REUNION AT THE CYCLOTRON. G. N. Glasoe (left) and J. R. Dunning revisit the Columbia cyclotron in December 1965.

daytime and Rainwater at night. The machine kept working as a research and teaching instrument until quite recently. In its old age it may have been the world's oldest working cyclotron.

Shortly after the announcement of the transfer of the cyclotron, the university also announced that its Pupin building has been designated a national landmark because of the important events in the recent history of physics that have happened there.

Harold C. Urey was working in Pupin Laboratory when he discovered heavy hydrogen in 1931. On 24 February 1939, during an APS meeting, Niels Bohr and Enrico Fermi lectured on uranium fission in Pupin 301. A week after the speech Leo Szilard and Walter Zinn performed experiments (on the seventh floor of Pupin) from which they concluded that uranium could be an explosive.

In 1940, with a $6000 grant from the Army and Navy, Fermi and a number of collaborators constructed the first "atomic pile," an arrangement of graphite bricks that was used to determine the neutron-absorption cross section of the substance and its possibilities as a moderator of chain reactions. The work was later moved to the University of Chicago, and Fermi went with it.

In 1947 Willis Lamb and Robert Retherford discovered the displacement between the $^2S_{1/2}$ and $^2P_{1/2}$ levels of hydrogen, which is now known as the Lamb shift.

The Pupin building was also the scene of much theoretical work and a number of theoretical announcements including Yukawa's theory of elementary particles (1950) and nonconservation of parity in weak interactions (1957). In all, five Nobel prizes have been awarded for work done in Pupin. They are: I. I. Rabi for nuclear magnetic moments; Polykarp Kusch for anomalous electron magnetic moments (see page 23, this issue); Willis Lamb for the Lamb shift; Charles Townes for the maser; and T. D. Lee for work on nonconservation of parity.

The building was constructed in 1925. It is named for Professor Michael Idvorsky Pupin, a physicist whose inventions were important in the development of long-distance telephone service.

CERN storage rings

A pair of intersecting storage rings will stack 28-BeV protons along the French border near Geneva, Switzerland. Construction of the rings, expected to cost 332 million Swiss francs, is scheduled to begin at CERN next summer.

In conventional high-energy physics experiments, energetic particles strike a stationary target and, since momentum is conserved, only a small fraction of the particle energy is available for particle interactions. In the CERN proton synchrotron, particles with 28 BeV kinetic energy in the laboratory system incident on a proton at rest in the laboratory have an energy in the center-of-mass system of 7.4 BeV.

An alternative scheme is to allow two beams of protons to collide. The CERN device will use a pair of nearly concentric rings intersecting in eight places (at an angle of about 15°). Each 300-meter ring will be filled with protons from the synchrotron, and the two beams will circulate in opposite directions. When the two 28-BeV circulating beams are allowed to collide, the energy available for high-energy interactions will be 56 BeV. This is equivalent to 1700-BeV protons colliding with a stationary target. Proton accelerators with that much energy will not be built for many years. (The biggest existing accelerator is Brookhaven's 33 BeV; a 70-BeV proton synchrotron will be completed soon at Serpukhov, USSR, and the AEC is looking for a site in the US for a 200-BeV proton accelerator.)

The storage ring designers plan to store a 20-A current in each ring (the protons from about 500 pulses of the CERN synchrotron at present intensity). Since the ring will be highly evacuated (10^{-9} to 10^{-10} torr is expected) it is believed that the number of gas collisions will be small enough to store the beam for several days. In a talk at CERN in October 1964 G. Cocconi predicted that the rate of proton-proton collisions will be about 10^4 to 10^5 interactions per second (in a volume of 140 cm^3). He remarked that "experiments on p-p cross section and scattering will be easy . . ." and that the device could also be used to identify and measure characteristics of new particles, such as the quark (see page 44).

Although the proton storage rings will provide a unique tool for studying proton-proton interactions, they cannot be used to produce super-high-energy beams of secondary particles. So the CERN people are the first to admit that they will still need a much larger proton synchrotron than they have now. They hope to start building a 300-BeV accelerator soon if CERN member nations approve the expenditure.

The CERN authorization was made at the 31st session of its council, when 12 member nations (all except Greece) agreed to participate in constructing the rings and extending the CERN site into French territory. Two new experimental halls for 25-BeV work, with auxiliary installations, will also be built. The Council approved a budget of 21.7 million Swiss francs for 1966, the major part of which will go for construction on the site. Main purchases of equipment are not scheduled to begin until 1967.

There are no plans to build similar storage rings in this country. In its policy statement for high-energy physics last year, AEC said there was no need to build proton storage rings in the US because CERN seemed very likely to go ahead with its design.

