

the matter is too much an echo of the claims and hopes of the various inventors, as recorded in their patent specifications, and too little an account of processes in actual use in the factories which turn out tungsten filaments on a commercial scale. In fact, very few even of those readers who wade through the whole ninety or so pages about these lamps will have gained the faintest idea of these processes. A reduction of this portion of the book would have given space for a description of the Nernst lamp and its properties, which lamp certainly deserves more than a casual mention.

(4) The last of the books before us can be recommended to those who would prefer to read the matter in German. The ground taken up is, for the most part, thoroughly discussed from the theoretical point of view, and the British reader will probably come across some instructive ideas which are new to him. In places there is a tendency to ignore facts which do not lend themselves to a simple theory, and there is a leaning to the physical side of the subject rather than to the engineering side. There are also some statements which give the reader quite a wrong impression, because they are not accompanied by a statement of the very special conditions to which they apply. For instance, we are told that the E.M.F. of a ring armature is independent of the number of poles, while the power is proportional to that number, in such a way that the reader would take the statement to apply to a given armature, whereas it would only apply if the size of the armature were increased along with the number of poles so that each of the latter might be kept of a constant size. The book does not contain, as a knowledge of English books with equivalent titles might lead one to expect, any structural details or views of machines. Still, it is well worth reading, and certainly merits a more substantial binding than the publisher has given it.

D. R.

SCIENCE AND PHILOSOPHY.

- (1) *Proceedings of the Aristotelian Society*. New Series. Vol. xiii. Pp. 375. (London: Williams and Norgate, 1913.) Price 10s. 6d. net.
- (2) *Encyclopædia of the Philosophical Sciences*. Vol. i.: Logic. By A. Ruge, W. Windelband, J. Royce, and others. Translated by B. Ethel Meyer. Pp. x+269. (London: Macmillan and Co., Ltd., 1913.) Price 7s. 6d. net.
- (3) *Evolution by Cooperation*. A Study in Bio-Economics. By H. Reinheimer. Pp. xiv+200. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1913.) Price 3s. 6d. net.

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- (4) *The Science of the Sciences*. By H. Jamyn Brooks. Pp. 312+ix. (London: David Nutt, n.d.) Price 3s. 6d. net.
- (5) *Probleme der Entwicklung des Geistes*. Die Geistesformen. By S. Meyer. Pp. v+429. Leipzig: J. A. Barth, 1913.) Price 13 marks.
- (6) *Naturphilosophische Plaudereien*. By H. Potonié. Pp. v+194. (Jena: Gustav Fischer, 1913.) Price 2 marks.

PLATO dreamed of a dialectic that should be the science of the sciences, and philosophers have often assumed that philosophy is the essence of knowledge, into which are distilled the results of empirical research. Metaphysical logic may be considered to assist science by suggesting new modes of generalisation, new points of view for classified facts. Darwin's theory of natural selection was a philosophical view; so is Bergson's estimate of mind. Every *-ism* is of this nature; Weismannism and Mendelism, neo-Darwinism and Pragmatism, are examples. Mathematics is equally suggestive of new generalisations; the work of Galton and of Karl Pearson are cases in point. The Φi formula of Mr. William Schooling is perhaps the most recent. But it is arguable that all such generalisations are ultimately themselves suggested by new facts, and simply show the mind's plasticity of reaction to new environments. It is arguable that they are inevitable and obvious, once given the particular concatenation of facts suggesting them, but that the discovery of new concatenations of facts is not at all beholden to philosophical suggestion. It is said that the inductive idea suggested to Bacon a new mode of research; on the contrary, it was the increase in observed facts and new concatenations of facts that suggested the inductive idea.

The study of forms of thought develops with the material for thought, witness the developments introduced by Poincaré and Bertrand Russell. The latter's analysis, in (1) "The Proceedings of the Aristotelian Society," of the notion of cause is a refreshing proof of philosophical vitality. The word "cause," he says, "is so inextricably bound up with misleading associations as to make its complete extrusion from the philosophical vocabulary desirable." He well points out that advanced sciences like gravitational astronomy, even physics in general, never employ the term "cause." "The reason why physics has ceased to look for causes is that, in fact, there are no such things. The law of causality, I believe, like much that passes muster among philosophers, is a relic of a bygone age, surviving, like the monarchy, only because it is erroneously supposed to do no harm." What scientific laws do,

instead of stating that one event A is always followed by another event B, is to state *functional relations* between certain events at certain times (these are *determinants*), and other events at earlier or later times, or at the same time. No *a priori* category at all is involved.

