

the nation industrially and commercially is to be maintained in face of the fierce competition of the advanced nations of the world. The nation is really entering upon the most critical period of its history. The old spirit was splendid, but it will not avail against modern science any more than we could make progress on the Somme without modern science in furnishing us with the great artillery and high explosives required for battering down the trenches before us. Undue specialisation in secondary schools was undesirable in the best interests of education.

Lord Haldane's address was followed by a valuable paper by Sir A. Trevor Dawson, of Vickers, Ltd., on "Education after the War, with special reference to Engineering Instruction," in which he strongly urged the desirability of apprenticeship beginning at an earlier age than at present, and that the most capable boys should devote a portion of each day to the workshop and the rest to the school, and that every encouragement should be given to capable and talented boys, with a view to their being sent on to the technical college or university to complete their theoretical training, serving their vacations in the works so that they may have the advantage of special courses of advanced work on experimental research. The council of the association was instructed to prepare a public statement dealing with the immediate necessity for the further development of the means of scientific and technical education, and a resolution was passed calling upon Parliament to abolish all forms of exemption from school attendance below the age of fourteen, and to require compulsory facilities for continued education up to seventeen years of age, extending to at least six hours per week within working hours, for all persons employed who have left school. A further resolution was passed to invite the governing bodies of the various agricultural schools and colleges to join the association. On Saturday, October 21, a valuable and suggestive paper was read by Major Robert Mitchell, director of the Regent Street Polytechnic on "What Can Be Done to Train Disabled Sailors and Soldiers in Technical Institutions?" The facilities existing in London for the training of such disabled men in various occupations, and the success which had followed the work, together with the necessity for its further extension throughout the country, were fully set forth.

RECENT WORK ON TSETSE-FLIES.

THE tsetse-flies (*Glossina*) continue to occupy the attention of entomologists working in tropical Africa. Dr. W. A. Lamborn has now published (*Bull. Entom. Research*, vii., part 1) a third report of his investigations into the habits of these flies in Nyasaland (see NATURE, vol. xcvi., p. 90). He believes that an abundance of the flies usually indicates the presence of "big game" in the neighbourhood; yet he doubts whether the destruction of game would be effective in reducing the numbers of the fly, because "the game, if severely harassed, will retire [to surrounding areas] during the dry season, when only it is possible to hunt, returning in the wet and probably bringing more flies with it." In the same number of the bulletin there is also a paper by Lt. Lloyd on *Glossina morsitans* in northern Rhodesia. His observations show that in districts where game is scarce tsetses are often more numerous and troublesome than where game is plentiful; he suggests that this is because the flies, in the absence or scarcity of other mammalian prey, must attack man in larger numbers and with a more violent hunger. Mr. Lloyd, like Dr. Lamborn, finds males much more abundant than females in ordinary collections of *Glossina*, but Dr. Lamborn points out

that the proportion of females is largely increased when flies are caught beneath an umbrella or resting on trees, approaching the equality with the males which is seen in flies reared from puparia. Both writers have interesting notes on species of *Mutilla* (described by R. E. Turner in the same number of the bulletin), the larvæ of which are parasitic in the pupæ of the tsetses, while Dr. Lamborn has shown that a small chalcid (*Syntomosphyrum glossinae*), believed also to be a parasite of the *Glossina*, is really a hyperparasite on the *Mutilla*.

A convenient and useful summary of our knowledge of the tsetse-flies ("Notice sur les Glossines ou Tsé-tsés") by E. Hegh has been published in London under the auspices of the Belgian Colonial Ministry. It serves as an introduction to the structure, life-history, and classification of the insects in tropical Africa generally, but with special reference to the Belgian Congo. M. Hegh begins his historical introduction with the work of Bruce in 1895-6, and seems to ascribe to that distinguished surgeon the discovery that tsetse-flies carry disease. The deadly action of *Glossina* on European domestic beasts was well known to Livingstone during his early African journeys, and in his "Missionary Travels and Researches" (1857) he described the effect of the tsetse's bite on cattle and horses. With a seeming prevision of modern discoveries, he wrote of the "germ" of a poison "which enters when the proboscis is inserted to draw blood," and which "seems capable, although very minute in quantity, of reproducing itself." Bruce's contribution to the subject was the demonstration of this "germ" as a flagellate blood-parasite or Trypanosoma.

