

grants. In other words, a department with a student population of 43 spent £87,000, just over £2,000 per head.

In the same year the physical sciences departments had 700 undergraduates costing about £550 per head, less than the national average. There could be no better ammunition for those, including the UGC, who are arguing that there should be fewer and larger biological sciences departments. It seems that small departments are not only poorly placed to do significant research but also uneconomic teaching establishments.

EMBO

Almost Home and Solvent

WITH luck, on February 13 the European Molecular Biology Organization will be one step nearer a permanent solution to its financial problems. At Geneva on that day the ambassadors of twelve and possibly thirteen western European countries (the only country of any consequence which is not on the list is Belgium) are to sign an inter-governmental treaty establishing the Conference of European Molecular Biology. This ceremony was originally billed for last October or November at Berne, but shilly-shallying over the official working languages for the conference and the second and third thoughts of some countries about joining have caused the delay. Once the conference treaty has been signed, it will go to the thirteen governments for ratification. Then the conference will at last get down to business as arbiter of EMBO's requests for funds, which in future are to come from the collective public purse.

Optimists, including the British Department of Education and Science, believe that ratification will take only two or three months and steps are apparently already being taken to arrange the first conference meeting. The first item on its agenda will be the EMBO request for \$630,000, the sum needed to meet the cost of EMBO's current fellowship, travel and summer school programmes. The conference will also scrutinize EMBO's administrative arrangements and its budget proposals for the next two years.

At present EMBO is living off what little it saved from the three-year grant from the Volkswagen Foundation, which expired at the end of December, together with some interim payments made by several of the signatory governments—including Britain, France, Germany, Italy, Sweden, Switzerland and Holland—as an emergency measure to tide EMBO over until some formal arrangements are made. But, as the DES is quick to point out, these interim payments in no way imply that the governments which are making them have accepted the EMBO budget. That will have to be decided by the full conference. It seems likely that once a decision is reached, the countries will contribute in proportion to their gross national products. West Germany, therefore, will foot the largest share of the bill.

Proposals for an international EMBO laboratory along the lines of the CERN laboratory in Geneva have been in the air ever since the organization was founded. Indeed, they have been discussed at inter-governmental meetings in preparation for the establishment of the conference, but ratification of the treaty will provide for the first time the machinery for formal

discussions. Once the immediate problem of a budget for 1969 has been settled, the conference probably will begin discussions on the laboratory. With surprising foresight, the British have already started an inquiry into the idea. Since Christmas a working party of the Council for Science Policy has begun to examine the general question of international laboratories with special reference to the proposed EMBO laboratory.

UNIVERSITY PAY

No Love for Mr Jones

No recent official report has produced a louder or more prolonged clamour of academic wrath than Mr Aubrey Jones's remarks about merit payments. The Prices and Incomes Board, rash enough to suggest that the consumers' opinion might be sought before merit payments for teaching were awarded, has suffered a severe reverse. But if the University of Edinburgh is a typical institution, it is not the merit awards themselves that are repugnant, but simply the idea that students might be asked where they thought the awards should go. Professor Michael Swann, addressing the General Council of the University on January 30, reported the results of a straw vote held at a General Assembly of staff, when about 400 of the university's teachers were present. Only about twenty-five of them, he said, were against merit awards altogether; but only another twenty-five were willing to countenance merit awards for teaching alone. The vast majority, about 350, were willing to accept the notion of merit awards if they were given for research and teaching together. "I myself believe that this is abundantly the right answer", Professor Swann said, "and I hope the Government will heed it".

Professor Swann said that the most immediate threat to the universities was the PIB's attempt to shift the balance away from research. There was, he admitted, a real problem to be faced as the cost of research increased, and he suggested that the universities would have to accept some concentration of the research effort in "centres of excellence". It must mean, he said, that few universities could hope to achieve the highest excellence on a wide front. But this evidently does not inhibit them from trying. Professor Swann went on to say that "I am determined that we aim at nothing less than the very highest international excellence in scholarship and research, in every faculty. We have gone a long way, but we are not yet there". Restraint, it seems, does not begin at home.

