new 36-inch infrared telescope of NASA-Ames, which is mounted in a C-141 airplane.

Mariner 10, scheduled for launching on 3 November, will transmit video pictures of the comet in January and February. These images, combined with photos taken at different angles from ground-based equipment, could show the true comet shape and the trajectories of transient structures moving through the tail.

Helium. Some observers will be looking for atomic species never before discovered in comets—such as helium. A spectrograph on Skylab (S082A) is believed sensitive enough in the extreme ultraviolet range to find ionized helium; Richard Tousey of the Naval Research Laboratory is the principal investigator for this experiment. Deuterium will also be sought. Maran explains that Ernst Öpik of the Armagh Observatory, UK, believes helium could be stored as an ice, whereas a more widely held view (introduced by Delsemne and Pol Swings in 1952) is that clathrates (chemical compounds trapped in water snow) in comets may also trap the helium, which leaks out slowly. If the helium cloud exists, it would be larger than the visible head of the comet (less than 5×10^4–1×10^6 km) and smaller than the hydrogen cloud (greater than 10^6 km) in extent, estimates Maran.

Still another group of observations will be made from five sounding rockets to be launched in January from White Sands, New Mexico. Among those sending up experimental packages will be William Fastie (Johns Hopkins), George Lawrence (University of Colorado) and Theodore Stecher (Goddard). —*Marian S. Rothenberg*

Argonne ZGS yields polarized proton beam

A collaboration of physicists and engineers at the Argonne National Laboratory has produced polarized proton beams of 6 GeV, the first polarized beam to be achieved in a synchrotron, says Alan Krisch (University of Michigan). The beam, with a polarization of $(62 \pm 15)\%$ was achieved by using a polarized proton source in conjunction with the Zero Gradient Synchrotron (ZGS).

Krisch and his university colleagues have cooperated with Argonne accelerator staff to install on the ZGS a $225 000 polarized-proton source (acquired from the Auckland Nuclear Accessory Company Ltd, Auckland, New Zealand). The source was installed in June and successfully operated with the ZGS-linac injector to produce a 50-MeV beam having 70% polarization. The beam current was 3–4 microamps. Acceleration to 6 GeV in the ZGS was achieved during July; a beam of 12 GeV is anticipated later this year.

A potential problem in accelerating the polarized beam is the existence of energies where strong depolarizing resonances occur. The strongest resonances between 50 MeV and 6 GeV are believed to be at 3.7 and 4.6 GeV; four more depolarizing resonances are expected between 6 and 12 GeV. To overcome this difficulty, at least up to 6 GeV, a system of pulsed quadrupole magnets was constructed to allow the tune of the ZGS to be changed 12 times each cycle permitting the beam to be passed rapidly through the resonance energies.

Several research groups are expected to utilize this high-energy polarized-proton beam. In general, according to Krisch, the study of pure spin states and spin–spin correlations will be expedited because both the beam and the target can be polarized. Heretofore, information on spin–spin correlations was obtained through triple-scattering experiments. Krisch's group measured total cross sections for the scattering of polarized protons from a polarized proton target at 3.5 GeV. This was accomplished by using 10% of a circulating beam of 3×10^8 protons per pulse. The Argonne and Michigan group in collaboration with St. Louis University physicists will continue work this fall to get a comprehensive set of elastic-scattering differential cross-section measurements.

Another group at Argonne will use an Effective Mass Spectrometer to study baryon resonance production with the polarized beam. A University of Pennsylvania experiment will deal with the asymmetries in inclusive processes, and a University of Chicago group is interested in the polarized-proton beam as a possible good source of polarized hyperons. Such a source could lead to significant new weak-interaction experiments on hyperon decay. —RAS

Neutral currents

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trinos and one-third antineutrinos, with the peak of the spectrum at about 25 GeV. They find that the ratio of non-muon-producing interactions to muon-producing interactions is $(29 \pm 9)\%$, a value consistent with the CERN results.

The NAL experimenters say that the simplest explanation of their result is that neutral currents exist. However, they note that other causes of the effects are possible: there may be contamination of the muon-type neutrinos with electron-type neutrinos; a new particle may be produced, substantially affecting the correction for undetected muons; there may be some novel process resulting from a new type of lepton.

Sources of error. Commenting on the CERN experiment, C. N. Yang (Stony Brook) said that he was convinced that the group has found neutral currents. Leon Lederman (Columbia), on the other hand, felt that neither experiment is yet completely convincing; he is worried about the dangers of the so-called "bandwagon effect."

In the CERN experiment the events, if they are not due to neutral currents, can only be due to neutrons, we were told by Robert Palmer of the CERN team. If these neutrons enter the front of the chamber they would be attenuated as they pass down the chamber. Many events would be seen at the beginning of the chamber and almost none at the end. In contrast with this, the events seen are uniformly distributed down the length. The only other way neutrons could enter the chamber and produce the events is if they were made by neutrinos in the steel that surrounds the chamber. The neutrons so made could then leak in the sides of the chamber and produce events distributed uniformly along the length, as observed. The CERN group estimates the number of events from this source by counting how often they observe a neutrino event making a neutron in the chamber and observe the subsequent interaction of that neutron. From these events they calculate that at most only 20% of their observed events could come from this source. Some experimenters are still worried, however, because the CERN group had to employ a Monte Carlo calculation to obtain this result.

Some experimenters have criticized the NAL experiment because of the difficulty of knowing how to correct for certain muon-producing events that do not go through the muon detector, which is at the end of the array and subtends only a limited solid angle. One way to calculate this number is to assume scaling, that is, to take the low-energy results, and scale them to high energy to find out the angular distribution. A second way to get this number is to use neutrino interactions in part of the iron magnet to determine the muon efficiency.

Theoretical significance. As long as ten years ago, T. D. Lee and C. N. Yang had suggested in their paper on neutrino reactions that one should look for neutral currents. A neutral current occurs in a process where a lepton scatters off another particle, does not change its charge, and a heavy neutral particle is exchanged between the lepton and the particle it scatters from. (An exception to this definition is that you can get a neutral current when electron-