Letters to the Editor.

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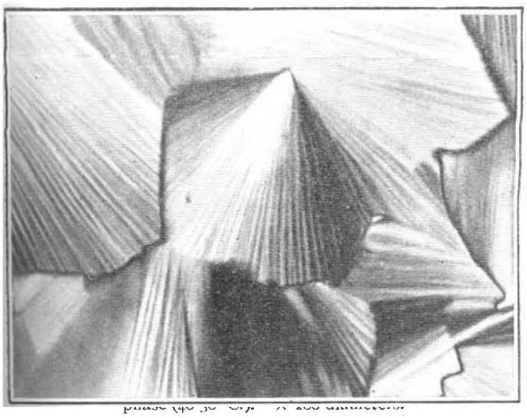
Liquid Crystals—Soap Solutions and X-rays.

AMONGST the earliest examples of Lehmann's liquid crystals were the transparent double cones of ammonium oleate. MacLennan's work has shown that this transparent anisotropic state is common in soap solutions. The accompanying photograph (Fig. 1), taken by Mr. W. J. Elford in this laboratory at the suggestion of my colleague Mr. Piper and myself, shows the very striking appearance presented by these transparent solutions when examined in slightly convergent light between crossed Nicols. The transparent conic anisotropic liquid shown occurs in 2·5 weight normal potassium laurate at 45° C., magnification 200 diameters, and it exhibits very clearly the characteristic fan-like structure composed of focal lines.

A glance at the photograph shows the aptness of



phase (40-50° C.). × 200 diameters.

Friedel's designation of this state of matter, namely, "liquide à conique," which he now proposes to supersede by the term smegmatic (smectique) in order to place soap curds in this class. We have found, however, that every aqueous soap such as potassium laurate may be prepared in each of the forms: hexagonal crystals, curd fibres, and anisotropic and isotropic liquids.

Piper and Grindley found a year ago that the curd fibres show an X-ray structure resembling Müller and Shearer's X-ray diagrams for crystals of fatty acid, whereas anisotropic liquids have given negative results. Following Friedel, they ascribed these curds to the "smegmatic condition." Friedel nevertheless expressly states that for any substance there can be only one "smegmatic" form, and that there are no discontinuities in a "smegmatic" specimen other than the apparent focal lines. Now curd fibres are discrete, and they differ greatly in almost every way from the conic anisotropic liquid soap illustrated in the accompanying photograph, which is seen to typify Friedel's "état smectique" or "liquide à conique." It is therefore evident that Friedel's attempt to classify opaque soap curds as "smegmatic" when that state is already filled by the transparent conic liquid soaps would disrupt his classification of liquid crystals and necessitate the *ad hoc* setting up of a new group within which to include such curds. JAMES W. MCBAIN.

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Earth Tides and Ocean Tides.

I AM in entire sympathy with Mr. Lambert's plea in NATURE of June 21, p. 889, for further research on earth tides. It is much to be regretted that so little has hitherto been effected in that direction. I only wish our "far-flung" Empire had done its share in investigating geophysical problems connected with the earth's crust. I fancy, however, that the horizontal pendulum would be more easily and cheaply installed in outlying stations than the interferometer apparatus of Michelson and Gale. The Milne-Shaw seismometer can be adapted for the purpose by the addition of a stationary mirror tracing a reference line on the record.

Mr. Lambert refers to the "greater apparent rigidity in the prime vertical than in the meridian . . . in various places near the Baltic Sea." This presumably applies to the horizontal pendulum observations at Potsdam and Dorpat (in Esthonia). He goes on to say that "when various ingenious explanations of this peculiarity were found to be untenable, it came finally to be accepted that the true explanation lay in the effect of the oceanic tides."

At Potsdam, where the inequality of the rigidity in different directions is much greater than at Dorpat, the direction of maximum rigidity is apparently not due east and west but about 8° north of west and south of east. This is approximately parallel to the strike of the later foldings in the older rocks to the south and no doubt also of those covered by the Quaternary deposits in the neighbourhood of Potsdam itself. This folding probably extends some miles down in the earth's crust and must diminish the rigidity in a direction at right angles to its strike. I fail to see why this explanation is untenable.

It would be interesting to ascertain how rigidity varies with direction in the neighbourhood of lines of north and south folding. JOHN W. EVANS.

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The Structure of Molecules in relation to their Optical Anisotropy.

As is well known, the light scattered transversely when traversing a column of gas or vapour is not completely polarised, the defect of polarisation depending on the nature of the substance. The explanation of this phenomenon as developed by the late Lord Rayleigh, Born, Sir J. J. Thomson and others is that the molecules which scatter the light are optically anisotropic, that is, have different refractivities in different directions, and are oriented arbitrarily in space. From the point of view of dispersion-theory, the interpretation usually given is that the electrons responsible for the refraction of light are anisotropically bound in the molecule.

This way of regarding the matter, though perhaps not formally incorrect, does not hold out much hope of progress in interpreting the experimental results, owing to the scantiness of our knowledge regarding the manner in which the dispersion-electrons are bound in complex molecules. Recently, under the writer's direction, a series of accurate measurements have been made in his laboratory of the scattering of light in some thirty different gases and vapours by Mr. A. S. Ganesan, and in more than sixty different transparent liquids (chiefly organic compounds) by Mr. S. Krishnan, and the empirical knowledge thus accumulated of the relation between light-scattering and chemical constitution emphasised the unsatisfactoriness of the position of the subject on the theoretical side. Thus,