One of the most elementary philosophical ideas is that of purpose in evolution. Another is evolution. Mr. Arthur Lynch criticises the latter (papers of the Aristotelian Society) in an interesting and anecdotic essay. Very much in point is one of his texts, viz., the remark of Kirchhoff: "There is only one science (mechanics)." But Mr. Lynch's plea for a wider and deeper application of the idea of an all-pervading Purpose is unconvincing, though rhetorical.

The idea of Will dominates the psychology of the day; it belongs, of course, to the Purpose-idea. We could wish that some critical philosopher, such as Mr. Russell, would subject it to a merciless analysis. The same may fitly apply to the philosophy of chance and probability. The papers on these subjects read before the Aristotelian Society show the over-elaboration which often precedes the simplification of an idea. In the first volume of "The Encyclopædia of the Philosophical Sciences" (2) there is a similar elaborate treatment of logic. Prof. Losskij thus states the "new conception of consciousness which is leading Philosophy out of the *cul-de-sac* of psychological Idealism": "Consciousness is the sum-total of everything which stands in a certain unique *relation* to the Ego. . . . Every fact of consciousness is made up of at least *three moments*; every such fact depends for its existence upon the presence of an Ego, of a content of consciousness, and of a relation between the two." This is the old logic writ large. Prof. Couturat more hopefully applies mathematics to the principles of logic. His notion of "propositional functions" is worth serious consideration. The plan of the Encyclopædia is suggested, no doubt, by the inconsistencies of the previous works. It consists, "not of brief articles summary in character, dealing with a great variety of topics, . . . but of original and relatively exhaustive discussions of fundamental aspects of each main subject." The index, significantly, is of authors only.

(3) Mr. Reinheimer agrees with the late M. Novikow in emphasising positive factors in evolution against such negative factors as selection by survival. According to Darwin, death is a main factor; nutrition and work, according to Mr. Reinheimer, are more important. His thesis is a good one; biological cooperation, similar to economic cooperation, must be taken into

account. Nutrition represents stored-up organic capital. It is parallel to reproduction. He has interesting observations on the fallacy of in-feeding, which is parallel to in-breeding. The book is suggestive, but, as a key, it only unlocks a side-door of the subject. Some elaboration of the orthogenesis doctrine seems more likely to open the main portal.

(4) Mr. Jamyn Brooks has already received careful critical consideration. In "The Science of the Sciences" he undertakes to correlate the three principal sciences of "Chemistry, Physics, and Metaphysics, or Matter, Force, and Mind." Thus, in his first prefatory sentence, he shows confusion, which becomes worse confounded as the argument proceeds. If he has a new idea, he ought to explain it, but when about to explain he goes off at a tangent to something else. The one idea I have gathered is the existence of mental æther, corresponding to material! The author's notion of construction and expansion as primary motion, and of translation as secondary, is not new. As for the testing of the hypothesis, continually mentioned, it fails to materialise.

(5) Herr Meyer, on the evolution of mind, brings together the latest results of animal-psychology, and treats of them in reference to the human mind. His expository method has the merit of being general; he abstracts the insect's mental life and applies it, in comparison with man's, to the forms of thought, such as space and time. This is a big book, closely reasoned and most comprehensive.

(6) The distinguished botanist, the late Prof. Potonié, has written a charming series of "easy-chair" essays on science. The popularisation of science, the art of explanation, the power of habit, dogma and criticism, knowledge and belief, imagination and science, the concept of purpose, are old subjects treated with freshness. In subjects which bring science and society into relation he is not afraid to speak out.

A. E. CRAWLEY.

OUR BOOKSHELF.

Das Relativitätsprinzip; die jüngste Modernität der Wissenschaft. By Leo Gilbert. Pp. 124. Wissenschaftliche Satyren. Band I. (Brackwede i. W.: Dr. W. Breitenbach, 1914.) Price 3 marks.

THE satire as a means of propaganda for scientific ideas is not of modern usage. Fechner was probably one of the last scientific satirists. Its revival in the present instance is the result of the considerable amount of mystification to which the electromagnetic principle of relativity established by Lorentz, Einstein, and Minkowski has