Formation of New Cell Walls in Cell Division

IN 1882 Giltay¹ suggested that the new cell wall was not a partition separating the daughter protoplasts, but that the latter each secreted a continuous wall around itself; the two daughter cells remaining for a time within the stretched wall of the parent cell.

This suggestion was neglected until 1938, when Priestley and Scott² published evidence of the phenomenon in the parenchyma, collenchyma and sclerenchyma of dicotyledons. This evidence was based on a maceration technique which dissolved the middle lamella, leaving only cellulose walls. Observations on such macerated material showed files of daughter cells surrounded by the stretched wall of the original parent cell.

I have applied this maceration technique to a number of flowering plants and found the phenomenon common to both stem and root tissues. This treatment has produced the same results in the rhizomes of *Aspidium* and *Equisetum*, the stem of *Sphagnum*, the thallus of *Lunularia* and the cortical cells of *Fucus* (see Figs. a-g). Another example of this type of cell-wall formation in the algae is reported for *Dictyosphaeria favulosa* by K. Wilson³.

Priestley and Scott hesitated to attribute this mode of wall formation to meristematic cells of the shoot apex, in view of the lack of information on the nature of these cell walls and their behaviour under maceration. It is, however, interesting to note that in the transverse section of the shoot apex of *Lupinus albus*, Ball⁴ depicts groups of cells surrounded by a common wall.

More data are required before generalizations may be made, but the above evidence derived from representatives of the Bryophyta, Pteridophyta and Spermatophyta suggests that this mode of

cell wall formation may be universal in the higher plants.

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¹ Giltay, E., *Archives Néerlandaises*, 17, 432 (1882).

² Priestley, J. H., and Scott, L. I., *Proc. Leeds Lit. Phil. Soc.*, 3, 532 (1938).

³ Wilson, K., *Ann. Bot.*, N.S., 15, 279 (1951).

⁴ Ball, E., *Amer. J. Bot.*, 36, 440 (1949).

The 'Golgi Substance'

IN *Nature* of August 11¹, Dr. A. J. Dalton described the appearance under the electron-microscope of the 'Golgi substance' in cells of the mammalian intestinal epithelium and liver. During a period of many years I have devoted a great deal of attention to the part of the intestinal epithelial cell studied by Dr. Dalton and have reported my results in full².

To find out what lies in this part of the cell, it is necessary to make one's examination before the cell has undergone any visible changes resulting from its death. The intestinal epithelial cell of the mouse can easily be examined in what is usually called a 'supra-vital' state; that is, the living tissue can be removed from the body and at once examined in a suitable saline solution. The cells undergo no visible change for a considerable time. Under phase-contrast the so-called Golgi region (close to the nucleus and on the side of it directed towards the free border) can be seen to contain a number of separate spherical or sub-spherical bodies, some of them containing one or more vacuoles. These bodies I call lipochondria. I reject the name 'Golgi apparatus', because that, by Golgi's definition, is a network.

Lipochondria are easily stained supra-vitaly with neutral red or dahlia. If one wishes to have a permanent preparation, one should use the sudan black method³, though even this may somewhat distort them. The non-vacuolate bodies are lipoid all through; the vacuoles, when they occur, do not contain lipoid.

I have demonstrated these lipochondria of the living cell to others repeatedly (for example, in my classes in the University, at the meeting of the Association of British Zoologists in London in January 1950, and to Prof. Jean Brachet during his visit to Oxford in the same month), and am prepared to do so again.

The classical 'Golgi apparatus' consists of particles of osmium hydroxide or of silver deposited in or on various objects in various cells: in this particular cell on the lipochondria. Silver has a strong tendency to produce an artificial appearance. It is as though one were to try to find the shape of a group of transparent spheres by throwing particles of mud at them and recording accurately the shape assumed by the mud. Naturally enough, it often assumes the shape of a net. One could alter the appearance at will by throwing more or less mud, and the same applies in finding silver preparations of the cell.

Camera lucida drawings ($\frac{1}{2}$ " objective; reduced to $\frac{1}{2}$) of macerated material of (a) *Lupinus albus* stem, (b) and (c) rhizome of *Aspidium*, (d) rhizome of *Equisetum*, (e) stem of *Sphagnum*, (f) thallus of *Lunularia*, (g) cortical cells of *Fucus*, showing groups of cells enclosed or partially enclosed in the original parent cell wall. In most cases the cells are showing plasmolysis