

would not be economical to supply the outlying districts until the demand increases. They differ also from the L.C.C. and the local authorities in the constitution of the "Joint Authority" which they propose. They suggest that it should consist of sixty-two members. As most of the work would have to be delegated to technical committees, we think that a council of this size is much too big and would prove unworkable.

Very divergent opinions are held by some of the County and Borough Councils interested in the schemes. For example, the Middlesex County Council wants to be excluded, while the Surrey County Council, although only part of its territory is involved, wants to be included. The representative of the Poplar Borough Council, which has a scheme (4) of its own, objected to all the first three schemes.

It was pointed out, when the 1919 Electricity Act was passed, that it would be to the mutual advantage of the Joint Authority and the railways that the former should supply electricity to the latter. Some of the railway companies, including (5) and (6), think that they will be able to generate electricity more cheaply themselves, one of the reasons adduced being that the Joint Authority would not be able to borrow money more cheaply than the railway companies can, and would be hampered by having to provide a sinking fund on its capital, no such necessity arising in the case of the railway companies. We think that this is a very doubtful reason. It seems probable, however, that in any agreed scheme consideration of any railway load will be excluded, at least for the first few years.

The brief account given above of the first results of the inquiry will show that the great expectations which some engineers based on the 1919 Electricity Act have still to be realised. Financial considerations and vested interests have proved stumbling-blocks. But it is very satisfactory to note the conciliatory spirit in which the engineers immediately affected by the proposals have considered them.

Supply engineers recognise that fuel economy is the most important problem they have to study. Recent tests show that in the boiler-house it is possible by scientific management to employ usefully from 80 to 85 per cent. of the calorific value of the fuel. It is heart-breaking, therefore, for some engineers to have to use old-fashioned engines which consume 40 to 50 per cent. more steam per horse-power developed than the best modern engines. In the national interest it is

necessary that these engines should be scrapped at the earliest possible moment. The great increase in electric power consumption is well exemplified in the case of the city of Sheffield. The 1914 consumption was 20 million units. It is now 172 million units, the coal consumption being 5000 tons per week. In this connection we hope that the use of raw coal for steam-raising will soon be a relic of barbarism. There is no difficulty in designing furnaces for utilising coke, and several are in everyday use. The economies effected by using powdered fuel are also worth considering.

A hopeful sign of the times is the increasing co-operation between the electricity and the gas industries. At the inquiry Mr. G. W. Partridge, giving evidence in support of the companies' scheme (3), said that arrangements had been made with the Gas Light and Coke Co. with regard to leasing part of that company's site at Beckton for erecting a super-station which it was proposed to build in sections as the demand grew. Owing to the large quantity of coke and coke breeze on the site, much of which at present goes abroad, the cost of fuel would be very appreciably cheapened. The gas company would also be willing to let to the companies the use of the existing wharves, piers, railway sidings, etc. There would thus be a great saving in capital outlay. Any of the improvements, which are hopefully looked forward to, in the carbonisation of coal, the utilisation of waste heat, and new by-products would be to the mutual advantage of the two interests.

The history of electric supply in this country is largely one of legislative interference with a flourishing industry. We are glad that the industry is now so largely dependent on private initiative. Engineers have no delusions about receiving large Government grants, although the supply of cheap electric power, bringing new industries to life, is vital to the prosperity of the country. The inquiry has proved that the supply engineers are willing to accept the best and, consequently, the most economical solution, even if at first it affects their private interests adversely.

### Congress of Universities.

AT Oxford last week the second congress of the Universities of the Empire was held under perfect conditions as to weather and public and private hospitality. The large and distinguished assembly which forgathered in the examination halls on four successive days was drawn from fifty-nine universities widely

separated geographically, but inspired by the same ideals and working for the same increasing purpose. This number, it may be observed, has not grown markedly since 1912, when the first congress was held in London; but those who were privileged to attend both congresses must have been impressed by the different conditions, moral and economic, which have arisen during the intervening nine years. Lord Rosebery, in his opening address to the first congress, spoke with eloquence and prevision on the throes of travail which the world was at that time undergoing to produce something new to history—"something, perhaps, better than anything we have yet known, which it may take long to perfect or to achieve, but which at any rate means a new evolution." Two years later the thunderclap of war burst over the world. Evolution ceded place to a process more catastrophic in both its physical and its spiritual workings. May it not be said that the universities, stunned and hesitating, are still groping their way in the new world which is in slow and tentative formation?

Assuredly the note of uncertainty was frequently sounded in the papers read at the congress. Prof. Desch, in an address on the place of the humanities in the education of men of science, asserted that scientific education to-day lacked the "synthetic view" which would harmonise the laws of human society and of the physical universe and life. "Science without sociology is imperfect, but with it the artificial division between scientific and humanistic studies disappears." The relation of the universities to secondary education would appear to be a subject upon which definite conclusions should by this time have been reached by those who have applied their minds to the problem. Prof. John Burnet, the distinguished classical scholar of St. Andrews, confessed that his chief qualification to act as spokesman on this question appeared to be that he had failed in rather a conspicuous manner to find a solution which commended itself to anyone in his own country. Universities have been engaged in the training of teachers from their origin, and have for centuries granted to their masters of arts the *jus ubique docendi*. But, as Prof. John Adams pointed out, the principle that all teachers should be trained in universities is not yet established, and there is indeed a dangerous tendency for local authorities to train directly their own teachers within their own areas.

The subject of adult education found eloquent exponents in Lord Haldane, Prof. G. H. Leonard,

Sir Michael Sadler, and other speakers; but how vast and inchoate the issues must appear to universities harassed, almost overwhelmed, in the discharge of their immediate obligations! If there is one lesson enforced by the war, it is the danger of neglecting the applications of science. We find ourselves, as Prof. Smithells pointed out in a singularly temperate and closely reasoned address on the universities and technological education, "a people far spent by the cost of victory over a nation of technologists, a nation which had carried to the highest point the training of its people in applying exact science to the mechanical arts of both peace and war." Nevertheless, he was constrained to raise his voice against the unbridled pursuit of applied science and to direct attention to the restraints under which it should be fostered. The Germans, he admitted, among their excesses of regimentation, had good cause to reconsider their educational plan of isolating seminaries of technology. Technological studies must be given their proper place in our universities as a necessary part of the educational organism.

This line of thought was developed also by Sir Robert Falconer, president of Toronto University, who denounced the conception of a university as a set of public utility schools bundled together by the tie of a common administration. A university should be an organism with an intellectual and moral spirit giving it unity and life. The discussion on the nationalisation of universities raised the temperature of the congress by a few degrees. It is noteworthy that the idea of nationalisation has greater terrors at home than in the overseas dominions, some of the representatives of which seem disposed to hug their chains.

We have referred to a few of the questions of university politics and organisation which were discussed at the congress. There are others not less pressing. The relations of the central and local education authorities to university education in this country are still, in a large measure, unsettled. Further, the question of the future supply of university students under existing economic conditions gives cause for grave anxiety. In NATURE for June 30 we published statistics of students receiving university education, which indicated a total full-time student population for the United Kingdom in 1919-20 of 52,600, of whom nearly 17,000 were ex-Service students. Is it not obvious that this *net* total, assuming it will be maintained, is entirely inadequate to meet the future needs of our great and extending Empire?

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-