

scopes which—if OAO-2 survives six months—will chart about 50,000 stars. A life of two years would allow the whole sky to be covered. The key to the apparatus is a special 'Uvicon' television tube, sensitive to ultraviolet radiation, which can store the information received over a period of days; it uses a process called secondary electron conduction. The aim of the whole charting operation is to obtain a map of the sky in terms of broad band criteria; that is, to find the location and rough spectrum of the stars concerned. By contrast, the Wisconsin experiment will perform relatively few narrow band observations. Both sets of apparatus will be particularly useful for observing "hot" stars, which have temperatures up to about 50,000 degrees, and which emit most of their radiation in the ultraviolet region.

The next two OAOs are to be launched in 1969 and 1970 respectively, and will contain very high resolution equipment that will require much finer alignment than that aimed at in OAO-2. As a comparison, the Wisconsin telescopes have a resolution of 10 Å, and the second and third observatories are planned to have 2 Å and 1/10 Å respectively.

EDUCATION

Participating Students

WITH the autumn term over, academic staffs around Britain must be feeling that they have got off lightly. The student rebellion that flashed around continental Europe this spring was widely expected to infect the length and breadth of Britain before autumn was out. But nothing very much happened. Skirmishes at Birmingham and Bristol, both on issues that put wide public support behind the students, look like reaching a quick resolution.

Nobody knows how long the calm will continue, but recent moves by both students and staff to reach a fuller *modus vivendi* may serve to pre-empt future hostilities. Two agreements on student participation in student life appeared this term. One, dealing with university students and drafted by the Committee of Vice-Chancellors with the National Union of Students (NUS), appeared two months ago (*Nature*, 220, 105; 1968). The second appeared last week: drafted by leaders of the local education authorities of England and Wales, again with the NUS, it sets guidelines for student participation by the 170,000 students at colleges of art, education, commerce and technology.

The NUS seemed to be well pleased with the agreement last week. Where student welfare is concerned, it is certainly more definitive than the vice-chancellors' agreement. The local authorities said they were prepared to vest executive power in committees made up equally of staff and student representatives. Procedural matters such as the provision of a casting vote will apparently be decided by local negotiation. The NUS thinks that these committees will have a full set of teeth when it comes to dealing with academic paternalism: now that the legal age of majority is to be 18, the excessive readiness of many college staffs to stand *in loco parentis* over their adult charges is perhaps becoming anachronistic.

On matters of discipline, the agreement recommends that power should be exercised by committees on which staff, governors and students are equally represented,

and that there should be a right of appeal to the governing body. In the long term, perhaps the most important issue is curricula and the role of students in establishing them. Feedback from the students is solicited, but the agreement has little to say beyond this. Obviously the last words have not been spoken here, and it is of interest that a group of radical student organizations intends to discuss scientific curricula and course methods at a conference in Manchester in the new year. Scientific curricula have been chosen because scientists and technologists are likely to be greater victims of industrial alienation than their artistic colleagues, yet at the same time science faculties make a smaller contribution to the ranks of student activism than any other.

INDUSTRY

Home Grown Enzymes

SHINY rainbow-coloured catalogues from the American biochemical supply houses are to be seen in every British biological laboratory: nowadays they offer more than a hundred purified enzymes for sale. No British firm approaches this scope; the few British firms that there are act merely as agents and import all their enzymes, mainly from Japan, Germany and Holland. The absence of enzyme manufacturing capacity in Britain is bad both for the balance of payments and for the customer, who often finds that technical information about the enzymes he uses is not available in Britain.

W. and R. Balston Ltd, the firm of papermakers and manufacturers of Whatman filters, hopes to put this right. Jointly with the National Research Development Corporation, it has set up a new company, called Whatman Biochemicals Ltd, in an effort to enter the enzyme market. A completely new factory is to be built at Maidstone at a cost of £500,000, designed for the chromatographic separation of enzymes on a kilogram scale. Whatman Biochemicals hopes that the new plant will come into operation in 1970. Dr Colin Knight, the managing director of the new firm, said last week that he expects microbial fermentation processes will be the mainstay of production at first, but later the firm might make mammalian enzymes as well.

It is at first surprising the NRDC should choose to ally itself with Balston Ltd, a firm whose main trade is papermaking, rather than with, say, one of the drug houses. Presumably it was Balston's long experience in chromatography that made it a desirable partner—the company has been associated with the technique since the first experiments of Martin and Synge with filter paper in 1944. The new company will be closely associated with the biochemical engineering group of University College, London, which is well versed in the problems of scaling up biochemical separations to the industrial level.

