the efficacious proknocks all seem to disrupt in such a way as to lead to a similar type of branching. The mechanism whereby this branching leads to reformation of X and thus autocatalysis is discussed in a forthcoming publication.

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[1] NATURE, 135, 655, April 27, 1935.
[2] *J. Amer. Chem. Soc.*, 1929 and 1934.
[3] *J. Amer. Chem. Soc.*, **56**, 102; 1934.

Electronic Energy Bands of Solid Copper, Nickel, Cobalt and Iron

DURING the course of experiments on the soft X-radiations of the elements copper, nickel, cobalt and iron, evidence of electronic energy bands has been obtained. The examination of the radiations was made with a tangential grating vacuum spectrograph, and the lines under investigation were the group comprising the L series. These, and especially the L_α line, have been obtained with considerable intensity. Examination of the plates has shown a blackening on the long-wave side of L_α. Microphotometer records demonstrate that this is due to the fact that the line, although possessing a comparatively sharp peak, drops to zero very slowly on this side, and extends almost to the L_η line. Making an allowance for the slit width of the instrument, the wave-length difference between the maximum of intensity of the line and the end of the 'tail' is, for copper, 1·21 A. This corresponds to the large energy difference of 77·5 electron volts. The other three elements give energy differences somewhat less, but of the same order.

The distribution in this band, namely, a fairly sharp short-wave edge and a gradual diminution on the other side, suggests that the electrons in the initial state ($M_{IV, V}$) may follow, very roughly, a Fermi distribution. Such an explanation has been shown to be applicable to the K_α lines of a number of the light solid elements in which the initial state contains the valence electrons[1]. In the present case the $M_{IV, V}$ electrons are expected to be only partially bound, and some such distribution is therefore not altogether unexpected. It might be anticipated that the energy distribution of the $M_{IV, V}$ electrons would resemble more closely that of a semi-conductor than that of a metal, and it is therefore satisfactory to note that there is a marked similarity in shape between the present bands and that of the K_α line of graphitic carbon.

Taking the value 77·5 volts as the energy-spread in a Fermi distribution, the density of $M_{IV, V}$ electrons in the metal may be calculated. The result is too high, and corresponds in fact to the impossible value of 37 electrons per atom. It seems very likely that this is because the electrons are not completely free and cannot, normally, occupy the whole of the space in the lattice of the metallic crystal. Assuming that the number of electrons in the $M_{IV, V}$ group of copper is 10, one obtains the result that these are free to move in 27 per cent of the volume of the crystal.

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[1] Houston, *Phys. Rev.*, **38**, 1791; 1931. O'Bryan and Skinner, *Phys. Rev.*, **44**, 602; 1933. **45**, 370; 1934.

The Phenomenon of 'Wings' as a Vibrational Raman Effect: A Correction

WE have shown in our previous experiments[1] that the wings accompanying the primary scattered line in liquids are mostly connected not with the rotation of molecules but with slow oscillations probably characteristic of the crystal lattice, and have pointed out that this phenomenon is thus connected with quasi-crystalline structure of liquids.

In our note in NATURE of March 16, 1935, an error has crept in: the data and photograph given for the crystal of naphthalene do not, in fact, refer to this substance, but to the p-dibrombenzene crystal. In the case of naphthalene crystal, we have observed in the region of wings four Raman lines with frequencies: $\nu_1 = 45$ cm.$^{-1}$, $\nu_2 = 73$ cm.$^{-1}$, $\nu_3 = 109$ cm.$^{-1}$ and $\nu_4 = 124$ cm.$^{-1}$.

We give in the following table the oscillation frequencies in the region of wings for crystals so far examined by us. In all the substances studied, the

Crystalline substance		Frequencies in cm.$^{-1}$				
Benzene	C_6H_6			62	104	
p-Dibrombenzene	$C_6H_4Br_2$	20	38		93	
Diphenylether	$(C_6H_5)_2O$	22	38	67	104	
Naphthalene	$C_{10}H_8$		45	73	109	124

benzene ring is present, and this may probably explain the appearance of frequencies common to some of the crystals.

We have studied the state of polarisation of new lines in the crystals of p-dibrombenzene and diphenyl ether when the exciting light was unpolarised and polarised. For different lines, various coefficients of depolarisation ρ were found, ranging from $\rho = 0$ to $\rho \approx 1$. For one line of p-dibrombenzene, $\nu = 20$ cm.$^{-1}$, we have found $\rho \gg 1$ (in the case of polarised exciting light). Moreover, the coefficients of depolarisation for these lines depend upon the orientation of the crystal. As in melting the crystal, these Raman lines broaden in a continuous spectrum around the primary line, it is not surprising that in many liquids the wings are strongly depolarised. The depolarisation factor $\rho_n = \frac{6}{7}$, which is to be expected for rotational Raman lines, found for the wings by some observers when unpolarised exciting radiation was used, can be regarded as a fortuitous coincidence.

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[1] NATURE, 135, 100, Jan. 19; 431, March 16, 1935.

Distribution of Nuclear Mechanical Moments

TOLANSKY has suggested[1] that some importance might be attached to the relatively frequent occurrence of small values of those nuclear spins which seem to be due to neutrons, as compared with protons. Even without a detailed nuclear model, an interpretation of the trend may be given.

The nature of the effect of the exclusion principle on the average energy of similar particles is well known. The symmetry of states with opposite spin allows the particles to have a smaller average kinetic energy and energy of binding than they might have with parallel spins. This tendency (together with