

most dependable readings, fine wire thermocouples next, and other types of thermometers were unsuitable for measurements of this sort. J.D.H.

Direct Experimental Comparison of Several Temperature Measuring Devices. By Alice M. Stoll and James D. Hardy. *Rev. Sci. Inst.* 20: 678, September, 1949.

Nucleons

The Dirac theory describes correctly the spin of the proton and neutron, but attributes to them magnetic moments of 1 and 0 nuclear magnetons, respectively. This is in conflict with the experimental values of 2.79 and -1.91 . In 1938, Fröhlich, Heitler, and Kemmer attempted to explain this difference by taking into account the interaction of the nuclear particles with the meson field of the vacuum, but obtained infinite results. Schwinger has recently been able to circumvent the infinities in the analogous problem of an electron interacting with the photon field of the vacuum and has obtained excellent agreement with experiment. This success raised the hope of accounting similarly for the anomalous magnetic moments of the proton and neutron.

A relativistic calculation leads to the following results: the anomalous neutron and proton moments are found to be finite, of the right sign, and correct order of magnitude, but their ratio is -7 compared to the experimental value of -1.08 . However, in view of the approximations necessary to carry through the analysis, qualitative agreement is all that can be expected. A further conclusion is that in high energy processes, the effective anomalous moments are considerably smaller than under usual conditions.

The interaction of nucleons with the meson vacuum also gives rise to a small electrical force between a neutron and an electron. This is due to the fact that part of the time the neutron is dissociated into a proton and a meson. The magnitude of this force was calculated and compares reasonably well with experiment.

Similar calculations have recently been carried out by Lutinger, Case, and Slotnick, and by Heitler. S.B.

On the Electromagnetic Properties of Nucleons. By Sidney Borowitz and Walter Kohn. *Phys. Rev.* 76: 818, September 15, 1949.

Catalysis

Many gas reactions are accelerated when they take place at the surface of a finely divided solid, a "heterogeneous catalyst." In the process of adsorption it is recognized that gas often does not adhere uniformly to the surface of a catalyst. In many cases it has been possible to stop the reaction by the adsorption of an extremely small quantity of a foreign gas, a "poison." The amount of poison used is much less than the amount necessary to cover the entire surface of the catalyst, showing that only a small portion of the surface is catalytically active. Because of this nonuniformity, one cannot assume that a given step in a catalytic process determines the reaction rate, since at one part of the surface one process (say, rearrangement) may be slow, while at another, a second part of the catalysis (say, desorption) may be slow.

The part of the surface which will catalyze the reaction most effectively will be where the reaction itself will take place with sufficient speed, while at the same time the products will be able to break away and escape. The location of the optimum site will depend upon the rates of these two reactions being equal and upon the pressure of the reactants. A quantitative treatment of these notions is applied to the decomposition of ammonia.

It appears that adsorption data are only vaguely related to catalysis, because sites of overwhelming catalytic importance may not contribute appreciably to adsorption.

G.D.H.

Catalysis on Non-Uniform Surfaces. By G. D. Halsey, Jr. *J. Chem. Phys.*, 17: 758, September, 1949.

Golf Ballistics

The trajectory of a golf ball is determined by the force with which the club strikes the ball and by the forces which act on the ball during its flight through air. In a study of the latter, spinning balls, rotating up to eight thousand revolutions per minute, were dropped through a horizontal wind stream with a wind speed of one hundred and five feet per second. For convenience the force may be described as "drag" in the direction of the wind, and as "lift" perpendicular to it.

The drag of a standard golf ball increases almost constantly from six to eight hundredths of a pound over this speed range, and it reduces the distance of a drive by about one-third. The lift increases exponentially with the rotational speed, levelling off at a value of about six hundredths of a pound. Generally there is under spin and the lift is upward, increasing the height and distance of the drive, although rotation about an inclined axis can result in large horizontal sidewise forces. Accordingly, with precise swinging, the expert has remarkable control of the ball, while the frequent and often disastrous hooks and slices of the average golfer are to be expected.

The performance of a smooth ball emphasizes the importance of surface markings. The drag is about the same as for a standard golf ball, but the lift is entirely different. Below five thousand revolutions per minute the lift is negative; above that speed it is positive, but less than for a standard ball. In driving tests, as the club head speed increases, the smooth ball curves downward more rapidly, resulting in driving distances about half those obtained with a standard ball.

J.M.D.

The Aerodynamics of Golf Balls. By John M. Davies. *J. Appl. Phys.*, 20: 821, September, 1949.

The Tortoise and the Hare

A United Press dispatch from Cincinnati reports that science fiction writers are lamenting the fact their thunder is being stolen by the scientists who are coming up with things fiction writers had never even imagined. They're not alone: scientists are lamenting the fact that some of the science fiction writers' thunder *could* be stolen.