Enzymes are scarcely products for the mass market, but the new company is confident that demand for them is going to grow rapidly. Dozens of enzymes are now used in clinical medicine, and dozens more are regular playthings in the laboratory. The quantities involved in Britain are not large, but the company predicts that sizable applications in industry will appear before long. Further in the future, enzymes

may turn out to be the ideal therapy for inborn errors of metabolism caused by specific enzyme deficiencies, of which 120 are now known. But even if the problems of immune response are overcome, there remains the problem of getting intracellular enzymes into the right cells. Whatman Biochemicals obviously thinks that these problems can be solved, and the company seems to have some ideas how, but it declined to elaborate on them last week.

AIRBUS

One Step Forward, Two Steps Back

THE European Airbus struggles on from one crisis to the next. After last week's exercises in London, the airbus emerged as a new design, with different engines, fewer passengers and a distinctly slimmer chance of getting Government support. It has also changed its designation from A300 to A300B, although it might have led to less confusion if it had been A250. The principal effect of the design changes has been to reduce the capacity of the aircraft from 300 to 250 seats. This has been done to reduce costs, which had run far ahead of the initial estimates. Now, thanks to the reduction of capacity and some tricky work with the engines, the best estimate for the cost of the aeroplane is £170 million.

This represents a reduction in costs of something more than £100 million, and has clearly not been made possible just by the removal of 50 seats. The real economy is the decision not to develop the Rolls-Royce RB207 engine, two of which were intended to power each airbus. The engine was a completely new design, and would have cost £70 million to develop. Instead, the new design makes use of the RB211 engines, already designed and built for the Lockheed airbus. By the time the airbus is ready for the air, the RB211 should have been stretched enough to power it, and thanks to Lockheed it will be much cheaper than the airbus firms have any right to expect. On the face of it, this looks like a sensible way out of a difficult dilemma; the apathy of the airlines had begun to make it clear that the original airbus was a non-starter.

In effect, however, the decision creates a whole new set of dilemmas. For one thing, the three Governments—Britain, France and West Germany—are now no longer bound to lend support to the project, and one or more may welcome the chance of opting out. As Mr Wedgwood Benn made clear in the House of Commons, the British Government has no interest in the project unless the airbus company can stir up a good deal more enthusiasm than it managed for the old design. Most of Britain's contribution to the cost was to have been in the form of launching aid for the RB207; now that this has fallen through, the other countries are certain to want to re-negotiate the contract. Lockheed may not feel very happy that it is helping to finance the engines for a possible rival. And the agreements made between Rolls-Royce and various European companies for sharing the work on the engine will now have to be abandoned.

All this has created, as Mr Benn put it, "a new situation". If the airbus company can produce evidence of real enthusiasm for the new design, the next step would be for the three governments to

negotiate a new memorandum of understanding. Orders approaching 75 would seem to be the absolute minimum for justifying the project. The market in Europe is unlikely to be this big, so the company will have to try to sell the airbus elsewhere—which probably means in the United States. If there is a market for it there, it is more than likely that Boeing will be only too happy to fill it—and the advantage is on its side, because the airbus will in many cases be expected to replace the Boeing 727. The best chance might be to approach airlines which have already bought the Lockheed airbus, because a smaller airbus, using the same engines, might well offer an advantage on some routes.

Even in Europe, the A300B has a far from clear run. The British Aircraft Corporation has been hawking around a design called the BAC 3-11, which is broadly the same kind of aircraft as the A300B. The British Government, at least, will surely be keeping an open mind until it has had the opportunity of assessing airline reaction to the two designs.

AGRICULTURE

Research on the Farm

ENCOURAGING closer associations between the Agricultural Research Council's institutes and the universities is to be one of the central guidelines in the future development of the policy of the ARC, according to the council's report for 1967-68, published on December 12 (HMSO, 10s 6d). It is not so much the policy itself but the extent of its application which is new. Several of the ARC institutes have long-standing formal association with universities, and two or three—the Long Ashton Research Station at Bristol and the Welsh Plant Breeding Station at Aberystwyth, for example—are actually administered as an integral part of the local university.

But the increasing sophistication of agricultural science and of the equipment needed to pursue it—to say nothing of the mutual benefit of the individual scientists concerned—dictates still closer collaboration with the universities. (In the past ten years the rate of growth of the ARC's expenditure on equipment has been double the growth of the council's total spending on the rest of its research service.) Well over half of the 32 institutes with which the ARC is involved have or soon will have a formal association with a university; the remainder, geography permitting, are likely to follow suit in the next few years. And any new ARC institutes will no doubt follow the pattern set by the latest two, the Meat Research Institute at Langford and the Food Research Institute at Norwich which have been built alongside Bristol University and the University of East Anglia. During the financial year 1967-68, the council's budget was £12.468 million, compared with £10.437 million in the previous year. Nearly £5 million was spent on the ARC's ten institutes and fourteen research units, and roughly 40 per cent went on capital expenditure, especially at the new meat and food institutes. Another £6.25 million was spent on the established agricultural research centres such as Rothamsted and Long Ashton, which are only partly supported by the ARC.

The report has much to say about recent developments at several of the institutes which were visited