

years, it has become apparent that the OST has not been carrying out the long-term planning—particularly in manpower—for which it was given responsibility six years ago. A part of the trouble is that it lacks the staff to do the work, but it is also difficult for an office caught up in the day to day running of the presidency to set aside the time and energy to deal with long-term problems. It has also been a sad failing in the past few years that the OST has been less able to knock together the heads of those responsible for scientific research in the several agencies of the Government than its wellwishers must have hoped. Thus the Department of Defense some years ago was able to embark on a project for sponsoring academic research at universities without the approval of or even a detailed consultation with the National Science Foundation. And for all the misgivings of at least one director at the OST, the Federal Government was able in 1961 to embark on the programme to send a man to the Moon without even consulting the President's Science Advisory Committee. In this and several other ways, the position of the OST within the Administration but without power to do everything expected of it is a continuing source of trouble and discontent. There is every reason, in the interests of good government, why the power of the OST should now be more accurately mated to its responsibilities. If the new President does not do this more decisively than his predecessors, he may be hard pressed to fill the job.

FEDERAL LABORATORIES

Share and Share Alike

THE Daddario Sub-Committee of the United States House of Representatives Science and Astronautics Committee has come out for a much more thorough use of Federal laboratories. In a report based on hearings held in March and April this year, the committee says that the Administration has only a "passive" policy towards the use by one agency of laboratories belonging to another, and that there are no strong incentives to persuade the heads of government departments that they should use the facilities of other agencies instead of opening laboratories on their own account. Among several recommendations, the sub-committee suggests that the Office of Science and Technology (together with the Bureau of the Budget) should play a fuller part in the sharing out of work among laboratories, that laboratory personnel engaged on work for other agencies should be exempt from manpower ceilings (which will provide something of a carrot for the heads of agencies) and that techniques should be worked out for appraising the value of work done by laboratories (which will be something of a stick).

Although the sub-committee quotes the scale of expenditure on Federal laboratories, now running at something like \$3,500 million in the current fiscal year, as evidence of the scale of the problem with which it is concerned, the possibility of deciding how much is lost because the Federal laboratories are not as fully used as they might be is as remote as that of deciding how many murders go undetected each year in the large cities. Mr Daddario has, however, been able to collect some powerfully suggestive qualitative evidence that there

are economies to be made. He has, for example, discovered that even though the Economy Act of 1932 asks Federal agencies to see what they can do to help each other out before building new facilities or going outside the government service for laboratory services, the Comptroller General has been interpreting this regulation too literally. Government laboratories have sometimes been prevented from buying extra equipment to carry out particular tasks for other agencies even when they are best suited to do the jobs—in this spirit, the National Bureau of Standards seems to have been prevented from spending \$150,000 on equipment to test tyres for the US Army, with the result that the work had to be carried out more expensively elsewhere.

Even though some witnesses seem to have told the sub-committee that they were accustomed to "walk around these obstacles", the report asks that they should be done away with altogether. It also complains that the Office of Science and Technology has not shouldered what would seem to be its natural responsibility for coordinating the taking in of each other's washing among government laboratories, and asks that it should atone for this by working out a clear statement of policy (in collaboration with the Bureau of the Budget) and bringing this to everybody's attention. The sub-committee is also anxious that some branch of the Federal Government should do what the National Science Foundation has been trying to do for several years—to compile a catalogue of public research laboratories and other facilities.

The sub-committee's argument on the provision of discretionary funds for laboratory directors will make many heads of laboratories feel wanted even though it may not quickly change the attitudes of people in the Bureau of the Budget. Some flexibility in the budgets of the laboratories is held to be a necessary "incentive and a reward for creative work". Enquiries seem, however, to have uncovered a diversity of practice in the different agencies. The luckier laboratory directors seem to enjoy anything between 3 and 15 per cent of discretionary authority within their annual budget, with 5 per cent as the average. In other agencies, however, laboratories are expected to be run on a tight budget—NASA, for example, usually leaves no leeway for its laboratory directors. The sub-committee urges that there should always be some flexibility in the annual budget of Federal laboratories so that laboratory directors can chase after interesting and potentially rewarding opportunities as these present themselves. It quotes, however, a warning by Dr Donald Hornig that discretionary authority should not be regarded as a licence "to go off on tangents".

The sub-committee's case that laboratories should be to some extent exempted from manpower ceilings, at least to the extent that they undertake work for other agencies, is somewhat undermined by the decision in July this year that all manpower ceilings in the Federal Government should be restored to those obtaining in 1966. Looking forward to happier times, however, the report urges that flexibility of manpower would at once encourage laboratories to extend their activities in directions helpful to other agencies and allow them to concentrate on the quality of their work rather than on the numbers of people engaged in it. Here, as with the case for discretionary authority in the budget, the assessments of the real needs vary quite consider-

ably. The Office of Science and Technology and NASA seem both to have been far from pessimistic about the present position.

