

The question of the establishment of new universities—how many, in what districts, and with what special characteristics—has to be examined. There are also questions relating to the co-ordination of university work with the view of obtaining the maximum benefit from the minimum expenditure, a consideration which in future will be increasingly in the minds of public men and public authorities. We are reluctant to criticise a congress which has been the means of publishing so many useful contributions to educational thought; but it is impossible to overlook the need for a more systematic discussion of these questions of university organisation and for the formulation of guiding principles. As Lord Rosebery insisted at the first congress, every university must work out its own salvation in its own way, and a centralisation of the Universities of the Empire would be demoralising to them and fatal to their growth and development. Acceptance of this general idea should not inhibit an orderly study of various questions of university organisation, the decision of which is already long overdue. If the universities limit their contributions to these discussions to expressions of personal opinion, however adroit and enlightened, the task of finding solutions to these difficult questions will have to be undertaken by some other authority.

A Psychology of Logic.

Psychologie du Raisonnement. By Eugenio Rignano. (Bibliothèque de Philosophie Contemporaine.) Pp. xi+544. (Paris: Félix Alcan, 1920.) 18 francs.

THE distinguished editor of *Scientia* has given us in this volume a valuable and most useful study, which is likely to take its place as a recognised book of reference. It is original, both in its method and in its subject-matter, to a very high degree, and part of its originality is the way in which it brings together, and works into a complete scheme, the researches and theories based on the researches of experimenters and theorists in all the sciences. The main purpose is to present a psychology of reasoning. By reasoning is meant the higher logical processes of the mind which are distinctive of intellect, and by psychology a descriptive science which interprets a definite domain of reality by bringing it into relation with other domains.

The theory is given in the chapter entitled "Qu'est-ce que le raisonnement?" This appeared as the first of a series of articles in *Scientia* eight

or nine years ago, and it forms now a kind of centre or nucleus around which the argument plays. The answer to the question is that reasoning is nothing but a consecutive series of actions or experiments carried out simply imaginatively in thought and not effected materially. The result of the imaginatively represented process is the demonstration or conclusion to which reasoning leads and at which it aims. Reasoning is experimenting internally, thoughts are merely imagined acts.

It will be seen, therefore, that Signor Rignano's psychology moves on the scientific plane and ignores the metaphysical problem. It accepts existence and is unconcerned with the genesis or with the ultimate nature of reality. Given the physical, biological, and physiological basis, psychology can define its data by relation to it. Memory, perception, and productive and reproductive imagination can be described and their function, scope, and limitations determined. The scheme of the work is then clear. A psychology of logic has to show, first, the evolution of reasoning from inferior forms of mind which do not attain to it; secondly, the evolution of reasoning itself into its higher forms; and, finally, the positive factors as they are revealed by the study of abnormality.

On the basis of the assumption that mentality is a phenomenon within the objective world of physical science and presupposes the independent existence of that world, it is undeniable that a great deal of practically useful science can be formulated. The author's numerous, excellently chosen illustrations of the reasoning process are very fascinating. They provide the kind of interest which used to thrill us in the old descriptive "natural histories." Certain doubts as to the soundness of the method, however, very soon invade us. There are extraordinary stories of animal intelligence—all standard illustrations and taken from recognised authorities (Romanes, Jennings, and others), and to be differentiated, therefore, from the tall stories which fill the correspondence columns of some newspapers; but, even so, it is questionable whether they do not darken rather than enlighten judgment as to the mode of working of the animal mind.

To understand the mentality of a dog or of an amoeba, surely we ought to study the most ordinary responses and not single out some special case of anthropomorphic behaviour as peculiarly significant. This vice of method spoils a good deal of Signor Rignano's excellent work. For example, take his theory of intuition. In contrast with deductive reasoning, intuition is character-

ised by immediacy. But this immediacy, if we have understood the author correctly, is always relative: the reasoning has been so swift that we have not noticed the stages. Intuition is simply a telescoping of that imaginative experimenting in which all reasoning consists. No one, we venture to suggest, would adopt such a view had he studied instinctive behaviour directly and in its general aspect without attempting to base theories of genesis on specially induced experiments, whether on the infusoria or on the higher vertebrates. The theory may not be wrong, but the method is suspect.

