

Zoology at the British Association.

THE meetings of Section D attracted a large gathering of zoologists from this country and a worthy representation from the Dominions and from the United States. Prof. Gilson, of Louvain, was the only Continental guest of the Section.

Discussions.

The discussion on the need for the scientific investigation of the ocean has already been reported in NATURE of September 2 (p. 30), and Mr. H. G. Maurice's address in which he urged that fisheries research is the business of the State was published in NATURE of November 25. The discussion on this address may now be briefly summarised.

Prof. James Johnstone entirely agreed with Mr. Maurice that a Government Department of Fisheries ought to be thoroughly staffed and equipped for the prosecution of scientific research. But this policy brought a serious responsibility, for sooner or later the fishing industries would ask for the results of the investigations, e.g. whether fish had become more abundant or whether investigation had suggested new and improved methods of utilising sea-fish and products at present useless. As a practical suggestion he thought that in all such economic scientific investigations a new kind of worker was now necessary—the man of the inventor type of mentality—whose task it would be to apply to industry the new discoveries of the laboratory, marine station, or exploring vessel. Pure scientific investigation for its own sake was the proper work of the universities and marine stations, and no development of economic research ought to curtail it.

Prof. Gilson (delegate of Belgium on the International Council) supported the view that a maritime country should have a Department of Fisheries Research, and stated that Belgium has adopted this system and, notwithstanding the profound disorganisation of her finances, granted the sum asked to enable her full share of oceanographical and fisheries research to be undertaken.

Prof. Garstang remarked that twenty years ago they were in the midst of acute controversies between rival groups of marine biologists and between all these and the Fisheries Department in regard to the initiation of the International North Sea Investigations. It was, therefore, particularly gratifying to him to note the unanimity which now prevailed as to the wisdom of the arguments which induced the Government to proceed with that enterprise and were now put forward by the Ministry of Fisheries as convincing reasons for its continuance. It must, however, be recognised that there is a danger to science of its best exponents in one subject being concentrated into one Government Department.

Prof. Meek said that all were of the same mind that a Government Department should be fully equipped for research so long as the independence of pure science was maintained and it was recognised that much of the work could be done in independent institutions. He then went on to refer to recent trawling results on the Northumberland coast, which showed that fishery conditions in those waters were the same to-day as in 1913. He referred to the areas of distribution of fish from the Canaries to Barents Sea, and pointed out that explanations must be sought in the study of movements of water and of the lives of diatoms and other microscopic organisms.

Mr. Neale (Cardiff) stated that neither the Government nor practical fishermen have given enough con-

sideration to the future of fisheries. He found the catches to be no larger now than before the war, and in some cases they were smaller, and he was inclined to believe that natural causes were mainly contributory, and that knowledge of these was required. The amount of ocean fished is very small as compared with the total area of the ocean, and he asked for investigations which owners of commercial trawlers could not carry out.

Dr. E. J. Allen expressed satisfaction with the broad views on scientific research now held at the Ministry of Agriculture and Fisheries and put forward by Mr. Maurice, and remarked that it was also gratifying to hear that those engaged in the fishing industry now realised the usefulness of scientific investigations.

Mr. Maurice briefly replied, explaining that collaboration in fisheries research was on the high road to being achieved between England, Scotland, and Ireland, the three countries settling their schemes and policy by quarterly inter-Departmental conferences.

The president (Prof. Stanley Gardiner) suggested that the Section might arrange for a full day of discussion at its meeting in Edinburgh in 1921; and circularise the various fishery federations and associations to see if their members would be inclined to attend the meeting of the Association and put up their own facts and problems for friendly discussion with the scientific members of the Association. The position of the Scottish capital as a common meeting-ground for the four greatest trawler ports—Aberdeen, Fleetwood, Grimsby, and Hull—seemed to him to offer an eminently favourable opportunity for such discussion.

Protozoa.

