

review the activities of foreign firms in Britain. Apart from that, he suggests that the Government should simply encourage British industry to become more competitive.

## ENVIRONMENT

### Power Station Pollution

FEARS of creeping contamination of the environment by waste products from nuclear power stations have so far proved to be unfounded. According to a handbook published recently by the International Atomic Energy Agency (*Management of Radioactive Wastes at Nuclear Power Plants*, IAEA, £2 10s), the performance of the waste management facilities has been "excellent". "In no case has there occurred any exposure in the plant environs which has even approached, let alone exceeded, the recommendations of the International Committee on Radiological Protection", the report claims. It should be possible, given the same care in future plant design, to maintain this good record. The report does not, however, envisage any radical change in waste management, apart from relatively minor engineering modifications of existing systems, and it unfortunately does not attempt to guess how wastes from breeder reactors may be handled. These will present new problems, like learning how to deal with contaminated liquid metal coolants.

Apart from these anodyne conclusions, the IAEA report publishes four reviews, of waste management in Canada, France, the United Kingdom and the United States. These echo the general air of cheerful confidence, though the United States report by Morton J. Goldman of NUS Corporation of Washington does point to two areas which may pose problems in the future—the release of tritium from light water cooled reactors, and the possible contamination of the secondary water in pressurized water reactors by leaking steam generator tubes. The difficulty with tritium, which is a long half-life nucleide, is that it is hard to separate from other waste materials. But it is only likely to be a problem on "dry" sites where the cooling water is recirculated through cooling towers. In these circumstances, Mr Goldman says, it is conceivable that the tritium concentration could reach unacceptable levels. Finally, he says that steam generator leaks have occurred in most, if not all, operating PWRs, releasing contaminants into the secondary water, which is supposed to be perfectly clean. This could impose a shut-down of the station, "because of an otherwise relatively minor leak", according to Mr Goldman, unless there were facilities for decontaminating the secondary water. Such facilities, he says, may well be included in future designs.

Meanwhile, two American engineers have published an equally soothing report on the subject of so-called "thermal pollution" from thermal or nuclear stations. Wesley O. Pipes, professor of civil engineering at Northwestern University, and L. P. Beer, previously a senior staff engineer with Consolidated Edison, writing in *Electrical World* (February 10, 1969), say that concern about thermal pollution has been exaggerated. This conclusion is derived from a study of a thermal power station at Waukegan, Illinois, which has been discharging 760,000 gallons of warm water into Lake Michigan every minute for the last forty years.

Con Ed hopes to build a nuclear plant at Zion, seven miles from Waukegan, which would treble the amount of warm water being pumped into this part of the lake, which is probably why the survey was undertaken. The water from the thermal plant was at 57° F, 11° F above the ambient, but Pipes and Beer could find no evidence of environmental damage. No temperature difference could be detected 3,000 ft from shore, and the hot water had not affected the water chemistry in any significant way. Bottom living organisms vital in the food chain of fish had not been eliminated, and trout and Cobo salmon, even near the outlet, had suffered no apparent shock. Professor Pipes said that the combined heat inputs from the two power stations would raise the average water temperature by less than 0.1° F during one summer. "This increase", he added rather surprisingly, "would be nullified during the following winter". The Lake Michigan survey produced results similar to those reached by the Tennessee Valley Authority, which undertook surveys in lakes and rivers near TVA power stations. "Personally I am much more alarmed over organic pollution from sewage and from oil pollution", added Professor Pipes. "Oil pumped into Lake Michigan with the bilge from lake boats does a great deal more damage to lake life than any possible thermal damage." With that, even the most ardent conservationists would probably agree.

## COMMUNICATIONS

### Discussing INTEL SAT

It is interesting, and perhaps significant, that the Soviet Union has sent a delegation with observer status to the current Washington conference directed to drawing up a permanent agreement on INTEL SAT, the international telecommunications satellite network. A total of sixty-three nations round the world have joined in the 5-year interim phase of INTEL SAT which ends this year, but the Soviet Union is not one of them. All members of the ITU (International Telecommunications Union) are entitled to attend as observers, however. In the Soviet communiqué announcing the attendance of its delegation at the Washington meeting, it was stressed that the country had offered to provide an international system "open to all nations" (*Inter-spunik*) at the Vienna conference on the peaceful uses of space last August. Is more going to be heard of this proposal at Washington? There is plenty of time for such developments. The meeting opened on February 24 and the first session is due to run for a month. Only the Americans show any genuine confidence that all the business can be concluded in one session. It is more generally anticipated that a second session will be necessary, preceded by a pause for delegations to return home and confer with their governments. So far the official head of the British delegation, Mr P. F. Hancock of the Foreign Office, has not put in an appearance at the Washington meeting but is being held in reserve for the more crucial stages ahead. So far the official opening speeches have been disposed of, and a series of working parties set up for detailed consideration of specific points.

The main points at issue are:

(1) Should the international network be "governed" in the same manner as at present under the Interim Agreement, which provides the US with more than

50 per cent of the voting power? (Most of the European member countries say no.)

