

discussion of work with others in the same or related fields is a vital stimulus to progress. Few specialists in the tropics can expect such contacts.

Professional isolation has a secondary effect: it can lead only too easily to professional oblivion. The young man overseas, having no opportunity for the self-advertisement provided by conferences and meetings, remains unknown to those of his seniors who might help promote his professional interests.

The greatest problem of all who serve overseas, according to Dr. Weatherly, is education of children. It looms even larger than the purely professional problems, but it inevitably leads to a vital question which is professional in nature. This is the question of length of service. In view of professional and family difficulties, the ideal arrangements would seem to be five, ten or even fifteen years of service, with the opportunity of a return to the United Kingdom when professional or family circumstances demand.

The not-so-young biologist who wishes to resign is confronted with the problem of obtaining a post in the United Kingdom; for this the specialist is better placed than his administrative colleagues. A general agricultural officer is unfit for a return to Britain in proportion to the length of his service. His intimate knowledge of the agriculture, people and climate of an area in Africa is not likely to impress a committee of the Ministry of Agriculture in Britain, or a commercial firm wanting a farm manager.

The difficulties of the biologist research officers wishing to return to the United Kingdom are considerable. For a man who obtains a Colonial Office scholarship immediately after his first degree, the possibility of obtaining a higher degree is precluded. In any event, the type of work carried out in a government department might not be suitable for submission as a thesis. Moreover, his work, although very valuable to his employers and perhaps very valuable as experience to himself, may have led to little publication except in local reports or journals. Then there is the disadvantage of physical remoteness. The head of a department receiving applications for a post is likely to view one from overseas less favourably than others. Nor can the attitude which many senior biologists have to work overseas be precluded. In most branches of biology, tropical experience is not at a premium—it is often regarded

as an improper and largely irrelevant version of experience gained in the United Kingdom.

This misconception is rendered possible by the fact that so many senior biologists themselves have never visited, or worked in, the tropics and are in no position to assess the value of tropical experience. Many biologists who have spent some years of successful research in the tropics might reasonably look forward to a biological post in one of the universities in the United Kingdom, but the pattern of university recruitment to-day makes their chances very slender. University teaching has become a profession which may be entered at the bottom, occasionally at the top, but very seldom in the middle.

Finally, there is the problem with which a university tutor is faced in advising students whether to take up tropical work. Is a young man to-day well advised to enter a field of work which seems to be contracting? Self-government in overseas territories and the increasing education of Africans and other peoples up to university-level must inevitably mean fewer posts for Europeans. This would seem to point to scientific careers in the tropics being in many cases rather short, at all events much shorter than thirty years.

Guarantees of security for young men who wish to venture overseas are essential. As biologists they are taking great professional risks and their interests should be safeguarded. Such safeguards are expressed by the Colonial Office in "Reorganization of the Colonial Service, 1954"* as follows: "They will be given adequate notice of any intention to terminate their employment in consequence of constitutional changes, and Her Majesty's Government in the United Kingdom will endeavour to find them alternative employment should they so desire". The word 'endeavour' should be replaced by 'undertake'.

Other contributions to this important meeting were made by D. Rhind, Secretary for Colonial Agricultural Research, who talked about biological research in Colonial territories; Prof. A. H. Bunting, who considered the problems of biologists in the transition of Colonial countries to independence; Prof. G. F. Asprey, who examined the problems of biologists in university colleges overseas, and Prof. R. D. Purchon, of the University of Malaya, who was particularly concerned with the problems of his own university.

* Colonial No. 306. (London: H.M. Stationery Office.)

TRADE WASTES

AS a result of public demand for the abatement of pollution of rivers, the River Boards Act, 1948, and the Rivers (Prevention of Pollution) Act, 1951, all those concerned with the disposal of polluting liquids, and particularly industrialists and local authorities, have found it necessary in recent years to give serious consideration to the development of efficient methods of treating such liquids to reduce their polluting character. During the past three years, several symposia on industrial effluents have been held in Britain, and a report has been issued* on the proceedings of a successful and

well-attended symposium held by the Midland Branch of the Institute of Sewage Purification at the University of Birmingham on April 9, 1957. The chairman was Dr. A. Key, senior chemical inspector, Ministry of Housing and Local Government, and the proceedings were opened by Alderman A. Paddon Smith, chairman of the Birmingham Tame and Rea District Drainage Board. The papers presented dealt with the problems concerned with acceptance of trade effluents into public sewers, the obligations imposed on local authorities and traders by the rivers pollution prevention Acts, and methods of treatment of particular waste waters.

