

detector was in a subbasement, it was effectively shielded by building and earth except for a "window" tilted at an angle of about 40 deg with respect to the zenith.

Using independent electronics and a liquid detector, a second experiment was done in an adjoining room; the detector looked at the same part of the sky as those in the first experiment. After two months running, the signal obtained in two-hour time bins showed a peak 6.1 standard deviations above the mean, but the peak was shifted about 15 deg in zenith angle and was somewhat broader than in the first experiment.

"What kind of neutral particle could be coming from the stars?" Cowan asks. The primary he is observing must be neutral, he says, or it would probably be smeared by magnetic fields. Neutrinos and gammas are the only known stable chargeless particles, and other kinds of neutrals would decay before reaching earth. Cowan does not think he is picking up gammas, since they would cause electron showers, and little if any correlation between star passage and air showers has been found by cosmic-ray physicists.

Cowan's group is doing several new experiments to spot other possible particles being produced and to identify the source of neutral flux. Using a liquid detector they will try to see whether the entering neutral makes a muon right away or first makes a pion that then decays to a muon. Then by adding a gadolinium salt to the liquid they will look for neutrons that might be associated with muon production. They are also looking in greater detail at the muon energy spectra.

A spark-chamber "telescope," 1.3 meters square, recently started running on the ground floor of a campus nun's dormitory. Besides seeing everything the scintillation counter does, the "telescope" shows a spark track of the muon and any other charged particles. Two-dimensional photographs are being taken and Cowan's group is looking for correlations between the direction of muon tracks and points on the celestial sphere.

Three other experiments are under way: (1) A long water-filled slit with

a lab underneath the water, a tube poked up through the water, and a scintillation detector below will act as a transit telescope. (2) Another transit telescope will start running this month, deep in a former Atlas missile site near Plattsburgh, N.Y., to obtain data at a different latitude. (3) A long thin liquid scintillation counter will be built to search for correlations between sidereal time and muons that lie in the detector plane.

Penn State magnet

A 100 000-gauss magnet has been added to the facilities of the Cryogenics Laboratory at The Pennsylvania State University. The magnet will be used to help cool experimental samples by adiabatic demagnetization to temperatures very near absolute zero. (Temperatures as low as 0.00002° K have been reached in work at the Penn State laboratory.)

With the new magnet, cooling will be done by both electronic and nuclear demagnetization. In the electronic case, a sample of paramagnetic material is cooled by liquid helium to about 1° K. Then a magnetic field is applied. When this happens, unpaired electrons in the sample seek to orient themselves in line with the field. In so doing, they give up heat to the refrigerant. Then the magnetic field is turned off, and the electrons try to return to random orientation. If no external heat is applied, the electrons must draw heat from the thermal motions of the sample to return to the random state. The heat they take is given up to the refrigerant, and the sample cools below the refrigerant temperature to a degree that depends on the strength of the field.

Adiabatic demagnetization of nuclei requires stronger fields and lower starting temperatures (about 0.01° K) because of the relative weakness of nuclear magnetization. It also involves a "double demagnetization" in that two magnetic fields are applied to the sample at once, and the heat from both interactions is drained off together. By double demagnetization, Penn State people say, it is possible to reach temperatures as low as a millionth of a degree.

In general, the experimental work will deal with structure and properties of materials in a "relaxed" (supercooled) state. Thermodynamic parameters are of special interest. The laboratory was established in 1933 by John G. Aston, professor of organic chemistry, who has been its director ever since.

New accelerators

The University of Virginia publicly opened its new Accelerator Building on 17 April. Main equipment is a 5.5-MeV Van de Graaff jointly financed by the university and the National Science Foundation. The facility is arranged so that the accelerator can be adapted as a negative-ion injector for a tandem Van de Graaff.

A 120-MeV electron linac is nearing completion at the US Naval Postgraduate School in Monterey, Calif. It has a beam intensity of 20 μ A and gives 2.5 μ sec pulses at a rate of 120 per second. It was financed by the Office of Naval Research and used excess experimental equipment from the linacs at Stanford University.

McMaster University (Hamilton, Ont.) has purchased a 15-MeV tandem Van de Graaff from High Voltage Engineering Corporation. Installation is scheduled for the fall of 1967. Capital for the project comes largely from grants by the National Research Council of Canada and the Province of Ontario.

A contract to design and fabricate a 140-MeV electron linac for Oak Ridge National Laboratory has been awarded to Varian Associates. The machine will produce 1000 pulses per second at a peak current of 15 A. Delivery is expected in 18 months. Money comes from the US Atomic Energy Commission.

At Harwell, the United Kingdom Atomic Energy Agency is commissioning a new 180-cm sector-focused cyclotron. It will be used to accelerate heavy ions (up to about mass 40). Design provides for an internal beam of up to 1 mA of 50-MeV protons (ultimately up to 100 μ A externally) and microampere beams of heavy ions with energies in some cases up to 10 MeV per nucleon. □