If only the interactions of π mesons with nucleons are taken into account, then the theoretical probabilities of the processes

$$\pi^0 \rightarrow 2\gamma \text{ (Ref. 3) and } \pi^+ \rightarrow e^+ + \nu + \gamma \text{ (Ref. 4)},$$

obtained from perturbation theory, are greater than those observed. The considerations above indicate that it is possible to reduce the discrepancy between theory and experiment by allowing also for the interactions of π mesons with all baryons.* Of course, without a study of the interaction with a K meson we are still unable to say with certainty that the new Gell-Mann theory gives better agreement with the experimental data for these processes.

In conclusion I wish to thank Professor M. A. Markov, Professor Khu Nin, V. I. Ogievetskii, and M. I. Shirokov for their interest and for discussions of the work presented here.

*This same result for the decay process $\pi^0 \rightarrow 2\gamma$ was also obtained by Gell-Mann.[1] An analogous result was obtained earlier by Kinoshita.[3]

[1] M. Gell-Mann, Phys. Rev. 106, 1296 (1957).
[2] R. H. Good, Jr., Rev. Mod. Phys. 27, 187 (1955).
[3] T. Kinoshita, Phys. Rev. 94, 1384 (1954).
[4] S. B. Treiman and H. W. Wyld, Jr., Phys. Rev. 101, 1552 (1956).

Translated by W. M. Whitney
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SUPERCONDUCTIVITY OF BERYLLIUM FILMS CONDENSED ON A COLD BACKING

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IT is known that bismuth films obtained by condensation on a backing cooled with liquid helium display superconductivity.[1] Until now this was the only case of observed superconductivity induced in such a way in a metal which displays no superconductivity in the ordinary bulk state to temperatures on the order of 10^{-2} degrees K.

This letter reports on the superconductivity of beryllium films obtained in the above method.

The procedure for obtaining the films was analogous to that used in many investigations for the study of superconductivity of metallic films.[1,2] The apparatus consists essentially of an evacuated glass bulb, containing the evaporator in the form of a small tungsten helix carrying a piece of the evaporated metal. When the metal is evaporated the bulb is immersed in liquid helium. The low power of the evaporator (several watts) permits condensation of the layer with an insignificant temperature rise in the film above the bath temperature. Electrodes for the measurement of the electric conductivity of the resultant films are fused into the walls of the bulb.

The measurements were made with several films. The thickness of the measured films was approximately 10^{-6} cm. It is interesting to note that the only stable films were those thinner than 10^{-5} cm, and further increase in thickness caused them to crack.

Fresh films already display superconductivity at 4.2° K. An exact determination of the transition temperature has not yet been made, but a rough extrapolation of the dependence of the critical current on the temperature yields a value of approximately 8° K. As in the case of bismuth, the properties of the film vary greatly upon heating. Heating even to a temperature of liquid hydrogen transfers the superconductivity of the beryllium film into the liquid-helium temperature range.

[1]Proc. Int. Conf. Low Temp. Phys., Oxford, 1951, p. 119; W. Buckel and R. Hilsch, Z. Physik **138**, 109 (1954); N. V. Zavaritskii, Dokl. Akad. Nauk SSSR **86**, 687 (1952).

[2]A. I. Shal'nikov, Nature **142**, 74 (1938), J. Exptl. Theoret. Phys. (U.S.S.R.) **10**, 630 (1940); N. E. Alakseevski, Dokl. Akad. Nauk SSSR **24**, 27 (1939), J. Exptl. Theoret. Phys. (U.S.S.R.) **10**, 1392 (1940).

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COMPARISON OF CALORIMETRIC AND IONIZATION MEASUREMENTS OF THE ENERGY FLUX OF SYNCHROTRON GAMMA RAYS

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THE comparison of the different methods of measurement with the identical spectrum is of interest not only for the determination of the energy flux of the γ-rays but also is useful in relating data obtained from ionization measurements to the actual energy absorption in matter. According to the literature,[1] various methods give results that differ up to 25%.

The energy flux in the γ-ray beam of the 85-Mev synchrotron of the Leningrad Physico-Technical Institute was determined both with a calorimeter and with ionization chambers. The energy in the γ-ray beam required to produce a charge of one Coulomb in a special copper ionization chamber was determined by both methods. The copper chamber served as a standard.

In the calorimetric measurement the γ-rays were absorbed in a lead cylinder. The temperature change of the cylinder was determined with a thermistor which had a temperature coefficient of about -6% at 20° C. The cylinders had a diameter of 5.5 cm and lengths of 11 and 4 cm respectively. The correction for incomplete absorption of the γ-rays in the cylinders was obtained from the transition curves of lead. The final results (at 20° C and 760 mm Hg) are given in Table I. They were obtained with a beam diameter of 3 cm. The energy losses due to neutron emission[2] were also taken into account. The result obtained with the 4 cm and the 11 cm long cylinders differ by 2%. This difference lies within the limits of the errors. It indicates, however, that the actual absorption of energy in lead is not given completely by the depth dose curve.

TABLE I

Cylinder length cm	Percent fraction of absorbed energy according to transition curves	Energy for one coulomb of the standard, U_K, Mev/coulomb	Maximum error %
11	99.5	$4.65 \cdot 10^{18}$	4.0
4	82	$4.55 \cdot 10^{18}$	2.5

The energy flux of the γ-rays was also determined by the method of the depth dose curve.[3] In this method the ionization in a thin walled chamber is determined as a function of the thickness of absorbers placed in front of it. The depth dose curves for C, Al, Cu, and Pb were obtained. The curves reproduced in several runs. The exponential decrease at large depths agreed well with the minimum of the γ-ray absorption coefficient in the particular material. The energy was obtained from the area under the transition curves. The results, particularly for light elements, depend strongly on the choice of the ratio (averaged properly over the energy of the electrons)

$$\rho = (dE/dX)_Z / (dE/dX)_{\mathrm{Air}}$$

where dE/dX is the energy loss of the electrons. The choice of ρ and the results of the determination by the method of transition curves relative to the calorimetric determination (U_Z/U_K) are shown in Table II. A possible error of ρ of 2.5% has been

TABLE II

Material	C	Al	Cu	Pb
ρ	0.840	0.820	0.740	0.610
(U_Z/U_K) %	96	90.3	91.6	84
Total error %	6.5	7.3	9.0	5.5