not necessary; and yet, with this book in hand, the beginner may feel sure of not going astray, if he follows the directions laid down in it.

The book opens with a brief statement of the various classes of bacteria, which is followed by a consideration of the theory of spontaneous generation, and the principles upon which sterilization depends. These latter are very well and briefly stated. The various methods of sterilization are spoken of and explained, and due prominence is given to the method of 'discontinuous' or 'intermittent' sterilization so much used at present.

The second chapter is devoted to the various forms of bacteria, and to an elucidation of the microscopic technique. The method of observation of unstained and stained bacteria is fully shown, and the general principles of the aniline colors are explained. Here are brought together, in a convenient form, all the various staining-fluids of Koch, Ehrlich, etc., with their formulae. The various accessories in the way of reagents and instruments, are, of course, included.

The importance of the bacillus of tuberculosis in furnishing a conclusive method for the diagnosis of this disease leads the author to devote a number of pages to the methods of staining this organism; and all workers in this branch of investigation will be glad to find the full account of the methods of staining *spores* which is given. The method of treating sections of the tissues for purposes of showing bacteria contained in them closes this portion of the work. The various culture methods and materials are clearly given; and the formulae for the various nutritive media, are, of course, added. The advantages of the solid over the fluid cultures are so manifest as to need but a very few words; but these advantages are here so clearly set forth, that any sceptic may be convinced if he will but read the evidence.

Something is said of the saprophytic and parasitic bacteria, and a summary of the general biological problems involved is given.

The book closes with a few words on the special investigation of earth, air, and water.

All the more important implements needed are figured in very good woodcuts, and there are two lithographic plates showing various culture colonies and stained bacteria.

The work is a good one, and well done. It is especially needed at the present time of interest in all that belongs to bacteriological research, and will certainly prove useful to any one interested in the subject who is able to translate easy German.

SAPORTA'S PROBLEMATICAL ORGANISMS OF THE ANCIENT SEAS.

FOSSIL algae are proverbially difficult and unsatisfactory subjects for study. Usually of irregular and variable forms, without definite and characteristic surface-markings, and composed only of cellular tissue which has entirely disappeared, they have left shadowy outlines, or mere casts, that afford only the most general and superficial characters for comparison among themselves or with living plants: hence there must be considerable uncertainty in regard to the botanical relations of even those best preserved; while those which are more obscure are liable to be, and have been, confounded with tracings made by floating objects, the tracks or burrows of annelids, with sponges, alcyonarians, medusae, and other soft-bodied and perishable organisms. Yet the supposed remains of seaweeds are so abundant in rocks of all ages, from the Cambrian up, that they could not be ignored; and a large number of more or less distinct imprints, some of which are unmistakable algae, have been figured and described by Sternberg, Brongniart, and other writers on fossil botany who have followed them. Count Saporta is one of the latest and most learned of these writers, and one who has done much excellent work in his studies of the mesozoic and tertiary plants of France. In his valuable and voluminous contributions to the 'Palaeontologie Française,' and in his 'L'évolution du règne végétal,' he has given a large number of figures and descriptions of what he supposed to be fossil seaweeds, and has attempted a more thorough review of this department of fossil botany than any one else has ventured on. As to the character of much of his material, there can be no reasonable doubt; but some of his specimens are too obscure to warrant any very positive assertions, and in some cases his conclusions have been questioned.

A somewhat sweeping criticism of Saporta's work was recently made by Mr. A. G. Nathorst (*Bull. de la soc. géol. de France*, 3 sér. t. xi. p. 452), who considers that most of his so-called algae are simply casts of tracks or other impressions mechanically made on the sea-bottom.

The work now published is largely a defence of the views heretofore held by Saporta, and it contains figures and descriptions of a number of the casts and impressions which have been the subjects of controversy. Among other things noticed are those peculiar and enigmat-

Les organismes problématiques des anciennes mers. Par le MARQUIS DE SAPORTA. Paris, 1884. 4°.

ical objects which have been found in all countries, and have been described under the names of Cruziana, Rusophycus, etc. These are usually casts of impressions in what was the slimy surface of a mud sheet, sometimes an inch, sometimes a foot or more, in length, by from one to two inches in width. A deep sulcus traverses the middle, and the surface is marked by divergent and parallel, or curiously reticulated and inosculating ridges.

