

with this it was gratifying to note the large number of new members, particularly so of those working in connection with the Board of Agriculture and Fisheries, and in the newly established university departments.

It is hoped that with the increase in the number of meetings there will be a still further increase in the membership, and that the association will take its position amongst the numerous other learned societies, thoroughly representative of all branches of applied biology.

To a very much larger extent than hitherto, the association will in the future play no unimportant part in defining the scope of economic studies in biology, and having now definitely taken up its headquarters in London, it will be more in touch with Governmental departments. Representative as its membership is of the universities of the country, and not a few of our Colonial departments, the possibilities that lie before it are endless, and should exercise a very profound influence upon the future of economic biology in this country, tending to raise its status to the level it occupies in other countries, and to become still more beneficial to the people of this country and its great Colonial Empire.

W. E. C.

#### FATIGUE AND EDUCATIONAL WORK.

THE London County Council's annual Conference of Teachers, held last week, yielded some notable pronouncements. On the opening day, January 1, Canon Masterman laid stress upon the training in morals and in imagination which pupils gain when history is properly taught. History provides an education in sympathy not only with our forefathers, but with "the brotherhood that binds the brave of all the earth." The true historian always cares supremely for the truth; the critical faculty of the pupil must be carefully trained. To the great deed they must offer their admiration, their gratitude if they could, and, if not, then their silence. The historian differs from the antiquary in his constant thought of the present; the boy who rides in imagination with the knight to the *Parliamentum* at Westminster will have a clearer idea of the responsibility of citizenship. The pageantry of history is sacramental; it has an inward and spiritual import, and, unless the teacher feel something of the spiritual significance of history, he had better teach algebra or mechanics all his life.

On the second day, Mr. W. H. Winch gave the results which had attended a few experiments he had made in testing the fatigue of adolescents who were in attendance at evening continuation schools. He pointed out that his experiments in connection with the fatigue of day-school pupils had yielded no satisfactory result, while he had found distinct evidence of fatigue in adolescents who continued their education in the evenings. His experiments indicate that, in the cases he examined, adolescent students suffered a loss of ability as the period of instruction drew to a close. He instanced six sets of experiments, and in the only case which did not show the results of fatigue subsequent inquiry showed that 75 per cent. of the students were not occupied during the daytime. From such evidence he concluded that evening continuation schools were not places of serious continued education for adolescents; they were a waste of educational appliances. The chairman, Dr. W. McDougall, Wilde reader in mental philosophy, thought these conclusions somewhat premature, as it did not follow that work which caused a measurable amount of fatigue was work which should, therefore, not have been undertaken.

Mr. T. H. Pear described an experiment in connection with the fatigue which ensues from loss of sleep in which it was demonstrated that the fatigue persisted long after the subject was of opinion that the effects of the lack of sleep had disappeared. He suggested that, on account of fatigue, the teacher who energetically changed from a strenuous lesson on one subject to a lesson of equal strain on another subject lost efficiency; the early lesson caused fatigue, and should have been followed by a period for recuperation.

The conference closed with a description of six educational experiments; it was announced, as evidence of the wide latitude for experiment allowed in the elementary schools, that no fewer than sixty descriptions of such experiments had been offered for the consideration of the conference.

#### ENGINEERING AT THE BRITISH ASSOCIATION.

THE Engineering Section of the British Association met under the presidency of Prof. Gisbert Kapp, who took for the subject of his address the electrification of railways. The address, which was printed in full in *NATURE* of October 9 (p. 184), was followed by an interim report of the committee on gaseous explosions, which very briefly chronicled the work accomplished during the year, and described the steps which are being taken to carry on further research work at the Imperial College of Science. One of the notes presented to this committee was also read by the authors, Profs. Petavel and Asakawa, and described some experiments on the effect upon gas-engine efficiency of varying compression ratio. In these experiments the brake-horse-power increased in the same proportion as the theoretical air efficiency, but the mechanical efficiency decreased as the compression ratio increased.

The concluding paper of the first meeting was read by Prof. Burstall on solid, liquid, and gaseous fuel, in which he discussed the various advantages obtained from each kind of fuel, and outlined a scheme for utilising, to the best advantage, a large daily supply of coal at the pit mouth by the production of coke, fuel gas, sulphate of ammonia, and various by-products of the tar obtained from the retorts.

The first paper on the Friday morning dealt with the application of the internal-combustion engine to railway locomotion, and described a bogie-coach of 60 ft. in length propelled by two six-cylinder Daimler engines through the medium of gears affording six-speed ratios. Recent trials demonstrate the feasibility of maintaining a high speed over long distances at a reasonable cost, and the author, Mr. F. W. Lanchester, advocated the running of such vehicles on main lines at frequent intervals as much more economical and satisfactory than a service of long trains at considerable intervals. In the paper which followed, Dr. Hele-Shaw described a new type of hydraulic weighing-machine of the piston type, in which packings are dispensed with, while friction and leakage are practically eliminated by ingenious mechanical devices.

The propulsion of barges on canals by aerial propellers was described by Mr. L. B. Desbleds, and although the possible efficiency of this system of propulsion was shown to be very small, the author considered there was a limited field for its application in cases where submerged propellers could not be employed.

Mr. Lanchester directed attention to the various factors which cause instability in aeroplanes, and with the aid of models demonstrated the important features