Prof. C. A. Kofoid described recent observations by himself and his pupils on the neuro-motor system of ciliate and flagellate protozoa. The perfection of the Barber micro-dissection apparatus, which can be operated with great delicacy of action under an oil-immersion objective, has made possible the demonstration of the existence in certain protozoa of a complicated fibrillar system comparable with the nervous and muscular systems of higher animals. This integrated neuro-motor system is connected with the nucleus, and plays an important part in the division of the organism into two. Experimental proof of the conducting function of the fibrillar system in the ciliate *Euplotes* was established recently by Dr. Taylor, who succeeded in cutting the fibrils in the living animal. He observed that in these cases there was interference with the integrated co-ordinated movements of the animal. Cuts of similar extent made in other specimens, but which did not sever the fibrils, did not produce interference with co-ordination.

Prof. Kofoid pointed out that many of the flagellates are asymmetrical, and generally have a sinistral or left-handed torsion. The origin of bilateral symmetry which prevails in Metazoa, composed of many cells, appeared to him to be bound up with two features of the structure of protozoa: (1) The co-ordinating mechanism, already referred to, in the protozoa and its persistence in the form of fibrils connecting the constituent cells of the Metazoa; and (2) the production during division into two of a sinistral and a dextral daughter-cell, the latter due to a reversal of the primitive sinistral symmetry and forming a mirror-image of the left one, the maintenance of the union of these two cells thus providing the first step in the origin of primitive bilateral animals.

Prof. R. W. Hegner discussed the relations of nucleus, cytoplasm, and external heritable characters in the genus *Arcella*, in which the nuclei can be seen and measured in the living animal and the chromatin mass accurately determined. Pure lines of *Arcella dentata*, obtained during vegetative reproduction from "wild" specimens by pedigree breeding methods, differed from one another in size and spine-number, which are closely correlated—the larger the shell, the greater the number of spines. These two characters were found to be correlated also with chromatin mass, for uninucleate descendants of halves (obtained by cutting into two) of binucleate animals were only about half as large as binucleate specimens belonging to the same line. The uninucleate descendants of halves of binucleate specimens always regained the binucleate condition after a few generations. The later descendants were always binucleate, but the size and spine-number of the typical binucleate were reached only after three or four more generations, during which the diameter of the shell and the number of spines increased gradually, *i.e.* the great change within—the doubling of the chromatin mass—was accompanied externally by small changes in a definite direction. If the internal condition had not been known, the conclusion would have been reached that the change in external heritable characters was due to several gradual modifications instead of to one large mutation.

Messrs. E. Heron Allen and A. Earland read a paper on protoplasm and pseudopodia, based on observations on Foraminifera. They conclude that protoplasm is capable of almost unlimited extensibility and attenuation by imbibition of water, and that pseudopodia are not extended as such, but formed from protoplasm surrounding the shell. They claim for the pseudopodia a rudimentary nervous reaction to stimuli.

Prof. Kofoid exhibited a series of plates for a forthcoming monograph on the unarmoured Dinoflagellata, and Miss C. Herdman exhibited living specimens of *Amphidinium* from Port Erin.

The Influence of Salts on Growth.

Dr. Cresswell Shearer read a paper on the influence of salts on growth. He described experiments which show that living bacteria offer considerable resistance to the passage of ions of various salts; dead bacterial protoplasm offers no resistance. There is something peculiar to the living state that conditions this resistance, and this should be kept in mind in all applications of the results of protein chemistry to living protoplasm.

Annelids.

In a communication on the polyphyletic origin of genera in the Oligochaeta and its bearings, Prof. J. Stephenson showed that the genera of the Megascolecidae can be arranged in the form of a phylogenetic tree. The differentiating characters are few, *e.g.* in the majority of genera of the sub-family Megascolecinae they concern only the setae, prostates, and nephridia. The evolutionary changes in these systems have demonstrably taken place more than once, and the differentiating characters and their various combinations are few enough to render it probable that the same combination, *i.e.* the same genus, has been reached in more than one way. Apart from probability, there is anatomical and geographical evidence that the genus *Megascolex* has arisen from both *Notoscolex* and *Perionyx*, and from *Notoscolex* more than once. The multiple origin of *Microscolex* from *Notiodrilus* has also been demonstrated, and there is some evidence of the multiple origin of *Pontodrilus*.

