who applied the highest standards to himself and tried, successfully, to live up to them, but took the foibles of his environment smilingly in his stride.

Among Fraenkel's hobbies were mountaineering and swimming, both of which he pursued until his last days. Having served during the First World War as a meteorologist with the German Army, he continued to remain interested in the field for the rest of his life.

Prof. Fraenkel is survived by his wife and four children.

Y. BAR-HILLEL

NEWS AND VIEWS

Acceleration at the Rutherford

THE £11 million 7·2 GeV proton synchrotron at the Rutherford High Energy Laboratory at Chilton, Berkshire, has at last begun to resemble the white elephant which is the Thai symbol of prosperity and good luck. Scarcely 10 months after *Nimrod* was opened in April, 1964, disintegration of the power supply motors caused a 10-month halt for repairs that were only completed 5 months ago. Now the operation of the laboratory is only interrupted every 3 weeks when ultrasonic tests are made in order to assure the laboratory that the stable door at least is guarded.

In practice, *Nimrod* has been running for 80 per cent of the time allocated to experiments—60 per cent of the total clock time—the other 20 per cent being lost in periodic breakdowns lasting from 30 min to a few hours. At this rate, Dr. Thomas Pickavance, the director of the laboratory, thinks it will be economic to run for another 15–20 years. Considering that the machine is in nearly continuous operation, Dr. Pickavance is pleased with the present level and, in fact, hopes within the year to equal the 90 per cent record at CERN—which, according to him, has had much longer breakdowns. Dr. Pickavance's colleagues, such as Dr. G. H. Strafford, head of the High-Energy Physics Division, believe that brief interruptions do not affect most experiments, and that increased beam extraction and greater beam intensity would be more important improvements. On another scale the laboratory hopes soon to circumvent, by introducing portable units, the bottleneck caused when an experiment is dismantled. Already twice as many experiments have been submitted as there is floor space available; the waiting period is often one to two years, though much of this is profitably used for preparation. Twelve to fifteen university physics departments make regular use of *Nimrod*, though only Oxford, Cambridge, and London are convenient for commuting.

Pickavance believes that as larger machines are built small ones such as *Nimrod* will not be put out of business; there is still a great deal of work to do and a large number of machines will be needed to do it.

Nimrod's future role will depend largely on international plans; Pickavance mentioned that sites for a 300 GeV European accelerator have been considered but nothing definite decided. The United States is planning a 200 GeV accelerator for early in the 1970s; France and the U.S.S.R. have recently agreed to co-operate on the 70 GeV electron accelerator being built in Serpukhovo by the Russians.

Electrostatic Generator at Oxford

A TANDEM electrostatic machine for 20-MeV protons in coupled operation has been installed in the Nuclear Physics Laboratory, University of Oxford. The system consists of a vertical injector—the pressure vessel of which is 42 ft. long and 13 ft. internal diameter—developed by the Electrostatic Generator Group of the Rutherford High Energy Laboratory, coupled to a horizontal 6-MeV (type E.N.) tandem, of which the generator was provided by High Voltage Engineering Europa of Amersfoort, Holland; the commissioning was carried out by the Oxford Electrostatic Generator Group. In single operation, the injector has delivered microampere beams of negative hydrogen ions at 10·2 MeV, negative oxygen ions at 9·5 MeV and He^{++} at 15·6 MeV, corresponding to 9·7 MeV on the terminal.

In operation, when coupled with the tandem, protons of 20 MeV energy have been delivered on target. The transmission efficiency has varied between 12 per cent and 30 per cent: this is illustrated in the case of hydrogen by 0·25 μamp analysed proton beam for 1·5 μamp of hydrogen negative beam injected into the tandem, and for oxygen by 0·9 μamp of oxygen analysed in the 6+ charge state for 1·3 μamp of negative oxygen injected.

Earthquakes and Buildings

THE book *Earthquake Investigations in the Western United States, 1931–64*, published by the U.S. Department of Commerce, Coast and Geodetic Survey (Publication 41–2), is a notable record of activity in the fields of earthquake recording and engineering and seismology.

Some of the material was first published in 1936 (U.S.C.G.S. Special Publication 201), including papers by R. S. McLean and W. W. Moore, R. R. Martel and the late Frank Neumann. New papers include several on instruments and instrumental studies and on damage studies.

The paper by John A. Blume on "The Building Vibrator" describes three vibrators at present in use, together with the methods of testing. In buildings, the vibrator is securely braced between two columns. A 4 in. × 4 in. strut is placed horizontally between the end of the vibrator and the adjoining column and is screwed tightly into place by means of two large bolts attached to the frame of the machine, or by a jack. To steady the apparatus, ballast is usually placed on skids bolted to the base of the machine. On structures in which there are no columns or walls for bracing, it is necessary to resort to other methods of transmitting the disturbing forces. On the Colorado Street Bridge, the vibrator was held in place mainly by piling a large number of sacks of cement on the skids. For ground shaking tests a heavy wooden framework was constructed to enclose a large vibrator. For horizontal forces, the frame may be jacked between curbs of a roadway, and it may be weighted down for vertical shaking. Resulting vibrations in structures or in the ground are measured by portable seismographs. For buildings a magnification of about 200 may be used, but for dams or on the ground the magnifications may be 1,500 to 10,000.

The tests have included buildings, dams, bridges, rock, and hard and soft ground. In each case, records showing forced vibration have been obtained. The test results indicate that such machines can be used to obtain valuable information that otherwise would be difficult to determine regarding the vibration characteristics of structures. This is especially true when simultaneous timing and recording are available from several sections of the structure. The use of the vibrator enables the positive identification of several of the highest natural periods of vibration in each translational direction of multi-storey buildings, and also the plotting of forced vibration