

on a 25 year contract affecting supplies of 350 million cubic feet of gas a day. This is much like the figure which has been widely quoted since negotiations started eighteen months ago, with perhaps a slight upward revision because of the effects of devaluation. The original contract signed with British Petroleum at 5*d.* a therm for 100 million cubic feet a day was obviously not going to be repeated—equally, the Gas Council's original offer of 1·8*d.* per therm was probably unrealistically low. Both Phillips and the Gas Council seem now to be satisfied.

This is entirely as one would expect. Despite accepting a price which some would consider low, Phillips is going to make a very handy profit. When the gas is flowing at full speed through the pipes, it will be collecting £1 million about every three and a half weeks. The investment probably cost £25 million, a sum which it will earn within two or three years. After that, all being well, it will be pure profit. But it is only fair to point out that it may not be quite so easy—the field may need further development in order to keep the gas flowing. And Phillips can fairly claim that without a generous return it would never have made the investment in the first place.

With luck, the agreement with Phillips will encourage the other companies involved to come to terms. Arpet, which shares Phillips's field on the Hewett Bank, must surely now settle on the same terms. And the other companies, Shell/Esso and Amoco (which shares its find with the Gas Council), must also now knuckle under. These finds are somewhat farther out in the North Sea, and rather deeper, so that Shell/Esso and Amoco may be able to squeeze a little more out of the Gas Council. But it is now the Gas Council which is the master, principally because the reserves of gas which have been found far outstrip demand. Even the Phillips find will be enough to supply one-third of present British demand for gas. By 1971, demand is expected to double, but even so there is likely to be something of a glut of natural gas for a decade or so. The oil companies negotiating with the Gas Council thus find themselves in a conspicuously weak position which no amount of bluster can conceal.

This should also have the effect of strengthening the case put forward by the Central Electricity Generating Board for a greater share of the gas. If the CEGB wins its case—and in the long run it can hardly fail—the principal loser will again be coal. But nuclear power, just emerging from a long and bitter struggle with the coal lobby, may now find itself embroiled in a similar struggle with gas. For the ordinary gas consumer, the Gas Council can only promise jam tomorrow. In the short term, it says, gas prices are certain to rise, in part because of the crisis in the Middle East. In the long run, Sir Henry Jones of the Gas Council thinks gas prices will fall, but less optimistic observers fear that natural gas will do no more than prevent an upward spiral in prices. To the domestic consumer, paying almost ten times as much as the Gas Council is paying Phillips for each therm of gas (the average price of gas to the consumer is about 25·5*d.* per therm), this seems very hard to accept.

## Exploiting Technology

THE role of public research and development services in British technology has been evaluated by the

Institution of Professional Civil Servants, and recommendations for improvements are published this week in a report entitled *Exploiting Technology*. The executive committee of the institution decided to look into the way research and development in the public sector are operating, with the belief that it could make proposals for action as well as examining the facts. The 70,000 members of the institution work in all branches of the public sector—government departments, public bodies, and with the research councils.

The report begins with the assumption that research and development are the key to any nation's prosperity, and Britain is not making the best use of its resources in this direction. Left to itself, industry does not undertake the necessary research and development, and although there are various forms of government encouragement—through such bodies as the Industrial Re-organization Corporation, the National Research Development Corporation and research associations and advisory services—there is scope for much more. The report discusses suggestions that more research and development should be taken from the public sector by industry, and concludes that little would be gained from this, as ideas are often badly thought out or too long-term to be of practical value in the near future. Any shake-out of staff from the public sector would in fact have very little effect in industrial research. Buildings, equipment and experienced staff are already in existence in the public sector, but although many of the organizations have been doing a good job, the report suggests that most of them could be effectively streamlined.

In its recommendations, the report calls first of all for a clear statement of priorities from the Government, so that money is not wasted on research that is too expensive or will shortly be abandoned. After this, closer cooperation between public sector research and industry is the main theme. Rationalization of organizations doing similar research work and industries with similar problems is called for, together with closer working of public bodies with industry so that research teams investigating problems in industry and industrialists are brought into research councils and the management of government establishments. A central body, organized by the government, should take charge of the coordination of scientific and technical information and its dissemination, but commercial security must be safeguarded. Exchanges of manpower are desirable, and the report suggests that mobility can be encouraged by workers having transferable pension schemes. Refresher courses are recommended for qualified staff, and it is suggested that firms will benefit if scientists and engineers are trained in management techniques. With the realization that streamlining of the public sector will affect members of the institution, the report states that there must be adequate preparation for the social problems involved in the changes of employment resulting from this reorganization.

