

We will pass over the little incidents of the journey to Jupiter. Suffice it to say that Mars and his moons were observed, that a few asteroids were met and a comet penetrated, and eventually the Callisto—that was the name of the car—was landed on a hard part of the planet's surface. Jupiter was found to be in the Palæozoic period; and a smattering of geological knowledge has enabled the author to conjure up multitudes of "extinct monsters," which quite eclipse those in Mr. Hutchinson's book.

Having passed through Saturn's ring, and seen for themselves that it was composed of meteoritic particles, the party arrived safely on the planet. Our belted brother was found to be an abode of spirits, upon the characteristics of which we are not competent to express an opinion. The height of the ludicrous is reached at a dinner given to the travellers by one of these airy nothings, who, we are gravely told, "took only a slice of meat and a glass of claret." The idea of a diaphanous bishop consuming meat and claret is very rich.

A word or two on the general character of the book may not be out of place. The author rightly terms his production a romance—that is, a story hung upon seeming impossibilities. There is no plot, and the characters are merely mechanical puppets used to expound didactic ideas, so the book cannot be called a novel. It is, in fact, little more than a reading-book suitable for beginners in astronomy. We doubt whether many people will read it through without skipping the prosy parts, but they who conscientiously do so will undoubtedly acquire a certain amount of more or less useful knowledge. The author is usually accurate in his astronomy; and this, considering that writers of romances generally play fast and loose with astronomical phenomena, is saying a good deal. We commend the book to readers who like instructive tales.

R. A. GREGORY.

OUR BOOK SHELF.

Ueber die geometrischen Eigenschaften homogener starrer Structuren und ihre Anwendung auf Krystalle. Von W. Barlow. (Leipzig: Engelmann, 1894.)

THIS paper, which was recently published in the twenty-third volume of Groth's *Zeitschrift f. Krystallographie*, is an interesting contribution to the theory of crystal structure.

Mr. Barlow investigates the nature of a homogeneous structure, by which he means an arrangement of any material of constant form which is uniformly repeated throughout its whole extent. To every point in such a structure correspond other points homologous with it, and these must constitute one of the sixty-five regular assemblages of points as defined by Sohncke in his well-known treatise on crystal-structure. But the symmetry of the structure is not always identical with that of the assemblage of points derived from it, and it is sometimes necessary to extend the latter by a geometrical process of reflection or inversion in order to arrive at the symmetry of the structure. This process results in the addition of 164 possible homogeneous structures to the sixty-five already established. Incidentally it is shown that the assemblages of Sohncke are not in reality independent, but can all be regarded as compounded of one or other of ten assemblages belonging to the least symmetrical types in the various systems of crystallography. Fedorow and Schönflies have independently

advanced a new theory, and agree in the result that there are 230 possible types of homogeneous structure. Since their methods are based upon Sohncke's definition extended by the principle of reflection or inversion, Mr. Barlow's investigation should lead to the same result. Now he finds 229 types, and expressly states that he is unable to account for a certain one of Fedorow's structures, so that his work is an absolute confirmation of the general accuracy of their calculations.

When this trifling question of 229 or 230 is settled, the problem of homogeneous structures, which was approached by Haüy 100 years ago, may be regarded as completely solved *from the purely geometrical point of view*.

Mr. Barlow's analysis of Sohncke's assemblages, and his laborious synthesis of the 164 new types, make the relations between the old and the new theory intelligible, and enable the reader to form a mental picture of all these complicated groupings: a task which is by no means easy from the writings of Fedorow and Schönflies without the aid of Mr. Barlow's tables.

H. A. M.

Theoretical Mechanics.—Solids. By Arthur Thornton M.A. Longmans' Advanced Science Manuals. (London: Longmans, Green, and Co., 1894.)

THE manuals published in this series are written specially to meet the requirements of the advanced stage of science subjects, and the present book will be found a very worthy addition. It is not surprising to hear, as the author tells us in the preface, that in preparing this work he was confronted by the syllabus of this department. The range which these 400 odd pages then cover, can on this account be at once gathered; and it can safely be stated that the book includes all that is generally necessary for any school course. The order in which the subject has been treated is first kinematics, in which the geometrical science of motion is dealt with, then statics, and finally kinetics, in which force is treated in its relation to motion. In each part the author feels himself by no means bound up as regards the choice of proofs and definitions; and he places before the reader, in a well-arranged series of paragraphs, all the theorems and problems, illustrating them when necessary with clear figures. The real essence of the subject, that is, the "book-work," has had special attention devoted to it, and each chapter contains a special number of problems to be deduced directly from it. Stress has been laid, too, on the importance of solving problems from first principles, and not from a direct substitution in formulæ. Formulæ can easily slip the memory, if not totally, then partially, and it is for this reason that numerous methods and samples of solution have been given.

Examples of all kinds, and especially those introducing great diversity of style, are scattered throughout the work, some being original, while others are obtained from numerous well-known sources. A useful appendix, containing a brief summary of trigonometrical formulæ, and a short index, brings the book to a conclusion. For the convenience of those who are preparing the subject for special examinations, a short list is given of the portions which may be omitted.

The Earth: an Introduction to the Study of Inorganic Nature. By Evan W. Small, M.A. University Extension Series. (London: Methuen and Co., 1894.)

IN this very acceptable addition to the well-known University Extension Series, we have a set of chapters which are not intended to form a text-book on physiography, but to serve as a book containing a certain amount of accurate and definite knowledge for the general reader. Such being the case, the author has not dealt fully with any of the various branches, but has treated, in a sketchy