eculiarities in the grouping and arrangement of crystals and the structure of minerals. Other physical properties such as cleavage, fracture, hardness, specific gravity, color, luster, etc., are treated briefly in the fourth chapter. In the fifth the chemical characters of minerals are discussed, and in the sixth the use of the blowpipe and simple means of making chemical tests.

The seventh chapter, taking up about one-half of the volume, is devoted to a description of the mineral species. Of course only the common and important ones are considered, the chief features by means of which each mineral may be recognized being clearly brought out and its crystallization or structure well illustrated. The uses to which the mineral may be put are also given. The classification adopted is not the usual and more scientific chemical one, where the minerals are grouped according to the acid radicals, for example, the *sulphates* as one group, the *carbonates* as another, etc., but the minerals are grouped according to the different metals which they contain. In each case there is first given a brief account of the metal and its uses, followed by a description of the common minerals containing it. The silicates, owing to their complexity and the fact that, with few exceptions, they are not economically useful as ores of the metals, are treated in a group by themselves.

In the last chapter some simple rules for the identification of minerals by means of their physical properties are given.

The book is one which certainly will be found very useful, and a careful study of it in connection with a collection of mineral specimens will form an excellent foundation in the science.

S. L. Penfield.

The Elements of Botany. By Francis Darwin. Cambridge, University Press. 1894. Macmillan & Co., New York. $1.60. Cambridge Natural Science Manuals.

It is a common habit of teachers and writers of botany to select a typical plant for study, one which shall illustrate within itself all the fundamental structures and life processes of plants. Francis Darwin in the volume before us takes up the problem at the other end: that is, he selects typical structures and phenomena and studies each in some common plant which seems to show a given feature in its most undisguised state or condition. This is evidently the most natural method for the beginner, for it selects those emphatic types of plants which yield the fundamental lessons with the least desultory effort on the part of the student. There is no single plant which illustrates all the phenomena of plant life and structure with equal clearness, and the student who seeks to draw all his typical examples from the one species is likely to obtain only a faint impression of all those processes and anatomies which are more or less obscure in his specimen. But if the student is allowed to range for his material, or rather, if a wide range of material is placed before him, he is impressed rather with general and representative phenomena than with dissection and specialization.

It seems to me, therefore, that the plan of Mr. Darwin's book is excellent. He illustrates the fundamental conceptions of the cell, of reproduction, of nutrition and of fermentation, by the yeast-plant, spirogyra, tradescantia, elodea and elder pith; of reserve materials and germination by the bean and gourd, tubers of potato and artichoke and bulb of tulip; of the phenomena and structures of roots, by broad-bean; stem tissue by sunflower, and the like. The book is a reprint of lecture notes, and this accounts for its brevity and directness of style, and also, no doubt, for some inelegancies of construction. The book is wholly elementary and is divided into fourteen chapters to accommodate 'the work of fourteen mornings,' which comprises the scheme of botanical lectures in the course in elementary biology given at Cambridge, England, to medical students. The book also has an appendix comprising directions for fourteen laboratory exercises to correspond with the class-room instruction. A particularly worthy feature of the book is the steadfastness with which it adheres to the discussion of the particular type in hand, thereby omitting the modifications and exceptions which so often confuse the mind of the beginner.

It seems to be necessary to take issue with Mr. Darwin's interpretation of the morphology of the rosaceous flower. He designates the flower-cup, in which the cherry ovary sits, and

which comprises the greater part of the edible portion of the pome, as the receptacle, whilst Americans have been taught by Gray and others that this cup is a calyx-tube. This flower-cup of the drupaceous roseworts 'is the axis or receptacle of the flower which assumes this remarkable form. The hollowing out of the receptacle brings the points of origin of the calyx, petals and stamens above the ovary.' (P. 170.) The stamens are therefore borne upon the edge of the hollow receptacle rather than upon the throat of the calyx, as we have been taught, and this receptacle is *deciduous* in the drupes! It is generally held that the very proof of being a receptacle is the fact that it persists and bears the ripened fruit. If this cup-ring which falls off the drupe-fruit is really a receptacle, then it is difficult to explain the structure of the rubus flowers upon the same plan, for in them the stamens are clearly borne upon the calyx-rim, and the receptacle persists within the multiple 'fruit.' The only warrant for calling this flower-cup a receptacle is found in the rose-hip; but this organ proves itself a receptacle because it persists and because it bears the fruitlets scattered upon its interior. But the outside covering of the hip is, if analogies with other genera are true, a calyx-tube covering; and in some roses this calyx covering is almost free from the receptacle. It seems to be easy to demonstrate that the flesh outside the carpels or core in the pomes is thickened calyx, and not receptacle; for the carpels all spring directly from the apex of the pedicel (and not from an expanded and cup-like surface, as in the rose-hip), and the sepal tips still persist in the ripened 'fruit.' If the flower-cup in the roseworts is a calyx-tube, then the structure of the flower is fairly uniform in principle throughout the family; but if it is a receptacle in prunus and pyrus, then a different architecture of flower must be assumed for all the rubus-like, fragaria-like and spiræa-like plants.

L. H. BAILEY.

An Introduction to the Study of Seaweeds. By GEORGE MURRAY, F. R. S. E., F. L. S., etc., Keeper of the Department of Botany, British Museum. London and New York, Macmillan & Co. 8vo. Cloth, 271 pp. 8 colored plates and 88 illustrations in the text. $1.75.

The algæ are least well treated of all the groups of plants in the average text-book, although for purposes of morphological comparison and general phylogenetic consideration they are of the first importance. The author of this most valuable and welcome little book has shown such familiarity with his subject, and such appreciation of the relative importance of detail, that it is much to be regretted that he has confined himself to the marine members and has not treated the group as a whole.

The author has modestly entitled his book, 'An Introduction to the Study of Seaweeds,' but we may venture to predict that it will be used rather as a handbook both by the less advanced and by the more advanced student, combining, as it does, summaries and discussions of the very latest literature and personal researches with such convenience of form and simplicity of style of writing that it is not only valuable to the special student but available also to the general reader.

Mr. Murray, after a general introduction treating of the important topics concerning the seaweeds in general and the division of the group into the four ordinary subgroups fairly well characterized by their color, begins for purposes of convenience with the Olive-green or Brown Seaweeds. Starting with the more complicated forms of these, the rock-weeds and gulf-weeds or Sargassa, he proceeds to the less complicated forms, tracing the simplifications of structure and details of reproduction, step by step down to the lowest forms of the group. It is noticeable, however, that the simplest undoubted member of the group, the *Phæosaccion Collinsii*, described by Farlow from our New England coast, and by Rosenvinge from the Greenland coast, is omitted, whether purposely or not is not evident. It is, however, a form so different in its cylindrical thallus of a single layer of cells, without hairs and without specialized zoösporangia, that a discussion of its relationship with *Punctaria*, for example, would have been of very considerable interest.

The Grass-green Seaweeds follow the Olive-green, and while admirably treated are perhaps less interesting than the latter. It is interesting to note that *Codiolum* is removed from beside