

alloy disk, 15 mm. in diameter and 5 mm. thick, mounted co-axially with the needle. The entire unit had a mass and moment of inertia of about 6 gm. and 0.8 gm. cm.² respectively. It was spun *in vacuo* by the action of the field of a small bar magnet mounted horizontally on an air-driven turbine³ spinning below the disk at about 1,500 rev./sec.

The rotor was speeded up to about 1,200 rev./sec. Its action was such as to indicate that small or large rotors probably can be taken up to their bursting speeds with macroscopic stability, and that many types of drive may be used.

Damping observations were carried out at speeds in the neighbourhood of 600 rev./sec. with the driving magnet removed. Under these conditions, one encounters a frictional torque due to residual gases, and three torques of electromagnetic origin due to misalignment and the earth's magnetic field. In this preliminary work the residual gas pressure was estimated to be of the order of magnitude of 10⁻⁵ mm. mercury, alignment was done roughly, and no attempt

was made to neutralize the earth's field. However, the observed deceleration at the above speed was about 2×10^{-3} rev./sec.², corresponding to a frictional torque of about 10⁻² dyne cm.

It is believed that this device offers possibilities in experiments in which it is necessary to suspend rotatable systems under a variety of conditions. The low frictional torque exhibited suggests its use in experiments in which this property is useful directly, or indirectly as in the attainment of relatively constant rotational speeds for use in velocity of light determinations, etc.

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May 12.

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¹ Holmes, F. T., *Phys. Rev.*, **51**, 689 (1937).

² Reported by F. T. Holmes at meeting of the Va. Acad. Sci., May 7, 1937.

³ Beams, J. W., Weed, A. J., and Pickels, E. G., *Science*, **78**, 338 (1933).

Points from Foregoing Letters

Measurements of cosmic ray intensities at various atmospheric heights at Madras, India and San Antonio, Texas, indicate, according to Prof. I. S. Bowen, Prof. R. A. Millikan and Dr. H. V. Neher, that the incident cosmic rays produce their maximum ionization before they penetrate more than one tenth of the atmosphere. The authors deduce, from the absorption coefficient down to sea-level, that the particles in the cosmic rays are predominately positive electrons, not protons.

Prof. G. Lemaître points out that the discrepancy in the position of the magnetic centre of the earth, as determined from magnetic measurements and as calculated (from the variations in the intensity of cosmic rays along the magnetic equator), is considerably reduced if one takes into consideration that the cosmic rays consist mainly of positively charged particles.

A photomicrograph of crystals of lysozyme, a protein occurring in the nasal mucosa, capable of lysing certain bacteria, is submitted by E. P. Abraham and Prof. R. Robinson. From the ultra-violet absorption spectrum, the presence of 4.4 per cent of tyrosine and 2.2 per cent of tryptophane is deduced.

Dr. T. Iredale and A. Maccoll find that ethylene bromide (C₂H₄Br₂) decomposes at 340°–370° in a pyrex vessel into vinyl bromide (C₂H₃Br) and hydrogen bromide. This reaction is heterogeneous. No decomposition into ethylene and bromine was observed. The authors suggest that the *trans* form of ethylene bromide is the more stable at high temperatures.

Addition of cocarboxylase to acetone-treated lactic acid bacteria (which had thereby lost the ability to dehydrogenate pyruvic acid) restores their power of dehydrogenation, or oxidation, according to F. Lipmann. The presence of phosphate is essential to the reaction.

H. J. Almquist reports that vitamin K, which preserves normal blood-clotting in chicks, has been obtained in crystalline form.

Dr. H. L. Pearse finds that hetero-auxin sprayed on to the shoots of plants of the broad bean grown in water culture causes swelling of the stem, epinasty of the leaves, and inhibition of the terminal bud,

while the form of the root growth is unaffected. Approximately the same amount added to the culture solution retards the growth in length of the roots, and accelerates their growth in thickness, while the shoots, although slightly retarded, remain normal in appearance.

Experiments with cuttings of *Leptospermum scoparium* and of *Ficus repens*, confirming the root-stimulating properties of skatole, are reported by L. G. G. Warne and A. A. Jackson.

C. A. Wingfield has compared the oxygen consumption of normal and gill-less nymphs of a mayfly at various oxygen concentrations. It appears that the gills play little or no part in respiration at high oxygen concentrations, and only aid the oxygen consumption when the oxygen content of the water is reduced to a low value.

Using the Titchener-Ebbinghaus colour pyramid as the psychological colour solid, Dr. G. B. Welch calculates the number of discriminable colours to be of the order of 940,000.

A curve submitted by J. A. Crowther and H. Liebmann shows that when a colloidal dispersion of graphite is treated with increasing doses of X-rays, its zeta-potential (measured by the velocity of the suspended particles in an electric field) alternately increases and decreases.

A new determination of the charge of an electron by Y. Ishida, I. Fukushima and T. Suetsugu, with additional precautions and improvements, gives a value of $e = (4.806 \pm 3) \times 10^{-10}$ e.s.u.

An X-ray microscope by means of which a true enlarged image of chemically different layers, about 1/100th millimetre apart, was obtained, is described by Dr. L. V. Hamos. It depends on the focusing of the characteristic secondary radiation emitted from a surface layer of an object subjected to primary X-ray irradiation.

Drs. F. T. Holmes and J. W. Beams describe a macroscopically stable axial magnetic suspension which has a very small frictional torque. A six gram rotor when coasting at 600 r.p.s. required about eight minutes to lose one revolution per second.