woolston Prism Used for Doubling the Image       | 134 |

|   |     |
|---|-----|
| The Ophthalmoscope (Direct)                                       | 134 |
| The Ophthalmoscopy of the Emmetropic Eye                          | 135 |
| Direct Ophthalmoscopy   | 136 |
| Use as visuscope and optometer                                    | 136 |
| Use for fixation location and slit beam                           | 137 |
| Pleoptoscope  | 138 |
| Slit-beam projection  | 138 |
| Optical magnification in emmetropia                               | 138 |
| Magnification in myopia   | 139 |
| Indirect Ophthalmoscopy   | 140 |
| The observation system and magnification                          | 140 |
| Self-illuminated binocular instrument                             | 142 |
| Fundus Camera   | 143 |
| Objective Refraction  | 144 |
| Retinoscopy   | 144 |
| Automated instrumentation   | 149 |
| Humphrey's Subjective Refractometer                               | 152 |
| Astigmatism   | 153 |
| Jackson's cross-cylinder  | 153 |
| The pin-hole and the Scheiner disc                                | 154 |
| Compound Microscope   | 155 |
| Slit-Lamp Microscope  | 156 |
| The Corneal Pachometer  | 157 |
| Zoom-Lens Principle   | 158 |
| Operation Microscope (Zoom)                                       | 159 |
| Telescopes  | 160 |
| Javal Schiotz 'Keratometer' (Ophthalmometer)                      | 162 |
| Placido Disc Keratoscope (Klein-Keeler)                           | 164 |
| The Photokeratoscope (The Wesley-Jessen P.E.K.)                   | 164 |
| Contact Lenses  | 165 |
| Measurement of back curves of contact lens                        | 169 |
| The Radiuscope (Using Drysdale's Principle)                       | 170 |
| Sagitta   | 171 |
| Sagitta system applied to radius measurement<br>of contact lenses | 172 |

|  |     |
|--|-----|
| Gonioscope Contact Lens  | 172 |
| Various Miniature Gonioscopes and Fundus-Viewing<br>Contact Lenses | 174 |
| Fundus-viewing contact lens  | 174 |
| Applanation Tonometer  | 176 |
| Specular Microscopy  | 176 |

## SECTION VI BINOCULAR VISION

|   |     |
|---|-----|
| Horoptyer   | 179 |
| Panum's Area  | 180 |
| Crossed and Uncrossed Diplopia  | 181 |
| Diplopia in Strabismus  | 182 |
| Change of Apparent Size of Objects with Convergence<br>and Divergence | 183 |
| Stereoscopes  | 184 |
| Mirror Stereoscopes   | 185 |
| Aniseikonia (Image Size Difference)                                   | 186 |
| Synoptophore (Haploscope)   | 187 |
| Maddox Rod  | 187 |
| Prism Effect of Spectacles  | 188 |
| Convergence   | 189 |

## SECTION VII MISCELLANEOUS

|                           |     |
|---------------------------|-----|
| Exophthalmometer (Hertel) | 193 |
| Magnifying Aids           | 194 |
| Coherent Light and Laser  | 195 |
| Fresnel's Principle       | 196 |

# SECTION I

## Physiological Optics



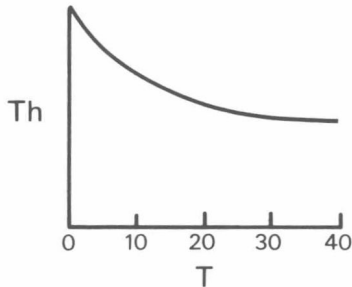
## ABSOLUTE THRESHOLD

### Definition

Smallest amount of light stimulus which will produce any sensation

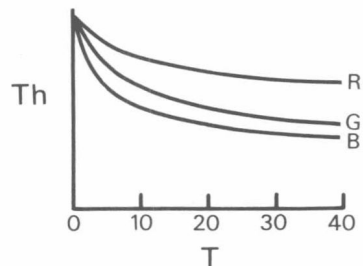
### Factors which influence absolute threshold

1. State of dark adaptation of the retina.  
This shows that the maximal sensitivity is obtained after 30 minutes' dark adaptation.



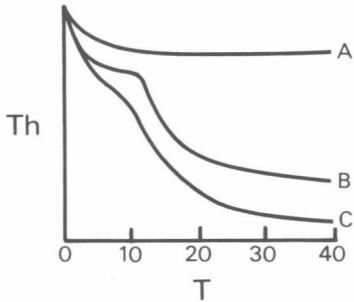
Th = Threshold (intensity of light)  
T = Time (min)

2. Wavelength of light  
lowest with blues and greens. Using different colours the sensitivity is highest for the short wavelengths.



