FROM BRITAIN

Fusion Lab Fund Cut

The long-feared cutback at Culham, Britain's plasma physics and nuclear fusion laboratory, was announced in Parliament by Anthony Wedgwood Benn, Minister of Technology. The laboratory's present annual outlay of about $11 million will be cut by 10 percent a year over the next five years.

Benn told MPs, "In so advanced a technology as this, circumstances can change rapidly. I have therefore agreed that the Atomic Energy Authority shall keep the situation under review and that in any event there should be a re-examination in five years' time."

Viewed as research in an area of fundamental physics, the work at Culham may not be too seriously affected by the cut, though there is the risk of loss of first-class scientists to American laboratories. A top AEA scientist thinks the cutback not unreasonable, but points out that every good man at Culham had received at least three offers from the U.S.

The decision seems to underscore the view that the prospect of harnessing nuclear fusion remains remote, while in Britain especially work on the fast reactor has progressed very satisfactorily. Even if a sustained fusion reaction were shown to be possible, it may at this stage be difficult to justify on economic grounds a crash program to develop fusion reactors.

In view of this, it seems likely that Culham's role in basic science will be recognized by transferring the laboratory to the Science Research Council. Culham employes number about 900 persons. *David Fishlock*

Terrifying Ineptitude

A government tribunal appointed to inquire into the disaster at Aberfan, a Welch coal-mining village, on Oct. 21 last year, when pit waste partially engulfed the village, killing 144 persons, mostly children, puts the blame wholly upon the state-owned National Coal Board.

At 9:15 a.m. the report states, "many thousands of tons of colliery waste swept swiftly and with a jet-like roar down the side of the Merthyr Mountain which forms the western flank of the coal-mining village. This massive breakaway from a vast tip (dump). . . . engulfed and destroyed a school and 18 houses and damaged another school and other dwellings in the village before its onward flow substantially ceased."

The report describes events preceding the disaster as "a terrifying tale of bungling ineptitude by many men charged with tasks for which they were totally unfitted, of failure to heed clear warnings, and of total lack of direction from above."

In support of its inquiries the tribunal set in train a series of scientific investigations under Prof. A. W. Bishop of Imperial College, London. They found that water had contributed importantly to the events of that morning, in four principal ways. First, water from a spring beneath the waste tip caused "back-sapping"—defined by Prof. Bishop as the removal of material from the toe of the tip, leading to intermittent slips of progressively increasing size.

Second, water under pressure at the base of the tip acted "much as a hydraulic jack," reducing the effective stresses in the fill and initiating a sheer displacement.

Third, water filling (or almost so) the voids of the loose fill of the tip and covering the mountainside below made the wastes susceptible to a catastrophic flow slide "since a shear displacement or shock wave could result in the transfer of most of the load on to the relatively incompressible water in the voids, thus reducing the frictional strength to a very low value."

Finally, water liberated by the slip and consequent flow slide caused a "mud run" of tip rubbish. Altogether, slippage was estimated by Prof. Bishop at 150,00 cubic yards. At the time of the disaster the tip had reached a height of 111 feet and was estimated to contain about 297,000 cubic yards of waste.

One of the recommendations of the tribunal was that managers and surveyors should as soon as possible be made aware of the rudiments of soil mechanics and ground-water conditions, and that their statutory qualifications should in future include some acquaintance with soil mechanics and hydrogeology.

FROM MEXICO

Sewers 300 Feet Down

Mexico City, plagued by constant shifting of the subsoil, which disrupts the removal of waste waters and causes regular flooding of city streets, is working on an ambitious project to eliminate flooding as well as nauseating odors.

Sandhogs are working on 40 shafts at key city points. These will link up with future deep tunnels that will cross the city valley floor, removing waste products without odor.

The new underground sewage system is being planned at a depth of 300 feet. City authorities believe that when completed, they will eliminate a threat to the city's health.

Digging of main shafts proceeds at a rate of approximately 33 feet a day, with dynamite detonated from top of shaft. Sandhogs then move in, loading loose dirt and rocks into huge buckets, clearing the shaft for further explosions.

Contractors claim all possible security measures have been taken, with cement and steel casing put up to prevent cave-ins during the around-the-clock work shifts. A total of 160 buckets of debris is removed every 24 hours.

"It's hot and dusty at the bottom of the shaft," said one dirt-encrusted worker, "but you get used to it.

"The pay is good, and all of us are heavily insured. And we have our union representative constantly on hand so workers can check on policies before going into the hell hole." *Emil Zubryn*

FROM AUSTRALIA

Solar Stills for Sheep

The possibility of distilled water for livestock, using solar-powered desalination equipment, has been suggested by the Federal Government's Commonwealth Scientific and Industrial Research Organisation.

It could mean considerably heavier stocking in arid parts of the Australian inland, but economic evaluation of the use of desalted water appears to lag behind the technical progress, according to the latest issue of RURAL RESEARCH IN THE CSIRO.

Solar distillation offers the best immediate hope for providing drinking water for livestock in many pastoral areas. Costs of this method had been dropping appreciably—one estimate suggested they were now one-fifth the cost of 10 years ago—and research by the CSIRO Division of Mechanical Engineering, which developed low-cost stills, is reducing them further.

In solar distillation, energy from the sun evaporates saline water moving slowly along a gently sloping trough. The water vapor condenses on the underside of the glass roof enclosing the trough and trickles down into a separate trough, provididng very pure water for human or stock consumption.

The more efficient stills now produce fresh water for $3 to $4 per 1,000 gallons. This compares with 20 to 25 cents per 1,000 gallons paid by the consumer for metropolitan water in Australia and around 3 cents (excluding Government payments for dams

(*see p. 213*)

(Continued from p. 204)

and other major works) for irrigation water in the main irrigation districts.

However, it is against the more expensive stored rain or bore water, paid for entirely by the farmer, that desalting has to compete. Solar stills suitable for watering livestock need to produce between 200 and 2,000 gallons a day if they are to be practical for use in the field. Stills already built span this range. *W. A. Scholes*

FROM U.S.S.R.

Resins in the Mines

Plastic reinforced with fiberglass has lately come into use in the Soviet mining industry as a substitute for timber supports in mines. High-strength beams are made of glass and synthetic polyester resins, a combination that is both non-corroding and fire-proof. They are manufactured by the Lisachansk chemical works in Donbas.

Polyester resin is also applied as a protective coating to reinforced concrete structures, for concrete is subject to rapid deterioration from waters containing acids and salts.

Pipes made of fiberglass and polyester resin are replacing metal pipes in the sinking of mine shafts by the freezing method, which is used when the soil is wet and sandy. In this process, a low-temperature salt solution, or brine, is pumped through polyester pipes into the walls of the shaft, freezing the sand and water into a solid icy armor two to four meters thick.

Synthetic resins have also helped mine builders in developing entirely new methods of bringing watery sands under control. One method is simply the pumping of resin into the sand. Since it does not mix with water, the resin acts as a kind of liquid "piston", forcing the water out of the tiniest pores and cracks. Another employs formaldehyde resin to glue the shifting particles into a solid mass. Within 70 minutes after this resin and its hardeners have been pumped into the ground, it is as hard as concrete.

Another resin, epoxy, makes it possible to glue together underground reinforced concrete structures. Epoxy is best used in combination with another resin, such as furan, to reduce its viscosity. To this paste can be added sand, graphite and soot, to make the material less responsive to temperature change. One can so choose the ratio of these additives that the parameters of the material will vary according to temperature exactly as concrete does. Such a joint is stronger than the material being glued together. And the paste can be used to bind wet as well as dry concrete. *E. S. Gruzinov*