netic field; in this case the tail in the density of states arising from the fluctuating impurity potential becomes relatively more important than for the zero-field situation. From their results they suggest a new explanation for the incomplete "freezeout" (trapping of carriers by bound states whose binding energy increases with magnetic field) of carriers in certain materials; the phenomenon had been observed for many years but had not previously received adequate explanation.

Organization. Other solid-state laboratories include:

- Properties of semiconductor crystals, D. N. Nasledov, director
- Semiconductor physics, Tuchkevich
- Nonequilibrium processes in semiconductors, S. M. Ryvkin
- Amorphous semiconductors, B. T. Kolomietz
- Theoretical solid-state physics, L. E. Gurevich
- New semiconductor compounds, Goryunova
- Strength of materials, S. Zhurkov

The plasma-physics laboratory, which specializes in diagnostics, is headed by Victor E. Golant, and the laboratory of atomic collisions is directed by N. V. Fedorenko and V. M. Dukelskii.

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V. M. TUCHKEVICH

OLEG KONSTANTINOV

In high-energy physics, the theoretical group is headed by J. M. Shmushkevich and V. N. Gribov, and D. M. Kaminker is in charge of experiments. The institute has a 1-GeV proton synchrophasotron, which has produced a beam. When the machine reaches its full intensity, experimenters expect to extract muon and pion beams.

The institute built its original fame on nuclear physics. Its old cyclotron, the first one built in the Soviet Union, was rebuilt to do Coulomb-excitation studies. I. Ch. Lemberg heads nuclear-physics research.

Impressions. Like its counterpart in Moscow, the Lebedev Institute, the Ioffe Institute impressed us with the variety of physics research going on there. Since our visit to Leningrad was a short one, we concentrated on the solid-state program. But the institute's reputation has a broad base, resting in many different areas. —GBL

Zeeman Effect Determines Interstellar Magnetic Fields

The first direct measurement of the interstellar magnetic field in our galaxy has raised the question of why the field is stronger in other spiral arms than it is in our own. Despite its limitations the data give theorists new parameters for the frequently invoked role of magnetic fields in galactic dynamics and stellar evolution.

Gerrit L. Verschuur, a South African working at the National Radio Astronomy Observatory in Green Bank, West Va., measured Zeeman splitting of lines in 21-cm hydrogen spectra with the 42.7-meter telescope. He examined absorption spectra of the radio sources Cassiopeia A and Taurus A, which lie close to the galactic plane, and emission spectra of two sources at high galactic latitude.

Verschuur reported (*Phys. Rev. Letters* **21**, 775) classic Zeeman splitting in the distant Perseus arm of our galaxy, in the direction of Cassiopeia, corresponding to a magnetic field strength of 20 microgauss. Lack of splitting in the spectral component of our local Orion arm allowed Verschuur to calculate a lower limit there of 0.2 ± 0.8 microgauss, significantly lower than the previously estimated 4.0 microgauss.

Verschuur concludes that either our local region has an unusually low field strength or else the Perseus region is unique. The latter alternative could be correct, he suggests, if a supernova or gravitational collapse had compressed and amplified the magnetic field.

New Upper Limit For Photon Mass

If the photon has a mass, say Alfred S. Goldhaber and Michael M. Nieto in *Phys. Rev. Letters* (**21**, 567, 1968), it is less than 4.0×10^{-48} gram. They derive their number by Erwin Schrödinger's method. A finite mass adds a term to Maxwell's equations and makes the calculated vector potential fall off exponentially like a Yukawa potential carried by a finite-mass meson. In the solution the principal observable effect is an apparent constant component to be added to the earth's dipole magnetic field.

Goldhaber and Nieto have compared fields measured by satellites and observations on the earth with known sources of real and apparent external components (proton belt, hot component of magnetosphere plasma, geomagnetic tail, solar-wind compression of geomagnetic field, interplanetary field) to derive their upper limit. It corresponds to a value for the external field made up of 2×10^{-4} gauss measured and 10^{-3} for assumed error because of noisiness in earth observations and uncertainties in fitting satellite data.