(2) Supposing a modified version of the present organization is accepted, should the American commercial company, COMSAT, continue to act as international manager to an international organization? Again, this is widely held to be anomalous and, by many, invidious, too—but a clear cut alternative may not emerge immediately.

(3) Should INTELSAT take navigational, meteorological, earth resource and other "service" satellites under its wing, in addition to the public telecommunications links for which it was created? There is, too, the controversial question of whether US launchings will be available for foreign operational satellites of any kind, and on this hangs the independent launcher argument.

(4) The distribution of work contracts under the Interim Agreement has not been ideal—at least in the eyes of technologically competent nations other than the US. (European countries have contributed something like 30 per cent of INTELSAT funds so far and gained only 4 per cent of the contracts.) A formula that is fair to everyone, without jeopardizing the sound principle conveyed in article 10 of the Interim Agreement that contracts should be placed with the "cheapest, best and most timely" bidders, will be hard to devise. This item may take up a good deal of time.

It is perhaps worth remarking that no announcement of the start of the conference or prospectus of its objectives has appeared in this country from any official source apart from the Soviet news agency. There are few areas which are going to exercise so profound an influence on the texture of life as the revolution in long range communications for which this international meeting will provide the programme.

## NUTRITION

### Can Asians digest Lactose?

THE ability of the Asian bowel to digest lactose has been a topic in the columns of *Nature* for some time now. Two Australian doctors, A. E. Davis and T. Bolin, broached the subject by describing a condition of lactose intolerance in some Asian students resident in Australia (*Nature*, 216, 1244; 1967). When fed with 80 grams of lactose, the Asians, but not the Caucasian controls, developed abdominal pains and diarrhoea, while the relatively small changes in their blood sugar levels indicated a deficiency in intestinal lactase.

The finding has obvious relevance to food aid programmes for Asia, which rely heavily on milk products rich in lactose of which there is a surplus in the Western world. Prophecies of doom were somewhat damped by W. A. McGillivray, a scientist at the New Zealand Dairy Research Institute (*Nature*, 219, 615; 1969). Dr McGillivray made two points: first, all human babies have a supply of lactase. The lactase of their mothers' milk is the only carbohydrate source for most of them. The disappearance of lactase in adult Asians may be an adaptive change, subject to reversal if the Asians had a consistent dietary supply of lactase in their adult life. Secondly, 80 grams is a large dose, and the daily amount of lactase recommended in aid schemes is about one-sixth of this.

Some Thai doctors made the next contribution;

G. Flatz and his colleagues at the University of Chiang Mai showed that lactose intolerance was widespread in Thai adults, even among dairy workers who had been consuming milk products for years (*Nature*, 221, 758; 1969). Dr Flatz set the maximum safe daily dose of lactose at 14 grams, the amount in half a pint of milk. But the central point remains: if adult Asians lack the enzyme lactase, and if, as seems to be the case, this enzyme lack is irreversible, then doubt is cast on the wisdom of emphasizing milk products in aid programmes, for the lactose content of this food will have no nutritive value.

This last point was tackled this week by Dr I. L. Hepner, the editor of *Process Biochemistry*. He pointed out to *Nature* that the American dairy industry has for years been treating milk with lactase, to convert the lactose disaccharide to the much sweeter mixture, galactose plus glucose. The Americans use the process to increase the sweetness of ice cream and chocolate, without recourse to the relatively costly sucrose. Microbial preparations of lactase are quite cheap, and Dr Hepner argues that the process could easily be applied on a mammoth scale to all the Western dairy surplus destined for food aid. Dr Hepner's comment was that "a little more knowledge of current practices in food technology would do no harm to researchers in nutrition".

## STORAGE RINGS

### Planning Experiments at CERN

CONSTRUCTION work on the intersecting storage rings (ISR) at CERN has now passed the scheduled half way mark, and, barring any major disasters, the proton beams should undergo their first collisions some time in 1971. High energy physicists are already arguing about the suitability of different experiments to the ISR conditions, and Professor Gerard K. O'Neill, of Princeton University, devoted the first of two special lectures on the CERN storage rings, given at University College London, last week, to the factors which affect the choice of experiments and to how physicists are trying to resolve this choice.

Table 1. PARAMETERS OF THE INTERSECTING STORAGE RINGS

Circumference	943 metres
Intersection angle of two beams	15 degrees
Maximum energy of each beam	28 GeV
Total centre of mass energy	54 GeV
Equivalent laboratory energy	1500 GeV
Interaction rate	$1.6 \times 10^5/s$
Momentum spread	2 per cent
Beam current	20 A
No. of interaction regions	8

The principal parameters of the storage rings are given in the table. The interaction energy of the two 28 GeV proton beams in the laboratory frame of reference is 1,500–1,700 GeV, or about sixty times greater than that produced on the proton synchrotron. The existence of this huge energy opens up the way—at least in principle—for investigating two of the most challenging problems currently facing nuclear physicists, namely the existence of the hypothetical particle, the quark, and the possible existence of an inter-