

covered from the land, once the magnet is installed the gondola will be so topheavy that the group would prefer to recover it from water. HAPPE 7/8 successfully demonstrated that they could retrieve the gondola from the Pacific with the help of a big ocean-going derrick.

Experiment. HAPPE 2 is expected to collect about 1000 protons per hour and twice that many electrons.

The experiment will measure the momenta of charged secondary particles produced when cosmic-ray protons strike a lithium-hydride or beryllium target, which covers half the spark-chamber area. Since neutral particles will not be detected, one will get only a rough estimate of the primary proton energy.

Wahlig explained that the experiment will offer the first really high-

energy check on various statistical models, which predict the number of secondaries, their angular distribution and their momentum distribution.

To define its high-energy beam, HAPPE 2 will measure proton and electron spectra. The group will also try to study the flux of particles with high atomic number (light output of the counters is proportional to Z^2), but for heavier particles it will be difficult to correct for the air above the gondola. The high-energy electron spectrum is of great interest because it is expected to be affected by inverse Compton scattering, in which the electrons are scattered by photons in the primordial blackbody radiation.

Future plans. Since the statistical theories are actually for proton-proton interactions, Wahlig noted, one really should have a hydrogen target; so in HAPPE 3 the group plans to put a small hydrogen target above the magnet. Then they can see how many rho mesons or f^0 mesons are produced, and they can study the invariant mass of pairs or triplets of particles, as well as getting statistical properties.

Below the magnet they expect to put a large H_2 target, about two meters long, to study p-p total cross sections. They may also be able to measure p-p elastic scattering, but this will depend on how bad the background is.

The HAPPE flights will search for antimatter in cosmic rays. Alvarez says that if they find just one antihelium particle, the experiment "will have paid for itself." (Such an observation would be strong evidence that some neighboring galaxies are made of antimatter.)

One possibility is to move HAPPE onto a satellite, where statistics of course would improve greatly. The Berkeley group has teamed up with a cosmic-ray group under Wilmot Hess, of the Manned Spacecraft Center, in making a formal proposal for a high-energy cosmic-ray laboratory in one of the Apollo Applications Program (AAP) satellites.

—GBL

More on CP Violation: Experiments Disagree

Last fall many high-energy physicists felt that the phenomenological description of CP violation in K meson decay was at last complete (PHYSICS TODAY, November, page 73). Now the situation is up in the air again. At the Chicago APS meeting, in a special session on K^0 decay, two new experiments

suggest that we still do not know the value of $|\eta_{00}|^2$, the ratio of the two neutral-pion decay rate of K_2^0 to the two-neutral-pion decay rate of K_1^0 .

When experiments at CERN (by Jean-Marc Gaillard and his collaborators) and at the Penn-Princeton accelerator (by James Cronin and his collaborators) were reported early last year, the preliminary value for $|\eta_{00}|$ appeared to rule out Lincoln Wolfenstein's superweak theory, which predicted a value half as great.

One new experiment, reported at the meeting by T. Kamae of Princeton, finds $|\eta_{00}|$ is 2×10^{-3} with error limits of $+0.7 \times 10^{-3}$ and -2×10^{-3} . The other experiment (jointly conducted by the U. of California, Berkeley and the U. of Hawaii), still in extremely preliminary stages, reported by Sherwood Parker, gives $(3.2 \pm 0.6) \times 10^{-3}$ (however, it is too early to estimate systematic errors). Earlier reported values were no smaller than 3.9×10^{-3} . Rumor has it that data from a new CERN bubble-chamber experiment are substantially smaller than last year's preliminary values.

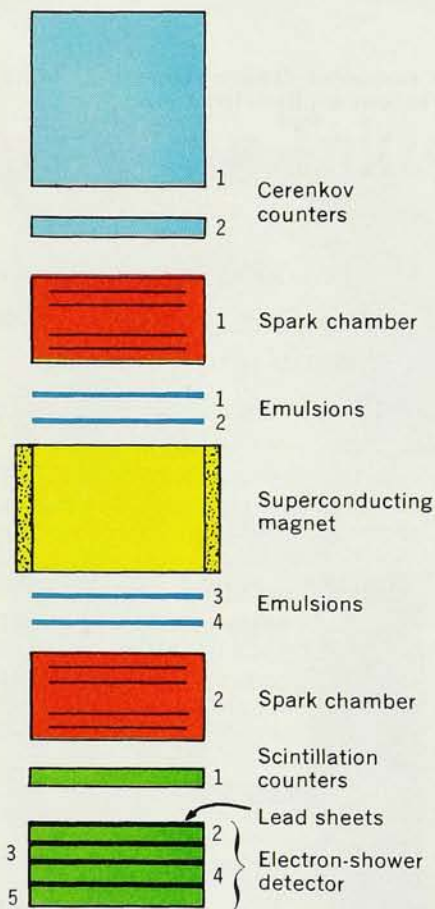
Sentiments expressed at the Chicago meeting include: "It looks good for Wolfenstein again." "I never liked the Wolfenstein theory. It tells us that the only way the superweak force can be observed is in the CP-violating decay of K_2^0 , and that's too frustrating." "The experiments still haven't ruled out the $\Delta S = -\Delta Q$ explanation for CP violation." "Let's wait and see."

Electric Field Suppresses Lambda Point in Helium

By applying a strong electric field to liquid helium Harris A. Notarys of Ford Scientific Laboratory, Newport Beach, Calif., has completely stopped superfluid flow. The only previous way to suppress the superfluid transition temperature T_λ was by applying pressure. Results are reported in *Phys. Rev. Letters* 20, 258 (1968).

The helium flowed through a porous mica sample, 5 microns thick, that had diamond-shaped pores with sides 0.08 micron or 0.16 micron long. Notarys measured flow rate as a function of applied electric field.

For all pores and fields up to 2 MV/cm Notarys found strongly temperature-dependent effects within 15 millidegrees of T_λ . For the larger pores at 1.5 mdeg below T_λ , the superfluid flow was stopped completely by fields greater than 1.2 MV/cm.



DETECTION APPARATUS for HAPPE 2, which will detect cosmic-ray protons with momenta from 100 to 3000 GeV/c. Electron-shower detector tells whether electron or proton triggered Cerenkov counter. 9.5-kG superconducting magnet has open center bore 1 meter in diameter. HAPPE 2 will be launched by balloon in the summer of 1969.