GEOMETRICAL OPTICS: ADAPTED TO THE USE OF THE HIGHER CLASSES IN SCHOOLS, &C.

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PREFACE.

THIS is, I imagine, the first time that any attempt has been made to adapt the subject of geometrical optics to the reading of the higher classes in our good schools. That this should be so is the more a matter for remark, since the subject would appear to be peculiarly fitted for such an adaptation. The great simplicity of its primary laws, in the first place, and the very small amount of analysis which, generally speaking, they involve, render the commencement not so unattractive as that of many subjects which are usually taken as the beginning of the second course of mathematical reading: whilst the new ideas and trains of thought which are introduced at every stage appear to me to be at once interesting and valuable. The conception of a virtual image, to take an early instance, is probably an entirely new one to the reader's mind. So also is the idea of a caustic curve, and the subject abounds with similar new considerations.

But the chief advantage that this subject possesses appears to me to be the middle position which it holds between the purely theoretical and the purely experimental. It contains sufficient of physical interest to give reality, and the easy and certain experiments by which it can be illustrated are convincing evidences of the correctness of the results, whilst the analysis which is requisite to obtain these results is sufficient to afford the reader, who up till now has been studying Algebra and Euclid, a proof that the said Algebra and Euclid have really some distinct use in explaining the phænomena of common life.

When the idea of writing such a book was first suggested to me by my old master, Professor Drew of King's College, I was afraid that there was hardly room, under the present system, for the subject in the course of a boy's school-work: I therefore, after making some progress in it, wrote to obtain the opinion of the head mathematical masters of two or three of our best schools; and I cannot sufficiently acknowledge the courtesy with which these gentlemen gave me the information I required. While acknowledging that the doubt which I had expressed existed in their own minds, they urged me strongly to continue my work, as they fully agreed in recognizing the great use of introducing a subject into school-work which should combine new ideas with practice in former knowledge.

The familiar use of the subject of Geometrical Optics by all who have received any but a very slight mathematical training precludes the possibility of originality in the facts themselves, and admits of but small originality in their treatment. At the same time it is hoped that it will be found that this book is not merely a rescript of any existing work.

It might be thought that it would be an easy task to adapt a subject of simple principles to the comprehension of boys possessing mathematical knowledge of the standard usually found in the higher classes of our schools. I imagined so myself, and during the course of my working I have been gradually learning my error. I can only wish that what I consider to be an object of the highest importance had been approached by some one more fitted both by mathematical knowledge and experience than by one whose sole qualifications are considerable fondness of the subject and a great desire to afford to beginners some glimpse of one of the steps to science to which their daily mathematics are leading. I have endeavoured as much as possible to avoid the example of those popular lecturers who explain difficulties by ignoring them. But as the nature of my design necessitated brevity, I have omitted entirely one or two portions of the subject which I considered unnecessary to a clear understanding of the rest, and which appear to me better learnt at a more advanced stage,—such