commercial activity and financed by a budget which would ensure the total autonomy and freedom of scientific research. Research, he said, should not be "cramped" by government plans. Industrial research should be carried out in the research institutes of the ministries concerned (a network of such institutes does exist), or contracted out to academic institutes; but the overall direction of research by the government should cease.

In effect, Solidarność is seeking a major change in Poland's science policy. Since the early 1970s, research has been organized and funded on the basis of a complex hierarchy of "problems" (governmental, key, interdepartmental, departmental and branch problems) geared to the needs of the national economy. Research on a given problem will generally be carried out at many institutes simultaneously, and problems of coordination and control, including the interface between the academic and governmental sides, have led to a proliferation of bureaucracy. The establishment view, however, as represented by Dr Ignacy Malecki, director of the Institute of Fundamental Problems of Technology of the Polish Academy of Sciences, is that the problem structure is not in itself a bad thing. Dr Malecki, a member of a special commission looking into the management of the "problem" system, said that the consensus was that the system should stay, although trimmed of its bureaucracy. He added that in his opinion there was room for improvement in financing. **Vera Rich**

Science council

Mess about money

The UK Science Research Council is in a financial mess. But nobody can say how serious the trouble is, because figures and tables released in the 1979-80 annual report last week are wrong. The SRC now confirms the misuse of a computer program, as a result of which some research grants which have ceased have been displayed as current. A claim in the report that grant payments had increased by 72 per cent since the previous year took SRC officials four working days to disown once the inconsistencies had been pointed out to them.

Behind this is a more serious problem — what chairman Sir Geoffrey Allen last week called a "hiccup" in the council's cash flow. He and his officials are being coy about the size of this financial spasm. Some say that the council must find at least £10 million from within its current budget to pay for excesses last year in grant-giving by the Science Board, responsible for small science and neutron and synchrotron radiation physics, thus shedding doubt on claims earlier this year that the Science Board was turning away "alpha quality" grant applications for lack of cash.

The anomaly dates back to a success:

Hardship everywhere

The Science Research Council's report for 1979-80 (HMSO, £7.10) is liberally spattered with references to the consequences of financial stringency, within a budget totalling £176 million. The budget last decreased 1 per cent in real terms in 1980-81, and will show a modest increase after that — but, says the report, new initiatives will be impossible without producing stagnation in favoured areas of the council's programme, or markedly reducing other programmes.

Nuclear physics is the most vulnerable of the big spenders — although contributions to CERN fell from £27.7 million in 1978-79 to £25.3 million in 1979-80 largely because of the stronger pound. The nuclear physics budget is not one of the "favoured areas" of the SRC's programme, and it has fallen a factor of two in real terms since 1975-76. It will fall again by 18 per cent this year, and another 9 per cent the year after, says the report, to £2 million below a "minimum programme"; but despite this the board sees LEP, the large electron positron ring that CERN plan, as its accelerator for the late 1980s, as its highest priority. It is "seeking council support" on this project. Meanwhile, equipment for the 30 MV Van de Graaff Nuclear Structure Facility under construction at Daresbury is to be further delayed.

X-rays and neutrons provided by the synchrotron radiation source at Daresbury, opened last week, and the Spallation Neutron Source under construction at the Rutherford Laboratory are threatened by lack of money to exploit them; and existing neutron sources will be run down. The high proportion of the Science Board's funds devoted to neutron scattering will fall after 1981-82, when the modernization programme at the Institut Laue-Langevin high flux reactor at Grenoble, in which the UK is a partner, is completed.

Computers. The SRC needs to find £8 million capital "over the next few years" to replace its central computers, and more if allowance is to be made for an increasing demand.

Research students supported by the SRC will continue to be a falling proportion of good graduates in science or engineering. In 1972, 46 per cent of such graduates, applying for SRC grants, were awarded them. In 1979-80 the proportion was 36 per cent, and now the number of grants must be held constant against an increase — for the next few years — of about 4 per cent a year in university output. But there should be a few more cooperative awards in science and education (CASE awards), designed to link students with industry as well as university. Even so, this council hopes to fund more in-service training.

