

most important factor in Britain's economic development—the rate of investment in new plant and equipment. For too long investment in Britain has been insufficient. Economic growth at the upper end of the scale—4 per cent a year or more—will be possible only if there is a substantial increase in investment, as the document admits. But it produces no recipe for encouraging investment by private industry, beyond what is already provided by the regional economic policy.

UNIVERSITIES

Expansion Slowed Down

BRITISH universities can expect an average annual growth rate in the next few years of only three per cent—just under a quarter of that enjoyed over the past five years. The University Grants Committee reveals this in its *Annual Survey for 1967–68* (HMSO, 2s 3d), the first year of the new quinquennium. In 1967–68 there were 200,121 full-time students, which was more than the emergency expansion target of 197,000 set by the Robbins Committee in November 1963. This means that in the past five years the universities have expanded at an average rate of 13 per cent a year, but between now and 1972 the Government has agreed to an increase of only 20,000–25,000; the crash expansion programme is over.

The survey gives details of the supplementary allocations of funds made to twelve universities from reserves set aside during the initial distribution of the quinquennial grant, and of the £286,400 spent on “pump-priming” projects involving collaboration between universities and industry. Up to October 1968 the UGC's Sub-Committee on University/Industry Collaboration had received twenty-six applications and approved seventeen of them, ranging from the appointment of an industrial liaison officer at Oxford and Surrey to the initiation of a new type of interdisciplinary PhD course at Aston.

The effect of inflation on university recurrent grants, which are decided five years in advance, is particularly serious at times of economic squeeze. As a result the committee has decided to adopt a procedure for considering each year the extent of inflation so that it can if necessary ask the Government for further funds. After consultation with the Department of Education and Science, the committee has agreed to review the situation each September, relying heavily on the Index of University Costs (now maintained by Professor J. A. C. Brown of the University of Bristol) so as to be able to make submissions to the Government at the beginning of the academic year in October.

The distribution of departmental expenditure derived from the returns for 1966–67 is shown in the table. Since the 1966–67 academic year the UGC has also asked the universities to show the apportionment of academic staff time between undergraduate and postgraduate teaching, research and administration. But because of the misgivings of the Committee of Vice-Chancellors and Principals about the reliability of the returns, the UGC has agreed in principle to drop this line of enquiry. Instead it will accept the vice-chancellors' suggestion of a much more thorough enquiry addressed periodically to a sample of Britain's academics. During the year the UGC and the vice-

PERCENTAGE DISTRIBUTION OF DEPARTMENTAL EXPENDITURE

| | 1966–67 | | | |
|-------------------------------------|-----------------|-----------------|------------|---------|
| | U.g. teaching % | P.g. teaching % | Research % | Other % |
| Arts | 50.9 | 10.5 | 27.5 | 11.1 |
| Social studies | 44.7 | 15.9 | 27.1 | 12.3 |
| Education | 9.7 | 55.3 | 21.7 | 13.3 |
| Physical sciences | 33.2 | 20.8 | 35.2 | 7.8 |
| Biological sciences | 38.8 | 17.5 | 35.3 | 8.4 |
| Engineering | 43.9 | 19.7 | 28.1 | 8.3 |
| Pre-clinical medicine and dentistry | 39.7 | 13.9 | 38.7 | 7.7 |
| Clinical medicine | 21.2 | 19.6 | 33.8 | 19.4 |
| Clinical dentistry | 51.7 | 9.1 | 26.0 | 13.2 |

chancellors also reached agreement about setting up a central record of all university students and staff. By 1973 it is hoped that the University Central Council on Admissions will have a computerized record of all students and most staff. A policy group consisting of representatives of the UGC, the DES and the vice-chancellors will consider requests for access to the record.

The painful results of the Government's cutback in capital expenditure are saved to the end of the report, which is Sir John Wolfenden's swansong as chairman of the UGC. In January 1968 the Government announced a reduction of £3.25 million spread over the academic years beginning in 1968 and 1969. To effect these savings the UGC deferred by a year £5.5 million of building work. Then in July 1968 the UGC was asked to prune capital expenditure yet again. As a result of its letter of August 1 to the vice-chancellors, £10 million of work was deferred for a year, and as a consequence the projects scheduled to begin in 1969–70 had to be completely revised to keep below the limit of £29 million set by the Government; in the three academic years from 1967–69, capital spending will amount to £79.6 million instead of the £95.1 million originally expected.

RESEARCH COUNCILS

Growth Rates Confused

THE Vote on Account, an annual exercise in confusion organized by the British Treasury apparently for its own amusement, has once again contrived to give the wrong impression. The figures published last week for research council budgets in *Nature* (221, 790; 1969) are not directly comparable; the 1968–69 figures are

| | 1968–69 (£ million) | 1969–70 (£ million) | Increase in real terms (per cent) |
|--------------------------------------|---------------------|---------------------|-----------------------------------|
| Science Research Council | 42.127 | 45.844 | 3.8 |
| Medical Research Council | 15.311 | 17.141 | 6.6 |
| Agricultural Research Council | 13.483 | 14.663 | 0.8 |
| Natural Environment Research Council | 9.193 | 11.725 | 20.4 |

given in 1968-69 prices, and the 1969-70 figures in 1969-70 prices. The percentage increases calculated do not then give a true impression of the growth of the research council expenditures. Unfortunately, there is no simple rule of thumb which can be used to convert increases in money terms into increases in real terms, but the Department of Education and Science has provided the list of growth rates for the research councils, shown in the table, together with the expenditure figures taken from the Vote on Account.