G. H. C.

ZOOLOGY AT THE BRITISH ASSOCIATION.

THE papers read in Section D were devoted chiefly to the consideration of problems arising out of the war. An account has already appeared in NATURE for October 19 of the papers on fisheries.

Flies.

Mr. F. M. Howlett gave a lecture dealing with the occurrence, habits, life-history, and means of prevention and destruction of the principal insects which have been troublesome during the campaign in France and Flanders. In another communication he surveyed briefly the known facts regarding the senses of insects, and gave an account of his observations, made in India, on the extraordinary attractiveness for the males of certain species of flies of isovaleric aldehyde, isoeugenol, and methyleugenol.

Miss O. C. Lodge gave an account of studies on the habits of flies in relation to means employed for their destruction. The best bait for blow-flies was found to be liver, brain, and fish which had been already attacked by maggots, and thus rendered more attractive. Baits were found to be much more attractive in the sun than in the shade. The best bait for house-flies is a mixture of casein, banana, any sweet substance, and water. Formalin in water (about 1:13) is apparently the best poison (excluding scheduled poisons) to use against house-flies.

Bilharzia Disease in Egypt.

Dr. R. T. Leiper gave an account of the later results obtained by the War Office Bilharzia Commission in Egypt. After sketching the conditions in a village where 91 per cent. of the schoolboys were found to be infected with Bilharzia, Dr. Leiper stated that the Commission had proved the occurrence of two species of Bilharzia, the chief characters of which he pointed out with the help of lantern illustrations. The egg of

Bilharzia haematobium is terminal-spined, and the cercariæ are found in the fresh-water molluscs, *Bulinus contortus* and *B. dybowskii*. The egg of *Bilharzia mansoni* is lateral-spined, and the cercariæ occur in *Planorbis boissyi*. From these molluscs the cercariæ escape, and were proved to enter experimental animals through the skin as well as through the mucous membrane of the mouth.

Protozoa and Disease.

Dr. Helen Pixell-Goodrich gave an account of the amœbæ parasitic in man, namely, *Entamoeba histolytica*, the specific cause of amœbic dysentery, from the large intestine; *E. gingivalis*, from the mouth; and *E. coli*, a harmless species, feeding on the contents of its host's intestine. Dr. Pixell-Goodrich devoted special attention to *E. gingivalis* in relation to pyorrhœa, but although this amœba occurs so commonly in these lesions, it was not considered to be the cause of the disease. The morphological similarity of the trophozoites of *E. gingivalis* and *E. histolytica* was pointed out, and the large characteristic inclusions of the former were held to be the nuclei of lymphocytes.

Dr. T. Goodey's paper dealt with the results of observations by Mr. Wellings and himself on *E. gingivalis*, which they found in the mouths of both young and old persons wherever there was accumulation of food débris. They concluded that there is nothing to show that the organism is in any way causally connected with pyorrhœa, the food bodies being nuclear fragments of decomposed salivary corpuscles.

Dr. Annie Porter gave an account of observations by Dr. H. B. Fantham and herself on the flagellate protozoa associated with dysentery, with special reference to cases from Gallipoli. *Trichomonas hominis* has been found in cases of severe diarrhœa at Salonica; prophylaxis is directed to the prevention of contamination of food or water by infected material and by possible insect carriers and rodents (similar Trichomonads occur in rats, mice, and rabbits), and to the isolation of human "carriers." Cases of Tetramitus diarrhœa have been found among patients from Egypt, Gallipoli, and Salonica. *Giardia (Lambli) intestinalis* was found to be the commonest flagellate in the stools (3800) of the soldiers examined, and in some cases occurred in enormous numbers; one stool was estimated to contain 14,400,000,000. *Giardia* derived from man is pathogenic to kittens and mice, producing erosion of the intestinal cells. Rats, mice, and cats can act as "reservoirs," and by contaminating the food and drink of man may spread the organism.