## Doctorates in Physics

THE Royal Society has just published a report on the training of PhD students in physics. The report forms part of a Royal Society survey, started in November 1965, on postgraduate training in science and technology in the United Kingdom. Sub-committees were set up to investigate the content and quality of training

for the PhD degree in six groups of subjects—biology, chemistry, engineering, earth sciences, mathematics and physics. The report of the chemistry group was published in March last year, and the Royal Society hopes that the reports of the other four groups will appear before the end of 1968.

The physics sub-committee, under Professor C. C. Butler of Imperial College, limited its attention to a study of postgraduate lecture courses attended by physics PhD students and a comparison with courses available in graduate schools in the United States. Butler sent a letter to the heads of all university physics departments asking for brief details of postgraduate lecture courses attended by PhD students, and it is on the replies to this letter that the new report is based. Rather surprisingly, the sub-committee did not ask the PhD students themselves for views on postgraduate training.

The present undergraduate course is no longer sufficient to prepare students for a full professional career, and the report approves of the recent trend towards lecture courses for PhD students. The sub-committee realizes that it is often difficult for experimentalists to complete a PhD within the three years of a Science Research Council maintenance grant, and any extension of course work will increase the difficulties. It therefore recommends that provisions for fourth year grants should be made in certain cases.

Comparison with graduate schools in the United States—largely based on the opinions of British physicists who have worked in American universities—revealed no evidence that the standards of PhD training are significantly different in the two countries. There seems, however, to be some foundation for the widely held view that the American experimentalist has a broader theoretical knowledge than his British counterpart.

Some of the value of these six studies of postgraduate training in science and technology is being lost because the organization of the surveys is being left to the discretion of the individual chairmen. The chemistry report, for instance, was based on enquiries among university professors and six centres of chemistry in the United States, while the more ambitious sub-committee for engineering has written to 1,900 postgraduates and to 90 companies and institutions. This will make comparison of the training afforded to students in different subject groups difficult.

## Soul-searching for ESRO

ON Wednesday and Thursday of this week there was a meeting of Alternates of the European Space Research Organization (ESRO) where the main pre-occupation was expected to be the continuing exercise of preparing ESRO's case (see *Nature*, 216, 696; 1968) for the European Space Conference in Bonn in June. It is hoped that here a policy and programme for European space will finally be settled. At the last European Space Conference, in Rome last July, a special committee was set up to evaluate the various proposed projects in European terms. This Advisory Committee on Programmes was chaired by J. P. Causse from the French aerospace industry, supported on the technical side by five independent experts, and it produced its report at the turn of the year. The ESRO Alternates were to consider it in detail at this

week's meeting. There seems no reason why the Causse Committee's report should not then be published.

The main dilemma facing ESRO is whether its activities should be substantially redirected towards "useful" satellites, such as the communications satellite sponsored by CETS (the European Conference for Telecommunications by Satellite), or retain its original purpose of providing scientific research opportunities beyond the resources of individual countries. The immediate clash is between the European communications satellite and the large astronomical satellite as candidates for ESRO's major project for its first decade. It seems out of the question that both projects could be adopted at the present financial level of European space organizations. It will be interesting to see what the Causse Committee has had to say about their relative merits.

## Full Stop on Decimals

BRITAIN'S plans to adopt the metric system of units have run into a little local difficulty. A dispute has arisen over the decision by the Decimal Currency Board to use the full stop or point as a decimal marker, instead of the comma which is common in metric countries. The British Standards Institution, which is responsible for organizing the change to the decimal system in British industry, favours the comma, combined with a space to indicate thousands. The construction industry, the first to embrace metric units, has already begun to issue reports in this form. If the Decimal Currency Board is to have its way, both the BSI and the construction industry will have to think again.

The traditional system uses a full point for the decimal sign and a comma for indicating thousands; the new system supported by the BSI would use the comma for the decimal sign, and each group of three figures would be separated by a space. Thus the Decimal Currency Board would write 5,650·3286 and the BSI would prefer the form 5 650,328 6. It is no secret that the joint metrication committee of the Ministry of Technology, an advisory body under the chairmanship of Mr A. H. A. Wynne, favours the system adopted by the Decimal Currency Board. Unlike most aspects of the metric system, there has so far been no international decision over which system to adopt, and this has made the committee's decision a difficult one. In reaching it, it took into account a number of factors.

First, there was the evidence provided by two questionnaires sent out by the BSI. The first, to the general engineering industry, produced inconclusive results. The second, which included financiers and merchant bankers, produced, predictably enough, a result in favour of traditional practices. The bankers felt that a system using empty spaces was an open temptation to fraud. The Decimal Currency Board—a notably conservative body—was swayed by much the same argument in favour of the traditional system. The Confederation of British Industry is also said to prefer the traditional system. In spite of this, the BSI continues to favour the space/comma system, and has written to the Decimal Currency Board to say so. The Ministry of Technology's answer to this is to say that, as long as there is no international system, it