

BIOLOGY AS A CAREER

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THE Institute of Biology recently held, at the Heriot-Watt College, Edinburgh, a symposium on "Biology as a Career" in which ten speakers dealt with various fields of work in which biologists are employed.

W. B. Yapp (University of Birmingham) discussed biology in schools and drew on information obtained by the British Association Committee on the subject. It was reported that many schools still do not include biology in their curriculum, this being true of a higher proportion in Scotland than in England. Since 1919 the total number of pupils offering biology in School Certificate examinations has increased six times; but the percentage of those taking biology has increased but slightly. Posts for teachers of biology often remained unfilled or filled by unsatisfactory candidates, and there therefore seem to be openings for biology graduates for some time to come. Criticisms that biology taught in schools is dry, limited and out of date reflect on the universities responsible for training the teachers. Too many professors and lecturers believe that the sole function of a university is to train research workers and that only the less well-qualified graduates should teach in schools. Mr. Yapp hopes that more of the best graduates will be encouraged to enter teaching; he mentioned that many problems in taxonomy and ecology require little apparatus and offer considerable scope for original work, so that teachers are by no means prevented from pursuing research.

This difficulty of obtaining adequate numbers of graduate teachers of biology was also the concern of Mr. G. Farclay (Moray House Training College), who outlined the Scottish methods of training teachers. In his experience of the science graduates taking courses in education with the view of teaching, on average only one in ten is a biologist. This leads to biology and general science being taught by those ill qualified to do so, even though those without biological training often make considerable efforts to fill the gaps in their knowledge of science. Were more students to commence their university course with teaching in view they would be able to take more suitable combinations of subjects, but, unfortunately, teaching is too often considered the last resort. The discussion which followed these two papers was concerned with the desirability of entrants to biological courses in universities having received sound training in mathematics, physics and chemistry even to the virtual exclusion of biology. The tendency among teachers to consider biology as an 'easier' subject suitable for those unable to master the more rigorous mathematical sciences was mentioned; this and the more obvious prospects and abundant posts in physics and chemistry result in teachers steering their better pupils into physical science.

A general survey of careers in biology was given by Dr. R. A. E. Galley (Office of the Lord President of the Council), who referred to the report of the Ministry of Labour on the supply and demand for biologists (see *Nature*, 167, 371; 1951) in which it was forecast that over the period 1950-55 nine hundred more graduate biologists would be produced than would be required to fill the available posts. Paradoxically this surplus is occurring at a time when

there are considerable difficulties in filling posts, particularly senior ones, in bacteriology, applied entomology, mycology, plant and animal physiology, etc. If students intending to take up biology were to take a combination of zoology or botany with physics or chemistry they would be more suited for work in the fields of research the rapid development of which will require a steady flow of recruits. Furthermore, such combinations, particularly with chemistry as a subsidiary subject, would make it possible for the holder of a pass degree to obtain a scientific post (not perhaps a research post) as a chemist or physicist.

Prof. S. J. Watson (East of Scotland College of Agriculture) said that there are many openings in agriculture and horticulture for the properly trained biologist who has taken a good honours degree in a pure science school of a university. To this degree should be added, if possible, a postgraduate course in the principles of agriculture. With such a training there are openings which fall into three groups: teaching in the agricultural departments of universities or in agricultural colleges; work in the National Agricultural Advisory Service as advisers on scientific problems, often out-of-the-ordinary ones, which are beyond the powers of the agricultural officers; and research on more fundamental problems in research institutes, for which a good general knowledge of agriculture is less necessary.

In considering careers in fishery research, Dr. C. E. Lucas (Marine Laboratory, Aberdeen) outlined the growth of organized marine biological work to the present stage where more than a hundred scientific officers and fifty experimental officers are employed in laboratories other than those maintained by the universities. Since the War there has been a steady demand for marine biologists, trained in Britain, as a result of developments in the Colonies and Dominions. The increased support for research has been due to a realization of the value of fisheries in maintaining food supplies and the dangers of irrational exploitation. The many fields of research yet to be developed for the further and more economical exploitation of the resources of the sea make it difficult to believe that, despite financial economies demanded by defence measures, a further expansion of staff will not take place. The type of recruit required is one with a keen interest, good mathematical background, training in ecology and ability to work in small boats at sea.

Prof. I. A. Preece (Heriot-Watt College, Edinburgh), discussing the requirements of the brewing industry for men of science with biological training, estimated the annual intake might be fifty persons. Those employed usually have received a basic training in chemistry, physics, biology (specializing in botany) and further chemistry (with specialization in plant biochemistry). For the majority a knowledge of microbiology is self-acquired, although in large firms and in brewing research specialist-trained microbiologists are employed. A biological outlook is most necessary, for any attempt to treat barley, hops and brewers' yeast as mere chemical reagents would lead to difficulties and disillusion. The training received by a brewer can, with very little modification, be useful in the food industry in general, in distilling and yeast manufacture and in certain branches of the pharmaceutical industry.

