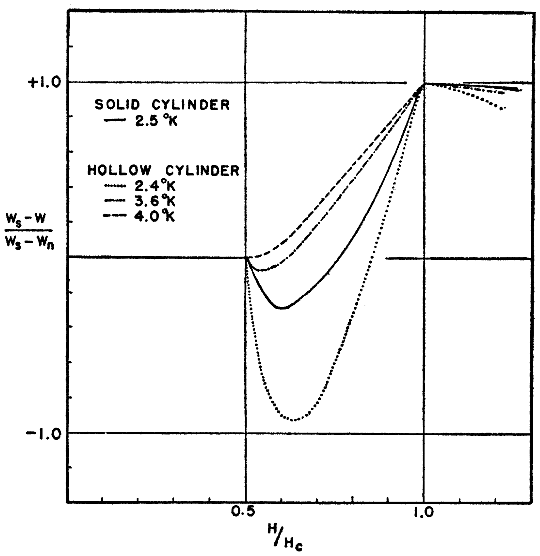


FIG. 2. Temperature dependence of the reduced thermal resistivity, $(w_s-w)/(w_s-w_n)$, of lead cylinders in a transverse magnetic field. $w_s$ is the thermal resistivity in zero field and $w_n$ is the thermal resistivity in critical field.

Fig. 1 appears as the solid curve. The remaining curves of this figure are transitions of the hollow cylinder on initial magnetization (the specimen was warmed above the transition temperature between each set of data).

A similar effect has been observed in niobium and in the alloy Pb-Bi (0.1 percent) by Mendelssohn and Olsen.[3] The anomaly in the intermediate state was taken as further evidence for a circulation mechanism leading to a thermal conductivity of alloy-type superconductors in the pure superconducting state that was relatively large as compared to their normal state conductivity.

The anomalously high thermal resistance in the intermediate state, as shown in Figs. 1 and 2 may be caused by:

(1) A circulation of superconducting and normal electrons, similar to that hypothesized in the case of alloys,[3] yielding a large contribution to the thermal conductivity of the superconducting state.

(2) A large thermal conduction by the lattice in the superconducting state.[4] This lattice conduction is largely quenched in the intermediate state due to the suddenly increased number of free electrons which act to scatter the phonons.

(3) A scattering of the normal electrons by the numerous surfaces bounding the laminations[5] of superconducting metal in the intermediate state.

Marked size dependencies should be observed in the second and third possible mechanisms mentioned above. Measurement of this dependency together with a more complete determination of the temperature dependence should permit a more complete understanding of the origin of this phenomenon.

Further work on this problem is in progress.

[1] K. Mendelssohn and R. B. Pontius, Phil. Mag. **24**, 777 (1937).
[2] For example, see W. Heisenberg, Z. Naturforsch. **3a**, 65 (1948).
[3] K. Mendelssohn and J. L. Olsen, Proc. Phys. Soc. (London) **A63**, 2 (1950).
[4] The possible role of lattice conduction in the thermal conductivity of superconducting alloys is discussed by J. K. Hulm, Proc. Roy. Soc. (London) **A204**, 98 (1950).
[5] L. Landau, J. Phys. USSR **7**, 99 (1943).

## Evidence for the Decay of a Negative π-Meson in a Photographic Emulsion*

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ILFORD C-2 200-micron plates were exposed in a spiral orbit spectrometer[1] to the Berkeley cyclotron. Positive and negative π-mesons entered the emulsion from opposite surfaces. While continuing the search for short μ-meson tracks from positive π-meson decays,[2] an unusual π—μ decay was found. The π-meson entered the emulsion from such a direction as to indicate that the meson was negatively charged. The π-meson track is about 120 microns long and ends near the middle of the emulsion. The grain density near the end of the π-meson track is saturated, indicating that the π-meson was traveling with a low velocity. The μ-meson

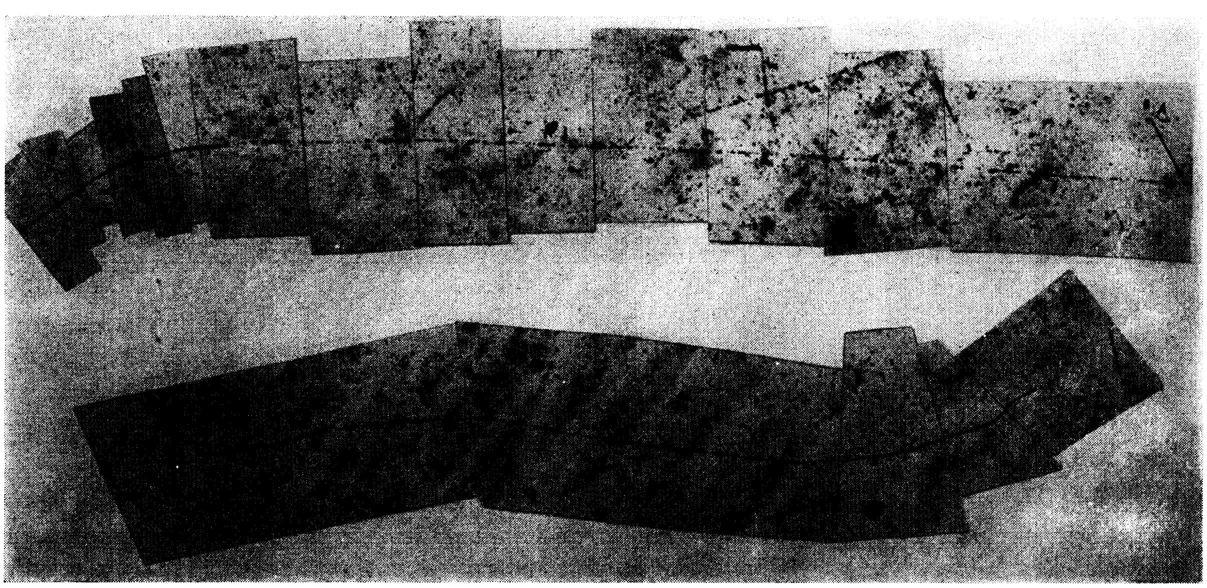

FIG. 1. A photomicrograph of the decay of a negative π-meson in a photographic emulsion. The π-meson track is near the top and to the left of the mosaic. The segments of the μ-meson track should be joined at the point indicated by the two arrows. The μ-meson track is 828 microns long.