The best laboratory limit, according

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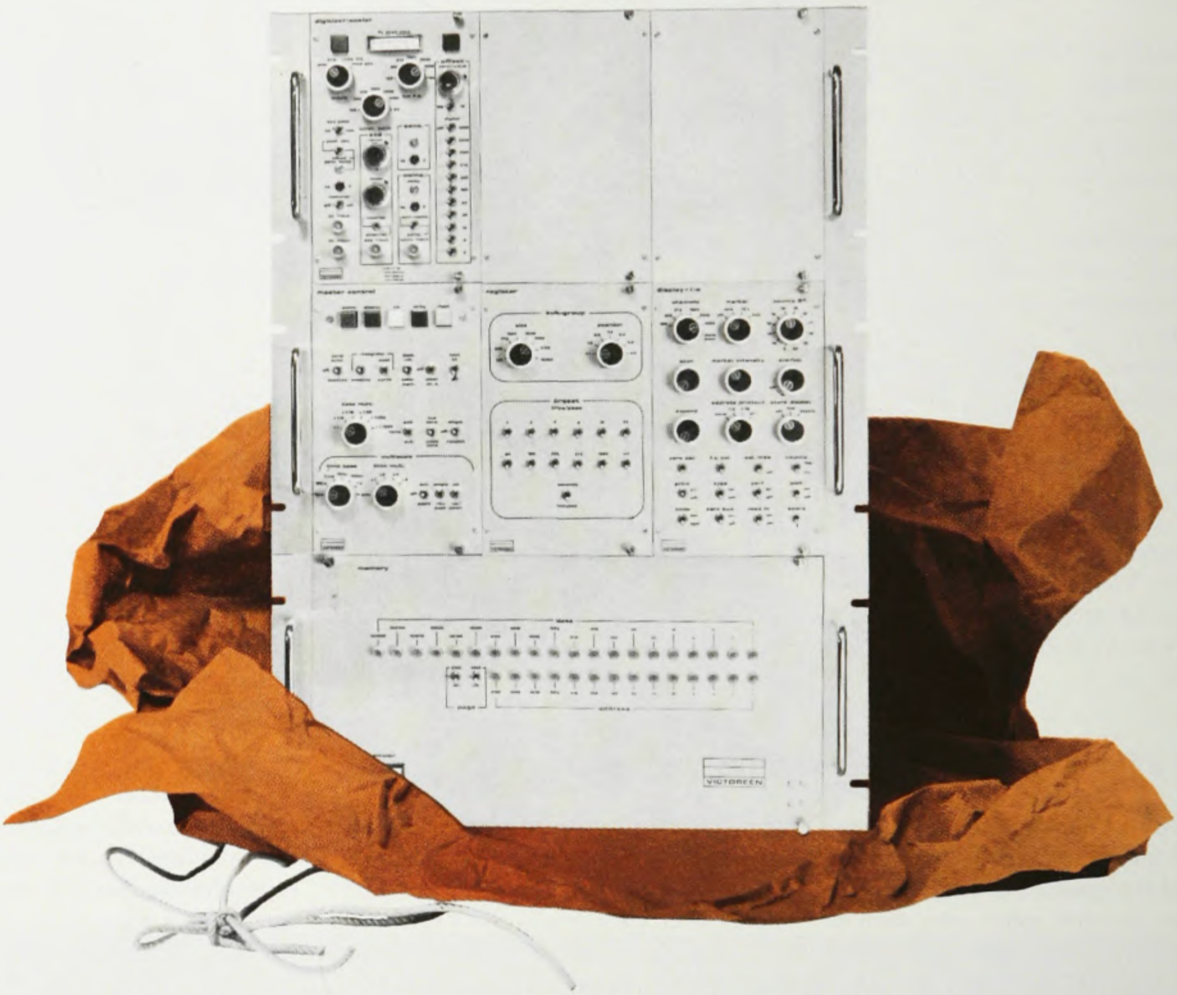

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to Goldhaber and Nieto, was that of S. J. Plimpton and W. E. Lawton (*Phys. Rev.* **50**, 1066, 1936) by measuring the potential difference between concentric spheres with the outer one charged.

New Cascade Particle Completes 5/2⁻ Octet

SU(3) is still yielding new multiplets. A Brookhaven-Syracuse group recently found a well defined Ξ^* resonance of strangeness -2 and mass 1930 ± 20 MeV (*Phys. Rev. Letters* **21**, 1119, 1968). The resonance appears to complete the $5/2^-$ octet.