Mr. M. A. Kershaw, in a paper on the first of these subjects, makes the point that one of the effects of

* Symposium on Trade Wastes held at the University of Birmingham. Pp. 167. (London: Joint Secretaries, Institute of Sewage Purification, 1957.) 10s.

industrial expansion is the aggravated pollution problem occasioned by increased volumes of trade effluent, frequently of a highly complex character. He accepts the view that trade effluents are best disposed of by discharge to the public sewers, provided that treatment is applied to the effluents so that they will not damage the sewers, or cause danger to workmen, or interfere with the processes of purification of sewage. Methods of removing constituents most likely to cause difficulty are outlined, and an organized system of trade effluent inspection and control operated by the local authority is advocated to ensure co-operation between the authority and manufacturers.

Dealing with the obligations imposed by the pollution prevention Acts, Mr. M. Lovett directs attention to the fact that, although during the interim period of seven years after the passing of the 1951 Act a river board may not, without the consent of the Minister of Housing and Local Government, institute legal proceedings against a person who "causes or knowingly permits to enter a stream any poisonous, noxious or polluting matter", the consent of the Minister is not required for proceedings against an offender who fails to comply with valid conditions of consent relating to a new discharge. A new feature which is referred to is that river boards may now 'apprehend' that a contravention of the Act is likely to occur as a result of a proposed use of a stream, and, subject to the consent of the Minister during the interim period, may obtain an order prohibiting the use complained of. The author, however, emphasizes that river boards are much more anxious to abate pollution than to institute legal proceedings.

In four of the five examples of methods of treatment of industrial organic wastes brought together by Dr. D. H. Sharp, biological oxidation forms the final stage, after preliminary chemical and physical treatment to remove substances which would otherwise interfere with biological action. Perhaps the most interesting of these preliminary treatments is that applied to the waste water from the manufacture of pesticides. These contain bactericidal and toxic compounds which are removed partly by adsorption on activated charcoal and partly by chemical precipitation before the neutralized and diluted waste is applied to percolating filters.

The paper on acid wastes by Dr. S. H. Jenkins and Mr. C. H. Hewitt is of particular interest in the Birmingham district, where a great deal of metal working is done, with consequent discharge of acid liquors and washings from preliminary pickling of the metal. Examples of acid discharges are quoted which reduced the pH value of sewage reaching a treatment

works to less than 3 for several hours. At this degree of acidity damage to the sewer occurs, the conversion of urea to ammonia is inhibited, and there is serious depression of the biological activity on which purification of sewage depends. Neutralization of acid discharges is therefore essential, and the authors describe (with illustrations) a range of neutralization plants of different sizes and designs.

Discharge of electro-plating wastes is also very common in the Midlands, and in a paper on treatment of these liquids Mr. A. E. J. Pettet stresses the need to consider conservation of water and chemicals in the plating shop before treatment of wastes unavoidably discharged is undertaken. Chemical methods of oxidation, reduction or precipitation are usually used for treatment, but cyanides can be destroyed biologically. Waste chromic acid anodizing solutions can be regenerated for re-use by means of recently developed ion-exchange resins resistant to the action of this acid.

The disposal of gas works effluents, dealt with by Mr. W. T. Lockett, is a problem of national concern, and investigators in the Midlands are particularly active in seeking a solution. The author traces the changing nature of the problem from the time when horizontal gas retorts were in use, ammonia was worth recovering from the liquor, and each gas works served a restricted area, to the present day when vertical retorts are most commonly used, ammonia can be recovered only at a loss, and small gas works are being superseded by centralized works serving large areas. Investigations fifty years ago showed that gas liquor could be treated biologically, the researches of the Institution of Gas Engineers during 1928-37 defined the conditions under which gas liquor could be satisfactorily treated when mixed with sewage, and revealed that certain changes in the operation of gas works could make treatment easier, and present-day researches are concerned with both chemical and high-rate biological methods of treatment.

Much discussion, reported in a separate booklet, centred around the mode of application of the 1937, 1948 and 1951 Acts and the cost to manufacturers and local authorities of treating industrial effluents. It was urged that by alteration of processes and by using conservation methods within factories, water and valuable materials could be saved and the cost and difficulty of treatment could be much reduced. Among examples quoted were that in one factory waste sulphonation acid was reconcentrated to give a crude but saleable product, and that in another small factory 10,000 gallons of water were saved a day by alteration of process and by introduction of a re-circulatory water system. A. E. J. PETTET

BASIC RESEARCH IN THE UNITED STATES

DETAILS of expenditure on basic research in the United States are given in various surveys published by the National Science Foundation, but the report "Basic Research—A National Resource", recently issued by the Foundation, is more in the lineage of Vannevar Bush's "Science—The Endless Frontier" and the Steelman report, "Science and Public Policy". It attempts to convey to the general citizen the meaning of basic scientific research and its bearing on the national economy, welfare and

security. The growth of basic research in the United States is briefly described in a chapter which illustrates some of the possibilities implicit to-day in virus research, in translation by electronic methods and in the study of other problems of social communication in leadership. After a brief reference to some unsolved problems, the following chapter outlines the present position of basic research in the United States, both in scale and in organization, while in the final chapter the strength-