

THURSDAY, JANUARY 22, 1914.

## MATHEMATICIANS IN COUNCIL.

*Proceedings of the Fifth International Congress of Mathematicians.* (Cambridge, August 22–28, 1912.) Edited by Prof. E. W. Hobson and Prof. A. E. H. Love. Vol. i., Part i., Report of the Congress. Part ii., Lectures: Communications (Section I.) Pp. 500. Vol. ii., Communications to Sections II–IV. Pp. 657. (Cambridge University Press, 1913.) Price 30s. net, two vols.)

A REVIEW of these beautifully printed publications of the Cambridge Press necessarily constitutes in some measure a survey of the proceedings of the Fifth International Congress of Mathematicians. Although more than a year has elapsed since these meetings were held at Cambridge, it may not yet be too late to form an opinion on the work that was then done, and its influences on the progress of mathematical science, and on the position of mathematics in Great Britain. These are subjects on which no two people can be expected to hold the same opinions, and it is therefore of great importance that a reviewer should be able to state his own views without prejudice to those held by other members present at the Congress, readers of the proceedings, or, indeed, anyone else.

While the corresponding records for Heidelberg (1904) are contained in one volume of 756 pages, and for Rome (1908) in three volumes, of which the first two contain 218 and 318 pages, the Cambridge volumes occupy 500 and 657 pages respectively. Nor was the attendance at the meeting less satisfactory. While Great Britain only contributed 2 per cent. of the members at Heidelberg and 4 per cent. at Rome, the attendance of 221 British members out of a total of 574 at Cambridge compares favourably with Germany's representation of 173 out of 336 at Heidelberg, and Italy's 190 out of 535 at Rome.

Turning next to the published papers, these reflect in no small degree the influences that have been making themselves felt in recent years in raising higher mathematics to the dignity of a science, and saving it from degenerating into mere cut-and-dried algebra. Even in that most difficult of all to popularise section—arithmetic, algebra, and analysis—the papers deal largely with analysis, and are not overloaded with formulæ, while a pleasing variety is introduced by descriptions of mechanisms for solving equations, and cases where a sum of powers is equal to the same power of one number. A physicist who was exclusively

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a physicist might find much to interest him in some of these papers. On the other hand, in the geometry section, where one naturally expects to find results adapted to visualisation, there are very few papers in which the investigations are not expressed in symbolic form. The paper on rational right-angled triangles would have been better placed alongside of the one above referred to on sums of powers. Is it the fact that pure geometry is exhausting its resources in three dimensional space, and that it is becoming increasingly difficult to find new subjects of investigation which do not require the use of extended algebraic formulæ?

Coming now to applied mathematics, the most noticeable feature is that the papers presented contain no conspicuous reference to aeroplanes, and, indeed, judging from their general character, it seems almost, if not quite, certain that the aeroplane has nowhere received mention in the proceedings of this section. We have work submitted on the old hackneyed "problem of three bodies," performing motions which no living man will ever see realised experimentally, also theories of the æther and gravitation. Now the peculiar type of brain which is capable of investigating the hypothetical motions of three hypothetical bodies is just the intellect required to investigate the motions of the most general character described by an aeroplane, and if it is necessary to assume a simplified law of air resistance, the conclusions will certainly afford some definite basis for a comparison of theory with experiment. As for the æther, this might well stand over when we know so little about the air, and with regard to gravitation, the fact that it may be propagated with finite velocity through space can scarcely give an aviator any hope of saving his life in the event of his aeroplane collapsing. The aviation problems awaiting solution at the time that this congress was held—and after—would have amply sufficed to occupy the proceedings of a separate section.