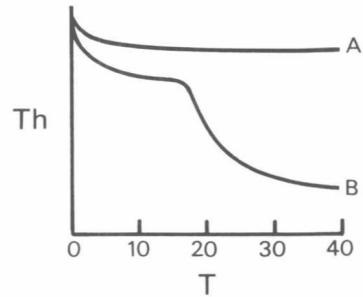
Th = Threshold (intensity of light)  
T = Time (min)  
R = Red light  
G = Green light  
B = Blue light

3. Position of retinal image. The para-foveal retinal zones have an increased sensitivity for low stimulus of illumination.



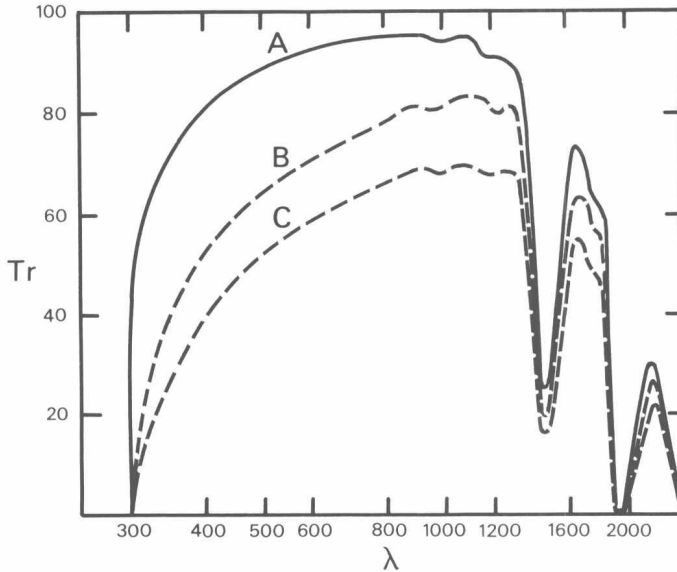
Th = Threshold (intensity of light)  
 T = Time (min)  
 A = Stimulus on fovea  
 B = Stimulus 2½° off fovea  
 C = Stimulus 10° off fovea

4. Size of retinal image. The area of retina stimulated is directly related to the threshold.



Th = Threshold (intensity of light)  
 T = Time (min)  
 A = Small stimulus subtending 2°  
 B = Large stimulus subtending 10°

## TRANSMITTANCE OF CORNEA



Tr = Percentage transmittance

λ = Wavelength of light

A = Total transmittance, age 4 years

B = Direct transmittance, age 4 years

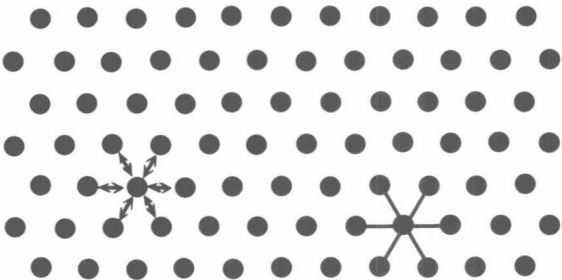
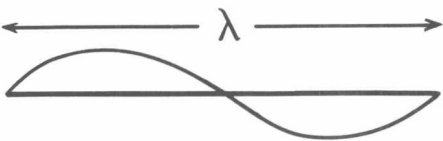
C = Direct transmittance, age 53 years

The cornea transmits light of wavelengths between 300 and 3000 Å. Virtually all harmful ultra-violet light is filtered out by the cornea but infra red can penetrate in sufficient amounts to be harmful. Trans-mission decreases with age.

Spectacle lenses (especially of tinted materials) further decrease the amounts of long- and short-wavelength light entering the eye. Clear plastic, such as polymethyl methacrylate, does not absorb ultra-violet light. See also p.43.

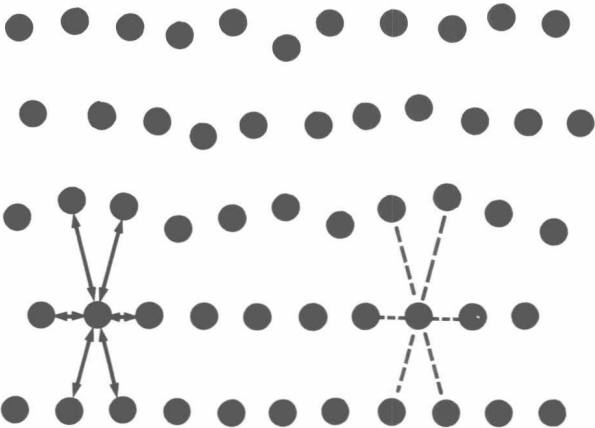


# LATTICE THEORY



λ = Wavelength of light

Cross-sectional view of fibrils arranged in lattice. The size of wavelength is shown above for comparison. Forces of repulsion and rigid links between fibrils are shown schematically.



This figure shows the swelling of the cornea and the disorder of rows of fibrils as a consequence of the weakening of forces of alignment from neighbouring rows. (From Maurice, D., 'The Physics of Corneal