track is 828 microns long and is nearly in the plane of the emulsion. The average length of the $\mu$-meson tracks from positive $\pi$-meson decays is 594 microns in these plates. The grain density along the $\mu$-meson track is nearly the same as along other $\mu$-meson tracks of the same residual range. The angle between the directions of the $\pi$-meson track and the $\mu$-meson track is less than 20°. A photomicrograph of the event is shown in Fig. 1.

About 4300 $\pi$-meson events have been observed in the group of C-2 plates. Only 5 $\pi$-meson events were found where the sign of the charge of the meson, as determined from the direction of the $\pi$-meson, is inconsistent with the phenomena associated with the meson.

Previous studies have shown that negative $\pi$-mesons which stop in photographic emulsions are always captured and do not decay. However, it is possible to explain the decay of the negative $\pi$-meson and the unusually long range of the $\mu$-meson track by assuming that the $\pi$-meson decayed in flight. Since the probabilities of decay in flight of negative and positive $\pi$-mesons would appear to be equal and since the number of $\pi$-mesons which are scattered and enter the emulsion from the wrong surface is only 1 in 1000, it is concluded that the $\pi$-meson which gave rise to the long $\mu$-meson track was negatively charged. If the negative $\pi$-meson decayed in flight, the energy of the $\pi$-meson at the time it decayed was only 50 kev.

* Supported in part by grants from the Iowa State College Research Foundation and the Research Corporation.

[1] R. Sagane and P. C. Giles, Phys. Rev. **81**, 653 (1951).

[2] W. F. Fry, Phys. Rev. **83**, 1268 (1951).

# Proceedings of the American Physical Society

## Minutes of the Meeting of the Division of Fluid Dynamics at Chicago, June 12, 1951

THE Division of Fluid Dynamics held a joint program with other technical societies as part of the First National Congress of Applied Mechanics in Chicago, Illinois, June 11–16, 1951. The Division meeting consisted entirely of invited papers. There was no response to the invitation for ten-minute contributed papers. The following are the invited papers.

1. "Steady Solution of Flows with Heat Addition Due to Water-Vapor Condensation." A. Busemann, *NACA, Langley Aeronautical Laboratory.*

2. "Role of Precision Measurements in Science and Industry within the Field of Thermodynamics and Gas Dynamics." A. M. J. F. Michels, *Van der Waals Laboratory, Amsterdam, Holland.*

3. "Turbulent Shear Stresses in Conical Duct Diffusion." J. R. Weske, *Johns Hopkins University.*

4. "Strong Shock Waves." E. L. Resler and A. Kantrowitz, *Cornell University.*

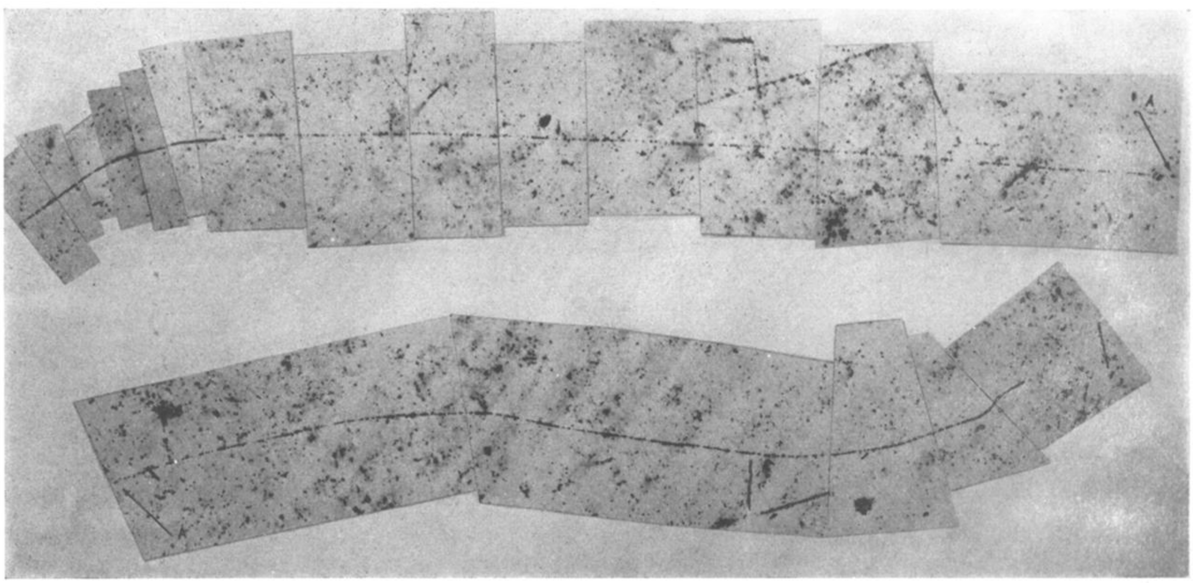

FIG. 1. A photomicrograph of the decay of a negative $\pi$-meson in a photographic emulsion. The $\pi$-meson track is near the top and to the left of the mosaic. The segments of the $\mu$-meson track should be joined at the point indicated by the two arrows. The $\mu$-meson track is 828 microns long.