ference of polarised light follows a normal path, but the part relating to biaxial crystals is unusually full. The later chapters deal with absorbing media, dispersion, structurally active media, and magnetically active media; each of these phenomena is shown to follow from suitable modifications in the expression for the light vector; the interesting question of the constitution of the ether which could give rise to such modifications is, of course, in the author's scheme passed by. But while this is necessarily the case, the analysis given is very full and complete, and Mr. Walker has added to the literature of the subject a book of real value. The book has been printed at the Cambridge Press and published by the Syndics, and their share of the work is admirable.

LIQUID CRYSTALS.

Kristallinische Flussigkeiten und flussige Kristalle. By Rudolf Schenck. Pp. viii+158. (Leipzig: Wilhelm Engelmann, 1905.)

THE announcement of the discovery of liquids that were doubly refracting and dichroic by Prof. Lehmann some fifteen years ago was received with considerable mistrust, for the possession by a liquid of these properties which had hitherto been associated solely with the solid crystalline state seemed at first sight almost inconceivable, and quite inconsistent with the generally accepted ideas as to the molecular tactics of liquids and crystals. The very name of liquid crystal seemed to be self-contradictory. Lehmann's results, however, were soon confirmed by other physicists, one of the most active amongst whom was Dr. Schenck, the writer of the present work on the subject.

Several explanations of Lehmann's observations were offered, based on the assumption that he had worked with liquids containing impurities. Quincke supposed them to consist of solid crystalline particles surrounded by a film of liquid, and Tammann endeavoured to explain their properties by assuming them to be an emulsion of two liquid phases. On the other hand, Lehmann pointed out that it was not justifiable to consider these cases as if they were isolated instances of irregular properties, since the behaviour of these liquids apparently so anomalous may be reconciled with that of other crystalline media if we consider the part played by the rigidity of crystals in maintaining their crystalline form. His investigations have shown that the rigidity of different crystals varies within wide limits. The majority of those we know best offer considerable resistance to deformation, while some, like yellow phosphorus, are quite soft, and others, such as the oleates, have so little rigidity that the force of surface tension is sufficient to deform the crystal from its true geometrical shape; in the limiting case, that of *p*-azoxyanisol and the other liquids investigated by Lehmann, the rigidity has become so small compared with the force due to surface tension that the crystal when placed in a liquid of equal density assumes a spherical form.

Lehmann's work was entirely microscopic, but macroscopic investigations were undertaken by other investigators. A study of the physical properties of the birefringent liquids, particularly of their viscosity and dielectric constants, and an unsuccessful attempt to resolve them by cataphoresis, showed that each of them was without doubt a single substance, and thus the hypotheses put forward by Quincke, Tammann, and other authors were disproved.

Prof. Lehmann's monograph on these bodies, which was reviewed in NATURE recently (vol. lxx., p. 622, 1904), consists mainly of an account of the results of his microscopic investigations and of the theory he has formulated to explain these. A very important part of the work was thus left undescribed, and Dr. Schenck's book covers the ground omitted by Lehmann, and, in addition, gives a short summary of the latter's experiments.

The preparation of the various substances that have been found to yield anisotropic liquids is described in detail, also the determination of their physical constants. The investigation of the surface energy of the liquids indicates that there is no sudden change in their molecular weight at the temperature at which the anisotropic liquid passes into the isotropic condition. The viscosity curves, however, show a large break at this temperature, the isotropic liquids being in some cases the more viscous. The density curves show a similar discontinuity. The two liquids have different specific heats, and there is a small but definite heat of transformation of one form to the other.

Dr. Schenck has given a very complete account of our knowledge of these anomalous liquids, which have great interest both for the chemist and physicist, and his book will be of great service to those who wish for information about them. It is clearly written and arranged, and contains a number of diagrams and plates. Of theories as to their nature he wisely fights very shy, and it seems that considerably more work is needed before we shall be able to form any clear idea as to their molecular structure.

H. B. H.

PLANT-BREEDING IN AMERICA.

New Creations in Plant Life: an Authoritative Account of the Life and Work of Luther Burbank. By W. S. Harwood. Pp. xiv+368; 50 illustrations. (New York: The Macmillan Company; London: Macmillan and Co., Ltd.) Price 7*s.* 6*d.* net.

THERE is something to be said in favour of this work; at the same time we imagine no one will have more cause to regret its appearance than Mr. Burbank himself. The reasons for this expression of opinion are easily supplied. It is decidedly desirable that the outside public should be made aware of the enormous practical importance of what is called plant-breeding, and that they should be familiarised with the means and methods adopted by experts for the multiplication and improvement of flowers, fruits, and other vegetable products. A slightly increased percentage of sugar in the sugar-cane or the beet, an apparently trifling improvement in the staple of