War and Eugenics.

Mr. Hugh Richardson stated the case for the institution of an inquiry into the after-effects of war on population. He pointed out the nature of the evidence available or to be sought, the statistical methods to be employed, and, after referring to the various and dubious theories held in the past, indicated some of the problems which seemed capable of solution. Subsequent speakers—Dr. Chalmers Mitchell, Dr. Doncaster, Dr. Tocher, and Prof. MacBride—were emphatic in supporting the case for an impartial inquiry and for the collection and preservation of statistical information by the Registrar-General, the Army recruiting staff, school medical services, and other agencies.

Dr. F. A. Dixey exhibited and commented upon a series of insects collected on the way to and from and in Australia in 1914. Mr. Heron-Allen exhibited lantern-slides illustrating the mussel fishery and the life of Alcide d'Orbigny at Esnandes.

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The Friday afternoon was devoted to a visit to the Dove Marine Laboratory at Cullercoats, the members being taken over the laboratory and aquarium by the director, Prof. Meek. J. H. ASHWORTH.

ENGINEERING AT THE BRITISH ASSOCIATION.

MR. GERALD STONEY devoted his presidential address to a review of some of the errors committed in the past by masters and men in the engineering industry. An abridgment of the address appears elsewhere in this issue of NATURE.

After the address a paper on "Limit Gauges" was read by Dr. R. T. Glazebrook, director of the National Physical Laboratory. This subject has been forced upon the attention of the whole engineering world by its importance in the manufacture of munitions. The greatly increased scale of manufacture necessitated the production of an enormous number of gauges, both for workshop use and for testing. The National Physical Laboratory has acted as the checking authority for the correctness of the gauges employed by the Government inspectors. Dr. Glazebrook first described the principles of limit gauging and then the various methods and apparatus evolved for dealing with the problem at the National Physical Laboratory.

A paper on "The Principle of Similitude in Engineering Design" was read by Dr. T. E. Stanton, who discussed the possibilities and difficulties of obtaining accurate information for the design of structures, ships, aeroplanes, propellers, etc., from tests made on small models.

The late Mr. Leslie Robertson, who was lost on the *Hampshire*, had promised to read a paper on the work of the International Standards Committee. Mr. le Maistre, who has succeeded him as secretary of the committee, took over the task, and read an interesting paper on "Standardisation and its Influence on the Engineering Industries."

Mr. H. T. Newbiggin described the *raison d'être* of the Michell type of bearing. Already in common use for thrust bearings, it is now being experimentally applied to journal bearings.

Prof. W. M. Thornton discussed "The Influence of Pressure on the Electrical Ignition of Methane," and described experiments showing that, as the pressure is gradually increased, the energy in the spark necessary to cause ignition increases in a stepped, discontinuous manner.

Prof. W. H. Watkinson described some tests showing that Diesel engines could be worked satisfactorily with compression pressures considerably lower than those usually employed.

Prof. G. W. O. Howe read a paper on "The Calculation of the Capacity of Aerials, including the Effects of Masts and Buildings." Papers on this subject were read by the author at the Sydney and Manchester meetings; in the present paper the subject is carried further, and a number of numerical examples and experimental results are given which fully confirm the method of calculation.

Mr. McLachlan described the results of some experiments on a Poulsen arc, to determine the best magnetic field strength to employ for maximum output and for maximum efficiency.

The only research committee that reported at length was that on "Complex Stress Distribution," in connection with which Dr. Stanton exhibited a model of a new machine in use at the National Physical Laboratory for subjecting a specimen to a rapidly reversing combination of bending and twisting.

The last day of the meeting was devoted to a joint discussion with the Chemical Section of the report of the Committee on Fuel Economy.