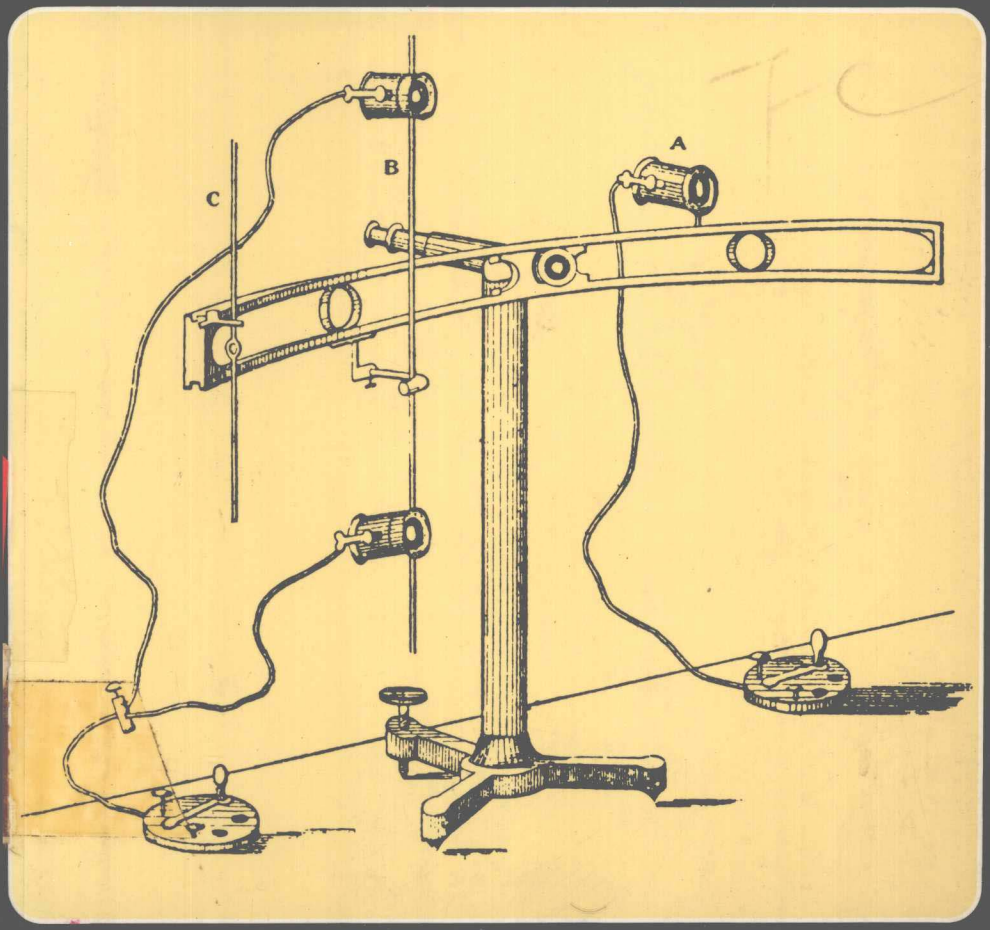
REVISION CLINICAL OPTICS

MONTAGUE RUBEN
E GEOFFREY WOODWARD



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Montague Ruben
and
E. Geoffrey Woodward

Drawings by
Terry Tarrant

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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 Tarrnt who has done all the drawings.

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

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

Contents

SECTION II

BASIC OPTICS

SECTION III

CLINICAL OPTICS

SECTION IV

VISUAL OPTICS

SECTION V

INSTRUMENTS

SECTION VI

BINOCULAR VISION

SECTION VII

MISCELLANEOUS

SECTION I

Physiological Optics

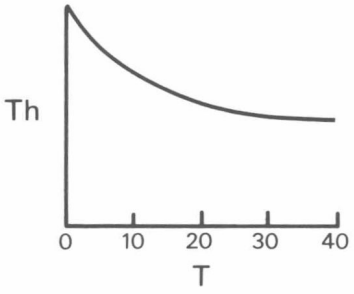
ABSOLUTE THRESHOLD

Definition

Smallest amount of light stimulus which will produce any sensation

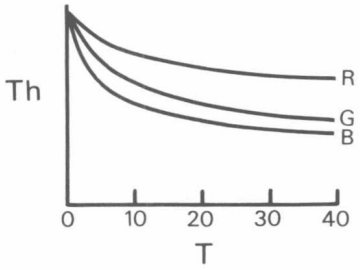
Factors which influence absolute threshold

