European nuclear fusion

Torus takes summer break

EUROPE's collaborative experiment in nuclear fusion, the Joint European Torus (JET), produced "real plasma" for the first time last week — and was then shut down for August. The machine has been operating since 24 June at the site alongside the Culham Laboratory of the UK Atomic Energy Authority in Oxfordshire, England. Last week, the machine produced a current of 0.6 MA in the D-shaped torus as a pulse lasting for a quarter of a second.

This, however, is rather less than the 1 MA current that had been hoped for "One month was just too short", one JET physicist said last week. Now the whole experiment will have to wait while the electricity utility, the South-Western Electricity Board, upgrades a circuit-breaker on the power line supplying Culham. The board says that the problem has not been caused by JET but by the need to modify throughout the United Kingdom all circuit breakers of the type used for linking two power stations to one customer.

The August shut-down had been planned for some time, but it is frustrating for the JET team. Most of the past month has been spent battling with impurities, the high-atomic number ions derived largely from the walls, which radiate energy and which thus reduce the conductance of the plasma. The walls had been baked at 200–300°C and subjected to glow-discharge for 250 hours, and it seemed that the machine was "cleaning up well" just before shutdown.

Earlier, a number of technical problems had delayed the operation of JET. Heating coils for the instrument ports in the vacuum chamber were delivered late, with the result that most runs have been carried out with cold ports, which have invited wayward condensation of impurities. Nevertheless there is confidence that JET will reach 4–5 MA in a few months' time, perhaps by the end of the year.

The goals are now to finish cleaning up JET when it comes on line again on 12 September and to investigate the control of the unique JET D-shaped plasmas. (The ring is like a ring-doughnut whose cross-section is a D.) Then successive levels of diagnostics — plasma measurement systems — will be tested, relevant software developed and the functioning of the plasma limiters (which stop the high-temperature plasma hitting and burning the walls) checked. Fuel injection will be investigated.

By mid-1984, JET should be ready to move out of this "phase I" into the 18-month "phase II", where successive levels of external heating of the plasma up to 5 MW thermal, using neutral beams and radio-frequency heating, will be tried. This will be a critical time: the neutral beam heating "pushes the available technology to the limit" while the antennae needed to radiate the radio-frequency energy into the plasma "are an area of uncertainty", according to a JET physicist. The extra heating is believed to be essential to push a deuterium-tritium plasma up to the 10 keV temperatures (and the 2-4 $\times$ 10^{20} $m^{-3}s$ density times confinement time) needed for a self-sustaining fusion reaction.

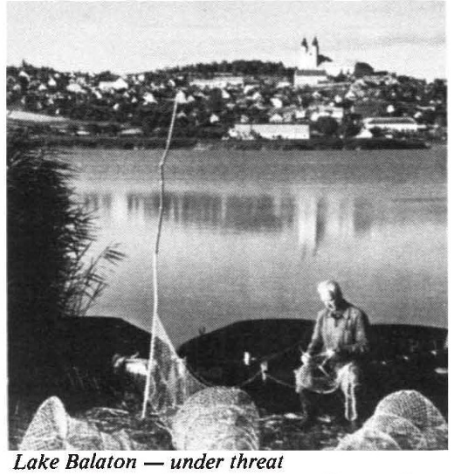
Phase III (another 2 years, taking the project to the end of 1987) should see more heating (up to 19 MW), and a decision on whether D-T ignition conditions are likely to be reached in the plasma core, and thus whether to proceed to D-T operation. Phase IV in 1988 would see D-T operation and ignition, leading to alpha-particle production and heating and such neutron activation of the apparatus that the experiment would finally be abandoned — as, of course, a success. **Robert Walgate**

Hungarian environment

Belated help for teachers

A NEW subject — environmental education and awareness — will make its appearance in the syllabuses of Hungarian teachers' training colleges in September. The course — which will include a compulsory examination — is part of a major drive to heighten environmental awareness in the whole Hungarian nation. According to the National Authority for Environmental Protection and Nature Conservation — Hungary's supreme coordinating body on environmental matters — considerable progress has already been made but a closer look at the situation suggests that much remains to be done.

To begin with, it is somewhat surprising that only now is a teachers' course being introduced. since environmental education



Lake Balaton — under threat

was introduced in primary and secondary schools by the syllabus reforms of 1972. In 1974, a special Commission on Environmental Education was established, while in 1976, the Act on Protection of the Human Environment stressed that citizens should be made aware of the tasks and requirements of environmental protection by means of schooling, training, public education and information campaigns.

Moreover, in spite of the 1972 reforms, one important sector of secondary education still has not been fully brought into the environmental network — the vocational training schools for the 14–18 year olds, which are the main source of future skilled workers in industry and agriculture.

There is some doubt, too, about the extent of public awareness of the environmental issues. Hungary's classic environmental problem is the eutrophication of Lake Balaton, the major water resort of Central Europe, which caused considerable concern in the mid-1970s and necessitated careful monitoring of fertilizers in the surrounding counties of Zala, Veszprem and Somogy. With fertilizers, by a logical association of ideas, went plant protection chemicals, the more potent types of which are not permitted south of Highway 61 on the northern shore of the lake.

Less obvious pollutants, such as acid rain, or the emission of hydrogen fluoride from an aluminium works, still attract little attention. Last month, Dr Bruno Straub, the government's leading adviser on environmental matters, appeared on a special television "write-in" programme, answering viewers' letters on environmental topics. Virtually all the questions dealt with the more apparent forms of pollution. If it is invisible and does not smell, it seems, the Hungarian public does not easily recognize the menace. **Vera Rich**

Estonian on trial

AN Estonian physicist, Dr Johannes Hirt, who in 1962 was awarded a Lenin Prize for research in construction technology, could face a death sentence for "embezzling state property on an especially large scale". Details have just reached the West of the trial which opened on 21 March and which promises to be one of the longest-running events in Soviet Estonian legal history.

Dr Hirt, who was managing director of the "Desintegrator" Construction Technology Bureau in Tallinn, is charged, together with five of his employees, with having defrauded the state of 1.2 million rubles. On another count, he and six employees are charged with giving bribes. On all 18 counts of the indictment, Dr Hirt protests his innocence and maintains that the whole trial is based on "envy and intrigue". He does, however, acknowledge that he is the author of several *samizdat* texts confiscated during a police search of his home. The indictment on this charge, however, has been separated from the trial now under way. Vera Rich

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