of the electron to the nuclear spin by a factor of 1.46 in excess of that given by Fermi's formula. The screening effect was taken into account in these calculations to the extent of including the first two terms in the expansion of the Thomas-Fermi potential function at the nucleus. With neglect of screening effects (i.e., including only the first term in the above expansion), a solution involving Bessel's functions shows that $\psi^2(0)$ would have to be increased by a factor of 1.39.

The values of the nuclear magnetic moment obtained by Fermi's formula should be divided, therefore, by at least a factor of 1.4 for the 6*s* state of Cs.

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A More Fundamental Thermodynamics

It has long seemed desirable to lay the foundations of a generalized thermodynamics designed: (1) to be more fundamental than classical thermodynamics in that it would comprise within its scope not only the state of equilibrium but also all possible fluctuations from that state; (2) to be more fundamental than statistical mechanics in that it would assume no mechanical laws.

The solution of this problem proves to be remarkably simple. All the laws of thermodynamics and of fluctuations may be shown to follow from a single cardinal postulate, which is essentially the following: If a given amount of some quantity such as energy or any form of matter is allowed to distribute itself between two systems, so that by one observation we find a certain fraction of the total amount in the first system, and again after a long time by a second observation we find a slightly different fraction, and so on until the statistical rules governing the observations have been ascertained—then these rules are independent of the mode of communication between the two systems.

A fuller development of this generalized thermodynamics will appear in the next number of the Journal of the American Chemical Society.

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Oscillations in Discharge Tubes

Following the publication by Chow[1] and Fox[2] of their results regarding oscillations in discharge tubes carrying heavy currents, we thought it desirable to re-investigate whether oscillations were present in some cold-cathode glow discharge tubes which we have been using, in which the current densities are less than a milliampere per cm^2. For this purpose we used a discharge tube 3 cm in diameter, having electrodes of steel which could be moved up and down the tube. A collector of iron 21 mm long and 0.1 mm in diameter was let in from the side. The discharge was run in neon, but no attempt was made to obtain the gas in a pure state. To detect oscillations we used a cathode-ray oscillograph, which was connected in turn across each pair of electrodes, i.e., collector and anode, collector and cathode, and anode and cathode. A linear time-base was used to determine the wave-form and frequency. Oscillations were only detected at relatively high pressures (1.4 mm to 2.1 mm) and then only when an *asymmetrical* anode glow was present. Even when a positive column was present, no oscillations were obtained so long as the discharge was symmetrical about the axis of the tube. The frequencies of the oscillations lay in the range 4 to 20×10^3 cycles per second. The amplitudes were very small, a typical variation in voltage between the floating collector and the anode being 0.7 volt on the steady potential difference of 21 volts. These results check up satisfactorily with tests made by other methods by K. G. Emeleus.[3]

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June 22, 1931.

[1] Chow, Phys. Rev. **37**, 574 (1931).
[2] Fox, Phys. Rev. **37**, 815 (1931).
[3] Emeleus, Proc. Cambridge Phil. Soc. **23**, 531 (1927).