though I cannot admit that this was an unhappy selection.

To the correspondent who asks me (p. 287) why I cannot conceive that the image on my retina is upside down, I can give no answer except that I am made so, although I admit that I have no right to speak for others, and that I should not have used the editorial *we* in the statement referred to.

I find many of the truths of science inconceivable, and while my intellect apprehends the logic of the evidence that the sun is more than a million times as big as the earth, I am absolutely unable to conceive this stupendous fact, or to reconcile it with my experience.

It seems to me that my *con*ceptions of nature are pretty strictly regulated by my *per*ceptions; and, while I have no desire to measure the minds of others by my own limited powers, I must ask the 'Psychologist' whether this correspondent has not failed to discriminate between apprehension of the evidence for a fact, and conception of the fact itself.

While I suppose every one admits that knowledge of the chemistry and physics of the organism is a necessary condition for progress in biology, I hope Professor Gage will improve every fitting occasion to tell the 'mechanical physiologists' that the problems of life are not yet reduced to physics and chemistry, and that consciousness is not yet proved to be 'a property of protoplasm.'

I shall gladly second him to the best of my ability as often as he insists that no progress in our knowledge of vital actions can be hoped for unless the organic machine is studied as a living being; but I must point out the fact that none of the passages he quotes (p. 590) have any bearing whatever on the problem of the origin of vital phenomena except so far as they show that it is as yet unsolved. This is a very different matter from proof that the problem is insoluble; and a schoolboy who believes that what his teacher has not yet explained is 'not explicable' may be making a most grievous blunder.

We are all of us schoolboys in knowledge of nature, and our admission of ignorance is not dogmatism but caution. I, for one, do not dare to say any natural event is 'not explicable' by means of the data of physical science; although I am sure all who have studied with me will confirm my statement that I have neglected no opportunity to insist that we have not yet made the slightest approximation to such an explanation of the phenomena of life.

I am, however, equally confident that I know of no approximation to any other explanation; nor do I believe that any one has any moral right to believe in one unless he is prepared to give evidence for it.

W. K. BROOKS.

BALTIMORE, November 19, 1895.

SCIENTIFIC LITERATURE.

Minerals and How to Study Them. A book for beginners in Mineralogy. By EDWARD S. DANA. 12mo, 380 pp. 319 figures.

This elementary book is especially welcome, as for a long time the need has been felt of such a work, by those who are commencing the study of mineralogy. For a full and proper understanding of the science there is needed a knowledge of chemistry, crystallography and physics, and to present the subject, therefore, so that it can be comprehended by beginners is not an easy matter. The books that have previously been available have either been so elementary that the science was not presented with sufficient clearness, or so technical and diffuse that beginners were almost discouraged in trying to become acquainted with the important facts of the science. One of the chief features of this new book is that the author has constantly kept in mind that the subject is being presented to beginners, the use of technical terms has, therefore, been wisely avoided and the subject-matter throughout the book is *readable.*

The first two short chapters are devoted to definitions and descriptions of the occurrence of minerals, and some hints as to how to study and collect them. The third chapter treats of crystallography and structure. The former is treated in a very elementary manner, the difficult mathematical relations are not gone into at all, and only the chief features and peculiarities of the six systems are given. The subject is illustrated not only by outline figures, such as one ordinarily sees in mineralogies, but also by some very excellent wood cuts illustrating pe-

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 blow-pipe 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