Robert Walgate

that of Mrs Shirley Williams, Secretary of State for Education and Science in the last government, in convincing her Cabinet colleagues that Britain should spend more on science. Uniquely, she brought in research council heads to convince other ministers that basic science was important — and in late 1978 won another £47 million for the councils, of which SRC would have received £33 million, payable from 1979-80 to 1982-83. Then came the new government; spending cuts, announced in the budget of June 1979, lopped off most of Mrs Williams's gift.

But well before the election she had privately warned the council chairmen to beware of Tory zeal. In case the government changed, she hinted, it would be wise to spend the money soon. In April 1979, SRC sent out a circular requesting applications for grants to buy equipment. £37 million of applications flooded in; SRC panels thought £20 million of them were deserving, and committed themselves to £7.5 million. In the event, the council received only £5 million of the Williams money.

The flood of applications, however, continued, and not just for equipment. The universities had seen the tap turned on after years of drought. It was against this background that "alpha quality" applications had to be turned down. Even so, the boards over-committed themselves and now all are being asked to cut back by delaying grant renewals.

Other factors worsen the SRC's current financial picture. Universities are putting in their bills earlier than usual, because they too have cash flow problems; and the largest price of SRC construction work — the spallation neutron source at the Rutherford laboratory — is going ahead on time (the council had allowed for slippage).

The only light comes from the strong pound, which reduced the council's subscriptions — totalling £42 million a year — to international bodies such as the European centre for subnuclear physics (CERN) and the European Space Agency by about £7 million; and from the volcanic rock underneath the new Isaac Newton telescope house at La Palma in the Canaries. Engineers had overestimated the strength of the rock, and the foundations must be rebuilt, causing a six-month delay and pushing a £500,000 bill into next year.

Robert Walgate

Large space telescope

Delay means money

Washington

US astronomers have successfully persuaded the National Aeronautics and Space Administration (NASA) to request additional funds in next year's budget to ensure the successful development of scientific instruments due to fly on the space telescope.

Previously, scientists had complained

that significant cost and schedule overruns with the 2.4-metre telescope, whose planned 1984 launch from the space shuttle will probably have to be postponed for up to a year, were leading the agency to cut corners in developing and testing the instrumentation thus prejudicing some of the scientific experiments.

For example, no reserve funds to meet unexpected difficulties had been included in the budget of the Goddard Space Flight Center, which is responsible for the development of the scientific instruments which will be located at the telescope's focal plane.

Partly as a result of this delay, caused chiefly by greater than expected technical difficulties in various parts of the project, cost overruns could amount to \$50–\$100 million, compared with an initial estimate of \$435–\$470 million.

The space telescope is only one of a growing list of NASA projects in the same trouble. In some cases, such as the Galileo mission to Jupiter, and the solar polar mission — delayed two years — these have been the direct result of problems with the space shuttle itself.

Ariane sells three

Washington

Intelsat — the international telecommunications satellite organization — has given a major boost to European space efforts with its decision to launch three of its nine satellite global communication systems from the French-built Ariane rocket.

Intelsat had originally hoped to launch the satellites from the National Aeronautics and Space Administration (NASA)'s space shuttle. Delays in the shuttle development programme, however, have caused concern about whether the launcher will be available in time. (Even after the first launch next year, it is uncertain whether NASA will be able to keep up its promised schedule of launches.)

Ariane is also experiencing problems, and following the failure of a test flight earlier this year there is no guarantee that it will be available for the Intelsat launches, which would be the sixth, seventh and eighth in the nine-satellite, \$300 million system. In this case, Intelsat would use Atlas Centaur rockets, which because of the shuttle delays are already being used for the first five satellite launches, with the first launch due to take place next month.

The launch vehicle for the final satellite in the series has not yet been decided, because Centaur launches are likely to be considerably more expensive than the shuttle. When all satellites are in orbit, the system will double the number of international telephone calls and television transmissions that can be handled simultaneously.