Since the discovery of the Ω^- particle completed the $3/2^+$ decuplet, dramatically verifying unitary-symmetry theory, resonances have been cropping up about as often as a new copy of *Phys Rev. Letters*. Since they do not usually fit neatly into a multiplet, it is a joy when a new resonance does.

With the new Ξ^* resonance, six multiplets are rather well established: baryons with $J^P = 1/2^+$, $3/2^+$ and $5/2^-$ and mesons with 0^-, 1^- and 2^+.

The Brookhaven experimenters were Jean Alitti, Enzo Flaminio, Wes Metzger, Dusan Radojicic, Ronald Rau, Nicholas Samios, Ian Skillicorn and Clarence Richardson. Syracuse team members were Daniel Bassano, Marvin Goldberg and Jack Leitner (deceased).

New Values for K^0 Decay Rate Still Disagree with the Old

For followers of CP violation (PHYSICS TODAY, April 1968, page 80 and November 1967, page 73) a recent Princeton experiment (reported by M. Banner, James W. Cronin, J. K. Liu and J. E. Pilcher in *Phys. Rev. Letters* **21**, 1107, 1968) offers another value

Two-Neutral-Pion Decay Rates of K^0

Experiment	$\|\eta_{00}\|^2 \times 10^6$
Gaillard I (CERN)	$18.5 +10.5, -6.5$
Gaillard II	13 ± 4
Cronin I (Princeton)	24 ± 5
Cronin II	15.3 ± 2.3
Cronin III	5.1 ± 1.2
Fitch (Princeton)	−2 ± 7
Berkeley	13 ± 3
CERN–Ecole Polytechnique–Orsay	4.8 ± 1.8

NEW 39.6-METER RADIO DISH at Owens Valley in California was dedicated 18 Oct. The $1.7-million instrument is the first in a proposed array of eight similar instruments to be mounted on rails in the shape of a cross with baselines of 4875 and 2750 meters. A special panel of the National Science Foundation has given the overall project high priority. In the background are two older 27-meter dishes that form a smaller interferometer on their own rail system 1065 meters from the proposed crossed array; these will be linked to the 39.6-meter antenna to form an interferometer with a much longer baseline. Present emphasis at Owens Valley is on interferometric studies of radio spectral lines, mapping the distribution of gas in our own and other galaxies.

for $|\eta_{00}|^2$, the ratio of the two-neutral-pion decay rate of K_2^0 to the two-neutral-pion decay rate of K_1^0. As the table (based on reports at the Vienna high-energy physics conference in September) shows, not only do various experimenters disagree with each other, but also with their own earlier measurements. Errors have been found in the first and second Cronin experiments; so Cronin III is the only valid entry for the group.

Some values in the table are consistent with the value for $|\eta_{+-}|^2$ (the ratio of the two-charged-pion decay rate of K_2^0 to the two-neutral-pion decay rate of K_1^0), about 4×10^{-6}. If η_{00} and η_{+-} are equal, the structure of K_2^0 is the only cause of CP violation.

In another effort, at SLAC, Melvin Schwartz, Stanley Wojcicki and their collaborators are tuning up equipment to start a new measurement of $|\eta_{00}|^2$.

Sputtered-Atom Beam Fills an Energy Gap

Neutral atomic beams in the energy range 1–50 eV can now be made with a new sputtering source developed by J. Politiek, P. K. Rol, J. Los and P. G. Ikelaar at the FOM Institute for Atomic and Molecular Physics in Amsterdam. This energy range, higher than the thermal energies of oven sources and supersonic nozzles but below the lower limit of charge-transfer ion neutralization, is not covered by other atom-beam sources. The new technique fills the gap with an energy range and intensity suitable for chemical reaction and vibrational-excitation work. Politiek, Rol and Los first mentioned their method at the Quebec conference on electronic and atomic collisions in 1965; the complete report appears in *Rev. Sci. Inst.* **39**, 1147 (1968).

Sputtering is the ejection of material from a solid bombarded with high-energy ions. In the new atom-beam source, argon positive ions at 4–10 keV are focused on a potassium target, which is kept free of oxide by scraping with a knife inside the vacuum system in a way reminiscent of Robert Millikan's "machine shop in a vacuum." Most of the sputtered potassium atoms arise from "focused collisions," that is, sequences of collisions along the close-packed directions of the crystal, which occur when the energy of the incident ion and disturbed lattice