Possibly an appeal to Prof. Reissner might have elicited some contribution on this subject. With regard to workers in our own country, it seems not improbable either that Lord Kelvin died too soon, or that aeroplanes came too late. Lord Kelvin had an extraordinary power of commanding both the attention and respect of the practical engineer and the interest of the mathematician, and had he been able to investigate the stability of aeroplanes, it is certain that the present deadlock would never have arisen; on the contrary, mathematical proceedings would have been filled with aeroplane papers, and aviators would be

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presented with results of far deeper reasoning than is contained in the writings of some authors who have dealt with the subject. The balancing of the four-crank engine and a paper on the graphical recording of sound waves accompanied by diagrams which seem instinctively to represent graphically the strident tones of the gramophone, have at least some relation to the vast complex of unsolved problems which present themselves in everyday life.

In view of the ever-growing importance of statistical science it is gratifying to find the subsection dealing with this subject represented by eleven papers, nearly half of them by British contributors. The next section deals with philosophy, history, and teaching of mathematics. There are ten papers and discussions on "didactics," but the most important feature of this section is the report of the International Commission on Mathematical Teaching, which was constituted at Rome with Prof. Fehr, Sir George Greenhill, and Prof. Klein as executive committee. The list of publications drawn up by them and by the various subcommittees for different nations occupies twelve pages of the volume. The publication of these reports has received substantial financial aid from the Governments of the respective countries, and they deal fairly thoroughly with the conditions of mathematical teaching in all grades of schools and in the universities. The main danger is that few people will have the time to read the reports for any except their own nation.

In addition to the sectional meetings of the congress, we have eight lectures by Profs. Bôcher, Borel, Brown, Enriques, Prince Galitzin, Prof. Landau, Sir J. Larmor, and the late Sir W. H. White.

Profs. Hobson and Love are to be greatly congratulated on their success in organising the congress and bringing out this splendid record of some of the advances of mathematical science in the four years preceding the meeting.

In the opinion of the present reviewer, however, one important element of success was missing. The holding of a mathematical congress in Great Britain afforded a unique opportunity for bringing the claims of British mathematicians before the British public. A discussion on this subject could easily have been organised on purely international lines, and representatives of different nations would have been able to give us their own experiences as to the extent that their efforts are recognised and backed up by public support in their countries. The proceedings of such a discussion would have been widely circulated in Press reports, and would

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have appealed to, and been read with interest by numbers of, people to whom papers of an abstract character are unintelligible and uninteresting. Had the congress been a classical one, there is little doubt that discussions on the educational value of Latin would have been widely reported in all the newspapers, and often accompanied by long leading articles.

But no such discussion was held. On the contrary, the address by the late Sir William White on "The Place of Mathematics in Engineering Practice"—the one address sufficiently popular for the ordinary newspaper reporter and reader—was certainly not calculated to remove existing prejudices against the "unpractical" mathematician. But if the position of English mathematics and mathematicians did not figure in the official programme, it was freely discussed in the reception room, the refreshment tent, and the college halls where guests were hospitably entertained. References were not infrequent to cases of hardship where able mathematicians had failed to earn adequate incomes from teaching work, and to fallings-off in the numbers attending mathematical classes both in Cambridge and elsewhere. This private interchange of experiences between the initiated could scarcely serve any useful purpose; while a vigorous appeal to the public in plain English language, supported by a sufficient body of English speakers, and aided by the opinions of foreign experts, might have exercised a marked influence over the progress of future events.

In short, the Cambridge Mathematical Congress has done nothing towards improving the prospects of the brilliant mathematician who is too good to spend his life in badly paid teaching appointments even when he can secure them.

It has done nothing to stop the exodus from our university classes of the best mathematical talent that is sent up from the schools, and which is attracted by the better prospects that are open to students of chemistry or engineering.

It has done nothing towards increasing the staffs of our university colleges, and providing them with an adequate number of mathematical professors, each a specialist in his own line; while on the other hand the diversion of students into other channels frequently renders such increases financially impossible.

It has thus done nothing towards helping our English university colleges to come into line with those of other countries as centres of higher study and mathematical research.

And such an opportunity is not likely to recur for many a year to come. G. H. BRYAN.