Sailors and Soldiers on the Land, together with some Considerations by a Free Trader in Favour of the Policy therein Advocated."

THE following volumes are in preparation for appearance in the "University of Michigan Studies" (*New York: The Macmillan Company*):—Contributions to the History of Science, part ii., "The Prodromus of Nicholas Steno's Latin Dissertation on a Solid Body Enclosed by Natural Process within a Solid," translated into English by Prof. J. G. Winter, with a foreword by Prof. W. H. Hobbs, illustrated; part iii., "Vesuvius in Antiquity," passages of ancient authors, with a translation and elucidations, by F. W. Kelsey, illustrated; Scientific Series, vol. ii., "Studies on Divergent Series and Summability," by Prof. W. B. Ford.

OUR ASTRONOMICAL COLUMN.

TWO LARGE FIREBALLS.—On October 20 at 8h. 14m. and 10h. 34m. p.m. large fireballs were observed. The first was seen by Mr. J. E. Clark, of Purley, Surrey, and it was estimated as twice as bright as Venus. The path was 82°+62° to 79°+35°, and its duration four to five seconds. The second was seen by Mrs. Fiammetta Wilson at Totteridge, Herts, and by Mr. Denning at Bristol. It appeared as a ball of fire streaming slowly along in a level course about 8° above the northern horizon. This fireball was at a great distance from the observers, and probably over the southern region of Scotland. It probably emanated, like Mr. Clark's fireball, seen earlier on the same night, from a radiant near Zeta Herculis low in the N.W. sky.

ENCKE'S COMET.—Further particulars of Dr. Max Wolf's recent observation of Encke's comet are given in *Astronomische Nachrichten*, No. 4861. The search for the comet was undertaken at the instigation of Dr. Kritzinger, and eight plates were taken at different times during August and September, with exposures amounting altogether to about thirteen hours. The last two exposures were made on September 22, in a very clear sky, and though the plates were on the point of being regarded as failures, the use of lower magnifying power easily revealed the comet, at a point about 20′ from the position given by the ephemeris. The comet appeared on both plates as a faint nebulous patch, with an extremely small condensation, and the displacement of the images in the interval between the exposures corresponded precisely with the ephemeris. The photographs were taken with the 71-cm. reflector, which was guided to follow the probable motion of the comet. The observation is of special interest from the fact that the comet was not far from the aphelion point of its orbit.

INTERNAL MOTION IN SPIRAL NEBULÆ.—An investigation of internal motions in the spiral nebula Messier 101 has been undertaken by A. van Maanen (Proc. Nat. Acad. Sci., vol ii., p. 386). In the first instance measures were made with the stereocomparator on two photographs taken by Ritchey in 1910 and 1915, and strong evidence of motion, even in this short interval, was obtained. Other plates, taken with the Crossley reflector of the Lick Observatory in 1899, 1908, and 1914, were afterwards included in the discussion. The resulting data depend upon measures of eighty-seven nebulous points and thirty-two comparison stars. Relatively to the mean of the comparison stars, the annual motion of translation of the nebula was found to be +0·005″ in R.A. and −0·013″ in declination. The mean rotational motion is 0·022″ left-handed, and the mean radial motion 0·007″ outward. The measures further indicate a small, but scarcely trustworthy, decrease of rotational motion with increasing distance from the centre. At the mean distance of 5′ from the centre, the rotational motion of 0·022″ corresponds to a period of about 85,000 years. If the parallax were known, and if it could be assumed that the movements were in elliptical orbits, the central mass could be calculated. A comparison with the average translation of spiral nebulæ determined by Curtis suggests a parallax of 0·005″, while a comparison of the cross-motions with the known radial velocities of some of the spiral nebulæ leads to 0·0003″. The corresponding central masses are 30,000 and 140,000,000 times that of the sun, and the corresponding orbital motions 21 and 345 km./sec. Evidence of rotation has also been found in Messier 81.

THE ASSOCIATION OF TECHNICAL INSTITUTIONS.

A LARGELY attended general meeting of the members of the Association of Technical Institutions was held on October 20-21 at the Imperial College of Technology and Science, under the presidency of Sir Alfred Keogh, K.C.B., the president of the association, with the view of discussing educational questions bearing upon the work of technical schools and colleges. The Right Hon. A. H. Dyke-Acland, the chairman of the executive of the governors of the Imperial College, extended a welcome to the members and referred to the splendid service which Sir Alfred Keogh, the rector of the college, in his capacity of director of the Army Medical Service, was rendering to the nation.

The conference was addressed in the first instance by Lord Haldane, Chancellor of the University of Bristol, who took for his subject "Education after the War, with special reference to Technical Instruction." He made clear in his address that unless technical education was based upon large ideas and was penetrated by sound knowledge it must surely fail. He deprecated most strongly the current controversies which sought to place the teaching of the humanities and natural science in unfriendly relation. Knowledge was one and indivisible. The study of fine literature and of the thought it embodies was just as needful to the complete training of the human being as the study of mathematics or of the phenomena of Nature, since the object of all true education was a wider, a more penetrating and stimulating vision. The teaching of the higher mathematics could, if taught in the right way, be made as stimulating as the classics. There was a great awakening in the nation, induced by the events of the war, to the paramount necessity for knowledge. Education and business were not really in two compartments. Rightly considered, the successful pursuit of manufacture and commerce depended for its permanence and value upon sound methods of education and the acquisition of accurate knowledge. Many apt and clear illustrations in support of this contention were adduced from the sphere of chemical, physical, and electrical science and practice. In the domain of applied science attention was directed to the fact that London was the great centre of the world's trade in furs, but that in order to make the furs marketable to the consumer we exported them to foreign countries, notably to Saxony, where alone they could be dyed and treated with suitable effect. The aloofness between the man of business and the man of science must cease, and all classes from the workers upwards, amongst whom there was splendid raw material, must receive the benefits of scientific training. We must have a higher standard of knowledge not only for managers, but for workmen also, if the position of

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. xcvii., 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 Ll. 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 *iso*valeric aldehyde, *iso*eugenol, 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