These figures, although they show that the research councils will be doing substantially better in financial terms, also indicate that increases in costs have eaten away much of the advantage. The ARC, in particular, must be feeling very sorry for itself.

SHIPBUILDING

Turbine Trouble Diagnosed

SIR ARNOLD LINDLEY, called in by the Minister of Technology to investigate defective turbines in the Queen Elizabeth 2, has turned up nothing unexpected. His report, delivered last week, confirms that the turbine blades failed in fatigue, caused by resonant vibration in the tangential mode. The blades in rows 8, 9, 10 and 11 were set vibrating at their resonant frequency by the steam issuing from the preceding steam nozzles, and the condition was made more serious by the nature of the blade mountings. A secondary cause of vibration may have been torsional vibration of the rotor, caused by lack of truth in the main coupling from the rotor to the reduction gears, but Sir Arnold is convinced that steam excitation was the principal cause. To remedy the deficiencies, Sir Arnold says that the blades in rows 7 to 12 should be changed to "rhubarb" section, which gives better strength at the junction between blade and root, and that the first 1.1 inches of each of these blades should be thickened, again to increase root strength. Midway along each blade, lacing or binding wires should be provided to damp out the principal mode of vibration. Finally, in the rows of blades from 2 to 6, the method of mounting should be modified to remove stress concentrators; this can be done by removing fillets at the junction of the blade with the root.

Happily, Sir Arnold's report has been accepted by all involved, including Cunard, who had previously made angry noises about appointing their own independent expert. "We are very greatly encouraged by this report", said Sir Basil Smallpiece, chairman of Cunard, adding that, of course, there would still be a need for full sea trials and subsequent stripping of the turbines to make sure all was well. Sir Basil revealed, with some reluctance, that the delay had cost Cunard "£2.5 million in gross revenue", but John Brown Engineering would not be drawn on the cost of the repairs. Sir Arnold's schedule provides for the turbines to be reassembled and in the ship by March 21, and for a proving voyage early in April. If all goes well, the ship should be handed over by the second half of April. To judge by the alacrity with which the port turbine has been returned to Southampton, Sir Arnold's report does no more than put the seal of approval on steps already taken by John Brown Engineering.

Mr Anthony Wedgwood-Benn, clearly relishing the

role of peacemaker, hinted that his department would be taking up Sir Arnold Lindley's recommendation that "more work should be done in turbine development and instrumentation", although all agreed that in matters like these it was impossible to be right every time. To have tested the turbines fully before they were installed, Sir Arnold said, would call for boilers "as big as Battersea Power Station", at a cost nobody was willing to bear.

In effect, Sir Arnold's report clears all those who are still around to care. Blame is attributed only to Pametrada, the now defunct organization which designed the turbines in the first place. The failure of the blades, said Sir Arnold, "is no reflexion whatever on the quality of workmanship or of material used in any part of the construction of the HP turbines". It is, perhaps, a reflexion on John Brown Engineering's enthusiasm for monitoring the design work contracted out to Pametrada. Even if it was impossible to anticipate exactly the resonant frequency of the blades, it would surely have been possible to avoid stress raisers in the junction between blade and root. In this sense, the whole episode is a lesson in the dangers of divorcing design from construction. Mr Benn, who is an advocate of contract research, particularly if it helps to employ Government establishments, should not have missed the point. But he almost certainly has.

ENGINEERING

Ronan Point Discussed

THERE were more than mere murmurings of discontent at a meeting organized by the Institution of Structural Engineers at City University last week. The engineers were discussing the report of the investigation into Ronan Point, the twenty-two storey block of flats in Canning Town, London, a section of which collapsed dramatically last May. The meeting, attended by Mr Hugh Griffiths, the chairman of the tribunal which conducted the investigation, and Sir Alfred Pugsley, a fellow member of the tribunal and a past-president of the institution, was called to discuss the long term implications of the report, rather than the precise circumstances of the collapse at Ronan Point which is the subject of legal proceedings. The principal complaint was that the actions taken after the tribunal had reported were motivated by "panic" and "hysteria". Some blocks, one speaker complained, were standing empty awaiting rules from the Ministry of Housing which might never be made, and some local authorities were finding it difficult to accept blocks as "satisfactory" because the word had not been defined. When the new rules were published, all the people who had just set up home in the flats might have to move out for alterations to be made.

While it was generally agreed that codes of practice were useful guidelines for the designer and that they needed to be brought up to date, it was argued that they were not substitutes for professional experience and skill. Some of the engineers who spoke feared "codes of mandatory practice" which would restrict initiative. It was made only too obvious how little is known about structures and the forces acting on them. Mr Gordon Rose, a member of the institution, suggested that there should be a two-tier system with