

fruit should contain no more than 130 parts per billion of ethylene dibromide, but he had yet to persuade longshoremen in the United States that fumigated fruit could be handled safely.

Nobody knows the economic cost of the "abrupt interruption of the channels of trade" caused by the infestation and the consequent fumigation, but Mr Rominger thinks it exceeds by an order of magnitude the direct cost of aerial spraying to California, put at \$50 million for this year.

The reasons why California was caught napping by this year's events are now becoming clear. Operations against the Medfly are directed from the state's laboratory at Los Gatos, between San Jose and Santa Cruz to the south of San Francisco Bay. Medflies were first recognized in Southern California in June 1980, but that infestation was successfully dealt with by the release of sterile male flies, as had been the 1975 infestation near Los Angeles.

The importance of the nearly simultaneous outbreak in Santa Clara county (just north of Los Gatos) was appreciated only much later, partly because insect traps were more thinly spread but also because the complete life-cycle of the insect (22 days in tropical conditions) seems to vary enormously from one microclimate to another and may be as long as 77 days in the northern counties.

The density of traps in the northern counties at risk has now been increased to 50 per square mile, and adult Medflies are still sporadically being caught in them. Members of the laboratory's staff recall with anguish the early months of this year, when they were "desperate" for supplies of sterile males to release into the field. More than 10,000 million were used before aerial spraying was begun in mid-July.

The belief that supplies of supposedly sterile larvae from Peru were in reality fertile seems not to be supported by the evidence the laboratory has collected. The staff says that the Peruvian supplies of sterile flies were, however, poor in quality — some consignments yielded only 10 per cent of viable adult flies. The fertile females of Peruvian origin recognized in the field in June this year (on the basis of a fluorescent dye) may well have derived from larvae contaminating a Peruvian consignment after the bulk of it had been irradiated.

The present hiatus in the campaign against the Medfly has not stilled political recriminations, directed chiefly at Governor Edmund G. (Jerry) Brown. Mr Brown's stand against the aerial spraying of a carbohydrate bait laden with malathion, in the face of technical advice to the contrary, is widely resented by his opponents in the state legislature as well as by farmers' organizations and many agriculturalists.

Thus Mr Richard Niellson, a member of the State Senate, is concerned that the incident will have permanently damaged

California's reputation as a reliable supplier. He, among other members of the legislature, is planning to use the budgetary process now beginning to see that proper provision is made for the war against the Medfly in 1982 and succeeding years. But this year's experience, when the Red Cross centres set up to deal with casualties among the urban population of California were hardly used, has, Mr Niellson says, seen a decline of the "Rachel Carson syndrome" among the Californian electorate.

Mr Rominger, who with some of his technical advisers had threatened to resign if aerial spraying was not begun, hopes that the 17-member "pest prevention task force" due to hold its second meeting this Monday will insulate pest protection from politics. The committee is intended to present the governor and the state legislature with a general strategy for protection against all insect pests by the beginning of 1982. Meanwhile, the state will have to decide what to do about the 700 claims for civil damage which have been lodged, while inspection stations at the Californian border are likely to reappear.

For most Californians, the events of the past months are likely to prove cathartic. Next season, farmers (who are not prevented from ground spraying with malathion and more powerful insecticides) will take more active steps to protect their crops. The state as a whole seems to have recognized the economic importance of its agricultural industry, worth \$14,000 million a year. And people in urban areas have been left with a lasting impression of helicopter visitations at night (when the air is still), with their searchlights illuminating suburban gardens. "This is what it must have been like in Vietnam" said one whose white Volkswagen is still spattered with grey malathion bait.

Nuclear Structure Facility

Nylon slip shows

Water in the nylon insulating links of the charging system of the Nuclear Structure Facility, a 30 million volt tandem Van de Graaff accelerator for nuclear physicists under construction in the United Kingdom at Daresbury Laboratory in Cheshire, is now blamed for delays which will put the commissioning of the machine back at least to spring 1982.

A new material, Torlon, will have to be used in place of the monocast nylon in the pioneering machine, which is the highest voltage Van de Graaff yet designed. The nylon, Daresbury physicists found to their cost, contained a small proportion of water. This did not affect the insulating properties of the nylon at room temperature, but the conductivity rose a hundred-fold between 20°C and 35°C, the physicists discovered. So when the "laddertron" — a charging belt like a tank track made of alternating links of nylon and aluminium to carry charge up to the high-voltage

terminal — was first tested at full scale, and friction raised its temperature to 35°C, it failed.

