

annual grant of \$4 million, to start in April 1970 and to go on for five years in the first instance. In addition, the group recommends that support for Canadian user groups should be increased from about \$1 million in 1969-70 to at least \$2 million in 1974-75.

The report argues that particle physics is important to Canada for "cultural, educational, scientific and technological" reasons. But the construction of a Canadian machine would not be sensible, for the cost of a machine large enough to be scientifically interesting would be excessive in view of the relatively small number of high energy physicists in Canada. It would be much better, the report says, to take advantage of the fact that the United States is already launched on the Batavia machine, and offer to join in the construction, equipment and operation of the accelerator. This would be better than the suggestion, previously made, that Canada should simply supply a large item of experimental equipment. What the report envisages instead is "direct participation" in the building of the machine, turning the National Accelerator into an international laboratory rather than a national laboratory.

The most effective mechanism for such participation, the report says, would be the formation of a Canadian Universities Research Association, forming a relationship with NAL much like that already enjoyed by URA. The Canadian contribution of \$4 million a year would be held in Canada, at the disposal of the director of NAL, and this, the report implies, would be a real incentive for NAL to spend the Canadian contribution in Canada. The amount involved is, however, small in comparison with the cost of the 200 GeV machine, which will cost \$250 million to build, together with \$60 million for associated experimental equipment, and another \$60 million a year to run. With money like this at stake, the Canadian contribution is small, but the group may well have made the canny calculation that it is all the Government is likely to provide. A tight budget in Canada has been followed this week by allegations that public expenditure is already out of control again, and the Government is unlikely to look kindly on new ways of spending its money. But the cancellation of Canada's intense neutron generator several months ago has left particle physicists in a militant mood, and the Government may come under considerable pressure to adopt the group's recommendations.

POLLUTION

Oil Leak in California

by a Special Correspondent recently in Santa Barbara

THE offshore oil well in the Santa Barbara channel which became uncontrollable on January 28, 1969, had released a large quantity of crude oil by the time it was brought under control on February 8. After that, although minor seepages took place in the area of the well, they were probably less in amount than the natural seepages normal for the region. The oil released subsequently polluted around 30 miles of coastline. It is impossible to estimate just how much oil was released up to February 8, but it seems reasonable to estimate that nearly 1,000 tons of oil have arrived onshore, that is, that the pollution was very roughly an order of magnitude less than that suffered

by Cornwall and Brittany as a result of the wreck of the Torrey Canyon.

Great efforts were made by the oil company concerned, in cooperation with State and Federal authorities concerned with pollution, under the local coast guard commander, to limit the pollution by setting booms around the drilling platform, and by spraying the slick with water soluble dispersant. Because of poor weather, these operations were unsuccessful, and much oil reached the shore. Harbours and sloughs (small estuaries) had, however, been boomed, for the most part successfully; only at Santa Barbara was oil driven into the harbour by an onshore wind.

Cleaning operations so far have been directed towards the harbour at Santa Barbara, and the sandy beaches nearby—on the whole with conspicuous success. The main method adopted has been to lay straw on the beaches at low tide, and to spread it on the oil slicks, and then to clear the oil-soaked straw by raking and with bulldozers. One problem has been the disposal of quantities of oil-soaked straw, which make large piles on the beaches, for there are fears of contamination of land water if it is dumped inland, and there are strict air pollution regulations which prevent burning of the straw in the open. No attention has yet been paid to the rocky areas of lesser amenity value, apart from the rocks inside Santa Barbara harbour, where high pressure warm water hosing has been used on some of the rocks.

Except for the water soluble dispersant used to treat the oil slicks at sea, chemical cleansing or dispersant materials have not been used, and the important biological consequences of "detergents" on the shore (exemplified by their use during the shore treatment in Cornwall in 1967) have been avoided.

In the short term, the group of animals and plants most affected has been the seabirds, several thousand of which have been brought in to cleansing stations. In many places, the fauna of the rocky areas have been coated with oil. These include limpets (*Acmaea* spp, *Lottia*); barnacles (*Pollicipes*, *Balanus glandula* and *Cthalamus fissus*), mussels (*Mytilus* spp) and chitons (*Mopalia* sp). But these forms do not seem to have been greatly affected. It seems probable that if the rocky areas are not treated with toxic chemicals, natural processes of oil weathering and bacterial degradation, combined with the effects of grazing forms (now very obvious in Brittany) will in time cleanse much of the affected areas. On the sandy beaches, which are highly mobile, fresh sand has already covered layers of oil-soaked straw in several places, so that sections through the beach reveal layers of oil/straw mixture within it. The normal drift line heaps of kelp (*Macrocystis*) are coated with oil, but it too early to say whether this will interfere with their normal breakdown by crustacean herbivores, and thus provide an interruption in the food chain of the sandy beaches. Investigations of the short term and long term effects of the pollution are already under way (fortunately the ecology of the shore, and the normal plankton distribution of the channel are well known from previous studies); the results of these studies will provide a most interesting comparison with those made as a result of the Torrey Canyon pollution, for it seems that they will deal with the effects of crude oil alone, rather than with the effects of crude oil and detergent.