To assert the polyphyletic origin of a genus is, however, unorthodox; writers obviate it by merging the genera concerned, but this is to evade the difficulty. The answer given to the question of polyphyly has a bearing on geographical distribution. A number of genera of the sub-family Megascolecinae occur both in India and Australia; the *Octochætinae* occur only in India and New Zealand. These distributions are explained by assuming land-bridges between India and Australia and between India and New Zealand. But such connections cannot have existed since the Eocene, or Eutherian mammals would have entered Australia and New Zealand. Earthworms are, however, a recent group, and such a genus as *Megascolex* is among the phylogenetically youngest earthworms; its origin, and probably that of other genera common to the two regions, must have been recent (since the Eocene). Land connections are thus apparently insufficient to explain the distribution, and a double origin of at least the phyletically younger genera seems worthy of consideration.

Prof. Pierre Fauvel sent a summary of the results of his examination of the marine annelids collected in the Abrolhos Islands by Prof. Dakin. Sand- and mud-dwelling Polychaeta were absent; Aphroditidae and Eunicidae were plentiful, together with Amphinomidæ and a few Nereidae—a small fauna of Polychaeta creeping on the stones and corals. Of the nineteen species from the Abrolhos, five are known only from the warmer parts of the Indian Ocean, eleven belong to the tropical area, but often extend beyond it northwards and southwards, and three belong to the Australian coast. The Polychaeta fauna of the Abrolhos is probably the same as that of most of the coral-reefs of the Indian Ocean, with the addition of a few species belonging to the Australian coast.

Hookworm and Human Efficiency.

Prof. Kofoid, in an address on hookworm and human efficiency, described investigations made in the United States Army in connection with the elimination of hookworm infection among recruits. Examination revealed an infection of about 10 per cent. among men from the Southern States, and a slightly higher rate among whites than among blacks. A statistical investigation of the incidence of disease among 24,000 men at Camp Bowis, Texas, over a period of eight months (including that of the measles-pneumonia epidemic of the winter of 1917-18) showed that men in whom hookworm infection had been detected had a much higher sick-rate, and were more often sent to hospital for severe infections. Regiments with more than 10 per cent. infection by hookworm had a much higher death-rate from pneumonia than regiments with less than 10 per cent. infection by the worm. A comparison of the mental ratings obtained by the tests of the Psychology Board of the U.S. Army in the case of 10,000 recruits from the hookworm area showed that white able-bodied men with hookworm infection have a lower average rating than men in whom the infection was not detected. The mental deficiency thus measured was nearly 25 per cent., and affected all grades of intelligence from the highest to the lowest, but the latter somewhat more severely. Hookworm infection, even in cases when it is light, is a matter of great educational, sanitary, and economic importance.

Physiology of Migration.

Prof. A. Meek discussed the physiology of migration. He stated that the passive denaturation of the egg, larval, and young stages of fish may be, and usually is, succeeded by an active down-current migra-

tion which is accompanied by seasonal on-shore and off-shore movements. But the periodic migrations of the species are markedly interrupted when the call of maturity comes. Then the migration is contranant, a longer or shorter distance according to species and circumstances, due to the effects of an internal secretion or hormone which exercises a profound influence on the central nervous system, and may also produce somatogenic results. The only invertebrate which is definitely known to react in this way on the approach of spawning is the crab—the females migrate contranantantly at that period—but it may be presumed that other large, active Crustacea and Cephalopoda respond similarly. Prof. Meek referred to Amphibia as being similarly affected at the spawning season, the hormone bringing about a return to gregariousness as well as somatogenic effects which characterised the period. The same appears to be true of aquatic reptiles, birds, and mammals, and Prof. Meek suggested that this pointed a way of approach to the subject of aerial migration. In the discussion following, Prof. Lloyd Morgan directed attention to the breeding habits of lapwings, and suggested that they were to be explained as due to hormone action, and other speakers proposed that attempts should be made to isolate and experiment with the hormone. Prof. Garstang discussed the question with reference to plaice, and Prof. Meek replied, pointing out in this case the distinction between the periodical and the spawning migrations.

Embryological Studies.

