

One of the chambers, the largest ever built, was constructed at Argonne by a team headed by E. G. Pewitt (PHYSICS TODAY, February 1968, page 57). The second chamber, built at Brookhaven under the direction of Ralph P. Shutt, is a prototype of a 25-foot chamber planned for the National Accelerator Laboratory (NAL).

The Argonne chamber is 3.7 meters in diameter and 2.2 meters deep, and the Brookhaven chamber is 2.2 meters in diameter and 2.8 meters deep. Cameras are mounted on the dome-shaped upper surfaces, and they view the chambers through fish-eye lenses. Argonne's 18-kG superconducting mag-

net was successfully operated a year ago. Brookhaven has run its superconducting magnet at 16.5 kG and plans to operate it at 30 kG.

The experiments performed in these new chambers will initiate the long-awaited exploration of neutrino-nucleon elastic and inelastic scattering. Because neutrinos interact only weakly with matter, one needs a large volume to accumulate sufficient statistics. Both groups expect about 1 event for every 1000 pictures. After an exposure of 500 000 pictures in hydrogen, Argonne will take 1 000 000 pictures in deuterium. Brookhaven is planning to make an initial exposure of 1 000 000 pictures with deuterium in the chamber.

Neutrino beams can be produced with a momentum range up to 1 GeV/c at Argonne, up to 2 GeV/c at Brookhaven and hopefully up to 6 GeV/c at NAL. Because of these different energy ranges, the neutrino experiments at the various labs may complement one another. Malcolm Derrick at Argonne feels that the determination of the axial-vector form factor from the elastic reactions, $\nu + n \rightarrow \mu^- + n$ and $\bar{\nu} + p \rightarrow \mu^+ + n$, will be most sensitive at the lower energies. The higher-energy experiments will be the best measurements of the inelastic neutrino interactions; these measurements may provide interesting comparisons with the inelastic electron-proton experiment at SLAC.

An Interview with Peter Kapitsa

Peter Kapitsa had come to Columbia University to receive an honorary degree. It was his first visit to the US, and at 75, even after a hectic month of travel, his eyes were sparkling and his conversation lively. "Are you a physicist?" he asked. I said, "Yes." "Good," he said, "The journalists sometimes ask stupid questions." He told me he does not work in low-temperature physics any more; his latest paper, 135 pages long, was to be published in the December *JETP*. It is on controlled thermonuclear fusion.

For Kapitsa the work is perhaps an

outgrowth of his long-standing interest in ball lightning. In 1955 he had proposed that the energy source needed to maintain the luminosity of the "ball" might be microwaves generated in thunderclouds and guided to the place where the ball appears. Power could be fed to the ball either by directional radiation from clouds or by propagation from clouds to the earth along the long cylinder of strong ionization that appears after a lightning discharge. Kapitsa's hypothesis inspired a recent experiment by workers at his Institute for Physical Problems;

they observed weak radiation in the 20–40-cm range at an altitude of 2000 meters during a thunderstorm (*Sov. Phys-Tech. Phys.* 13, 1475, 1969). Institute experimenters are also using high-power microwaves to create artificial ball lightning.

In controlled-fusion experiments, Kapitsa would like to contain the plasma with microwaves and use a superconducting cavity to get a high Q .

During the Columbia ceremonies Polykarp Kusch, who is vice-president and dean of faculties at Columbia, paid tribute to Kapitsa: "When I was a graduate student in the early 1930's, I and my fellow students were fascinated by Kapitsa's novel helium liquefier [which he developed while head of the Mond Laboratory at Cambridge University]. In fact, his interest in cryogenic machines has been fruitful for decades. We were also interested in the several techniques that he used for producing pulses of magnetic field of an intensity not previously attainable in experimental work. In general, all of his work is marked by an extraordinary technical imagination.

"Dr Kapitsa has shown great scientific taste in the problems that he has chosen to attack. He has made striking contributions to the physics of matter at very high magnetic fields. He has made critically important observations of the phenomena that occur in that remarkable state of matter, the superfluid state of helium II.

"I note that as early as 1922, Kapitsa wrote a paper with the title 'On the Possibility of an Experimental Determination of the Magnetic Moment of an Atom.' It makes excellent sense



KUSCH AND KAPITSA at Columbia ceremonies honoring Kapitsa.

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a half century later. Clearly, the exploration of the possibility of such a measurement suggests an almost clairvoyant sense of what the important problems were. Dr Kapitsa has made important contributions to many other parts of physics and technology, always with imagination, a flair for the novel solution to a problem."

As director of the Institute for Physical Problems in Moscow since his enforced stay in the Soviet Union began in 1934 (except when he was in disfavor from 1946 to 1954), he worked with a whole generation of Soviet physicists, including Lev Landau. Many of the institute theorists now work in the new Landau Institute for Theoretical Physics.

I asked Kapitsa to compare the state of Soviet and American physics. He observed, "There are 20% less papers published in the Soviet Union." "What does this indicate?" I asked. He smiled, "I don't know. It means you publish more papers than we do."