A paper by Prof. T. W. M. Cameron (McGill University, Montreal) on "Biology in Canada", which was read by Mr. T. M. B. Payne, dealt with the

development of biological research in Canada. The Government is the major employer of biologists, with seven hundred in the Department of Agriculture and a hundred in the Fisheries Board. Industry is now developing, and the stage of the 'branch factory' with research carried out in the United States or Britain is passing. The consequent demand for biological personnel will be met in the main from graduates trained in Canada; but there will always be opportunities, especially in government service, for well-trained research biologists. In discussion it was emphasized that the acceptance of posts in Canada and the other Dominions by British men of science is on the basis of emigration; this is in contrast to service in the Colonies, where leave and final repatriation to Britain is financed by the employing government.

Biological research in industries other than those concerned with agriculture or medicine was the subject of the next paper, by Mr. D. Neville-Jones (Intelligence Division, Department of Scientific and Industrial Research). Industries in which biology plays a part can be considered as falling into two groups: those using biological materials, in general the older industries, and those, the newer, which are based on biological processes. Research on food preservation was described as an example of biological work in the first group of industries, as were various pieces of work on timber growth and disease, on the problems of water pollution, and the prevention of fouling of ships' bottoms. Of industries dependent on biological processes the two most outstanding are those concerned with antibiotics and fermentation. Biologists in industry are a small proportion of the total scientific staff (of the thousand men of science in the establishments of the Department of Scientific and Industrial Research, eighty-eight are biologists). Many problems can only be tackled by those biologists prepared to widen their outlook, more particularly by absorbing some part of the chemist's outlook.

The functions of the Technical and Scientific Register were described by Mr. B. G. Meara (Ministry of Labour) as being: (a) the maintenance of an employment service; (b) the provision of advice on careers; (c) the supervision of the obligations of university graduates for National Service; (d) the making of surveys of employment prospects. The fulfilment of the last obligation has resulted in the report previously mentioned by Dr. Galley. The expected insufficiency of posts will affect the less well qualified; the prospects for those with first- or second-class honours degrees and sound training in physics and chemistry are reasonably good. It will be difficult to meet the demand for highly qualified specialists without increasing the pool of those at pass-level. The predictions of the Ministry's report are confirmed by the picture obtained by the employment service of the Register. Of those who graduated in 1951 only a very small number of men with first- or second-class degrees are still unemployed, while a larger number of women with such qualifications and still larger numbers of those with pass or general degrees have failed to find appropriate biological employment. In discussion Mr. Meara was able to reassure those who suggested that possible fields of employment have been overlooked. It was mentioned that a re-assessment of the employment position has been made. This confirmed the general conclusions of the report on the supply and demand of biologists.

Prof. J. F. Danielli (King's College, London), in a paper on "Biology in Universities", quoted the Technical and Scientific Register's estimate that universities are likely to absorb between fifty and a hundred biologists annually. His view is that under the impact of new knowledge the number of university biologists will be doubled in the next fifty years, leading to many new departments or the enlarging of existing departments with sub-departments such as, for zoology, protozoology, entomology, parasitology, ecology, comparative anatomy, cytology and genetics. On the analogies of physics and chemistry, a rapid growth of biological technology seems likely: this will need more specialized biologists, who could be trained either by existing universities or in possible new technological universities. Experience has shown that small units in universities are very effective for the undertaking of fundamental research, and more appointments for research, as distinct from teaching, will be desirable. Administrative assistants, recruited from capable general honours or pass graduates, in biological departments would undertake administrative work, thus freeing others for research and teaching. A revision of university teaching of biology is needed to allow for two streams of students, one following courses in botany or zoology as at present and the other specializing in subjects such as microbiology, biochemistry, cytology or genetics.

As honorary secretary of the Institute of Biology, Prof. Danielli summed up the lessons to be drawn from the symposium. It is desirable that headmasters should be encouraged to keep up the flow of pupils really suited to biology; discussions between schools, universities and employers should take place on the desirability of modifying existing courses; with existing courses students should be encouraged to take a physical science as a subsidiary subject; more biologists should enter teaching; biologists and employers should consider that a biological training is particularly suitable for those in administrative positions; by directing attention to further useful applications of biological knowledge the demand for biologists might be increased. Dr. Edward Hindle, president of the Institute, proposed, from the chair, a vote of thanks to the speakers and those, chief among them being Mr. F. T. Walker, whose work had made the symposium so successful.

OBITUARIES

Dr. Th. Mortensen

In Dr. Theodor Mortensen, who died on April 3 at the age of eighty-four, the zoological world has lost an authority of outstanding stature. Fifty-five years of his life had been devoted to the study of the Echinodermata, and of the Echinoidea in particular.

Mortensen was born, the son of a schoolmaster, in Harløse, Denmark, on February 22, 1868. In 1885 he entered the University of Copenhagen as a student of theology; but study of the works of Darwin decided him to turn his mind to zoology. In 1894 he became assistant in the Zoological Institute at Giessen in Germany, and in 1895 he was appointed to the Danish Biological Station and from then until the end of his life he worked always in or as from his own country. He took the degree of M.Sc. at the University of Copenhagen in 1895 and received his Ph.D. in 1897. During 1899-1900 he was zoological