

## AN OBSERVATION ON THE FUNCTIONING OF THE GOLGI APPARATUS

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The status of the Golgi apparatus as a distinct cellular organelle and its role in the formation of secretory products are now firmly established (Dalton, 1961). There have, however, been few definitive observations about the pattern of its functioning.

In the outer root-cap cells of maize and other species, as well as in other plant cells, the Golgi apparatus forms membrane-bounded vesicles, the contents of which are secreted through the plasma membrane of the cell. Progressive changes in the staining reaction of the contents of these Golgi vesicles are observable not only after the vesicles leave the Golgi apparatus but within the apparatus itself (Figs. 1-3). Study of these changes provides certain suggestions regarding the functioning of this organelle.

Formation of the secretion vesicles is apparently progressive across the "stack" of cisternae from one of its faces to the other. Cisternal elements are ultimately separated from the central structure in the production of secretion vesicles from the "mature" face. Continuing functioning of the apparatus presumably depends upon formation of new cisternae on the opposite face. Volume of the vesicles and density of their contents increase and internal structure becomes more apparent as the secretion vesicles "mature" (Figs. 1, 3). In the root-cap cells the separated secretion vesicles move

through the cytoplasm and their contents pass the plasma membrane. This pattern of functioning of the Golgi apparatus in production of relatively large secretion vesicles may relate to, or may be quite different from, the activity of the Golgi apparatus in the production of other types of vesicles and/or products (to be discussed in detail in a paper now in preparation). In this pattern of functioning the progress of change in the contents of the secretion vesicles is toward development of internal structure, revealed by certain fixations as fibrillar (Figs. 2, 3). The activity of the Golgi apparatus that involves the production of relatively large amounts of secretory products also must involve mechanisms for membrane production both for the increase in size of cisternae as they "mature" and for the formation of new cisternae on the "forming" face of the apparatus.

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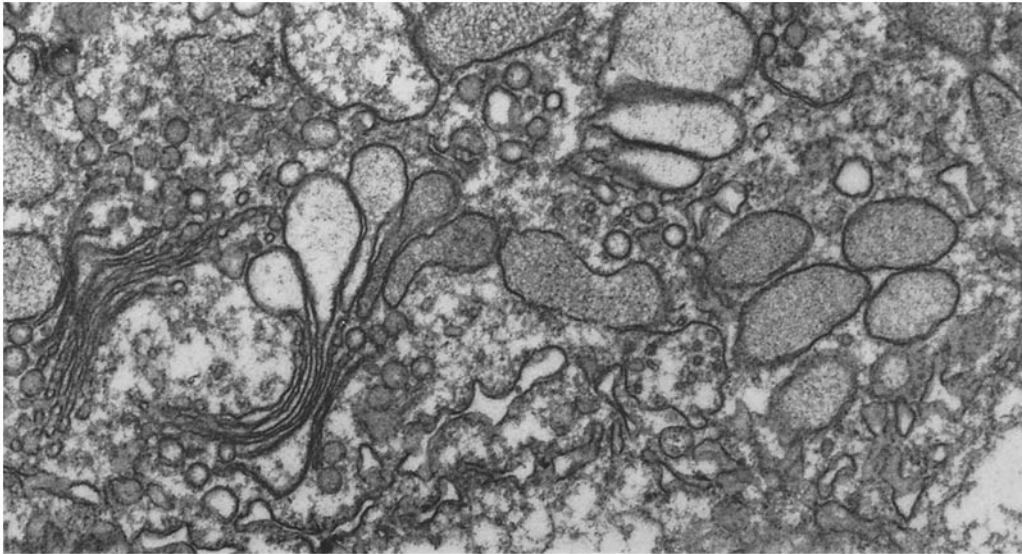
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### FIGURES 1 TO 3

Sections of an outer root-cap cell of the primary root of *Zea mays* L. showing Golgi apparatus producing secretory vesicles. Fixation in osmium tetroxide, by the method of Palade (1952); embedding in a mixture of Epon and Araldite epoxy resins.



**FIGURE 1**  
Golgi apparatus and numerous separated secretion vesicles.  $\times 34,000$ .

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FIGURE 2

Arrow designates the direction of "maturation" of the secretion vesicles.  $\times$  46,000.

FIGURE 3

Golgi apparatus and numerous separated secretion vesicles.  $\times$  33,500.