Torlon, an American-made material, was not available when the accelerator was first designed, but in a test section of laddertron it has proved its superiority to the monocast nylon. The whole laddertron will now be rebuilt with Torlon.

However, the problems of the accelerator are not over yet. Unfortunately monocast nylon was used for other parts of the accelerator. Now the laddertron problems appear to have been solved, these too may have to be replaced.

Moreover, early next year the accelerator tube — the evacuated metal and ceramic tube down which the beam of nuclei must pass — will be installed and tested. And unless the Daresbury team are lucky for once, this too may cause delays. At Oak Ridge National Laboratory in the United States, problems with a similar tube set a 25 million volt machine back by a year — and even now the laboratory may have to be content with 20 million volts rather than the design figure.

Nevertheless the delays at Daresbury have had one bonus. All the experiments will be ready in time for the first beam, despite a low rate of funding which implied that only the bare minimum of experiments would have been possible earlier.

Robert Walgate

Caltech

Kellogg birthday

Pasadena

The Kellogg Radiation Laboratory at the California Institute of Technology combined its celebrations of its fiftieth anniversary last week with the dedication of a new custom built Megavolt accelerator and a seventieth birthday party for Professor William Fowler, the third director of the laboratory. Fowler, always ebullient, stole the show, but the laboratory was at pains to emphasize that it has been clever enough to equip itself with a new accelerator, albeit in the MeV range, when high-energy physics laboratories are wondering how long their GeV machines will be able to function.

The Kellogg Laboratory is the West Coast's chief monument to R. A. Millikan, the president of the California Institute of Technology when the laboratory was first formed. Millikan's original prospectus included the use of high-energy radiation in the treatment of cancer. During the Second World War, the laboratory played an important part in the determination of nuclear cross-sections needed for the Manhattan Project. Since then, it has been principally concerned with the application of nuclear physics to other fields, astrophysics in particular.

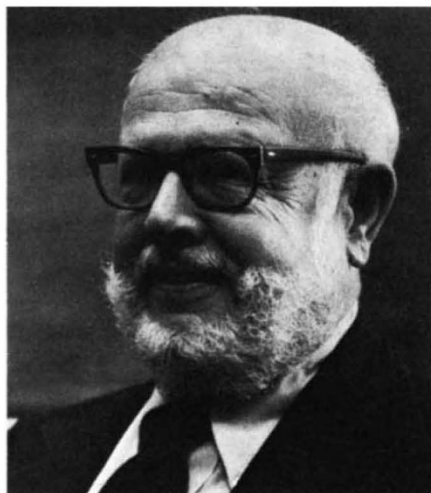
The new accelerator, represented last week by its external yellow tank and christened as if it were a sea-going object,

has been designed for high ion current and voltage stability. It will be used, among other things, for the laboratory measurement of nuclear cross-sections relevant to the processes of nucleogenesis which are at present uncertain.

But Dr Barbara H. Cooper also outlined a scheme for using the accelerator as a charge spectrometer for checking the claim by William Firkbank and his colleagues at Stanford University that electric charges exist which are a fraction of the electronic charge, and which might represent free quarks. Preliminary estimates suggest that by using an argon beam for sputtering free atoms from solid surfaces, it should be possible to evaporate one of the small niobium spheres used in the Firkbank experiments in about an hour, and that the tandem accelerator should be capable of detecting one fractionally charged particle in as many as 10^{18} niobium atoms.

While astrophysical problems will remain a central part of the Kellogg Laboratory's programme, diversification is also in the air. This is the spirit in which the laboratory is involved with studies of the release of radon-222 as possible predictors of major earthquakes, just now a matter of public interest in California.

According to Professor Thomas A. Tombrello, two of the network of radon monitors maintained by the laboratory near the San Andreas Fault had revealed a substantial increase of radon evolution since the early weeks of August. The



W.A. Fowler at seventy.

increased rate of evolution (which continues) has been closely correlated in time even though the two instruments are separated by 100 kilometres, and is said to resemble that which preceded the 1979 earthquake of magnitude 6.7. That event was marked by a transition from the normal compressive stress across the surface rocks of the San Andreas Fault to an extension — thought to stimulate radon release — but also by a cessation of radon release in the days immediately before the earthquake.

