smaller machine, capable of far higher plasma current densities. The ZT-40, with a minor diameter of 40 cm and a major diameter of 2.3 meters, has a plasma current capacity of 600 kiloamps.

Running at the moment with a plasma current of only 250 kA, the ZT-40 has already attained electron temperatures of 150 eV—extremely modest when compared with tokamaks of the same size, but comparable with the much larger Zeta. Furthermore, Baker is encouraged by the fact that temperatures and quiescent time periods appear to be scaling favorably with increasing plasma current. The longest stable periods of plasma quiescence—8 msec—were achieved in the ZT-40 by augmenting the transformer induction of plasma current with the discharge of a large, slow capacitor bank to make up for losses. The reversed field is sustained well during this extended period, Baker told us.

The reversal of the toroidal field in ZT-40 is at present accomplished by a hybrid technique of programmed and spontaneous reversal referred to as "aided reversal." The group plans to study wholly unaided field reversal in the near future. This would be the ideal mode of operation for an RFP reactor, Baker told us. "But we'll have to see which technique results in the lowest start-up losses."

The proposed British RFX, with dimensions somewhat larger than Zeta, will have a plasma current capacity of 2 megamps—comparable to that of General Atomic's Doublet III—the highest-current tokamak now in operation. Tihiro Ohkawa and his colleagues at General Atomic are also developing a variation on the RFP. Their Ohmic Heating Toroidal Experiment, it is hoped, will produce plasma stabilization equivalent to field reversal by twisting the external field coils into a helical configuration that produces a highly sheared magnetic field, somewhat in the manner of a stellarator (PHYSICS TODAY, August 1980, page 17). The Ohmic Heating Toroidal Experiment began operating in March. Ohkawa told us that it has already achieved quiescent periods of a few milliseconds. —BMS

A tandem mirror in place at MFTF

Testing is scheduled to begin this month on the first of two gargantuan superconducting magnets that will plug the ends of the tandem Mirror Fusion Test Facility at Livermore. When construction of the 375-ton magnet was begun three years ago, it was intended to serve as a single-mirror machine. But in the wake of a successful small-scale tandem-mirror experiment at Livermore, it was decided last year to expand the MFTF into a tandem mirror machine, MFTF-B (PHYSICS TODAY, October 1980, page 17).

In the tandem configuration, a central solenoid 30-meters long will be plugged at each end by a mirror machine. Thus the magnet just completed will require a mate for the other end. Winding of the second magnet will begin at Livermore this Fall.

Each mirror machine has a quadrupole field produced by a pair of "yin-yang" coils, shaped roughly like the outline of a pair of cupped hands. (The reference is to the traditional Chinese symbol signifying the duality of all things.) The maximum field between the coils will be 40 kilogauss.

Our cover this month shows the first yin-yang pair shortly after its completion in May at Livermore, where the superconducting niobium-titanium coils were wound. The massive stainless steel covers were produced by the Chicago Bridge and Iron Company. A welder is seen joining the two covers to enhance the stabilization of the yin-yang shape against the enormous magnetic stresses to which it will be subjected. The steel covers will be festooned with liquid-nitrogen baffles to shield the magnet, operating at a temperature of 4.2 K, against thermal radiation from the walls of the vacuum vessel. The magnet tests will be conducted inside the evacuated vacuum vessel.

The MFTF-B, scheduled for completion in about four years, is intended to reach ion temperatures of 2×10^8 K and a confinement parameter (particle density $\times$ energy confinement time) of about 5×10^{13} sec/cm^3, comparable to what is expected from the generation of large tokamaks now under construction. With a deuterium-tritium plasma, these conditions would suffice for "scientific-breakeven" fusion; but the MFTF-B will employ only hydrogen and deuterium. The purpose of the experiment will be to study plasma confinement and heating in a large tandem-mirror configuration rather than the fusion process itself. The estimated cost of the facility is about $226 million (1980 dollars). —BMS

Chinese-American project studies earthquake motion

Although earthquakes are an all-too-frequent phenomenon, good data on strong ground motion near the epicenters of major earthquakes are scarce. Such data are crucial for understanding the energy-release mechanisms of strong earthquakes. With better understanding of the seismic mechanisms comes the possibility of earthquake prediction, and guidance for earthquake-resistant structural design.

American and Chinese seismologists have recently undertaken a joint venture for extensive measurement of strong earthquake motion in the seismically active Beijing–Tianjing region of northern China. With a $350 000 grant from NSF, an array of about 35 ground-motion measuring instruments will be installed over the next two years in this region, where six major quakes have occurred in the last fifteen years. The NSF Earthquake Hazard Mitigation Program will fund the purchase of the strong-motion measuring instruments, and the Chinese State Seismological Bureau will install and operate the array.

The principal American investigators are Wilfred Iwan (Caltech), David Boore (US Geological Survey) and Taliang Teng (University of Southern California).

The aim of the joint project is to obtain systematic ground-motion data for strong earthquakes. An important feature of the array will be its mobility. In response to seismic events or indications, the individual instruments can be easily uprooted and redeployed. In this way, the mobile array can gather information about earthquakes with different types of fault-break and energy-release patterns under a variety of geological and soil conditions.

Although there have been several accurate predictions of large quakes in China, relatively few strong-motion records have been obtained to date. The Beijing-Tianjing region is among the most seismically active on Earth. The devastating 1976 Tangshan earthquake registered 7.8 on the Richter scale. The scarcity of strong-motion data from China and many other seismically active countries is attributed in part to the unavailability of adequate strong-motion measuring instruments. The 1978 International Workshop on Strong Motion Earthquake Instrumentation Arrays, sponsored by NSF and UNESCO, assigned high priority to cooperative international efforts to install such arrays.

The Workshop selected 28 promising sites throughout the world for the deployment of strong-motion instrument arrays. Since the Workshop, major earthquakes have occurred at or near four of the selected sites—in Japan, Iran, Mexico and Alaska. A number of Chinese seismologists studying past cycles in the Beijing–Tianjing area anticipate an earthquake even larger than the 1976 Tangshan disaster in the near future. □