With the object of giving Federal laboratories a greater sense of participation in scientific policy making, the sub-committee argues that ways should be found of letting the heads of laboratories function more effectively outside their immediate parishes. Although witnesses before the sub-committee seem to have been entirely in agreement with the objective, opinions differ as to the best way of achieving this. Dr W. Astin, chairman of the laboratory committee of the Federal Council on Science and Technology, urged that there should be more regular councils of laboratory heads within the separate agencies of government, and this is the solution which the sub-committee seems to favour. Other people, Dr Alvin Weinberg, for example, want to see laboratory directors more involved in the work of advisory committees such as the Federal Council itself and the President's Science Advisory Committee.

The sub-committee's views on the need to carry out systematic appraisals of the work of the Federal laboratories are understandably somewhat nebulous. It is convinced that something should be done, but not quite sure who should do it or how it should be done. Agency departments such as the AEC and the Department of Defense claim to have internal methods of appraising the work of their laboratories, but these necessarily rely on inspection by groups of experts appointed from within. Only rarely is it possible to apply objective yardsticks to the problem of appraisal—for example, when contracts have been let externally to civilian laboratories or when it is possible to apply objective criteria such as PERT. On the whole, the sub-committee in its report leaves the impression that it would like to see the Federal Government be more systematic about appraisal and that it would like to see the Bureau of the Budget and the Office of Science and Technology between them undertake the job.

BUSINESS

Precocious Managers

AMERICAN business success is so diverse a phenomenon that it is hard to find simple explanations for it. Recently it has been fashionable to suggest that sheer size has much to do with it, and many British companies are busily merging in order to cash in on the supposed advantages. But the United States also has very successful middle-sized businesses (in, for example, the chemical plant industry) and a plethora of small companies, many of them in the areas of advanced technology which are supposed to be reserved for the giants. It was of this last group that Professor Edward Roberts of MIT spoke when he addressed a meeting at the United States Embassy in London on "Technical Entrepreneurship".

Professor Roberts and his colleagues have carried out a study of 200 small companies started by scientists from four MIT labs, industry, an Air Force laboratory and the Mitre Corporation, a not-for-profit organization. With a few exceptions (like the emeritus professor who started his company after retiring from his chair) the entrepreneurs are young men, between 32 and 35 at the time their companies were launched. Most have master's degrees rather than doctorates, and most have

worked in development rather than pure research laboratories. Some of the scientists who started their own businesses seem to have been predisposed to it by their family backgrounds; 50 per cent reported that their fathers had been self-employed. There were also characteristic personality factors. The better entrepreneurs showed through personality testing that they possessed a high "need for achievement" but only a moderate need for power. The less successful tended to want power rather more strongly than achievement. Professor Roberts interprets this as suggesting that the power seekers are less successful because of their tendency to authoritarianism, which drives others out.

One of the crucial factors in the success of these companies is the amount of "technology transfer" which can be achieved between the laboratory and the business. Scientists who went straight into business from the laboratory—often starting their businesses while still drawing their laboratory salaries—were much more likely to succeed than those who delayed. Some of the scientists joined other firms for a short time, to get experience before starting their own businesses, but this seems to have been the wrong strategy. "Fledgling companies have no other advantage except for advanced technology", Professor Roberts commented; "when they use it, they win out". But the more successful companies did have marketing departments, suggesting that even a better mousetrap needs selling.

More often than not, the small companies were launched on a Government contract, and much seems to have depended on the good personal relations between the man starting the business and the people responsible for awarding defence contracts. This suggests that research contracts in the United States are awarded on a much less tightly organized basis than in Britain. As Mr Michael Shanks of British Leyland Motor Corporation suggested in the discussion, the American Administration "does not have the same stuffy attitude to public procurement as the British Government".

Professor Roberts has also extended his studies to include large companies, with revealing results. Using exactly the same methods, he studied sixteen new ventures undertaken by a large American firm in the communications and electronics business. The men identified as the entrepreneurs in these sixteen examples bore remarkable similarities to those scientists who had started their own companies. But, unlike them, the entrepreneurs within the big companies had been comparatively unsuccessful—only two of the ventures had been undoubted successes. Two were still in doubt at the time of the study, and the rest were dismal failures. Large corporations, Professor Roberts concludes, "are systematically biased against youth". To get away from this stifling situation, companies would have to adopt less rigid organizational structures, and be prepared to provide rewards to entrepreneurs directly related to their actual performance. The setting up of "new venture" divisions outside the immediate influence of the parent organization would also help. Within large corporations, an elder statesman (presumably too old to be an entrepreneur himself) should be responsible for encouraging innovation, taking the same role as the professor in a laboratory. This suggestion, at least, gave most of Professor Roberts's audience, too old for entrepreneurship themselves, a role with which they could identify.