

sovereignty are involved. Their difficulty is no reason for not tackling them.

Where the organization of European science is concerned, the ministerial meetings which the OECD has sponsored promise to be valuable, even if they have not yet done more than enable officials to know the names of those to whom they correspond in other countries. There is also a need for a more particular discussion of the common needs of Western Europe, either within OECD or at Strasbourg, in the Council of Europe. Then it was good to learn, last week, that Sir Harrie Massey, the chairman of the British Council on Scientific Policy, is to take personal responsibility for the international implications of British science policy. It is to be hoped that he will give himself a wide brief, and that he will urge his European colleagues to put stuffing into the old and most empty boast that science is already international.

MONEY TO SPEND

ONE of the cheerful parts of the report of the Council on Scientific Policy, published last week, is the statistical evidence it provides of the rapidly changing pattern of spending on research and development in Britain. There are a number of striking tendencies—some of them, at least, in the right direction. The declining emphasis on defence research and expenditure is the most heartening item of all. Over a decade, the proportion of the country's research and development expenditure provided by the defence agencies has declined from 59.1 per cent to 33.7 per cent (in 1964–65). In the past few years the defence departments of the Government have provided money at the roughly constant rate of £250 millions a year within a steadily rising budget which had grown to £756 millions in 1964–65, and the chances are that an increasing proportion of the defence money is anyway being spent on civil work. To welcome this is not, of course, to take a stand against defence research as such—that would be silly, for no country of importance manages to do without it. But there is no question that a decade ago the pattern of defence expenditure in Britain was lopsided. Now it is less so.

Naturally the universities and industry have benefited from this development. Over the past decade the value of research at universities has increased from £14 millions to £56 millions a year, and the value of industrial research and development from £200 millions to £508 millions a year. The change in the pattern of industrial research and development is especially to be welcomed because the proportion of it now financed by industry itself has increased over the decade from 39 per cent to 64 per cent. On the principle that the one who pays the piper calls the tune, this suggests that industrial research and development are now being directed more effectively towards the goals which should concern British industry—the commercial health and future of itself.

Where, then, are the snags? The sombre tendency in the statistics is that which shows that expenditure on research and development has become a static 2.6 per cent of the Gross National Product of the United Kingdom. Is this enough, or should the proportion be greater? This, it will be recognized, is a chicken and egg problem—which is the offspring, research and development or national prosperity? There will have to be a running battle on this issue in the years ahead, and the sooner it begins the better.

"BORN UNDER ONE LAW, TO ANOTHER BOUND"

Man Adapting

By Prof. René Dubos. Pp. xxii + 527. (New Haven and London: Yale University Press, 1965.) 10 dollars; 72s. net.

THE distinction between species, at the present time, is sometimes uncertain; the specific distinction between successive evolutionary stages is nebulous. This is not simply because of lack of evidence but because of the gradualness of the changes in the various factors that are used as criteria for a species. By all criteria our species is young, but our physiology and nutritional requirements probably retain many features that are well adapted because we share them with our predecessors. Dubos's basic thesis is that a person's genetic constitution defines potentialities; what actually happens depends on the environment and on nurture. He discusses in detail the extent to which our behaviour indicates incomplete adaptation.

Man Adapting starts, logically, with some examples of influences *in utero* and the effects of maternal care, or the lack of it, in infancy. There is then a section, in the Hippocratic tradition, on "Airs, Waters and Places" and one on rhythms. The interesting point is made that we are now exposed to an unprecedented amount of light and many of us to periodic inversions of the circadian rhythm. Animal behaviour is often modified by light and there is no reason to think that our own is not influenced also.

Primitive man lived an active life and had to tolerate a wide range of foodstuffs as well as intermittent privation. Modern man is sedentary and chooses to be more conservative and regular. Nutritional research has in the past concentrated attention on the needs of children or well-fed people leading active lives. In several places Dubos regrets the low esteem in which trophology is held and argues strongly for more work on novel foods, especially protein-rich foods, and on the needs of the sedentary and ageing. He goes so far as to suggest that contemporary forms of agriculture may become hobbies, like trout-fishing or cabinet-making, and be replaced by intensive methods in which the crop is the raw material for biochemical engineering. In studying nutrition particular attention should be given to the microbiota of the gut. Many experiments are quoted showing that not only the action, but the very physical structure, of the normal gut depends on the organisms growing in it. It may well be that the process of adaptation to a novel food depends primarily on microbial changes.

This discussion leads naturally to a discussion of pathogenicity and here Dubos is in his element. He quotes many examples of ubiquitous organisms that become pathogens when the host is stressed by crowding, amino-acid deficiency, or in other ways. He accepts specific aetiology, or the germ theory of disease, as "the most powerful single force in the development of medicine during the past century", but points out the enormous improvements in health brought about by people who did not know of it or even, like Ozanam and Florence Nightingale, rejected it. In the view of Dubos, people and animals adapt to changes in their environment, and the result is called disease when the attempt is unsuccessful. He devotes a chapter to the idea that some pathogens could be exterminated, but regards this as unlikely.

To an increasing degree, and throughout an increasing area, we have, in the past few centuries, been changing our physical and psychological environment in an unprecedented way. Dubos argues that we have not had time to adapt to these changes and they now come so fast that we probably never will have. He discusses the new chemicals to which we are now deliberately or inadvertently exposed. A blanket prohibition would be both impracticable and unreasonable, for traditional food-