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



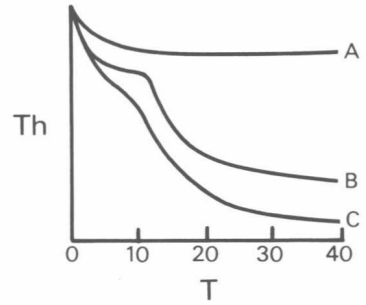
Th = Threshold (intensity of light)
T = Time (min)

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



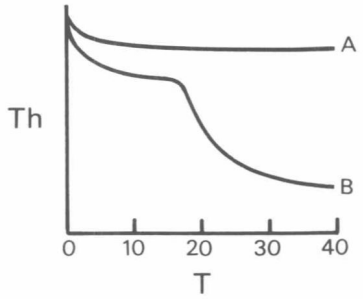
Th = Threshold (intensity of light)
T = Time (min)
R = Red light
G = Green light
B = Blue light

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



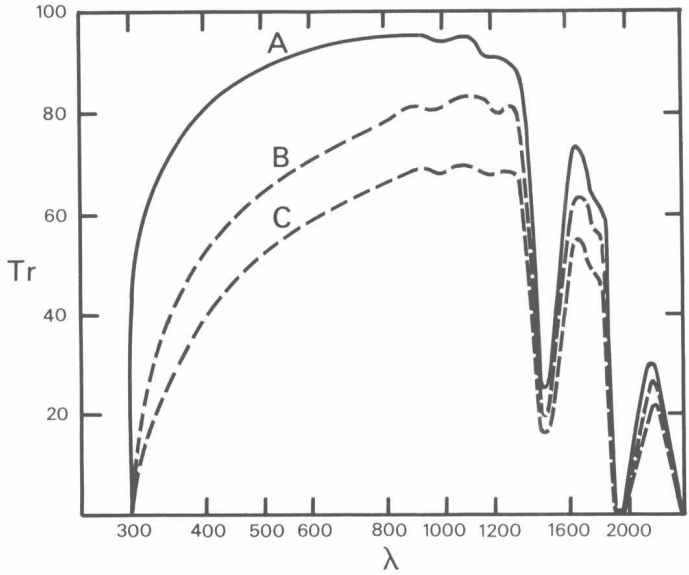
Th = Threshold (intensity of light)
T = Time (min)
A = Stimulus on fovea
B = Stimulus $2\frac{1}{2}^{o}$ off fovea
C = Stimulus 10^{o} off fovea

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^{o}
B = Large stimulus subtending 10^{o}

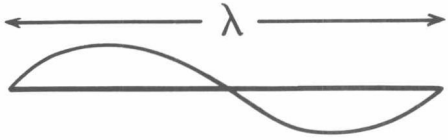
TRANSMITTANCE OF CORNEA

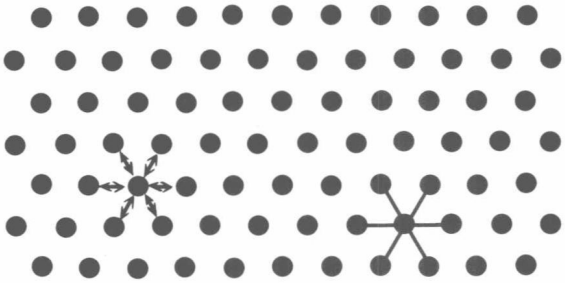


Tr = Percentage transmittance
λ = Wavelength of light
A = Total transmittance, age 4 years
B = Direct transmittance, age 4 years
C = Direct transmittance, age 53 years

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. Transmission decreases with age.

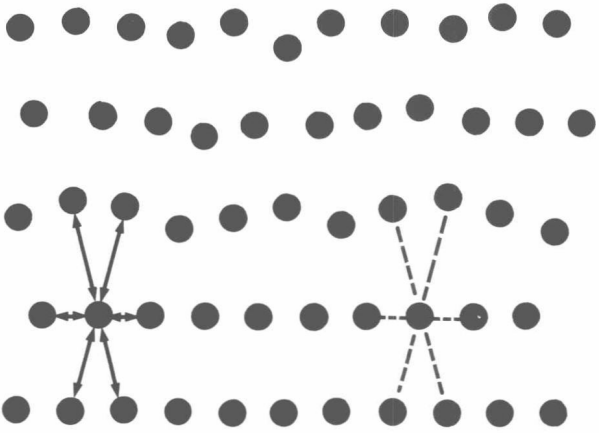
Spectacle lenses (especially of tinted materials) further decrease the amounts of long- and short-wavelength light entering the eye. Clear plastic, such as polymethyl methacrylate, does not absorb ultra-violet light. See also p.43 .





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