being in fact closer to their values for calcium soaps. The difference may be due to the adsorption of Na^+ ions; this was suggested by Langmuir and Schaefer to account for the difference between their own values for barium and calcium respectively. Measurements are in progress for 'soaps' composed of various other metallic and higher fatty acid ions.

Built-up films of volatile substances should also prove useful in molecular ray technique: the rate of effusion can be observed directly by matching the change in colour of the film within the transparent oven as already described.

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Large Anisotropy of the Electrical Conductivity of Graphite

GRAPHITE is a hexagonal crystal with a perfect basal cleavage. The carbon atoms in it are arranged in layers parallel to the basal plane, the atoms in each layer forming a regular hexagonal net-work[1]. The distance between adjacent layers is 3·4 A., which is much larger than the distance between adjacent atoms in the same layer, namely, 1·42 A. The crystal exhibits some remarkable magnetic properties. Whereas its susceptibility along directions in the basal plane is about $-0{\cdot}5 \times 10^{-6}$ per gm., which is nearly that of diamond, the susceptibility along the normal to the plane is more than forty times greater, being equal to -22×10^{-6} per gm. at room temperature[2]. The abnormal diamagnetism along the latter direction shows a striking temperature dependence[3], and is structure-sensitive[2].

Associated with the abnormal diamagnetism along the normal to the basal plane, we should naturally expect a much larger electrical conductivity in the basal plane than along the normal to the plane. On examining the available literature, we find that conductivity measurements on single crystals of graphite have been made along directions in the basal plane only[4]. We have therefore made measurements both along these directions and along the normal to the basal plane, using some well-developed single crystals from Ceylon. We find that the conductivity in the basal plane is at least *ten thousand* times larger than that along the normal to the plane. Whereas the specific resistance in the basal plane is of the order of $1C^{-4}$ ohm-cm., the specific resistance along the normal to the plane is 2–3 ohm-cm.

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Life-time of the Mesotron

IN a recent note[1], Prof. P. M. S. Blackett seeks to link quantitatively the observed life-time of the mesotron to other constants of Nature. I should like to propose what seems to me a simple and direct deduction of this quantity by relating it to the theory of the nature of the mesotron which I recently advanced[2].

This theory suggests that a heavy electron may be thought of as a quasi-stable state of an ordinary electron moving at a speed such as to enable it to fulfil a simple resonance condition with an atomic nucleus near which it chances to pass. Thus the 'birth' of a mesotron is connected with the approach of a moving electron to within a distance a of a nucleus, where $a \approx e^2/m_0c^2$ represents the range of nuclear forces.

It is natural to assume that, in addition, the annihilation of such a particle may be conditioned by close approach to a nucleus. The mean free path of a very fast electron moving among the nuclei of gas atoms is given by an expression of the form

$$l = \frac{1}{\pi n a^2}, \qquad (1)$$

where n is the number of atoms per unit volume and a has the value given above. Then the life-time of a mesotron moving with essentially the velocity of light will be

$$\tau_0 = \frac{l}{c} = \frac{m_0^2 c^3}{\pi n e^4}. \qquad (2)$$

Substitution of numerical values, using for n the number of atoms per unit volume in air, leads to $\tau_0 = 2{\cdot}48 \times 10^{-6}$ sec., in remarkable agreement with the experimental value of about $2{\cdot}5 \times 10^{-6}$ sec.

Speculations as to the fate of the excess energy (mass) of the mesotron upon its annihilation must be reserved until more extensive experimental information is available.

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Dipole Moment and Alkyl Chain Length

Baker and Groves[1] have recently determined accurate values for the dipole moments of toluene, ethyl benzene, isopropyl benzene, and tertiary butyl benzene, by the gas temperature method.

Baker has also pointed out[2] that the observed sequence of dipole moments is represented by a graph of exponential form (μ being plotted as ordinates against arbitrary equal abscissa increments).

Werner[3] has expressed the moments of a homologous series $C_nH_{2n+1}CN$ by means of an exponential series, but no relation exists between dipole moment and side-chain length as a homologous aromatic series is ascended. It is now found that if μ is plotted against $1/r^2$, where r is the distance between the carbon of the ring and the terminal carbon atom (H in the case of benzene) for C_6H_6, $C_6H_5CH_3$ and $C_6H_5.C_2H_5$, a straight line results:

	r (A.)	$1/r^2$	μ (D)
C_6H_6	1·06	0·890	0·00
$C_6H_5CH_3$	1·54	0·422	0·37
$C_6H_5C_2H_5$	2·53	0·156	0·58
$C_6H_5C_3H_7$	3·95	0·064	0·65

Limiting value, $\mu = 0{\cdot}69$ D.