"In what fields does the Soviet Union excel?" Kapitsa replied: "In

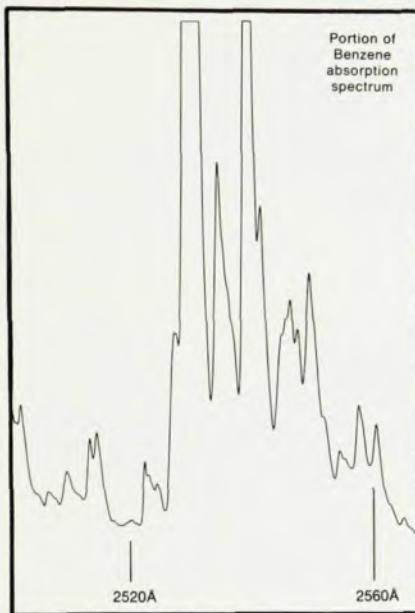


PETER KAPITSA, 75, has started work on controlled thermonuclear fusion.

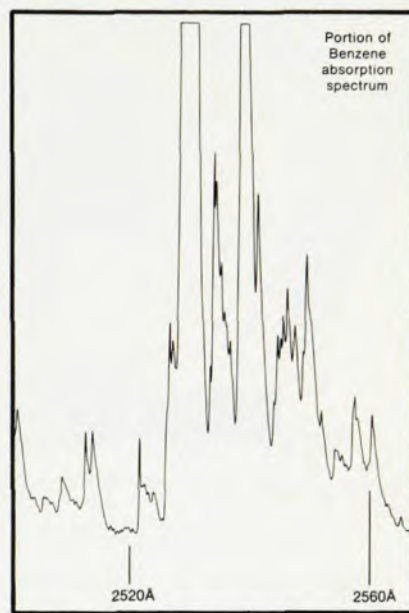
solid-state physics and in superconductors, perhaps we do a little bit better." But, he went on, the leadership bounces back and forth between the two countries. "It's impossible to compare. 25 years from now history will say who was in front."

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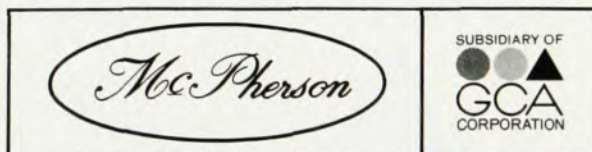


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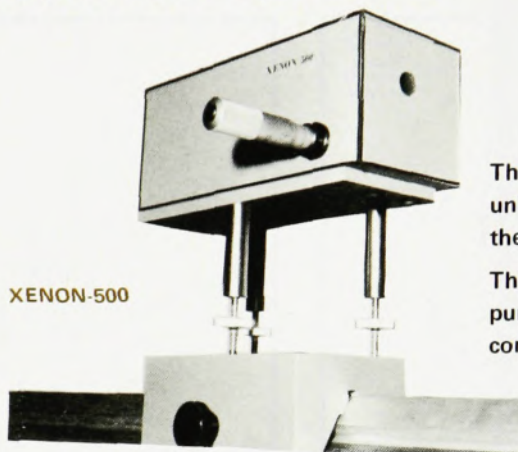
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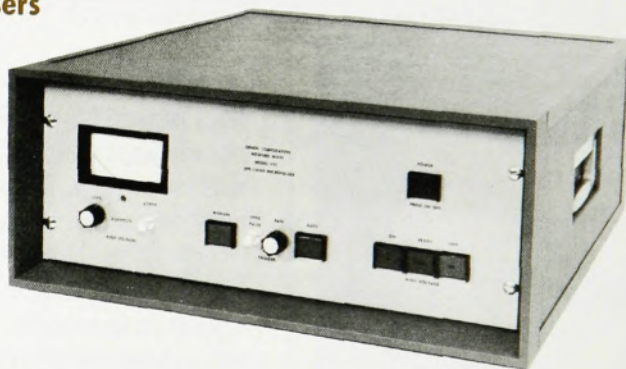
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utation for theoretical physics," I commented. "Yes, but you have such a man as Feynman. After the death of Landau we have nobody to take his place. You have also people such as Bardeen, Cooper and Schrieffer ... very good people."

In accepting the degree Kapitsa commented how happy he was to be at the university where Enrico Fermi, Isidor Rabi and Leo Szilard worked. He concluded, "International collaboration is the base of rapid and fruitful development of science." If our two countries have friendship, he said, then we will not have an atomic war.

—GBL

NAS Panel Details Advantages Of A Large Telescope in Space

In still another National Academy of Sciences report on US needs in astronomy, an ad hoc panel of the Space Sciences Board argues that a large (120-inch aperture) space telescope could help answer many of today's basic questions. Operated in orbit or on the moon, such an instrument could study objects five magnitudes fainter and ten times further away than is possible on earth. The panel says that the space telescope would be able to make the first measurements of the density, composition and physical state of the gas that surrounds galaxies, an important clue to galactic evolution. The eight-man committee, headed by Lyman Spitzer Jr. (Princeton), added that the telescope's chief value might well lie, however, in the discovery of entirely new classes of objects.

New Spectrometer to Measure 10^{13} -eV Cosmic-Ray Events

A huge ionization spectrometer using image intensifiers to record electromagnetic cascades is operating at the Louisiana State University Cosmic Ray Laboratory near Climax, Colorado. Richard W. Huggett, speaking at the eleventh International Conference on Cosmic Rays at Budapest in August, said that the apparatus will measure ultra-high energy (about 10^{13} eV) hadronic interactions. (His collaborators were Harry Coxell, C. Richard Gillespie, David R. Humphreys and P. Kevin MacKeown.)

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