ERGONOMICS

Collect More Data

THE ergonomics information service, covering the literature on human factors in engineering, which has been dormant for a year, is to be resurrected by ergonomists and information scientists at Birmingham University with the help of an £11,000 grant over three years from the Office of Scientific and Technical Information. The service was originally run by the Warren Spring Laboratory, but when this was taken over by the Ministry of Technology it was decided that the small research team was not a viable unit and that its work should be discontinued.

The group at Birmingham will survey about 90 British and 300 European journals so that, in collaboration with a similar group at Tufts University in the United States who will cover American and Oriental journals, it will provide a world wide coverage of ergonomics literature. The service will initially comprise a quarterly abstracts journal, the first issue of which should be published in March of this year. The centre at Birmingham will also produce specialized bibliographies on request and will deal with enquiries either by finding the relevant data or by directing enquiries to an appropriate research or academic department.

Mr J. G. Fox, director of the Information Centre, said that so far 140 different English firms have expressed an interest in buying the abstracts journal. His group is dealing with about five or six enquiries a week—mainly on how to improve human efficiency in industrial inspection or machine control.

Providing an information service in ergonomics is particularly interesting because of the interdisciplinary nature of the subject, including as it does a wide range of subjects from physiology to engineering. The chief research interest of the group is finding how best to present the information it collects. It may, for example, be more useful for engineers to have sets of data sheets rather than large collections of abstracts. Such investigations are also interesting because they bring to light discrepancies between the research work done in universities and the needs of industry. On the basis of the enquiries it receives from individual firms, the group hopes to be able to define the areas where research will be particularly useful. The possibilities of computer based retrieval systems are also being investigated.

MANAGEMENT

Recipe for Successful Research

"MUCH is said about the management of research and development", declared Dr Stewart P. Blake, "but little is known". Dr Blake, the vice-president for finance and business administration at Stanford Research Institute, was talking at the United States Embassy on January 29. His title—"Some Hypotheses on the Management of Research and Development"—was an indication of the diffidence with which he approached the subject. But this did not prevent him from sniping at those who think they know how to manage research and development. The Ministry of Technology, according to Dr Blake, is trying to do the impossible in assessing projects for their economic benefit before supporting them. "It's impossible to measure the economic effect of research and development projects", he said.

This was about the most definite statement that Dr Blake would allow himself. His other six hypotheses sounded like tentative statements of the obvious, although he assured his audience that they were not. "A well planned and well managed research programme produces better results than an unplanned and mis-managed one" and "If the quality of the research and development effort is good, there is a high probability that the quality of the end-product will be good" were two of the more tautologous of Dr Blake's hypotheses. Others were concerned with the difficulties of evaluating

research and development projects, and here Dr Blake made a useful distinction between efficiency and effectiveness. "It's possible to be effective without being efficient", Dr Blake observed; and if effectiveness is simply a measure of whether or not the aims of a research project are achieved, then this is obviously true. Equally, it is possible to be efficient but ineffective. By rating US companies on the efficiency with which they carry out research and development projects, it had proved possible, Dr Blake said, to reduce the overspending on US government contracts from something like 230 per cent to nearer 25 per cent.

OCEANOLOGY

Data from the Deep

Two hundred years ago, Captain Cook would no doubt have been grateful for the electromagnetic log to record the distance he had travelled each day, and sound an alarm when he had gone as far as he wished. He might have been less sure what to do with a precision-timed bottom pinger for positioning cameras and other oceanographic accoutrements at a required depth. The Marine Systems Division of Plessey, which makes these and other instruments for oceanographers, is mounting the largest single exhibit at Oceanology '69, the exhibition and symposium at Brighton from February 16 to 21.

Plessey's theme—"The Mass Acquisition of Data from the Marine Environment"—reflects the early stage of development of the science of oceanology. The principal need at the moment is to gather information about the oceans; later it should be possible to use this information to make use of the oceans and their resources, and to undo some of the harm already done by pollution.



Preparing to fire a probe from the launcher unit of the expendable bathythermograph system.

A valuable consequence of the automation of oceanographic recording is that the results of expeditions—no longer handwritten and laborious to process—should be published much more quickly. The expendable bathythermograph, shown in the photograph, has recently been introduced and sold to twelve countries for measuring the temperature of the sea at different