halves of the two forks, since the enclosed portions of the bark were, as can be seen in the illustration, quite straightened out. There remained only a thin lens-shaped cavity in the middle of the trunk. This cavity was lined, as has been noted, with bark, which had preserved its structure during the hundred odd years it had been enclosed. The sap-wood immediately below this bark had long since lost its function, and had assumed the appearance and, presumably, also the properties of the heart-wood.

Nothing can be found regarding the history of the tree, and it would be interesting if any readers of NATURE could suggest how the rejoining of the forks came about, if that be what happened. There was nothing to suggest that it had been brought about artificially.

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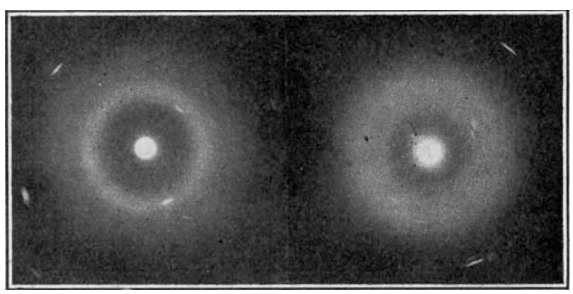
Sept. 1.

X-Ray Diffraction in Liquids.

THE experimental studies described in a previous note in NATURE (April 23, p. 601) have been continued by one of us (C. M. Sogani) and the structure of some thirty-five liquids has been studied by X-radiation. The present note indicates briefly some of the outstanding results of the investigation.

The twenty aromatic liquids examined indicate a remarkable variation of the structure of the diffraction halo with the form, position, and mass of the substituent groups which replace the hydrogen atoms in benzene. Ortho-, para- and meta-compounds are



a *b*

FIG. 1.—Diffraction haloes. *a*, Aniline; *b*, Nitrobenzene.

readily distinguished by their X-ray liquid haloes. When the benzene ring is loaded in an unsymmetrical manner, there is a broadening of the halo, which is the more striking the heavier the mass of the substituent group. The research furnishes numerous examples of this effect, a striking illustration being the difference in the haloes due to aniline and nitrobenzene respectively (Fig. 1 (*a*) and (*b*)). In several of the liquids, the halo becomes doubled, a good example being that of mesitylene, where the two rings are of nearly equal intensity.

The aliphatic liquids examined include several of the paraffins, some alcohols, and an extended series of the fatty acids ranging from formic acid up to brassidic acid, which has a chain of 22 carbon atoms. The results confirm the prediction of Raman and Ramanathan (*Proc. Ind. Ass. Cult. Sc.*, vol. 8, p. 154; 1923) that with such asymmetrical molecules, we may have more than one halo, the sizes of which correspond to different special configurations of neighbouring molecules relatively to each other in the liquids. The most striking illustrations of this are furnished by acetic acid and glycerine, each of which gives two haloes, corresponding respectively to the mean distance between neighbouring molecules which lie side by side and those which lie end to end. With very long molecules, however, only the former type of halo appears on the plates, and its size, as expected, is found to be independent of the length of the carbon chain. With the earlier members of the aliphatic series, noticeable variations appear both in the size and the character of the halo with increasing length of the chain.

The case of liquid mercury, which has also been examined, is of great interest in view of the monatomic character of its molecules, and also in view of the theoretical proof by Raman and Ramanathan (*loc. cit.*; 1923) that the X-ray scattering by liquids at small angles would be determined by the compressibility of the liquid. Mercury has the smallest compressibility of all known liquids ($3{\cdot}9 \times 10^{-12}$), and in agreement with the theory of Raman and Ramanathan, it is found to give a halo with a sharply defined inner margin and a very clear space within.

Further details will be found in papers appearing in the *Indian Journal of Physics*.

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The Influence of Insoluble Materials on the Physical Properties of Liquids.

BAKER in his recent presidential address before the Chemical Society (*Jour. Chem. Soc.*, **131**, 949; 1927) directed attention to some interesting observations on the changes in the vapour pressure and the surface tension of a number of liquids brought about by the presence of insoluble foreign materials. Charcoal, thoria, platinum black, and finely divided nickel, materials already well known for their power of catalysing chemical reactions, were used, and he found that they brought about a change in vapour pressure, increasing with time to a constant value and, furthermore, that whilst heating increased and cooling diminished this difference it gradually returned to the original maximum. Baker attributed these changes to alterations in the complexity of the molecular association of the liquid with the establishment, eventually, of a new equilibrium. It appeared to the present writers that any change in the degree of association must necessarily be accompanied by a more or less corresponding alteration in the density of the liquid, and it seemed to be desirable to apply the delicate method of density determination now available (Robinson and Smith, *ibid.*, **129**, 1262; 1926) to the elucidation of this question.

As a result of the preliminary experiments of this investigation, in which water and ethyl ether were used, it appears to be established that considerable alteration in density occurs when these liquids, at 15°-20°, are brought into contact severally with catalysts. The density of water at about 14°·1 in contact with carbon was found steadily to increase, +0·000080 in 48 hours, +0·00019 in 96 hours, +0·00020 in 150 hours, at which value it appeared to be constant. With ethyl ether and carbon, changes of greater magnitude were recorded, the increase in density at about 14°·8 being in this case +0·0009 in 18 hours, +0·0011 in 42 hours, and +0·0013 in 90 hours, this value being the same after 130 hours. Water at about 18°·5 in contact with thoria showed first a depression of −0·00017 after 24 hours, −0·00002 after 48 hours, followed by an increase above normal density of +0·00001, after 96 hours, +0·00011 after 192 hours, and +0·00015 after 209 hours. It is interesting to note that with this catalyst the change in density at about 23°·3 showed a much greater initial drop, namely −0·00040 after 24 hours, while

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