

**AN ELEMENTARY
TREATISE ON
GEOMETRICAL OPTICS**

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An Elementary Treatise on Geometrical Optics by W. Steadman Aldis

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PREFACE.

THE main object of the present treatise is to supply a text-book on Geometrical Optics to students reading for the Mathematical Tripos at Cambridge, who do not wish to proceed much beyond those portions of the subject which are required for the first part of the Tripos Examination.

The investigations are therefore not carried beyond *first approximations*. The discussion of the position of the foci of obliquely incident pencils has, however, been brought within this boundary, instead of being derived from the second approximations for direct pencils.

The Author hopes that the book may be useful to a wider class of students, not residing in any University, by giving to them a concise view of the mathematical explanation of instruments, with the practical details of which they are familiar.

The Author wishes to express his acknowledgements to several friends, for hints and suggestions, and especially to Mr W. M. Spence, Fellow of Pembroke College, Cambridge, for his valuable assistance in revising the book as it went through the press.

COLLEGE OF PHYSICAL SCIENCE,
NEWCASTLE-UPON-TYNE,
September, 1872.

The Second Edition has been carefully revised, and a few additions have been made to the text and the Examples.

UNIVERSITY COLLEGE,
AUCKLAND, NEW ZEALAND,
Jan. 1886.

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CHAPTER I.

LAWS OF REFLECTION AND REFRACTION.

1. THE subject of Optics divides itself naturally into two distinct parts.

One of these consists in the deduction by geometrical or analytical methods of the consequences of a few well ascertained laws which govern the simplest phenomena of light. The second consists in the explanation of the mechanical or physical causes which produce those phenomena. These two branches of the subject are usually known as Geometrical and Physical Optics respectively, and it is with the former exclusively that the present treatise is concerned. We shall not discuss the physical causes of the propagation of light, but taking certain laws for granted, we shall endeavour to trace out some of their more interesting and useful consequences. It will be necessary to commence with a few important definitions and explanations.

2. When we are in a place exposed either to the light of the sun or any artificial source of light, we are sensible of the existence of objects surrounding us. If the light of the sun be excluded or the artificial light extinguished, w