

portion of the work is more difficult to follow, owing to the necessity of subdividing the cross-sections, like the previous parts of the book, in accordance with the limits of the great formations. This difficulty is inherent in the case, and lies in deciding how to put the diverse phenomena before the mind in 'natural order' (much-abused phrase). If we follow the geographical divisions, there must be a continual interruption and resumption of the same geological horizon; whereas, if the geological boundaries are alone regarded, the geographical continuity is broken. Of the two solutions, perhaps the second is the better. The first of these subdivisions (chap. i.) is the 'primitive terrane' (used by de Castro to imply nearly what is meant by the archæan of Dana). It is very interesting in this connection (and not unexpected), to find that the upper division of the 'primitive' consists of the *roches vertes* which occupy this position in South Wales, the Appalachian belt, and in so many other places. They are mingled with chlorite schists and talc schists overlying the mica schists of Villalba, which latter contain biotite, muscovite, orthose, plagioclase, and two kinds of quartz; with garnet, zircon, sphene, and oligiste as accessories. Gneiss has been observed by Dr. Barrois only in subordinate thin layers intercalated among the mica schists.

The same is true of the garnetiferous amphibolites; but the difference between this Spanish stratigraphy, and that of those regions where similar rocks have been observed in America and in Europe, is, that the series in the former case are concordant. The Laurentian would appear, from Dr. Barrois' conclusions, to be wanting in the outcrops of Galicia, and the above-mentioned measures to represent a great development of the Huronian. The succession of Cambrian beds, both in the Asturias and in Galicia, he finds perfectly in accordance with Barrande's views of this part of Europe. From a fossil of *Archæocyathus* (Billings), characteristic of the Potsdam sandstone, found in the limestones of El Pedroso, MacPherson forms a column in which he thinks that possibly the Laurentian is represented at the base by mica and talc schists, with intercalated limestones of various colors, and sometimes filled with actinote (actinolite), and, more rarely, intercalated beds of felspathic grauwacke. On this rest argillaceous, splendid, siliceous talc schists, sometimes containing chialstolite; and on these, three benches of conglomerates, tuffs, and argillaceous schists and limestones, which he refers to the Potsdam sandstones.

Following this are details of the sections in

the Devonian and carboniferous. The sixth chapter treats of the phenomena which have modified the position of the paleozoic strata since these latter have been deposited. His conclusion is, that the Cantabrian Mountains owe their origin to two distinct lines of pressure; the one acting along east and west, and the other along north and south, lines. The former occurred between the carboniferous and Permian ages; and the latter, between the eocene and miocene.

The last subjects treated are the effects of denudation and the details of the actual surface-relief.

The work has been built on strong and sure foundations, and will long be cited as an authority. It is full of new facts and suggested analogies, and is characterized by thoughtfulness, industry, and modesty.

LOCKWOOD'S ELECTRICITY.

Electricity, magnetism, and electric telegraphy: a practical guide and handbook of general information for electrical students, operators, and inspectors. By THOMAS D. LOCKWOOD. New York, Van Nostrand, 1883. 377 p., illustr. 8°.

As indicated in its preface, Mr. Lockwood's unpretending book is not primarily intended for those having any considerable previous knowledge of the subject of electricity, but for the large number of persons who have not had the advantage of a scientific education, and yet find themselves in the employment of telegraph, telephone, or electric-light companies in various subordinate positions. To this class of persons the information contained in the work will doubtless be of great value; and, indeed, we do not recall any one book, of moderate size and price, in which so many of the different applications of electricity are considered in an elementary manner. To one familiar with the subject, the treatment of the more important topics must, of course, seem brief and occasionally superficial; but, recollecting the design of the work, it can hardly fail to win commendation, even from those who most clearly recognize its deficiencies.

