

But though Mr. Syme believes that he has utterly smashed Darwinism, he still professes himself an evolutionist, and in his last chapter gives us an alternative theory in the intelligence of the vegetable and animal cells.

"They are," he says, "the sole agents employed in the construction, and afterwards in the maintenance, of the most complex organisms, and their economic and social organization is both comprehensive and complete. When an injury occurs to any part of the organism, they collect in force on the spot for the purpose of effecting repairs, which they execute with singular skill and judgment, varying the means employed according to the circumstances of each particular case."

This theory will be found much more thoroughly as well as more amusingly set forth in Mr. Samuel Butler's "Life and Habit"; but, whatever may be thought of its merits, few evolutionists will accept it as a complete and sufficient substitute for the Darwinian theory of natural selection.

Mr. Syme has a considerable reputation in other departments of literature as a powerful writer and acute critic; but he has entirely mistaken his vocation in this feeble and almost puerile attempt to overthrow the vast edifice of fact and theory raised by the genius and the lifelong labours of Darwin.

ALFRED R. WALLACE.

#### METALLURGY.

*An Introduction to the Study of Metallurgy.* By Prof. W. C. Roberts-Austen, C.B., F.R.S. (London: Charles Griffin and Co., 1891.)

THE well-known efforts of Prof. Roberts-Austen in leading students to appreciate the application of correct principles to the metallurgic art, led to high expectation when the publication of his "Introduction to the Study of Metallurgy" was announced, and this expectation has not been disappointed. Although, as regards minute and accurate description of detail and general thoroughness, the volumes of Percy stand alone, and although more condensed works, such as Phillips and Bauerman's "Elements of Metallurgy," are available for the student, yet there has been a distinct want of a systematic exposition of the general principles of metallurgy, and of clear statements as to the physical characters of metals and alloys. These are more especially needed by students on the threshold of metallurgy, who desire to enter profitably on the study of the more or less disconnected details of the art as applied to the several metals, such as are to be found in the monographs of Sir Lowthian Bell, and of the late Sir William Siemens. The evident purpose of the volume is to meet this want, the author having deliberately subordinated details of smelting operations, in order that he might deal at length with the physical properties of metals and the constitution and characters of alloys, modified as these properties often are by thermal treatment, and by the presence of small quantities of foreign elements. Such questions are treated with much wealth of research, and abundant reference to authority. The book will hardly be popular with the class of students who merely attempt to "cram."

The importance of the amount of impurity, which may

either be valuable or prejudicial, in the application of metals and alloys in the arts, is strikingly shown by the aid of elaborate curves, among which may be noticed one indicating the influence of minute proportions of phosphorus on steel (p. 24), and others showing the action of nickel on iron, and of foreign elements on gold. A remarkable example of the effect of minute variations in the proportions of an added element is noted (p. 117) in the case of die-steel, which when containing 0.8 per cent. of carbon, may be made into dies that will strike 40,000 coins each, but which would be rendered practically useless by variations of under 0.2 per cent. of the carbon.

In noticing the special section of the work comprised in the first four chapters, the evidently strong points of the author should not be overlooked. He rightly regards it as of much importance that the student should be made conversant with the observations and works of the early metallurgists, with the reasoning which led to their practice, and with the advances which have, up to the present day, resulted from their labours. The treatment of metallurgy, as embodied in this section, is a novel feature, and must have involved much more labour and research than would at first sight be gathered from the fact that it has been possible to compress the conclusions into little more than a hundred pages. In the adoption of this treatment, the author has marked out for himself a course that cannot be too highly commended. The student will now be able to attack with advantage the difficulties he will have to grapple with later, and to discount erroneous statements and false reasonings, which, if presented under the guise of authority, prove to be veritable stumbling-blocks in practice, until the stern school of experience teaches better things.

Metallurgical processes are not treated in the detail usual in metallurgical text-books, and here the essential character of the author's method comes into prominence. Furnaces and apparatus, though classified and illustrated in the previous chapters, hardly appear again, but the general scope of metallurgical procedure is exemplified by means of typical processes, and these occupy thirty-five pages.

The classification of processes (pp. 238-241) well deserves praise. It presents to the student, in a few pages, and in a way not to be found elsewhere, the essential and distinctive characters of the whole of the methods of metallurgy, whether by "dry" or furnace processes, by the solvent action of mercury, by solution and precipitation (the so-called "wet" processes), or by the latest and already important methods which involve electrolysis. The more typical of these have been selected for descriptions, which are illustrated by the aid of diagrams showing the essential steps and sequence of operations. By the aid of these diagrams, the student has clearly presented to his eye such excellent but apparently complicated processes as the smelting of copper ores by the Welsh method (p. 242), and the Freiberg method of smelting complex ores (p. 250), which have hitherto been found very confusing, even when the descriptions have been very carefully written. With such guidance, the details of furnaces, of successive roastings and fusions, as fully elaborated in other works, can be studied without confusion or difficulty.

