been found to be, *less* than in the vapour states. Further, in many cases Θ can be considered as approximately equal to $-4/3.\pi.\mu^2$, whence, by substitution,

$$ {}_0P_{\text{sol.}}/{}_0P_{\text{gas}} = 1 + \frac{1-\varepsilon}{\varepsilon+2} = 3/(\varepsilon+2), $$

which is identical with the purely empirical result discussed and illustrated previously[4].

(2) The minority of compounds—for example, chloroform, ether and certain amines—which have negative Kerr constants[3], are particularly significant because *they should exhibit larger polarisations in the dissolved than in the gaseous condition.* Such experimental evidence as is available (cf. ref. 2) appears to support this. One extreme case can be quoted as an example: chloroform (Kerr[3] $B = -3 \times 10^{-7}$) at 25° has an apparent orientation polarisation in the liquid (bulk) state of 23·7 c.c. whilst the highest recorded value in the vapour state, calculated from the results of Sircar[2], is only 22·8 c.c.

Fuller information regarding the orientation polarisations in the gas phase of substances with negative Kerr constants is eminently desirable at the present time.

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[1] Raman and Krishnan, *Proc. Roy. Soc.*, *A*, 117, 589; 1927.
[2] *Trans. Far. Soc.*, 1934, Appendix.
[3] Briegleb und Wolf, *Fortsch. Chem.*, 21, Pt. 3; 1931.
[4] Le Fèvre, *Chem. and Ind.*, April 5, 1935, p. 316; and *J. Chem. Soc.*, June, 1935, p. 773.

Coalescence in Stages between Two Drops of a Liquid

A drop of benzene introduced into a vessel of water through a capillary tube spreads to a limited extent over the surface of galena that has been coated by any of the compounds known in flotation as collectors[1]. If now the tube be raised slowly, the benzene drop becomes elongated and then ruptures. The angle of contact being greater than 90°, a portion of the benzene remains on the mineral surface, the greater part contracts into a nearly spherical pendent drop at the end of the capillary tube, and the small portion that formed the 'waist' before breaking becomes a minute drop that rises slowly through the water. It does not immediately coalesce with the pendent drop when they meet. After a variable induction period, a very rapid change occurs, as the result of which the small drop may disappear altogether or may merely decrease in size. On occasions there may be four such diminutions in size before the drop disappears, the induction period for each being several seconds. Other organic liquids behave similarly.

A similar phenomenon has been observed with water. Small drops directed obliquely on to the surface of tap water do not immediately coalesce with it. It is presumed that the surfaces are contaminated by a thin film of grease or dust. Again, coalescence sometimes occurs in stages.

The probable explanation of these facts is that when true contact first establishes itself between the liquid in the small drop and that in the larger surface, spreading occurs so rapidly that the bubble does not fall (or rise) so quickly as its contents drain away; a waist is formed and rupture occurs before the complete drop has been absorbed. It is suggested that these phenomena would repay investigation in a laboratory equipped with a high-speed cinematograph.

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[1] Wark and Cox, "Milling Methods", *Trans. Amer. Inst. Min. and Met. Eng.*, 112, 189; 1934.

Statistical Tests

In discussions on statistical tests with various Continental statisticians and users of statistical methods, I have been struck by their universal mistrust of modern statistical tests as developed by Pearson, Fisher and other workers in Great Britain. I have come to the conclusion that the main reason for this attitude is a perfectly sound reason, namely, that a test is used by many workers in Great Britain as a *simultaneous test* of the untruth of one hypothesis and the truth of the reverse hypothesis. There is *in fact* a large region in the distribution of the criterion for which neither a hypothesis nor its reverse can be assumed to be true. One or the other *is* true, of course, but the test cannot help us in coming to a decision on the matter. Judgment must be reserved. For example, we may wish to test whether a given sample differs significantly from a random sample from a normal population. Applying the χ^2 test, after finding the best fitting normal distribution, and using $p = 0{\cdot}05$, say, as the level of significance, we may find that our sample is just not significantly abnormal.

The χ^2 criterion is perfectly justifiable up to this point. It is quite unjustifiable, however, to assert that the reverse hypothesis is true, namely, that the sample *is likely* to have come from a normal population, unless we have other reasons to believe this, in which case, of course, the χ^2 test is not used as a criterion of the truth of the reverse hypothesis. Given an equal *possibility* of an infinite variety of populations, the most likely group of distributions to have given it contains all those which will give the *modal* χ^2 value for the appropriate number of degrees of freedom. All these and an infinite number of others may be considered as *likely* to have given the sample, compared to the best-fitting normal distribution, which has indeed comparatively a very small likelihood. This likelihood is sufficient, however, to prevent our assuming abnormal distribution.

It is often of scientific and practical interest to investigate whether Gauss's law or other simple laws of distribution apply to a sample. There is no doubt that the χ^2 test, as usually applied, is quite useless for this purpose, though it may be most useful as a test of *significant heterogeneity*, using a low value of P as a criterion. It seems only reasonable that but a small part of the centre of the χ^2 distribution should be used as a test of *fit*.

I believe the mistrust of British methods on the part of the statisticians of other countries to be due partly to their failure to realise that the word 'normal' is usually employed to cover samples which are likely to have arisen from populations the estimates of the mean and other parameters of which have distribu-