retained here to facilitate comparison of the two structures. These directions are indicated on Figs. 1 and 2. If χ_L, ψ_L, ω_L; χ_M, ψ_M, ω_M; and χ_N, ψ_N, ω_N are the angles which these molecular axes make with the a- and b-crystal axes and their perpendicular, we obtain the following results, the figures in brackets referring to coronene :

$\chi_L = 81{\cdot}8°$ (84·8°)	$\chi_M = 44{\cdot}0°$ (44·2°)	$\chi_N = 132{\cdot}8°$ (133·7°)
$\psi_L = 82{\cdot}8°$ (85·6°)	$\psi_M = 48{\cdot}1°$ (46·7°)	$\psi_N = 42{\cdot}8°$ (43·7°)
$\omega_L = 10{\cdot}5°$ (6·9°)	$\omega_M = 101{\cdot}0°$ (96·8°)	$\omega_N = 89{\cdot}6°$ (89·6°)

With regard to the carbon–carbon bond-lengths in the molecule, the analysis is not yet sufficiently refined to enable us to measure these with precision. The preliminary results, however, indicate some interesting variations. The exposed bonds on the outside (indicated by heavy lines in Fig. 1) appear on the average to be shorter than the others (1·36–1·38 A.). The average length of all the twenty-two outer bonds is about 1·39 A., while for the nineteen inner bonds we obtain an average of 1·41 A., with some as long as 1·44 A. We expect to obtain more precise values when the structure has been more completely studied.

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Electrification of Liquid Drops

It has been known for some time that electrification is produced when water breaks into drops, one of the earliest observations being made by Lenard, who found charged drops in the vicinity of a waterfall. This phenomenon is of interest in many ways, one of the most important being in connexion with the production of thunderstorms.

It is a little difficult to see how, as some experimenters appear to suggest, water initially uncharged breaking into drops can on its own, without any other cause, give these drops electric charges. Any argument which gave one a positive charge would equally well give it a negative one. Some recent experiments show that charges are only produced if the break-up occurs in an electric field. The phenomenon then becomes understandable. Water is a conductor—though a bad one—and, if placed in an electric field, positive charges are induced on one side and negative on the other, so that on division these charges separate. If instead of water a non-conducting liquid is used, although the orientation of the dipoles gives the effect of surface charges when in a field, the charges are not separated as in a conductor, and in this case division produces no charged particles. This is analogous to cutting a magnet in half, which does not isolate magnetic poles.

The experiments required the minimum of apparatus. A copper vessel had a hole of about 1 mm. diameter drilled in the bottom. It was filled with water which ran through this hole in a continuous jet. This jet kept together for about 5 cm., and up to this point there was electrical conductivity back to the reservoir. Beyond this, the jet broke up into drops and conductivity disappeared. An insulated vertical copper cylinder was placed around the falling water, and this was charged to various potentials, V, between $\pm$ 1,000 volts above earth. The reservoir was kept at earth potential. The water fell into an insulated vessel connected to an electrometer, and was found to be charged the charge Q per c.c. depending on V. To a first approximation the water is at zero potential down to the break-up point, so that the break-up occurs in the field between the cylinder charged to V and a central cylinder of water 1 mm. diameter at potential 0.

It was found that Q and V in general had the same sign, and that Q plotted against V gave a straight line which just failed to pass through the origin, missing it by about 0·1 volt.

Thus over the large range of voltage variation + 1,000 to − 1,000, Q is proportional to V, which is consistent with the theory of induced charges. The small value of Q when $V = 0$, at first sight, conflicts with the theory that in zero field Q should be nothing; but there is little doubt that it is due to a contact potential difference. When the copper cylinder and copper vessel are both at earth potential, the water is at a slightly different potential and is therefore breaking up in a small field; and the value of V of about 0·1 volt for which Q is zero is a measure of this contact potential between running water and copper. (This method of measurement is being followed up.) There is a good deal of evidence for this, and it will suffice to mention only that the value of Q for zero field for distilled water is different from that for tap water, though the plots are parallel.

Similar experiments with carbon tetrachloride and transformer oil (both extremely good insulators) showed that in these cases an applied field had no effect whatever.

Many experimenters have claimed results in zero fields in regions electrostatically shielded from the earth's field; but this does not eliminate this contact-potential difference between the liquid and the metal with which it was last in contact.

The same considerations apply to sprays, which invariably give off charged drops although everything is apparently at earth potential.

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Atomic Binding Energies

In an earlier paper[1], we published the results of some calculations of analytical atomic wave functions for the ground-states of atoms lithium to neon. Since that time, we have had several requests for the values of the associated total electronic energies. These energies are therefore presented in the accompanying table, where they may be compared with those deduced from experiment. For the lighter atoms these experimental values have been obtained by summing the first, second, . . . ionization potentials of the atoms. For nitrogen, oxygen and fluorine, however, it has been necessary to estimate the last ionization potential by means of a small extrapolation. But the 'experimental' values quoted should all be accurate to about 1 part in 10,000. In no case do the theoretical values differ from the experimental ones by more than 1 per cent. This would still be true if an allowance were made for the motion of the nucleus.