Prof. J. E. Duerden gave an account of the pineal eye of the ostrich (for a summary of this paper see NATURE, vol. cv., pp. 516-17), described a caudal vesicle in ostrich embryos, and recorded the presence of Reissner's fibre. In embryos of about ten days' incubation a prominent vesicular swelling is present at the tip of the tail or on the dorsal surface near the tip. The cavity of the vesicle, in which the central canal of the spinal cord terminates, varies much in size and shape in different specimens. The ventral wall of the spinal cord lines the floor of the cavity and terminates somewhat abruptly, and the dorsal wall of the cord merges gradually into the mesenchymal tissue which constitutes the dorsal and lateral walls of the vesicle, without, however, showing any differentiation into an epithelial layer. The cavity is filled with a coagulable fluid in which cellular tissue in process of degeneration frequently occurs, and occasionally much black pigment is present. The external enlargement persists for only a short time, rarely lasting after the twentieth day of incubation. A similar vesicle has been found in several reptiles, and is well-developed in the penguin and the puffin, though in these it is not so large as in the ostrich. It is suggested that the vesicle in the ostrich, which varies so much in size, is in some way concerned with the regulation of pressure of the cerebro-spinal fluid at this early stage. Longitudinal sections of the caudal region show the presence of Reissner's fibre and its posterior attachment to the mesenchymal tissue. Reissner's fibre has been found to occur within the central canal of the spinal cord of vertebrates from the cyclostomes to the primates.

Mr. J. H. Lloyd dealt with the early development of the pronephros in Scyllium and Chrysemys, and supported Mr. Burlend's view that the pronephros arises as a non-segmental groove from the somatic layer of the mesoblast, and that the anterior portion of the duct is formed by constriction from this groove, and not by fusion of the distal ends of tubules. The evidence, as presented by the illustrations, was not convincing, and was subjected to considerable criticism.

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The Movements of the Sea.

At a joint meeting of Sections D and E, Dr. E. C. Jee gave a paper on the movements of the sea. He pointed out that the temperature of the deep waters surrounding the British Isles is essentially due to the Atlantic circulation. He dealt in some detail with the northern North Sea current, and stated that no significant correlation has yet been demonstrated between the variations of this current and fluctuations in the landings of fish. The current which enters the English Channel from the Atlantic affects the fisheries of the south-west area, and its strength seems to show the following variations: A winter maximum and a summer minimum, and a two-year, a six-year, and a twelve-year periodicity. It is probable that the fluctuations in the landings of pilchards are correlated with the variations in strength of the Channel current. The periodicities referred to are now being investigated by the International Council. The examination of numerous samples of sea-water and the liberation of surface and bottom drift-bottles are being undertaken with the object of obtaining information for a study of the migrations of mature plaice to and from their spawning-grounds in the Flemish Bight and the probable drift of the pelagic plaice eggs and the location of the fry in their various stages of development.

Prof. E. B. Poulton gave a preliminary account of the hereditary transmission of a minute, extremely variable, and generally asymmetrical marking in the forewing of the currant moth (*Abraxas grossulariata*).

J. H. ASHWORTH.

University and Educational Intelligence.

BIRMINGHAM.—At the last meeting of the council the Principal reported that the Staffordshire Education Committee is increasing its grant to the University from 450l. to 1000l. per annum. The Worcestershire County Council recently increased its annual contribution from 300l. to 500l.; and the Dudley Town Council has informed the University that it will include an annual sum of 50l. in its estimates.

Messrs. Dorman and Co., of Stafford, have presented a 20-h.p. petrol engine, and Messrs. Sturge and Co. an old beam engine. The Pro-Vice-Chancellor, Alderman Clayton, is providing 100l. towards the cost of removal and re-erection of the latter.

The University is affording facilities in the department of pathology to enable Prof. Shaw Dunn to take part in the training of the Naval and R.A.M.C. personnel required for the physiological department of the Chemical Warfare Section at Porton.

Mr. R. W. W. Sanderson has been appointed a demonstrator in physics for the current session.

Mr. R. G. Abrahams has been appointed honorary assistant curator of the pathological museum, Section of Surgery.

CAMBRIDGE.—By the time that this issue appears the vote on the admission of women to membership of the University will have taken place. Both sides are hopeful of the issue, and a fairly close vote is generally anticipated. Something of the vigour of the earlier fighting on this question has vanished, perhaps because the "old guard" realise that they are fighting a losing battle. If they hold their privileged position this time they know that their flanks are in the air, and that it is only a short time before they are liable to be overwhelmed in an attack from another quarter. Somewhat late in the day, many of them are holding out a promise of a place where everybody may go if only the Senate will throw out