

giant flares, are not distinguishable from the others". He went on to say that the likely warning period may be as little as 10 min.

Studies at the Radio and Space Research Station which are mentioned in the research station's first triennial report, published last week, may cast a more cheerful light on the situation (*Radio and Space Research, 1965-67; HMSO, 7s 6d*). Solar flares and their effects on radio wave propagation through the ionosphere have long been studied at the research station, but it is only in recent years that the importance of the millimetre-wave content of the Sun's radiation has been followed closely. As this component arises in the chromospheric layers, it is likely not only to give new information on the mechanism of solar flares but may even lead to a means of predicting their occurrence. According to the report, the wavelength of solar radio emissions depends on the depth within the Sun at which they originate, so that it would seem of value to record a number of wavelengths simultaneously. Equipment for 19 GHz and 71 GHz is already in operation, a swept-frequency receiver for the 100-280 MHz band is nearing completion and construction of a 37 GHz radio meter has started. In addition, a swept-frequency polarimeter for the 2-4 GHz band is being operated at the station by a group from University College, London.

Experiments in rockets conducted by the research workers at the station have provided successful measurements of various characteristics of the upper atmosphere. For example, in March 1967, a rocket was launched in cooperation with the Norwegian Defence Research Establishment to measure the energy distribution of electrons in an auroral display. Other experiments have been concerned with the measurement of electron density distribution in the lowest region of the ionosphere and the Sun's ionizing radiation producing these electrons.

With the trend towards increasing exploitation of very short radio waves for both space and terrestrial communications, transmission characteristics at a wavelength of 2.9 mm have been studied over a 300 m path; scintillations arising from variations in atmospheric refraction have been investigated, and measurements have been made of the attenuation caused by rain. In addition, measurements are being made of the absorption by water vapour at wavelengths between 0.783 and 0.793 mm in controlled laboratory conditions.

¹ *British Medical Journal*, 1, 50 (1969).

ENERGY

Uncertain Planners

THE planners of the European Economic Community in Brussels have been having a happy time the last month or so. Before Christmas, the Common Market commission launched an ambitious plan for the reform of agriculture in the EEC during the next ten years. Scarcely had the ink dried than another document, this time on the planning of energy resources, emerged from Brussels. The document is certainly important, possibly influential—but, like so much that goes on in Europe, its success depends not on its own good sense but on the good sense of European governments. That is in much shorter supply.

Like other advanced parts of the world, Europe's energy needs are rising steeply. A consumption that ran at 596 million tons of coal equivalent in 1965 will be up to 743 million tons by 1970 and 1,130 million tons by 1980. The merging of the three communities—Coal and Steel, Euratom and the EEC—eighteen months ago offered a splendid chance of producing a plan for this rapid expansion. The result so far is tentative only because anything else would be tempting the gods. It starts out from the premise that while Europe needs the cheapest energy supplies it can get, it should not be prepared to buy them at the expense of certainty of supply. From this, the plan turns to the problems of the free movement of trade, and, harder still, to the problem of harmonizing the systems used in the six countries for taxing energy supplies. The commission is proposing the uniform application of a value-added tax, combined with a reduction in the taxes imposed for the purpose of protecting other forms of fuel and the harmonization of the taxes on petrol. For coal, the commission suggests a concentration on a few efficient pits; for other fuels, including nuclear fuel, it suggests constructing a plan based on the investment intentions of individual enterprises. A plan like this, it says, could help to ensure that the energy supplies are sufficient to meet demand—if not, the commission is prepared to prepare recommendations for its members suggesting remedies. The commission also suggests annual meetings to discuss the investment plans of the EEC governments, so that it could advise; if it seemed that over-investment was about to take place, it would again produce recommendations to the members.

As for nuclear power, the commission declares a firm interest in the plan to set up a European separation plant for enriching nuclear fuel, and intends to alter the Euratom treaty so that it is in a position to supply nuclear fuel at sensible prices. Enrichment is becoming an increasingly important theme in Brussels, which perhaps sees it as a way of regaining some of the ground lost by the gradual but inexorable decline of Euratom. It seems likely that European countries, possibly within the framework of Euratom, the European nuclear industry association, will be putting forward firmer plans within the next few weeks. But there is a good case for postponing the final decision on the type of enrichment to be used until the agreement between the UK, West Germany and Holland on the development of the ultracentrifuge begins to bear fruit. It should then be much clearer which of the three enrichment methods—diffusion, centrifugation, or the jet nozzle system—is likely to be the best bet.

FALLOUT

The Decline Halted

THE concentration of long-lived radioactive fission products in the air over Britain during the first half of 1968 was roughly equal to that for the same period in 1967, ranging from 0.12 pCi per kilogram in January 1968 to 0.037 pCi per kilogram in September, according to figures published at the end of December by the UK Atomic Energy Authority (*Radioactive Fallout in Air and Rain; Results to the Middle of 1968, HMSO, 8s*). But in 1968, for the first time since 1963, the steady reduction in the concentration of long-lived fission products in fallout of about 50 per cent a year was

interrupted. The new fallout apparently came from the sixth Chinese nuclear test of June 17, 1967.

