In conclusion I believe in the reality of the transition

$$H_2O+e \rightarrow H_2O^- \rightarrow H^- + OH$$

but am not certain of the transition

$$H_2+e \rightarrow H_2^- \rightarrow H^- + H.$$

It is hoped that more precise measurements in the future will throw additional light on the matter.

One interesting feature of the phenomena is the extremely narrow range of electron velocities which are capable of producing these negative ions. The range is but little wider than the normal velocity distribution in the electron beam, as though the electrons, to produce a negative ion of a given type, were compelled to have a perfectly precise velocity.

W. WALLACE LOZIER
University of Minnesota
October 6, 1930

Wave Mechanics of Deflected Electrons

In a letter[1] appearing in the September 1 number of the Physical Review, Carl Eckart makes the assertion that the major conclusion of my paper[2] on the above subject is incorrect, and that the difference between $(e/m)_{\text{defl}}$ and $(e/m)_{\text{sp}}$ cannot be explained as a difference between wave and classical mechanics. He attributes the alleged error in my conclusion to the interpolation method of calculating the mean radius of curvature, admitting that the rest of the analysis is correct.

I had not neglected to verify the interpolation formula in question by direct calculation of the mean radius of curvature for the states $k=0$ and $k=1$. Shortly after seeing Dr. Eckart's letter, however, I noticed that the method of interpolation which I had employed is unnecessary, since the mean radius of curvature may be calculated rigorously from Eq. (43) of my paper. This equation does not lead to an infinite series even when p is fractional since k is a positive integer. For the mean radius of curvature it gives

$$\bar{\rho} = \frac{(\pi/2)^{1/2}}{s!}\left[\left(s-\frac{1}{2}\right)!\left(2s+\frac{1}{2}-k\right) + \frac{(s-3/2)!k(2s-\frac{1}{2}-k)}{2^2[1!]^2} + \frac{(s-5/2)!k(k-1)(10s-3/2-9k)}{2^4[2!]^2} + \cdots\right].$$

For the first order correction we need only the first two terms. Using S and K as defined in my paper

$$\bar{\rho} = \left(\frac{\pi}{2}\right)^{1/2}\frac{(s-\frac{1}{2})!}{s!}S\left[1-\frac{K+1}{4S}\right],$$

and applying Stirling's formula

$$\bar{\rho} = S^{1/2}\left[1-\frac{K-1}{4S}\right],$$

which is (except for the negligible -1 in the numerator of the second term) the same formula as obtained by interpolation. Therefore it is clear that Dr. Eckart was mistaken in his assertion that I had been led to incorrect results by the method of interpolation used.

Dr. Eckart bases his criticism of my work on a supposed disagreement between my conclusions and those obtained by Kennard[3] in an earlier paper. Working with the transformation theory of Dirac and Jordan, Kennard obtains the coordinates of the center of a wave packet moving in a magnetic field in terms of initial coordinates and momenta and notices that he is led to a formula identical with that given by classical electrodynamics. He does not, however, obtain the radius of curvature in terms of the energy, which is the significant relation from the experimental point of view. Therefore there does not seem to be any necessary conflict between Kennard's conclusions and mine.

LEIGH PAGE
Yale University
New Haven, Conn.
October 3, 1930

[1] Carl Eckart, Phys. Rev. **36,** 1014 (1930).
[2] Leigh Page, Phys. Rev. **36,** 444 (1930).
[3] E. H. Kennard, Zeits. f. Physik **44,** 347 (1927).