Wet processes are made equally clear in the same way, and the only fault to be found with this division of the work is that it is too brief. Whilst the work merits ungrudging approval, it may be observed that the author, who has done well in giving special prominence to the influence of foreign matter on the metals and alloys, has perhaps exaggerated the relative value of the study of thermal and mechanical treatment of metals as compared with improvements in smelting operations. This has led him to subordinate and curtail descriptions of metallurgical processes, which is to be regretted, because his diagrammatic methods of description are most effective. This part of the work will well bear expansion in the next edition, which will doubtless soon be called for.

THOMAS GIBB.

### THE RELATIVITY OF KNOWLEDGE.

*The Prevailing Types of Philosophy : Can they Logically reach Reality?* By James McCosh, LL.D., Litt.D., &c. (London : Macmillan and Co., 1891.)

WHAT is reality? The plain man when he opens his eyes and stretches forth his hands never questions the practical reality of the objects which surround him. The walnuts which he sees on his plate are resistant to the fingers, the wine in his glass has a *bouquet* the reality of which he can readily put to the satisfactory test of the palate. But the psychologist seeks to analyze these intuitions and perceptions, the validity of which no sane man doubts. He follows the intuitions and perceptions home, and finds that they are in some way associated with certain material transactions within the ivory casket of the human skull. And then he begins to speculate about an ultimate reality behind the reality of perceptions. The blush on the peach—is it really inherent in the fruit, or is it merely a mode of vibration of my own brain-molecules? And these brain-molecules—is their so-called matter aught but a figment of the mind? Or is this mind merely a subtle secretion of the grey matter of the cortex? Thus, many questions can be asked, and many answers given.

Dr. McCosh, in the little volume under notice, inquires, What do the leading philosophic systems of the day make of reality? "I am to put this question," he says, "to each of them. Do they acknowledge it, or do they deny it? Do they accept it in whole, or only in part? Do they attempt to prove it, or simply assume it?"

What, we naturally ask, is the "reality" concerning which Dr. McCosh asks these questions? He replies:—

"The only way of showing its nature is to point to examples of it. We look on the wall of the room in which we sit, and know it to be real. We see a bird flying, and know it to be an actuality. We are conscious of ourselves in pain, and we are sure of our own existence in a state of pain."

In other words, by "reality" Dr. McCosh means that practical reality which no man in his senses denies or thinks of denying.

The question Dr. McCosh sets himself to consider is therefore this:—How far do the leading philosophic systems of the day agree to regard *as absolute and ultimate* that practical reality, *relative to man as an organism*, in which every man out of Bedlam implicitly

believes? Such being the true nature of his question, it is scarcely a matter of surprise that Dr. McCosh should find that neither the experiential and sensational schools nor the *a priori* or Kantian school, nor the Scottish school will agree to do anything of the sort. They all see too clearly the difference between relative and absolute reality to identify them after the fashion of the ex-President of Princeton College. Or, if individual members of any of these schools do so identify them, they are for the most part honest enough avowedly to confess that they do so on theological and not on philosophical grounds.

Into the theological aspects of the question we cannot enter here. Suffice it to say that we have never expressed aught but respect for those who believe that the world was created by Divine fiat, and that man was endowed with faculties which enable him directly to apprehend its existence and nature. But we do not think that philosophy apart from revelation would have been led to this conclusion; and we doubt the wisdom of those who appeal to philosophy in its support.

We would have it clearly understood that it is not to the appeal which Dr. McCosh makes, but the tribunal to which he makes it, that we take exception. "Agnosticism," he says, "is upheld and propagated in the present day by several influential men, such as Mr. Herbert Spencer and Prof. Huxley. It is in the air, and our young men have to breathe it and suffer the consequences. It is evidently exercising a relaxing influence on the faith and doctrinal convictions of the rising generation. It is in my view the grand office, at present, of the higher philosophy, to meet and expose this doubting spirit." We would counsel Dr. McCosh to substitute in future editions for "higher philosophy" other words, and to boldly assume at the outset the theological position on the grounds of fundamental and unalterable conviction. Any conclusions of philosophy, whether experiential, Kantian, or Scottish, which run counter to this fundamental assumption will then, for him and his followers, stand *ipso facto* condemned. If the relativity of human knowledge be one of these unorthodox conclusions, Dr. McCosh is assuredly right for his own part in rejecting it on the grounds of unalterable conviction, though mere unaided and uninspired philosophy has, as his little book plainly shows, conspired with one voice to sanction it.

Dr. McCosh writes clearly, tersely, and forcibly, and gives in a short space an excellent account of the conclusions reached by the prevailing types of philosophy so far as they concern the question of reality.

C. L. L. M.

### OUR BOOK SHELF.

*An Explanation of the Phonopore, and more especially of the Simplex Phonopore Telegraph.* By C. Langdon Davies. (London : Kegan Paul, Trench, Trübner, and Co., Limited, 1891.)

THE present work contains a plain explanation of the phonopore, and is written in a manner that will be intelligible to all who are acquainted with the elements of electric technics and practical telegraphy. The phenomena which led to the invention of this instrument were the sounds generally known to telephonists