One of the most penetrating and instructive sections is the critical review of the forms of mathematical reasoning. Algebra stands at the top of the scale, logistic at the bottom. The former never parts company completely with the concrete as the latter does. Moreover, logistic stands condemned in our author's view for its utter inability to advance by reasoning to any new fact. Creative imagination is the driving force of reasoning, and this is not only absent from, but also definitely eschewed by, logistic.

Where Signor Rignano will seem to some to fail is in what he denies rather than in what he affirms. The concept when detached from the sensible imagination is for him purely verbal. A concept, self-contained and self-subsistent, a concrete universal, has no place in his theory of reasoning, and in itself is unintelligible. The polemic against metaphysics seems to us the weakest part of his book, and as it is quite unnecessary to his argument its introduction is to be regretted. The metaphysical inquirer is described as one who is determined at all costs to save values. He is moved by affective, and not by intellectual, motives. The reply is simply that, as a matter of fact, it is notoriously untrue. The philosopher, as philosopher, is absolutely indifferent to values as values. What impels him to metaphysical inquiry is not desire, or emotion, or affective consideration of any kind; it is the pure need of intellectual satisfaction. Even the author protests that the most "positive" and least metaphysical of inquirers cannot be indifferent to values—why, then, is it presumed to vitiate the motive in one case and not in the other?

Regarded from the author's point of view, as it should be, the book is full of interest, clear and sustained in its argument, and maintained throughout at a high level. We hope there will be a good English translation, for it should prove an excellent text-book for advanced courses.

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Text-books on Theoretical Chemistry.

- (1) *Die chemische Literatur und die Organisation der Wissenschaft.* By W. Ostwald. (*Handbuch der allgemeinen Chemie.* Band 1.) Pp. iv+120. (Leipzig: Akademische Verlagsgesellschaft m.b.H.: Gustav Fock, 1919.)
- (2) *The Foundations of Chemical Theory.* By Prof. R. M. Caven. Pp. viii+266. (London: Blackie and Son, Ltd., 1920.) 12s. 6d. net.
- (3) *Inorganic Chemistry.* By E. I. Lewis. Third (revised and enlarged) edition. Pp. xv+443. (Cambridge: At the University Press, 1920.) 9s. net.

(1) **P**ROF. OSTWALD'S book constitutes vol. i. of the "Handbuch der allgemeinen Chemie" which he is editing in conjunction with a number of eminent collaborators—Kuenen, Drucker, Marc, Bruni, Dutoit, Cohen, Halban, Bredig, and others—all recognised authorities on the several sections of physical chemistry to which they contribute. This introductory volume is, in effect, a long and discursive essay on the methods of propaganda of science and on the gradual development of the means of disseminating scientific truth. It traces the spread of scientific knowledge through the agency of societies, general and specialised, by means of discussion and publication, by scientific journals, and lastly by treatises, monographs, and text-books. It contains nothing but what is generally known to those familiar with the history of science, but the story is put together with considerable skill, and constitutes an eminently philosophical disquisition on an aspect of that history which has hitherto had few expositors.

Towards the conclusion of his essay Ostwald gives a free rein to his imagination in seeking to forecast the lines upon which the dissemination of scientific knowledge must proceed in the future. He is thus naturally led to what is an obsession with him—the possibility of the universal language—and we are treated to a short *excursus* on the relative merits and disadvantages of Volapük, Esperanto, and Ido. Recent events, for which Prof. Ostwald's own countrymen are wholly responsible, have absolutely shattered whatever hopes he may have entertained of the speedy realisation of his ideals. But, as he says in his preface: "Die Schrift wurde bereits 1914 fertiggestellt und gesetzt: die Ausgabe ist durch den Weltkrieg bisher verzögert worden." To allow the concluding paragraphs to remain unaltered when the work appeared in 1919 is characteristic of German mentality. It requires a very robust faith in the future to believe in their appositeness in present circumstances. We fear that the