First noticed by Dr. Locke in Ohio in 1838, and named by Vanuxem in 1842 Fucoides biloba, by D'Orbigny in 1842 Cruziana, by Rouault in 1850 Fraena, and by Hall in 1852 Rusophycus, they have been since referred to under one or another of these names by most writers on geology. By the authors mentioned they were regarded as the impressions of seaweeds; but by Dawson, Lapparent, Briart, Hebert, Hughes, Nathorst, and J. F. James they have been considered the tracks of animals. Saporta, in the work under consideration, discusses their character and origin at great length. He pronounces them fucoids, and calls them Bilobites, taking the name from De Kay, and referring for authority to the first volume of the 'Annals of the New-York lyceum of natural history' (1824), where a paper is published by De Kay, "On the organic remains termed 'Bilobites' from the Catskill Mountains," illustrated with one plate and four figures.

On referring to this paper, every American geologist will at once recognize in the fossil described, Conocardium trigonale, a characteristic mollusk of the corniferous limestone and the Schoharie grit. When the suture of this shell is exposed, the carinated valves present an appearance which led our earlier geologists to regard it as a crustacean allied to the trilobite, but distinguished by having two lobes instead of three. De Kay, though retaining the term 'Bilobites,' recognized its molluscous character, and its resemblance to Cardium. From these facts it will be seen that Bilobites of De Kay has no relation whatever to Fucoides biloba of Vanuxem, or Cruziana of D'Orbigny, and the name has been erroneously applied by Saporta. The descriptions of Vanuxem and D'Orbigny bear the same date; but, the old genus Fucoides having been broken up and abandoned, D'Orbigny's Cruziana would seem to be the proper name for these singular objects. Hall's name, Rusophycus (called Rysophycus by Hughes as being more correct), is apparently a synonyme of Cruziana, and, published later, must be superseded by that.

Though we have thus obtained a name for these objects, their true character is as far from being demonstrated as ever, nor does it seem probable that the present diversity of opinion will soon be harmonized. Every one who has seen much of the exposures of shallow-water sediments, shales, and flagstones, will concede that many of the so-called fucoidal markings are of mechanical origin, and will accept Nathorst's view that such casts as Eophyton and Panescorsea are inorganic. Where the cast consists of a number of divergent ridges springing from a common stem like branches from a trunk, such as Vexillum Sap. (which, however, can hardly be distinguished from Licrophycus of Billings), the conclusion seems inevitable that the cast is organic, and the form is rather that of a plant than a sponge.

Although so far resulting in little demonstration, the discussion in which Saporta and Nathorst have taken the leading parts has excited much interest, and has been productive of an important series of experiments and observations. Doubtless in this, as in many other discussions, the truth will be found to lie between the views of the opposing leaders, yet science will be advanced by the stimulus to inquiry furnished by these very differences.

J. S. Newberry.

PRONUNCIATION.

Meeting a book of this kind, admitting its possible utility, one naturally asks whether the pronunciations recommended are correct, with allowance for admissible variations, whether the description and representation of sounds are exact and clear, and whether the list of words likely to be mispronounced is judiciously made. The first and last of these questions suggest no severe criticism of this book, unless one considers only matters of detail. We mention only one. Paragraph 51, in the introduction, should be changed so as to make it clear that by 'antepenultimate vowel' is meant that in the Latin words referred to, not in the English, as is now absurdly said.

The second question shows the weakness and unpractical plan of the book. Passing by the introduction, which shows some careful observation, but has several hazardous assertions, we come to the body of the book. Here each page contains two columns, — on the right hand, the words in alphabetical order, but

A handbook of pronunciation. By Lewis Sherman. Milwaukie, *Cramer, Aikens, & Cramer, pr.*, 1885. 174 p., illustr 8°.