The ratio of cerium-144 to caesium-137 increased steadily from August 1967, as the debris from the Chinese test contributed an increasing proportion of the radioactivity at ground level in Britain. By mid-1968, fallout was derived in roughly equal proportions from the Chinese test in June and the reservoir of old debris in the atmosphere. Fission products from the later Chinese test of December 24, 1967, had barely reached Britain by mid-1968 and accounted for only 10 per cent of the total. From changes in the ratio of cerium-144 to caesium-137, it appears that the debris from the Chinese test has about the same residence time in the upper atmosphere as older debris and that the test of June 17, 1967, roughly doubled the size of the reservoir in the northern hemisphere.

In spite of this, the rate of deposition of long-lived nucleides in rain during the first half of 1968 was only 75 per cent of that of 1967, which suggests there may have been a reduction in the rate of washout of the new debris. This may only be temporary, of course. Since mid-1966, the accumulated deposit of strontium-90 in Britain has stayed constant; the new deposits balanced decay of the old and the rate of new deposition in 1967-68 was only a tenth of that in 1962-63.

Between June 5, 1967, and September 8, 1968, the French tested eight nuclear weapons in the south Pacific, but it is too early yet to detect any inter-hemispheric transfer of long-lived nucleides in the stratosphere. Short-lived fission products transferred in the troposphere were, however, detected in Britain within two weeks of the Chinese tests and about a month after the French tests. Barium-140 apparently travelled from the French testing ground north across the equator and was then carried across south-east Asia in the south-west monsoon.

On a global scale—and the report mentions that comparative tests of the American and British fallout monitoring systems have shown there is no significant difference between them—about 0.27 MCi of strontium-90 was deposited in 1967. This is roughly half the amount of the previous year and one-tenth the deposit of 2.87 MCi in 1963, which was the highest level ever recorded. The global accumulation of strontium-90 actually declined marginally in 1967 from 12.53 to 12.49 MCi.

CSIRO

Australian Research Boom

THIS is undoubtedly a time of growth for the Commonwealth Scientific and Industrial Research Organization of Australia. The annual report for 1967-68 shows that treasury funds for capital works increased to \$3.08 million from \$2.9 million in 1966-67. Several large building projects are under way, including rehousing of the Division of Chemical Engineering and an extension for the Division of Dairy Research. New laboratories or extensions have been completed for the Divisions of Radiophysics, Land Research, Meteorological Physics, Mathematical Statistics and Horticultural Research, and two more laboratories are planned as well as the new head office which the Government has approved for Canberra. This is expected to be ready by December 1970.

More than nine-tenths of CSIRO's resources are committed to the organization's first function, scientific research. In 1967-68, \$40,495,130 was spent on investigations, \$3,425,413 more than during the previous year. There are now almost forty divisions and sections of CSIRO throughout Australia and its territories working on problems ranging from plant nutrition to radio astronomy.

The Division of Soils is trying to improve the health of pine seedlings by infecting the roots with strains of mycorrhizal fungi that are particularly efficient at extracting nutrients from the soil. Fleas are being used by the Division of Animal Genetics in an attempt to decrease the proportion of rabbits that are immune to myxomatosis. This disease is a less efficient killer now than when it was released in 1950, because there is now a less virulent strain of myxoma virus that does not kill, but after infection the animal is immune from further infection. The rabbit flea, which was the principal agent of spread in Europe, has been imported and bred in Sydney. The advantage of the flea over the mosquito as a vector of myxoma virus is that after death there is a mass exodus of fleas onto another rabbit. Thus strains of virus which kill quickly are spread widely. The fleas are harmless to wildlife, domestic animals and man, and field trials with rabbits are now in progress.

Whiter and brighter wool is being produced by treatment with thiourea and formaldehyde, which the Division of Protein Chemistry has found to reduce the rate of yellowing. A new process for more efficient extraction of gold and silver from certain ores has been developed by the Ore Dressing Investigations Laboratory. Sulphide concentrates are ground, treated with cyanide, roasted, leached with an acid brine solution and again treated with cyanide, and more than 90 per cent of gold and silver can be recovered. Previously less than 50 per cent had been extractable.

AMERICAN EDUCATION

Value of a Degree

IN the United States, the average college graduate can look forward to earning about \$508,000 in his lifetime, or just about 50 per cent more than the average high school graduate's earnings of \$341,000 and more than double the high school dropout's \$247,000. This can be inferred from the *Digest of Educational Statistics, 1968* (GPO, Washington, \$1.75) just published by the Department of Health, Education and Welfare. Just over seven out of every ten fifth grade students in 1959 graduated from high school in 1967, four then went on to a college and two are likely to finish with first degrees in 1971.

In 1967, 56.4 million children were enrolled in schools staffed by 2.6 million teachers, and no fewer than 15 per cent of the 25 to 29 year olds had completed four or more years at college. On the other hand, 2.4 per cent of the population more than 14 years old in 1960 were illiterate. In the southern states, with the exception of Florida, the percentage of illiterates was well above the national average; Louisiana topped the list with 6.4 per cent illiterate in 1960, the latest year for which figures are given.

The rapid growth in private schools which occurred in the fifties has slackened off in the past five years, so