

in an unsuccessful attempt to wrestle with the novelties submitted to consideration. The only possible consolation or reward is the thought that a brief notice may prevent others from a similar distress and dissatisfaction. To say that the author does not accept the first law of motion, will perhaps serve to indicate the kind of man with whom we have to deal. After this one will be prepared to believe that any amount of curiosities and world-worn paradoxes will be met with in this collection of some two hundred quarto pages.

The feature, however, which distinguishes this production from all other works of the same character is the numerous suns which the author is obliged to introduce in order to explain the motions of the earth and moon. For those who are so benighted as to accept the gravitational theory, as developed by Newton and his school, one sun suffices; but the new Principia requires at least four. First, we have a central sun occupying "the eccentric centre of an ideal sphere." This phrase is hard to understand. It is suggested that it may mean that an imaginary sphere rotates about a point not its centre. Round this "ideal sphere" we have a so-called polar sun, circulating with its cortège of solar bodies and their satellites. This sun is called a polar sun because it revolves in a plane approximately parallel to the axis of the earth; but in what the peculiar necessity of its creation consists, we have failed to fathom with distinctness, and fear to misrepresent the ingenious author. On the surface of this ideal sphere another sun, called the equatorial, also revolves, this time from west to east, in a "mean equatorial plane." These three suns are necessarily made to be non-luminous bodies, only recognisable by the effects their "eccentric attractions and orbital revolutions" exercise on the earth and moon. Finally we have the visible sun. Of these four, the central sun is the master-key of the whole system, from which energy radiates in every direction, upholds all the members of the system, while simultaneously holding them apart. And any one who is at all accustomed to this kind of literature will conclude, without any further warning, that electricity is the energy invoked to sustain this system. It would have been distinctly disappointing not to have had electricity introduced as the mainstay.

Those who wish to see how this complication can be made to explain the precession of the equinoxes, the motion of the lunar nodes and apsides, nay, the predominance of land and water in the northern and southern hemispheres of the earth respectively, and many other strange things, must be referred to the book itself. There is, in fact, only one sentence in the book with which we can cordially and entirely agree, and that is the first "Who," says the author, "Who will believe the theory of astronomical motion set forth in the following pages? Not the astronomers, certainly." We venture to assure him that he is perfectly correct in this conjecture. W. E. P.

*A Manual of the Geology of India.* Second edition. Revised and largely re-written by R. D. Oldham, A.R.S.M., (Calcutta: Geological Survey Office. London: Trübner and Co., 1893.)

THE first edition of this book has been out of print for some years; meanwhile, Indian geology has greatly advanced, so that a revised and extended issue, bringing the work in line with the new results of the Geological Survey, has long been needed. Few are more capable of doing this re-writing and revision better than Mr. Oldham. He has had a wide and varied experience of survey work in India, and his acquaintance with the literature pertaining to the subject is evidenced by the "Bibliography of Indian Geology," compiled by him in 1888. Mr. Oldham has entirely altered the arrangement of the book. The original edition consisted of a series of descriptions

of separate districts; but in the present volume the rocks are described in chronological order. All references to economic geology are excluded, being relegated to the works specially devoted to it, while this deals with stratigraphical and structural geology. In the detailed table of contents, the excellent plan has been followed of indicating by a different type the matter which is new or entirely re-written in the present edition. A glance at this shows at once that Mr. Oldham has produced almost a new book. Especially interesting is the chapter on the "Homotaxis of the Gondwana System." Most geologists will remember the bitter controversy that once raged over the age of this system, but which has now died out. Mr. Oldham has made a detailed study of the rock-groups of the Gondwana system, and has compared them with their representatives in Australia and Africa. He has thus been able to show the relation of the Upper Palæozoic and Lower Mesozoic rocks of India, Africa, and Australia to those of Europe. The two last chapters in the book are entirely new. One deals with the age and origin of the Himalayas, and the other with the geological history of the Indian peninsula. In both of these a number of important questions are discussed in a scientific manner. Wherever Mr. Oldham has interpolated new matter, he has done it well. Unlike many other revisers, therefore, he has produced a restoration which really improves the old structure. The result is that the manual is once more the standard work on the present state of knowledge of the geology of India.

#### LETTERS TO THE EDITOR.

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#### The Weight of the Earth.

IN a letter in this week's NATURE, signed "The Reviewer," the writer does not notice that in the English language, and in all legal and common usages of it, including that of all scientific men in speaking of their weightings by ordinary balances, *weights* mean *masses*. The fact that the weight of the earth is  $6.14 \times 10^{21}$  tons is as clear as that the weight of a parcel of tea is 3 lb. It is the *heaviness* of a weight or mass that is a property accidental to its position, being less at the equator, greater at the poles, and nothing at the earth's centre. I have never yet heard a "box of weights" called a box of masses. I don't believe even "The Reviewer" calls it a box of masses. If carried to the centre of the earth it is still a box of weights, though the heaviness of the weights is zero.

The word "weight" is often used to denote the heaviness of a weight or mass. No dictum, either of "The Reviewer" or of myself can eliminate this ambiguity from the English language. But scientific men may greatly diminish the inconvenience of it, and may even tend to eliminate it altogether, if they persistently use the word "heaviness" when they mean heaviness.

May 12.

K.

"THE REVIEWER" makes a number of statements which he does not stop to prove; as, for instance, when he says that "the weight of a body would be practically nothing if the body was removed to a few million miles from the earth." But an appeal to experiment will show that the weight is unaltered. To fix the ideas, consider an astronomical or astrological chart, in which the earth is at the centre of a Zodiacal circle. Now, if a 100-ton gun is weighed in the scales of Libra, the weights required for equilibrium, as given by the lumps of metal in the other scale pan, will amount to exactly 100 tons; so that the weight of 100 tons at the distance of the Zodiacal circle, or at any other distance, is exactly 100 tons.

But if "The Reviewer" takes a ball of the mathematician's imaginary fine, weightless string, which he lets down from Libra to the surface of the earth, to the end of which weights can be attached, so as to equilibrate the 100-ton gun at the dis-