Letters to the Editor

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The Polarization of Electrons

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RECENTLY experiments have been performed to determine electron polarization as predicted by the Mott theory on scattering.[1] The present experiment was carried out to test the previous results with apparatus redesigned to reduce to a minimum any spurious asymmetries in the experimental method. This was accomplished, principally, by using Geiger counters in a coincidence arrangement.

Electrons accelerated to an energy of 400 kev by a Van de Graaff electrostatic generator were used throughout the experiment so that a comparison with previous results would be possible.[1] The accelerating potential was stabilized to within ± 0.5 percent. The same assembly for double scattering as constructed for the previous experiment was used, with the exception that ground conical joints with centered apertures replaced the aluminum exit windows. Into these joints were accurately fitted metal cylindrical units, each with a thin, vacuum-tight, aluminum window. Each cylinder contained two Geiger counters mounted parallel to each other and to the entrance window. Both units were evacuated and filled with a gas mixture of argon and alcohol. The counter cathodes were of oxidized aluminum with thin entrance and exit windows large enough to include the solid angle defining the electron beam. Two advantages of the above arrangement are evident. First, the coincidence counter units may be interchanged precisely with respect to the exit windows; secondly, the whole top foil assembly may be rotated as one unit without disturbing the existing geometry.

Two separate twofold coincidence circuits operated two scaling and recording circuits. The counter-circuit resolving time was much better than required for successful operation. Background counts from twofold coincidences were almost negligible with the beam on. Backgrounds were taken by interchanging the top foil and holder with an identical blank holder. The lower foil holder contained a gold foil interchangeable with an aluminum foil. Adequate shielding was obtained by enclosing the whole rotating top assembly in a circular lead box; additional shields were placed along the accelerating tube, around the Faraday cage, and over defining apertures.

Gold foils were prepared by evaporation, and the thickness was calculated by utilizing the inverse square law, those used in this experiment being 3.8×10^{-5} cm thick. This would give a calculated ω of 5° on Wentzel's criterion. The aluminum foil was 7.6×10^{-3} cm in thickness and was commercially prepared.

The ratios of the number of electrons scattered into the two resulting beams were obtained with all the orientations necessary to determine the reflection-transmission ratios of gold and aluminum, the counter-geometrical asymmetry, and the percent polarization of the electrons in transmission. Table I lists a few of the more important corrected ratios. The letters *A* and *B* refer to the two coincidence counter assemblies, and the orientations are as listed in reference 1, Fig. 4.

The counter-geometry asymmetry was 1 percent. Note that no separation of the asymmetry into that due to the counter or geometry alone was made.

The apparent asymmetry due to polarization for gold is 6.8 percent, a result in agreement with that of Shull, Chase, and Myers,[1] while the apparent asymmetry for aluminum is -2.1 percent.

The reflection-transmission ratio[2] for gold foils, as well as that obtained by using an aluminum bottom foil in transmission, was 1.49. The complete results of this experiment will be published at an early date.

TABLE I. Ratio of electrons scattered into the two beams.

Orientation of foils, and counter units	Ratio
II Gold upper and lower foil	1.41
IV Gold upper and lower foil	1.58
V Gold upper and lower foil	1.56
V Aluminum lower foil	1.46
VIII Aluminum lower foil	1.51

[1] Shull, Chase, and Myers, Phys. Rev. 63, 29 (1943), and references therein.
[2] For a discussion of the importance of these ratios, see paper by Goertzel and Cox, Phys. Rev. 63, 37 (1943).

The Cepheid Theory of the Origin of the Solar System

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THE regular features of the solar system are well known and various theories have been proposed to explain them. However, these have been found to be inadequate on the general grounds of angular momentum and of energy, e.g., Jeans and Jeffreys' tidal theory has been criticized by Russell, and Lyttleton's "enticement" theory criticized by Luyten and Hill. The author, while considering the large adiabatic pulsations of the Cepheid variable, was led to an entirely different theory of the origin of the solar system, based on the instability of radial oscillations of a variable star. The square of the amplitude has been neglected in most investigations on oscillating stars, which are restricted to the consideration of small oscillations. The author has found that the oscillations are no longer stable when terms of the order of the square of the amplitude are retained. He has considered in detail the star