

the two real eigenvalues of the electron's magnetic moment (or rather its projection on a given axis) $\pm \frac{he}{4\pi mc}$, two imaginary eigenvalues $\pm \sqrt{-1} \frac{he}{4\pi mc}$, which can be easily shown to correspond to two real values of the electric moment (or its projection) associated with the electron's spin (the electric moment in the corpuscular interpretation is equal to the magnetic one multiplied by $\sqrt{-1}$). The smallness of ψ_γ, ψ_δ with respect to ψ_α, ψ_β corresponds to the fact that the real part of the electric moment is equal to that of the magnetic one multiplied by v/c , v being the electron's velocity and c that of light.

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Rate of Vaporisation and Vapour Pressure: A Method of Measuring the Specific Area of a Surface.

LANGMUIR (*Phys. Rev.*, 2, 329; 1913) has developed a method for the determination of the vapour pressure of metals from measurements of the rate of vaporisation of metallic filaments *in vacuo*. The vapour pressure is calculated from the Knudsen equation,

$$p = m \sqrt{\frac{2\pi RT}{M}} \quad \dots \quad (1)$$

where m is the rate of evaporation *in vacuo*, after making the assumption, which Langmuir supports with a considerable amount of experimental data, that the accommodation coefficient is unity. In this way he determined the vapour pressure at high temperatures, first of tungsten (*loc. cit.*) and later, with other workers, of platinum, molybdenum, silver, gold, copper, and nickel (Jones, Langmuir, and Mackay, *ibid.*, 30, 201; 1927).

In order to determine the rate of vaporisation from unit area of the filament, Langmuir also assumes tacitly that the specific area of a metal surface is equal to the apparent area. This assumption is, however, in general, not justifiable for irregularities of atomic dimensions are present to a greater or lesser extent in all surfaces. (See Bowden and Rideal, *P.R.S.*, A, 120, 80; 1928. Zwicky, *Proc. Nat. Acad. Sci.*, 15, 253; 1929. Constable, *P.R.S.*, A, 119, 196; 1928.) The work of Bowden and Rideal demonstrates that the specific area in suitable circumstances may be many times greater than the apparent area.

The error involved in the vapour pressure measurements from this assumption may be calculated quite easily. Let m' equal the measured rate of vaporisation from unit 'apparent' area: then

$$p' = Km',$$

where K is a constant given by (1) and p' is the vapour pressure as determined by Langmuir. Now if A is the ratio between the specific and apparent areas, the true rate of vaporisation from unit specific area is m'/A ; and the true vapour pressure p is given by

$$p = \frac{Km'}{A},$$

that is

$$p' = Ap.$$

The values of the vapour pressure determined by Langmuir's method will, therefore, be too large by a factor equal to A . Further, the values of the chemical constants calculated from Langmuir's data appear to show that at least in the case of tungsten and molybdenum this correcting factor may be quite large, for the deviations from the theoretical chemical constant are $+1.40 \pm 0.50$ for tungsten, $+3.02 \pm 0.50$

for molybdenum, and -0.25 ± 0.40 for platinum. If these deviations are to be attributed *exclusively* to the factor A , it would appear that while in the case of platinum the specific and apparent areas are approximately equal, in the case of tungsten the former is approximately five times the latter, and in the case of molybdenum twenty times. For the determination of the vapour pressure from the rates of vaporisation it is, therefore, necessary to know A accurately. It is important to note that A is a measure of the area accessible to condensing molecules of the vaporising solid. This is likely to be very different from the value of A determined, for example, by the method of Bowden and Rideal, which measures the area of a surface accessible to hydrogen ions.

We have so far been concerned with the possibility of the determination of the vapour pressure from the rate of vaporisation, given that A is known. It is quite clear, however, that the converse can be carried out: that is, knowing the true vapour pressure and the rate of vaporisation to determine A , since A is simply the ratio p'/p of the vapour pressure p' calculated from the rate of vaporisation to the true vapour pressure p . Moreover, since the true vapour pressure p can be measured accurately by some equilibrium method, such as the Knudsen effusion method, and p' can often be determined accurately from the rates of vaporisation, we have a fairly exact method for measuring A which is capable of extended application.

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The Classification of the Primates.

MR. TATE REGAN'S letter in *NATURE* of Jan. 25 on the classification of the Primates, with special reference to the microstructure of the dental enamel, again raises the vexed question of Primate phylogeny. Attention has lately been redirected to this problem by the reiteration of the 'unorthodox' opinions of two eminent anatomists, H. F. Osborn and F. Wood Jones.

A consideration of the conflicting points of view regarding the origin of the human stem will, I think, reveal that there are two sources of confusion which tend to prevent a lucid survey of the problem, (1) an arbitrary use of the conception of irreversibility of evolution, and (2) the careless employment of a nomenclature which is often insufficiently defined.

As regards the first point, it is to be noted that, in the absence of an abundant palaeontological record, the construction of a phylogenetic tree must depend almost entirely upon a study of comparative anatomy, with a proper appreciation of the distinction between primitive or generalised, and specialised anatomical characters. If, in the interpretation of the anatomical data, reliance is placed on the 'law' of irreversibility of evolution, it is possible, by a sort of theoretical triangulation, to infer the nature of the common ancestor of the existing members of a natural group. But if the 'law' of irreversibility be accepted at all as a basis for argument, it should be carried to its logical conclusion unless strong evidence to the contrary is forthcoming in exceptional cases. Further, if *all* the available anatomical evidence is taken into account, such lines of argument will inevitably lead to the conclusion that the Catarrhines cannot have been derived from the Lemuriformes (Lemuroidea of Mr. Tate Regan)—as the 'Lemuriformes' are commonly defined, nor can the Platyrrhines have been derived from the Tarsioidea—as the 'Tarsioidea' are commonly defined.

In regard to the second point, the adoption of a