Pioneer VI

The solar wind at the end of December was much slower than at times of high solar activity. The figure, determined from experiments aboard the interplanetary probe Pioneer VI, is about 670 000 mph. Values as high as two million mph have been recorded in periods of high solar activity. Aside from solar-wind studies, the artificial planet carries a number of experiments to record aspects of interplanetary conditions.

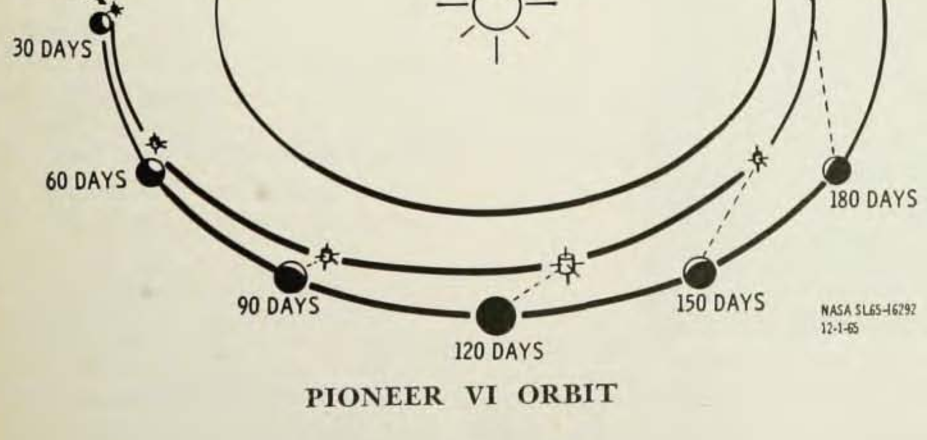
Pioneer VI was sent off on 16 December to orbit the sun between Venus and earth. It will reach perihelion at 0.8143 astronomical units and aphelion at 0.9836. The period will be 311.3 days.

The probe was designed to be one of the magnetically cleanest spacecraft ever built. Its field at 30 in from the center is one half gamma (earth's surface field is 50 000 to 70 000 gamma). It will thus interfere very little with the magnetometers aboard, which seek information about the strength and configuration of the solar magnetic field. Especially interesting are distortions of the (putative) dipole field caused by solar emission of charged particles, which carry field lines away with them.

The various solar-wind experiments can record electrons, protons, and charged ions over a wide range of energies (two to 10 000 eV are covered by one or another device). A radiopropagation experiment with a high-frequency (423.3 Mc/sec) reference signal and a low-frequency (49.8 Mc/sec) test signal will be used to determine variations in total electron content in the space between Pioneer and earth.

Cosmic-ray investigations include both solar and galactic studies. A cosmic-ray anisotropy detector will seek to determine how the number and energy of galactic cosmic rays may vary with direction of arrival. A cosmic-ray telescope will measure both solar and galactic arrivals and attempt to determine the effect of solar activity on the galactic component.

The probe is a cylinder 35 in long and 37 in in diameter and weighs 140 pounds. It was fired from Cape Kennedy. A series of such craft is planned to orbit the sun in a band 40 million miles wide, which will straddle the earth's orbit.



PIONEER VI ORBIT

Chicago astrophysics lab

The University of Chicago has dedicated a new laboratory for interdisciplinary research in astrophysics. The building contains about 32 000 sq ft of laboratory and office space and cost $1.75 million of NASA's money. Two floors are above ground and two below. The subbasement is a concrete-shielded counting laboratory for measuring radioactivity of meteorites and planetary samples. A vertical shaft 3 ft in diameter extends 50 ft below the subbasement level to bedrock for low-level counting.

Chicago faculty members who will have office or laboratory space in the new laboratory include John A. Simpson Peter Meyer, S. Chandrasekhar, Edward Anders, Eugene N. Parker, Anthony Turkevich, and Peter D. Noerdlinger. The laboratory is associated with the university's Enrico Fermi Institute for Nuclear Studies.

New telescopes at Yerkes

A pair of small telescopes for special work will be installed at the Yerkes Observatory of the University of Chicago during the coming spring. A new building, 64 by 16 ft with two 16-ft domes, is being prepared to house them. Construction will cost about $45 000, and the telescopes will come to $75 000 more.

One of the instruments is a wide-field telescope with an objective prism to study formation of young stars, their effect on their predecessors, and the material of which they are made. The other instrument is a photoelectric nebular spectrophotometer designed to measure and analyze light from objects with low surface brightness but large images, such as comet tails and diffuse nebulae. Chemical composition of the interstellar medium and the nature of particles in comet tails will be studied. The building will also contain a photographic darkroom and an optical and electronics laboratory.