

when they are offered free they are not used. Giving them away often increases suspicions. Anything which is free must be no good, is the feeling. Recent events in India suggest that some people would rather starve than change from eating one cereal to another. It may be encouraging that in experimental tests with "Paubina", the children seemed to like it and their mothers have accepted it.

## Controlling Pollution

MORE than £30 million is spent each year in Britain on the treatment of sewage and industrial waste water, according to the report of the Water Pollution Research Laboratory of the Ministry of Technology for 1966 (HMSO, 15s. 6d.). About half of the laboratory's resources are concerned with various methods of treatment of wastes, but other work includes a study of the effects of pollution on rivers and estuaries and the coastline. During 1966, the last of these was the largest single project; the object was to study the influence of environmental factors on the rate of dispersion of sewage discharged into the sea by coastal authorities. To do this, physical dispersion of liquid sewage has been followed using a radio-tracer, bromine-82. Bacteriological examinations of sea water samples have also been undertaken. In this way, it is hoped to provide an improved basis for choosing sites for discharge of sewage into the sea and for deciding on the degree of treatment required before discharge.

The control of aquatic weeds such as *Elodea canadensis*, *Myriophyllum spicatum* and *Zannichellia palustris* costs river authorities some £300,000 each year; the use of a proprietary herbicide is now being investigated for this purpose. An important and continuing line of work at the laboratory is the determination of the effect of pollution on fisheries—the toxicity of zinc to trout eggs, for example. Results of research have shown that sudden rises in temperature increase the sensitivity of trout to phenol and toxicity of phenol to rainbow trout also increases with salinity.

Studies designed to improve the performance of unit processes used in the treatment of domestic and industrial waste water have formed an important part of the laboratory programme. In addition to conventional methods, a new method of treating sewage has been developed which involves wet oxidation at high pressure. The contribution which protozoa make in the activated sludge treatment of sewage has also been followed; it seems that these organisms bring about a marked clarification of the effluent.

The treatment and disposal of sludge present more difficulties than almost any other waste treatment operation. In the 1965 laboratory report, it was pointed out that in some sewage the concentration of synthetic detergents had risen to a level which caused acute inhibition of sludge digestion: digestion can now be restored by the addition of a long-chain amine which causes precipitation of the detergent, and an experimental study of twenty-two new detergents has been carried out.

## Aid by Modelmaking

THE development of econometric models has offered economists a better chance of making the right decisions. By designing quantitative models which

behave like the economy of the country concerned, it should be possible to assess more precisely the effect of small changes—in tax structure, age distribution, birth rate, or the supply of trained manpower. The history of the past three years of British economic policy indicates the sort of errors it might then be possible to avoid.

The Organization for Economic Co-operation and Development has now attempted to apply the same sort of reasoning to development assistance (*Quantitative Models as an Aid to Development Assistance Policy*, OECD, 1967). The sorts of questions which need answering are concerned with the effects of decisions about aid on the development of the country concerned. Would the development plan be overturned by a 10 per cent reduction in aid? Should the transport sector be developed at the expense of primary production? How would changes of birth rate or migration influence economic progress? One difficulty, of course, is that econometric models are only as good as the data that go into them, and most underdeveloped countries are short of reliable statistics—often, the OECD expert group reports, the records include a quantity of miscellaneous information and statistics, without combining them into any coherent pattern. Despite this, the expert panel went on to assess how valuable the models might be.

It is clear from the start that the notion of a comprehensive model which could provide an answer to every question is unrealistic. The solution to this, according to Professor Chenery of Harvard University, and a member of the panel, is not to make the model more complicated, but to design instead a set of related sub-models to carry out the more detailed work. The group considered two models of the Pakistan economy, one prepared by Professor Tims at Harvard, and the other by Professor Chenery. The models take as one fixed point the desire by the Pakistan government to end foreign aid by 1982. Interestingly, the model reaches different conclusions from the planners in Pakistan; they assumed that aid would fall steadily as a proportion of GNP from 8 per cent in 1965 to 1 per cent (representing enough to cover external interest and dividend payments) in 1985. But the model shows an increase in aid in the early period, to a peak of 10 per cent in 1975, and then a fall to zero by 1982. This is because in the early period heavy investment is needed to produce rapid growth in the economy: demand for capital therefore exceeds what can be supplied from home resources, although 24 per cent of the growth in GNP would be saved. Demand for foreign capital therefore increases in the short run. After 1976, the emphasis would shift to the task of import substitution, or increasing exports, either of which would have the effect of improving the balance of payments. Total investment falls, and can thereafter be financed from Pakistan's own resources. After 1983, the model predicts self-sustaining growth, with sufficient investment to prevent imports from out-running exports.

