OUR BOOK SHELF.

In Starry Realms. By Sir Robert S. Ball, D.Sc., LL.D., F.R.S. (London: Isbister and Co., 1892.)

THIS is another striking example of Sir Robert Ball's skill in popularizing the most fascinating of the sciences. Though the same story has been to a large extent told by him before, there are several new features which prevent the least suspicion of staleness. The author is perhaps most interesting in his homely illustrations of astronomical dimensions. Among these are the disc of the moon projected on the map of Europe, and three lunar craters similarly compared with the map of England. The history of a falling star, as told by a particularly intelligent meteorite, is also worth special notice.

The two final chapters consist of "An Astronomer's Thoughts about Krakatoa," and "Darwinism in its Relation to other Branches of Science." The former is a popular account of the Report of the Krakatoa Committee of the Royal Society. The moral of the last chapter is that the scientific method of Darwin is closely related to that employed in astronomy. "Astronomers were the first evolutionists: they had sketched out a majestic scheme of evolution for the whole solar system, and now they are rejoiced to find that the great doctrine of Evolution has received an extension to the whole domain of organic life by the splendid genius of Darwin" (p. 349). We can confidently recommend the book to all classes of readers. Those who are already familiar with the subject will find much to delight them.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Basset's Physical Optics.

I DESIRE to make a few remarks on Prof. Schuster's review of my treatise on physical optics.

The sentence in the preface to which he refers is not perhaps very happily arranged, and might be amended as follows:—

"I have a profound distrust of arguments based upon vague and obscure general reasoning instead of upon rigorous mathematical analysis." This, however, is a small matter; what I wished to protest against was, the practice which has crept into more than one recent work, of slurring over an investigation by means of a page or two of general talk, instead of writing out a careful mathematical demonstration; or at any rate making a serious attempt to grapple with mathematical difficulties, and trying to arrive at a definite result.

I fully admit, that when a subject is in a state of growth it is often impossible to dispense with hypothesis. But whenever this is necessary, the hypothesis should be expressed in clear and definite language; the evidence and arguments for and against the hypothesis should be properly marshalled and discussed; the reader should be plainly informed that the proposition which forms the basis of the investigation is a hypothesis and not an established fact, and that consequently further research may show that the hypothesis must either be abandoned or modified. When an investigation is conducted on these lines, all obscurity and vagueness will be avoided; for the reader will be thereby enabled to clearly understand the exact nature of the assumptions which are made, and will be able to discriminate between those portions of the investigation which consist of hypothesis, and those which constitute results deduced from hypothesis by the aid of mathematical analysis.

The dangerous character of arguments based upon general reasoning is well illustrated by the theory of the deformation of thin elastic plates and shells. When a thin shell is deformed by means of bodily forces, and stresses applied to its edges, the effect produced is extension, change of curvature, and torsion; and it might be argued from this, that the potential energy due to deformation is a homogeneous quadratic function of the quantities by which extension, change of curvature, and torsion are specified. But if the expressions for the potential energy of a cylindrical or of a spherical shell be examined (Phil. Trans. 1890, pp. 443, 467), it will be found that they contain certain terms which involve the *differential coefficients* of quantities by which extension is specified.

With regard to the concluding portion of the review, I must point out that one of the difficulties with which the author of an advanced treatise is confronted is *where to draw the line*. Upon this subject there is necessarily room for a wide difference of opinion. As my object was to write a book on physical optics, I considered that the reader might properly be expected to obtain his information respecting the various theories of the electromagnetic field, from the treatises and original memoirs on that subject; and for that reason I abstained from discussing purely electromagnetic theories, further than was necessary for the explanation of optical phenomena. A. B. BASSET.

July 25.

Causes of the Deformation of the Earth's Crust.

THE communication from E. Reyer in NATURE of July 7 (p. 224) "On the Causes of the Deformation of the Earth's Crust" is interesting from several points of view. It is an indication that the theory which looks upon mountain ranges as the effects of the earth's contraction does not satisfy the conditions of the geologist.

It is welcome to me individually as in the main accepting the principles of which I happen to be the exponent, and have systematized in the "Origin of Mountain Ranges," published in 1886. It is, however, the addition to this theory explaining the folding of strata by what Mr. Reyer aptly calls "gliding" that calls for examination. It is shown very clearly by experiment and otherwise that under certain conditions strata, when they reach a certain degree of inclination on the flanks of a mountain chain during elevation, must glide downwards by gravitation and produce folds and disturbances towards the lowlands. We have only to consider the effects of land-slides such as occur in the chalk districts in the south of England, and their effects on the shore deposits, to admit the truth of this. This aspect of the problem, though always present, has grown on me since my work was published, and I have little doubt that the "foot-hills" usually formed of the newer strata which flank most great mountain ranges are to a considerable extent due to gravitation and "gliding." I may point to the foot-hills of the Canadian Rockies and of the Himálayas as illustrations. The cases of folded lying upon undisturbed strata mentioned by Reyer are, as he clearly shows, explanatory on this view, but not by general contraction.

There are no doubt other effects traceable to the gravitation of masses of the earth's crust during elevation such as the lateral spreading of the plastic cores of mountain ranges in fan-like form, and the consequent shouldering of the strata on either side intensifying the effects of the folding of the strata by thermal expansion, as explained in the "Origin of Mountain Ranges."

I cannot, however, follow Mr. Reyer if he considers "gliding" an explanation of all folding. I am not sure that this is his meaning, though the last paragraph would seem to bear such an interpretation. It seems obvious to me, to mention only one of numerous examples, viz., the folds of Jurassic strata caught up in the gneiss of the Central Alps, as shown in Heim's section, reproduced in "Prestwich's Geology," and in plate xiv., "Origin of Mountain Ranges."

While looking upon "gliding" as only a partial explanation of folding, I welcome Mr. Reyer's fresh and vigorous treatment of the important problem of the causes of the deformation of the earth's crust. It is evidence that geologists and physicists are now allowing their minds to play freely round the subject of the orogenic changes of the earth's crust, and of the growth of philosophical conceptions on the geological evolution of our planet.

Park Corner, Blundellsands, July 11. T. MELLARD READE.

An Obvious Demonstration of the 47th Proposition of Euclid.

SOME years ago in trying for a simpler demonstration of this theorem I worked out the following. Its extreme simplicity suggested that it could scarcely be original; but as some years have elapsed, and as none of my friends have seen it else-