magma chamber. In addition, the profile contained reflections from what may be the Mohorovičić discontinuity (the Moho), a feature found in refraction studies and commonly interpreted as the boundary between the crust and the upper mantle.

Allan Sanford of the New Mexico Institute of Mining and Technology at Socorro first detected, by means of microearthquake seismology, signs of a magma chamber 18 to 20 kilometers below the surface. This method was used to construct a relatively detailed map of the chamber, but the amount of detail discernible within any particular part of the chamber was largely determined by the distribution and frequency of the microearthquakes. Phinney observes that the COCORP data provide a continuous profile rather than a collection of scattered reflection points which may be several kilometers apart. He believes that preliminary COCORP data provide an indication of layering of the chamber edges.

While providing interesting new details, early results from COCORP have also pointed up the difficulty of correlating results from vertical reflection profiling with those from refraction studies. For example, as the result of refraction studies, the Moho has been defined as the depth at which the velocity of sound changes sharply.

On the basis of COCORP data, Jack Oliver of Cornell University believes that a

Speaking of Science

Neutron Scattering: A New National Facility at Oak Ridge

One experimental technique that blossomed in the 1970's is small-angle neutron scattering. It has proved to be extremely useful for exploring the structure of a wide variety of biological, chemical, and physical entities with characteristic dimensions ranging from about 10 to 1000 angstroms. For American researchers, however, access to the neutron technique has been severely limited because European countries have had far and away the most numerous and best equipped facilities for neutron scattering. It was welcome news for these researchers, then, when the National Science Foundation (NSF) recently announced that the Oak Ridge National Laboratory (ORNL) will receive $1.4 million to be spent over 3 years for the establishment of a National Research Facility for Small-Angle Neutron Scattering.

According to Lewis Nosanow of NSF, an important reason that the award was made to ORNL rather than to one of a half-dozen other competing university and government laboratories was the laboratory's development of elaborate computer programs. These programs will enable users unskilled in the arts of small-angle scattering to carry out experiments with only a few hours training on what will be a largely automated instrument. Some construction will be needed to put the new facility into operation; this is expected to be finished in late 1979. In the meantime, an existing neutron scattering system at ORNL will be available about half of the time to outside users. In addition, a small-angle x-ray scattering system at ORNL will be available about 30 percent of the time as part of the new national facility. Small-angle x-ray scattering is complementary to its neutron cousin because the two structural probes have compensating strengths and weaknesses.

Neutron scattering can be used as a spectroscopic tool (inelastic scattering) to obtain information such as the spectrum of lattice vibrations in a solid. For structural studies, however, the technique works much like x-ray diffraction (elastic scattering). Needed are a source of monochromatic neutrons (that is, neutrons all having the same energy or wavelength), a detector to measure the intensity of the scattered neutrons at different angles relative to the incident beam, and a computerized data system to analyze the scattering patterns.

ORNL will be using its High Flux Isotope Reactor, the most powerful U.S. research reactor, as a source of neutrons with wavelengths near 4.7 angstroms. A position-sensitive proportional wire counter (with an area 70 centimeters by 70 centimeters) designed by Casimir Borkowski and Manfred Kopp of ORNL will be the detector. This detector is regarded as one of the most important features of the facility because of its ability to collect data so rapidly. Among other equipment to be built are a multipurpose sample chamber equipped for low- and high-temperature experiments and for studies at elevated pressures, and a 20-meter long evacuated tube for the scattered neutrons to travel through. The long tube is necessary so that the detector can achieve an angular resolution of the order of 2×10^{-3} radian. Finally, offices and sample preparation rooms will be built in a currently unused area near the reactor.

As with most large facilities, there will be a policy and advisory committee to oversee operation of the laboratory and a program committee to review research proposals and judge them according to their scientific merit. Since NSF and ORNL conceive the neutron scattering facility as a national resource, proposals from biologists, chemists, materials scientists, and physicists from any institution are equally welcome. If demand for time exceeds that available, a likely development at ORNL in the near future, the policy committee may have to establish some system to ensure that all disciplines have an equal opportunity to run experiments, a job that will require some diplomacy. For example, the director of the ORNL facility will be Wallace Koehler, a solid-state physicist, and the assistant director will be Robert Hendricks, a metallurgist. Moreover, ORNL has no tradition of in-house research on biological structures. Thus, one can already guess that biologists, who have found neutron scattering to be a fruitful technique (*Science*, 4 November 1977, p. 481), will be watching the administration of the ORNL facility closely.

As for catching up with the Europeans, Nosanow notes that there are already a half-dozen small-angle neutron scattering centers in France, Germany, and the United Kingdom, with more planned throughout Europe. In the United States, there are small-angle neutron scattering laboratories at Brookhaven National Laboratory (devoted mostly to biological research) and at the National Bureau of Standards (used mainly for polymer research), but these are intended primarily for support of in-house researchers and their collaborators. Thus, for U.S. scientists, it seems to be a matter of matching quantity with quality for the foreseeable future.—ARTHUR L. ROBINSON

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