## Industrial Biology

THE Institute of Biology last week held a conference on "Improving the contacts between industry and university". More than a hundred people settled into the comfortable orange seats of the Royal Society's

large lecture hall to hear ten speakers and some lively discussion, which frequently echoed the kind of discussion familiar in physical science since the publication of the Swann Report. Professor M. M. Swann himself introduced the morning session with the thought that for a long time biology had been "small, cheap and neglected", but that industrial biology is now growing rapidly. But it is not clear whether or not there is a shortage of biologists in industry, and no official analysis of the situation has yet been made. From remarks made by industrialists and academics, however, there appears to be room for more communication and co-operation. Some university departments, for example, had found that industrial budgets are so tied up that negotiations at board level are required to obtain small sums of money for a research project which in the long run could save thousands of pounds for the company. Some industrialists, on the other hand, when allotted money to pay for research in outside bodies such as universities, could find nobody who would take on particular projects. If graduates are reluctant to enter industry, some academics think it is because industry is not attractive enough, while some industrialists believe the universities are giving their students the wrong ideas.

Sandwich courses are one answer to this problem. Professor L. Broadbent of Bath University of Technology favours the thin sandwich, when the students spend alternate periods of six months in university and different industries, thereby gaining a wide variety of experience before coming to decide on a future career. Employers favour thick sandwiches, as they can give the student a worthwhile project during the year, but this long time away from university can easily disrupt academic studies.

Mr F. R. Reavell from Unilever described the difficulties of recruiting suitable biologists for industry. In 1966 there were 1,500 biologists in industry, most of them specialists. Mr Reavell saw the problem in terms of training "the right number of the right specialists for the few jobs". He wondered if the Institute of Biology could run a comprehensive appointments service.

Speaking of industrial biologists as honorary lecturers, Dr D. J. D. Hockenfull of Glaxo Ltd. said the difficulty came in "knowing what the students know", but lectures by industrial biologists can be of great value in communicating enthusiasm for the subject. Professor E. B. Chain of Imperial College discussed the question of academic biologists as consultants to industry. "In general," he said, "the situation is fairly satisfactory, and is improving." He believes the idea that fundamental and applied research are different is "a red herring". In his view there are only two types of research—"useful and useless". He suggested that a biological committee should be set up, possibly within the Science Research Council, to discuss and select long term research projects of industrial interest. Academics could then be approached and government money could be used to put the ideas into action. Dr A. Spicer of the Rank Research Centre described how he uses consultants in his research projects. Biologists are involved in the "marketing and economic implications" of a scheme and are therefore part of the team, instead of merely being outside observers.

Some of the difficulties faced by staff in moving between industry and university were mentioned by

Professor P. W. Brian. The two groups are too often "mutually suspicious", and cherish illusions as to the way of life of the other. Dr W. F. Jepson brought in the practical factors involved when such a move is made. Security of tenure in university posts was weighed up against higher pay in industry. There would be more movement between industry and universities if pensions were transferable.

## Parliament in Britain

### Libraries

LORD WINTERBOTTOM, Parliamentary Secretary, Ministry of Public Building and Works, acknowledged that the National Reference Library for Science and Invention formed part of the British Museum Library, and that its future arrangements would therefore be examined by the small independent committee which the government was setting up to investigate the national libraries. Alternative sites in the Central London area were being discussed, to see if they could provide whatever is needed after the committee reports. On November 30, in the House of Commons, the Secretary of State for Education and Science, Mr P. Gordon Walker, said he hoped to announce the composition of the committee soon. He hoped the committee would recommend that the library should be sited in Central London, but added that the government's decision on the Bloomsbury site was final. He would resist any attempt to move the National Lending Library for Science and Technology to London or to the Home Counties. (Oral answer, House of Lords, November 28.)

### Skylark

MRS S. WILLIAMS, Minister of State at the Department of Education and Science, said that the Science Research Council's Skylark sounding rockets which were launched at Woomera as part of the jointly financed Anglo-Australian programme cost the United Kingdom £175,000 in 1966-67. The cost in this country of the rockets, including research and development, was £531,000 in 1966-67. (Oral answer, November 30.)

### Food Additives

MR S. HAY, Joint Parliamentary Secretary at the Ministry of Agriculture, Fisheries and Food, gave details of the Food Additives and Contaminants Committee (chairman, Professor R. A. Morton) and the Pharmacology Sub-Committee (chairman, Professor A. Kekwick). Mr Hay said that the Minister of Agriculture and the Minister of Health asked the Food Additives and Contaminants Committee for advice when additives were used or proposed for use in food. This committee, in conjunction with the Pharmacology Sub-Committee, then took into account all the data available in this country and internationally. (Written answer, November 29.)

### Wash Barrage

MR A. GREENWOOD, Minister of Housing and Local Government, said that he was considering very carefully the suggestion of the Water Resources Board for a desk study to assess the scope for water conservation in the Wash and to appraise the case for a full feasibility study. Mr Greenwood asserted that the Wash Barrage proposition would cost about £90 million more than conventional methods, but added that the question would not be considered in isolation. (Oral answer, November 28.)