David Dickson

But in the case of the space telescope, there have been separate problems with each of the three parts of the project: the scientific instrumentation, the optical telescope assembly and the support system module.

In the case of the scientific instrumentation there have been what one scientist describes as a not unusual set of technical problems, extra costs caused by delays and a few "minor screw-ups" in all instruments except the high-speed photometer.

It is a similar story with Perkin-Elmer, which was awarded a \$58.5 million contract for the optical telescope assembly and which has also had difficulty in keeping work on schedule, finding that it lacked sufficient manpower for design needs and that a computer-controlled method for grinding one of the two optical mirrors was not as successful as had been hoped.

More recently, the other main contractor, Lockheed, awarded a \$73 million contract for the support systems module, reported that revised cost estimates were substantially larger than those originally submitted.

Both NASA officials and staff members of the relevant congressional oversight committees are looking closely for the reasons behind the delays. In particular, Congress wants to know whether tight limits on personnel have reduced the agency's ability to review contracts awarded to private companies.

In Europe, where several companies are working on apparatus to be included on the telescope, a delayed launch will relieve pressure on schedules that were said to be getting tight.

The delay seems unlikely, however, to have a significant impact on plans for a space telescope institute, which will be responsible for analysing the data received from the telescope.

NASA is expected to announce within the next few weeks the site that it has selected for the institute. Of the original four proposals submitted earlier this year, two remain in the running. One is from the Association of Universities for Research in Astronomy (AURA), which proposes building the institute at Johns Hopkins University in Baltimore; the other is a proposal from Associated Universities Inc. to locate the institute at Princeton University.

Although both proposals are accepted by astronomers as having strong merits, the balance may have been swung in favour of Princeton by a recent federal indictment against Computer Sciences Corporation (CSC). This company, which AURA intended to use to help develop the software for handling telescope data, is being indicted on charge of fraud and racketeering arising from a 1972 time-sharing contract.

AURA officials pointed out last week, however, that the section of CSC which has

been indicted is completely separate from that which would help operate their proposed space telescope institute, and hope that this will insulate them from any action which the federal government might take against the company. The General Services Administration (GSA), against which the frauds are said to have been carried out, has suspended the company from acquiring new business from the agency until a trial which is expected to open in January. The action by the GSA could affect 200 federal users of CSC's Infonet time-sharing system.

David Dickson

Biotechnology

Celltech set up

The formation of Celltech Limited, the first British company predominantly concerned with the exploitation of biotechnology, was completed on 6 November, according to an announcement earlier this week from the National Enterprise Board (NEB), the public corporation supported with public funds. The board will be the largest shareholder in the company, with 44 per cent of the shares. The remainder of the equity will be divided equally between the four remaining shareholders, the Prudential Assurance Company, the Midland Bank, British and Commonwealth Shipping and TDC (a venture capital investment trust, itself an offshoot of Finance for Industry, a joint venture between the clearing banks and the British government).

The shareholders have already subscribed the first tranche of the £12 million that will serve as the initial capital base of the company. The board of the company will chiefly be representative of the principal shareholders, with Mr G. Jackson of Philips Electronics Limited nominated by the National Enterprise Board (NEB), but will also include Dr J. L. Gowans, the secretary of the Medical Research Council, and Sir Michael Stoker, until recently director of the Imperial Cancer Research Fund Laboratories and foreign secretary of the Royal Society. Sir Michael will also be the chairman of the company's advisory board, to be known as the Science Council.

The council will also have as a member Dr Sydney Brenner, director of the MRC Laboratory for Molecular Biology at Cambridge, who has been involved with the planning of Celltech from the beginning. Other members of the council are to be announced in the near future.

Apart from the managing director of the company, Mr S. Fairtlough, the director of research and development will be Dr N. Carey, at present director of research at G. D. Searle Limited. Dr Caroline Vaughn, like Mr Fairtlough at present on the staff of the board, will be director of marketing. Other members of the staff of the company have yet to be appointed. The chairman of the company will be Mr Wynn Denman, a