X-Rays and the Cyclol Hypothesis

THE purpose of the vector map described by Fankuchen and Riley[1] to which Dr. Wrinch has taken exception in her recent letter[2] was merely to show that the cyclol C_2 skeleton does not contribute anything to the specific character of the observed X-ray reflections from crystalline insulin. No one imagines that insulin contains only (CCN) groups, but these are the only atoms of which the positions have been definitely stated by Dr. Wrinch, and therefore the only ones amenable to exact computation. Dr. Wrinch is, of course, at liberty to place other concentrations of density wherever she likes, but she cannot logically claim in this case that the structure arrived at in this way offers any confirmation of the cyclol hypothesis. Moreover, as has been shown already[3], Dr. Wrinch's construction of the vector map from such concentrations[4] has been incorrectly carried out, and therefore cannot confirm her proposed model of the insulin structure. Finally, the shape and size of the cyclol molecule do not offer a particularly convincing fit into the cell of insulin. Any spherical molecule of approximately the right molecular weight would fit the cell equally well. The only positive agreement is in the presence of a trigonal axis of symmetry, which can scarcely be claimed to justify the acceptance of such an elaborate construction.

We feel, therefore, that no case whatever has been made out for the acceptance of the cyclol model on X-ray grounds; indeed so far as it goes, the X-ray evidence is definitely against the model and in favour of one composed not of a cage but of more or less discrete sub-units, although it is admitted[5] that no model has yet been proposed that will fit existing experimental evidence. The arguments against the cyclol molecule on X-ray grounds have now been fully stated[6], and it seems to us unprofitable to continue the discussion until fresh evidence or new interpretations are provided.

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[1] NATURE, **143**, 648 (1939).
[2] NATURE, **143**, 763 (1939).
[3] Bernal, NATURE, **143**, 74 (1939).
[4] Wrinch and Langmuir, *J. Amer. Chem. Soc.*, **60**, 2247 (1938).
[5] Physical Society, discussion of paper of Langmuir, Dec. 20, 1938 (in course of publication).
[6] cf. 1 and 5, Bernal, *Proc. Roy. Soc.*, A, **170**, 75 (1939); Bernal, NATURE, **143**, 663 (1939).

Rapid Calculation of Relative Humidity from Readings of the Sling Hygrometer

AT the recent Institute of Physics Conference at Leeds, I communicated a rule which I have found useful for calculating the relative humidity direct from readings of the ventilated wet- and dry-bulb hygrometer. Expressed so as to facilitate rapid mental calculation, it is as follows: to calculate the percentage relative humidity, express three times the wet-bulb depression (° F.) as a percentage of the dry-bulb reading, and subtract from 100; or symbolically:

$$\text{R.H. (\%)} = 100 - 3\left(\frac{t - t'}{t}\right) \times 100,$$

where t = dry-bulb temperature (° F.)
t' = wet-bulb temperature (° F.).

The same formula applies when centigrade thermometers are used, except that the wet-bulb depression must then be expressed as a percentage of the dry-bulb temperature plus 18.

The rule applies only to the readings of a ventilated hygrometer, and breaks down at relative humidities below 30 per cent; but it applies very closely from 30 to 100 per cent relative humidity, and over an air-temperature range of 20° to 140° F. The degree of accuracy of the formula over these ranges can be checked by comparing calculated values with the corresponding values given in "Psychometric Tables for Obtaining the Vapour Pressure, Relative Humidity, and Temperature of the Dew Point" by C. F. Marvin, U.S. Dept. of Agriculture Weather Bureau, 1937. It will be found that the average difference between the calculated and tabulated values is less than 2 per cent R.H., whilst the maximum difference under extreme conditions within the ranges mentioned is ± 4 per cent R.H. For example, according to the formula, a wet-bulb depression of 5° F. at temperatures of 20°, 40°, 60° and 100° F. corresponds to relative humidities of 25, 63, 75 and 85 per cent respectively, whilst the tabulated values are 26, 60, 73 and 83 per cent R.H.

If the practical interest is confined to the more restricted ranges between 50 and 90 per cent R.H., and 40° F. to 120° F., the calculated relative humidity is in general higher than the tabulated by 2 per cent, and when this correction is made the error does not exceed 1 per cent R.H.

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Rapid Graphical Analysis of Circuit Performance by the Use of Logarithmic Charts

IN connexion with some recent work, use has been made of charts with log (| impedance |) and log (frequency) as axes, and the properties of this plane have been found to lend themselves to graphical use. The chief properties are:

The impedances of the three circuit elements (resistance, capacity and inductance) are represented by straight lines.

The impedance for all frequencies of any two elements in series is exactly represented by one of two curves the shape of which does not depend upon the value of the elements; these can therefore be made in the form of templates.

Since $\log \frac{1}{|Z|} = -\log |Z|$, operations upon impedances in series and parallel are equally simple, and the same two curves apply to elements in parallel as in series.

Since the ratio of the voltage (E_2) across one (Z_2) of two impedances (Z_1, Z_2) in series, to the total voltage E is

$$\frac{|Z_2|}{|Z_1 + Z_2|}$$

and

$$\log \frac{|Z_2|}{|Z_1 + Z_2|} = \log |Z_2| - \log |Z_1 + Z_2|,$$

and the attenuation in decibels is $\left[20 \log_{10} \frac{E_2}{E}\right]$, distances in the vertical direction give attenuations directly.