has not been our aim to provide for comprehensive syntheses of this type, which are not necessary in dealing with the comparatively small molecules in which we are interested, and which at the present time can be carried out efficiently only by a centralized computing service, to which our method should be regarded as complementary. Our procedure, which we consider to be sufficiently simple to be within the reach of any laboratory engaged on accurate structure analysis, is particularly adapted to the evaluation of electron densities with good accuracy over limited areas; for example, in regions where atoms are indicated by 'trial and error' or other preliminary investigations. The methods of selecting the cards and of tabulating confer a flexibility which enables this to be done with equal ease for any part of the unit cell, and by restricting calculations to regions which contain details of interest, it becomes feasible to use the Hollerith method not only for final syntheses but also for some, at least, of the preceding ones too.

We shall be glad to give working details of this method to anyone who is interested.

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[2] Cf. Booth, A. D., *Nature*, **156**, 51 (1945).
[3] For example, Comrie, L. J., in discussion on paper by Beevers, *Proc. Phys. Soc.*, **51**, 660 (1939).
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Orientation of Fibrils in Natural Membranes

In recent years, several studies of the orientation of chitin and protein chains in the insect cuticle[1,2] and of cellulose chains in plant cell walls[3] have appeared. Between 1938 and 1940, X-ray, optical and chemical studies of the cuticle of annelids and nematodes were made by one of us (L. E. R. P.) with the idea of obtaining information about the structure of other types of natural membranes. The cuticles of these animals are largely composed of fibrils of a protein belonging to the collagen group, distributed with their long axes in the plane of the cuticle and in two preferred orientations with respect to the long axis of the body. In annelids, such as *Aphrodite* and *Lumbricus*, the fibrils cross at *c.* 90°, and each set makes an angle of *c.* 45° with the long axis. In *Ascaris*, the two sets make an angle of *c.* 135° with each other and of *c.* 70° with the long axis. An arrangement of this kind may be mechanically advantageous, since the resulting membrane is capable of anisometric extension, though the individual fibrils are inextensible.

It has been suggested[4] that the cellulose chains in plant cell walls are deposited in sheets, alternately oriented in one or other of two preferred directions, and that this orientation depends on control exercised by the protoplasmic surface of the cell. The preferred orientation of fibrils in membranes bounding grossly macroscopic organisms, such as round and bristle worms, where the cuticle is formed by a hypodermis composed of millions of cells, would seem to require a high degree of co-ordination of the activities of these cells, if orientation depends on the protoplasmic surface beneath the cuticle. The mechanical aptness of fibrillar orientation in the cuticle, however, invites an alternative hypothesis: that shear and/or tension forces acting during secretion may be responsible for the observed orientation.

In the filamentous alga *Chætomorpha linum*, it has been shown[5] that both longitudinally and transversely oriented cellulose chains are present in each of the microscopically visible lamellæ of the cell wall. A macroscopic system in some respects similar has been studied in the cocoon of the chrysomelid beetle *Donacia*. Although first deposited as a viscid mass surrounding the larva[6], this barrel-shaped, chitinous cocoon afterwards hardens, becomes laminated, and exhibits positive birefringence with respect to the shorter diameter after freeing from sclerotin. The organisation of the cocoon cannot in this case be due to the intervention of a protoplasmic surface. Recently, one of us (M. M. S.) has shown that the thinnest single laminæ which can be separated from the *Donacia* cocoon are mosaics of birefringent and isotropic regions. If the extinction directions in a number of laminæ are plotted against frequency in a polar diagram, it is found that the chitin chains are oriented predominantly at 45° and 90° to the long axis of the cocoon.

These observations on different types of macroscopic cuticular membranes suggest that (*a*) 'crossed fibrillar'[3] orientation can occur at the surface of cylindrical units of a very different order of size from that of single cells; (*b*) preferred orientation of fibrils with respect to the morphological axes of the unit may be due to mechanical forces acting during deposition; (*c*) contact with a protoplasmic surface is not essential for the formation of a laminated membrane with two preferred orientations of chitin chains; (*d*) preferred orientation in two directions may occur within a single microscopic lamina of a multilaminate, macroscopic membrane.

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A New Method for Determining the Penetration Depth in Superconductors

It is a well-known property of high-frequency electrical transmission lines[1] operating in the normal mode that the velocity of propagation of a wave along the line is given by the equation $v = 1/\sqrt{LC}$, where L and C are the inductance and capacitance per unit length. But whereas for all frequencies used in practice the value of C is simply the electrostatic