

Electrical Units and the I.E.C.

SIR RICHARD GLAZEBROOK says¹: "It is recognised that in addition to the three accepted units of length, time and mass a fourth unit is required for the specification of electrical quantities". Recognised by whom? What has happened to the upholders of the old doctrine that these three quantities are possessed of some mystical peculiarity in virtue of which they are necessary and sufficient as 'fundamental units'? Is it abandoned; if so, what do those who held it now believe? Or has a fourth magnitude possessed of this mystical property been found; if so, what is it?

Though I may be in a minority of one, I ask leave to repeat the conclusions that I have expounded at such length in my "Measurement and Calculation". If a 'unit' means something fixed by arbitrary choice and not by facts, then, if n quantities are to be defined, at least n 'units' are necessary. If it means a choice made by assigning a value to some arbitrarily constructed body or system, then no 'unit' is necessary (as Planck's 'natural' system shows), and the number of 'units' that is convenient is a matter of opinion. An 'absolute system', if it means anything, means one in which arbitrary choices are made so as to

make equal to unity all universal constants that have no theoretical significance. The suggestion to make many of the n arbitrary choices in this way is very valuable; but it does not impose a unique set of choices. In particular, it does not force us to make either three or four arbitrary choices in a manner different from the remainder.

Two main errors are responsible for a failure to accept these certain conclusions. One is the ignoring of the distinction between what I have called A and B magnitudes, and of the fact that many magnitudes can be both A and B . The other is the belief, fostered by mathematicians, that experiment can establish the equality of magnitudes of different kinds; every experimentalist knows that it can only establish their *proportionality*.

I am expressing no opinion whatever concerning the practical convenience of Prof. Giorgi's system. I am protesting only against the view, apparently entertained by himself and his followers, that the number 4 has any greater factual significance in connexion with the choice of 'units' than the number 3, which used to be favoured.

NORMAN R. CAMPBELL.

¹ NATURE, 136, 71, July 13, 1935.

Points from Foregoing Letters

By means of their newly-devised supra-conducting galvanometer, Prof. E. F. Burton, F. G. A. Tarr and J. O. Wilhelm find that no thermo-electric current flows in a lead-tin couple if both junctions are kept below 3.7° K., when the metals are in the supra-conducting state.

The relation between the mass of the atomic nuclei of carbon and beryllium and the binding energy of their constituent alpha particles has been derived by Drs. H. S. W. Massey and C. B. O. Mohr.

The energy of the hardest known gamma rays (2.6 million electron-volts) obtained from ThC" and supposedly from RaC can be related, Prof. G. J. Sizoo states, to the position of radioactive elements of odd charge, grouped according to their disintegration constants, plotted against the highest energy of the electrons (beta rays) they emit. The graphs show a simple relation between the two quantities in the case of elements of even and of odd charge number, and suggest that the hard gamma rays now ascribed to RaC may really be due to RaC" and that similar radiation may be expected from UX₂ and AcC".

New X-ray and electron-diffraction analyses of carbon tetrachloride vapour have been made by Messrs. Ch. Degard, J. Piérard and W. v. d. Grinten. Both methods give values for the interatomic distances in good agreement with recent electron-diffraction investigations. From microphotometer records of electron-diffraction photographs, the influence of thermal vibrations could be detected.

Drs. G. S. Carter and L. W. Mapson find that various sterols have an action similar to that of acetylcholine, weakening and slowing the beat of the frog's heart, but they nevertheless appear to balance one another's effects when present together. The addition of either a sterol or acetylcholine to the gastrocnemius muscle of a frog in the resting winter condition leads to prolonged contraction, but when added together, only a normal twitch is observed.

From the amount of vitamin C (ascorbic acid) extracted from a potato under various conditions, M. van Eekelen concludes that vegetables contain a ferment which partially oxidises the ascorbic acid and interferes with its titration. This effect may be eliminated by the addition of 3 per cent trichloroacetic acid. The apparent increase in ascorbic acid observed by McHenry and Graham was due, according to Van Eekelen, to the destruction of the interfering oxidases and not to the liberation of more ascorbic acid from an ester.

E. J. W. Barrington reports the occurrence in the intestine and skin of the ammocœte larva of the brook-lamprey of a proteolytic enzyme apparently similar to that already known to exist in the ascidians. The alimentary systems of these forms are thus physiologically more closely akin than had been suggested by early work on the same subject.

Prof. E. C. C. Baly considers theoretically the velocity of activated chemical reactions brought about in two stages, such as those occurring in biological changes where an enzyme is adsorbed on a co-enzyme.

Drs. G. B. B. M. Sutherland and W. G. Penney point out difficulties in reconciling the shape of the NO₂ molecule inferred from a study of the force fields of triatomic molecules with that deduced from the absorption of infra-red light, and suggest a re-examination of the contours of the absorption bands of NO₂.

Certain viscous materials like golden syrup run out continuously from an orifice while others like clay paste drop out in 'blobs'. Dr. R. K. Schofield and G. W. Scott Blair ascribe the difference to the rate of variation in viscosity with shearing stress, and direct attention to the importance of this factor in such practical matters as the 'shortness' of flour dough and the 'necking' and rupture of metal cylinders.