Professor Tombrello prudently avoided prediction last week, saying only that "sometimes, perhaps in 25 or 50 years, one

of these events is going to be a precursor of a major earthquake". He complained, however, that financial support for earthquake studies of this kind in California was less than that in China and Japan. "Since 10 million people would be affected by a major earthquake, it would be worth putting a little money into it."

Albanian development

Hoxha looks ahead

Albania, too, has an urgent need of science and technology, according to party leader Enver Hoxha's speech to the congress of the Albanian Workers' Party last week. But although the "deepening of the technical scientific revolution" has encouraged teaching and research, practice lags behind precept. Mr Hoxha said that the most obvious need is for a mechanism for the gradual transfer of innovation on a "wider front" aimed at the "radical" transformation of technology and production.

Mr Hoxha's criticism came in a speech praising the achievements of Albania's system of education, scientific education in particular. He drew particular attention to Albanian achievements in hydroelectric and railway engineering, the sinking of deep wells, geological prospecting, stock-breeding and the machine tool industry. He emphasized that these had been accomplished by the Albanian people "relying completely on their own forces" — a justification of the country's long standing isolation policy. Although the Academy of Sciences is still the major centre for scientific research in Albania, Mr Hoxha said that the Committee for Science and Technology set up this year was an important instrument for the "better direction and organization" of science.

The targets for the Albanian 1981–85 five-year plan are more ambitious than in any previous quinquennium. Industry will receive some 46 per cent of the total investment budget, with special emphasis on mining and energy resources. Oil extraction is expected to rise by some 60 per cent, coal by 48 per cent and that of proved mineral resources (chromium, copper and iron nickel) from 30 to 200 per cent. The chemical industry will be considerably expanded, with an expected rise in production of some 65 per cent by 1985.

Mr Hoxha was at pains to say that these targets are "scientifically based and fully achievable". Furthermore, to provide the necessary personnel, special attention will be given to higher education. Student admissions during the next five years will rise by 45 per cent, new courses will be introduced and there will be a considerable expansion of postgraduate courses. Publication of "political, scientific, technical and artistic" books will rise by one million copies over the previous quinquennium and educational cinema, radio and television will be expanded. **Vera Rich**

Hoyle on evolution

The serious part of the Kellogg symposium provided Sir Fred Hoyle with an opportunity for a moderate (and self-critical) statement of his case for disbelieving conventional views about the evolution of the Universe, the "big bang" among them. Hoyle has been associated with the Kellogg laboratory since his collaboration in the mid-1950s with W.A. Fowler and the two Burbidges (Margaret and Geoffrey), now known as the gang of four, on the problem of nucleogenesis.

Hoyle said last week that, although content in the mid-1960s to give the supposed connection between the microwave background radiation and the big bang a "good run for its money", he had now lost patience with this approach. Two of his reasons involve the origin of life — the calculated time since the origin of the Universe of 10,000 million years or so is not enough to account for the evolution of living forms, while adiabatic expansion of the Universe would have been inimical to the evolution of highly ordered forms. But Hoyle also said that new evidence in support of the big-bang hypothesis was emerging only slowly. Yet "when people are on the right track, new facts emerge quickly". Hoyle said

he would change his view if it turned out that neutrinos have a mass of between 20 and 30 electron volts.

The essence of his argument last week was that the information content of the higher forms of life is represented by the number $10^{40,000}$ — representing the specificity with which some 2,000 genes, each of which might be chosen from 10^{20} nucleotide sequences of the appropriate length, might be defined. Evolutionary processes would, Hoyle said, require several Hubble times to yield such a result. The chance that higher life forms might have emerged in this way is comparable with the chance that "a tornado sweeping through a junk-yard might assemble a Boeing 747 from the materials therein".

Hoyle acknowledged that steady-state theories of cosmologies, of which he was one of the chief exponents in the 1950s, are not now tenable because of the evidence for evolutionary galactic and stellar processes. But the big-bang view is similarly not tenable because of the way in which it implies the degradation of information. Of adherents of biological evolution, Hoyle said he was at a loss to understand "biologists' widespread compulsion to deny what seems to me to be obvious".