The chapters on line-construction, office arrangements, and the adjustment and care of instruments, are excellent: and a very clear description of the principles of duplex and quadruplex telegraphy is given. There is also a good account of Mr. Gray's interesting harmonic multiple telegraph. Mr. Delany's ingenious multiplex synchronous telegraph is not described, probably because it did not

become well known until too late for insertion; but we hope it may find a place in a future edition. The telephone has a chapter devoted to it. We wish that the theory of the instrument had been stated more at length, and are surprised to find not even a reference to the musical telephone of Reis.

The preceding remarks apply especially to the latter and technical portion of the book. The earlier chapters, which treat of various theoretical matters, are less worthy of praise. The definitions of electrical units are in some cases far from clear. Some of the remarks on p. 96, regarding the unit of capacity, are quite misleading. There are also some apparent slips of the pen. Such, for example, is the statement on p. 119, that the resistance of a battery increases in direct proportion to the number of cells, which is evidently true only when the cells are connected entirely in series. To the same origin we may probably trace the erroneous statement on p. 94, regarding the use of the terms 'weber' and 'weber per second.' The chapter on electrical measurements seems rather to be compiled from text-books than derived from the writer's knowledge of such experimentation, and hence fails to have the suggestiveness that is found in some portions of the book. The few pages devoted to electrotherapeutics are unworthy of the title, and do not deserve insertion in a separate chapter; and more discrimination might well have been employed in the descriptions of the various electric lamps. The question-and-answer style is a disadvantage, which would be removed by the substitution of proper marginal titles.

A NEW CLASSIFICATION OF THE MOLLUSCA.

Encyclopaedia Britannica. 9th ed., vol. xvi., pp. 632-697. Article, *Mollusca*. By E. RAY LANKESTER.

As a rule, it is hardly in the ponderous tomes of an encyclopaedia that one looks for new, fresh, and breezy contributions to biology, or for epoch-making articles on biological topics. One rather expects the carefully weighed and sifted results of investigation which has already borne the test of publication and discussion, prepared for general comprehension by a divestment of all unnecessarily technical terms. In the present instance, whatever be the feelings of the layman who may refer to it, the scientific student of the Mollusca will be agreeably disappointed. It is rumored that the distinguished author has in preparation a manual of the invertebrates, of which it may be assumed

this article is the forerunner. For this reason, even in our limited space, which forbids a really thorough discussion of so large a topic, it is desirable that the attention of specialists should be called to it.

The school of which Professor Lankester is one of the leaders is marked by certain well-recognized features. They have broken away from the fetters of all previous zoölogical classification. Armed with the latest instruments and methods, they attack biological problems with ardor, and rarely fail to add materially to our knowledge, whatever be the subject treated. A new biology has arisen, and the gospel thereof is pedigree. By their ancestral trees shall ye know them, under whatever adult garb they may conceal themselves, — this is the new law of the new prophets.

So great a truth is contained in it, so rich the harvest under its stimulation, and so unanimously has it governed the generation first brought under its beneficial influence, that even yet to doubt its infallibility and ubiquity of application is to stigmatize one's self as a biological Philistine. Nevertheless, it is becoming pretty generally admitted that the relations of pedigree fail, in many cases, to express adequately the relations of adult animals as we find them in nature; and that the genealogical stand-point, like any other single stand-point, taken by itself, is inadequate to the broadest and truest view.

Professor Lankester's work has the merits of his school in a very decided degree, while some of its faults are equally well marked. These we shall endeavor to point out, though limitation of space will compel us to do much less than justice to both.

"The Mollusca," he tells us, "form one of the great phyla or sub-kingdoms of the animal pedigree or kingdom." After a very slight sketch of the history of molluscan classification, the works of Woodward and Bronn are mentioned with deserved approval, the latter being termed "the most exhaustive survey of existing knowledge of a large division of the animal kingdom which has ever been produced;" which would be true, if, for 'existing knowledge,' we were to read, 'knowledge existing twenty years ago.' Notwithstanding its great merits, the work of Bronn is now antiquated in many respects, as well as out of print, yet, so far, has found no worthy successor. If to the admirable and careful exposition of previous systematic work, characteristic of Bronn's monograph, Professor Lankester will join the biological results of the last twenty years, bringing both up to date, he will merit even higher