

# GOLGI COMPLEX

## - Its Structure & Functions

### INTRODUCTION

The differentiated portion of vac. system that is morphologically & functionally related to end. reticulum (ER) on one side & to the secretory ~~cells~~ vesicles on the other, is the Golgi Complex or Golgi Apparatus so named after its discoverer, Camillo Golgi (1890).

~~Even if there are reasons to consider Golgi body as a separate organelle~~

Even if they are in continuity w ER, there are reasons to consider the G.C. as a separate organelle & not its part. It seems to be associated mainly w the sec. functions. [In divid'g cells, the Golgi vesicles have been seen to collect in the mid spindle region suggesting that contents are being released by these, play a key role in the formation of plasma membrane.]

### HISTORY

St. George (1865) - 1st observed it.

C. Golgi (1890) - called it "Int. Ret. Apparatus"

Holmgren (1900) - as "Trophosphonium"

Perroncito (1910) - "Dichyosomes"

Cajal (1914) - studied them in diff. cells.

Nassonov & Bowen (1923-29) - Organelles of secretion

Baker (1951) - "Lipochondria"

Dalton (1952) - as "Parallel Membs", hence Baker (1959) called it as the "Dalton Complex".

Thus, we see that this is ~~various~~ but the ~~most~~ <sup>most</sup> "Golgi Complex" is the most acceptable term. Initially, Baker didn't accept this term, but in 1963, he <sup>too</sup> accepted this term.

### ULTRA STRUCTURE OF G.C.

In gen., 3-memb. components are recognised under the E.M. Microscope  $\Rightarrow$  DALTON & FELIX (1954) was 1st to give its str.  $\rightarrow$

- I. Cisternae
- II. Tubules & Vesicles
- III. Large vacuoles.

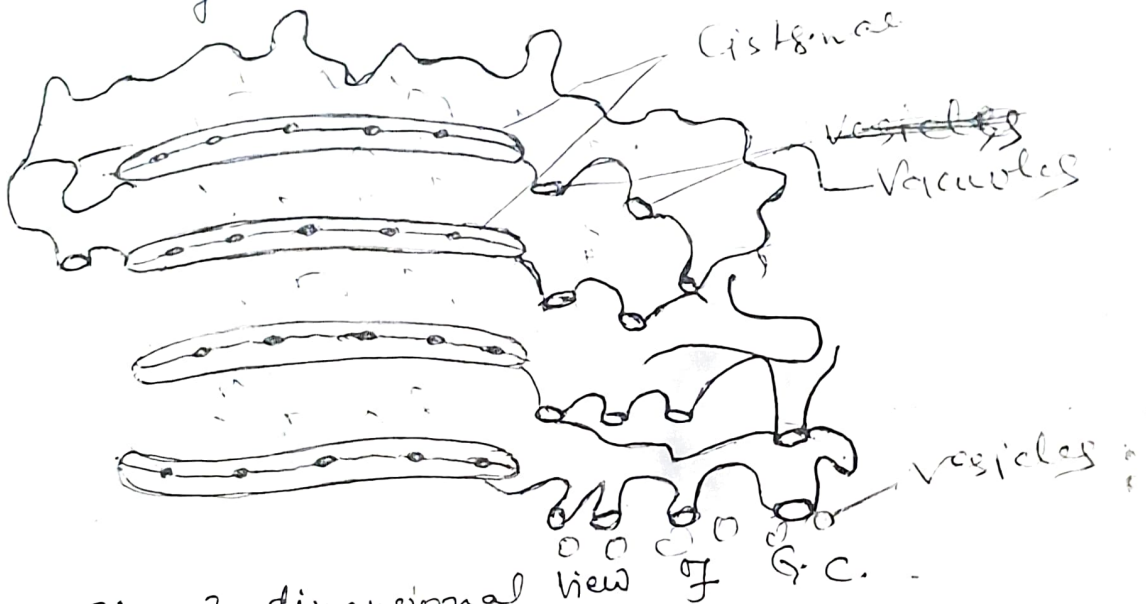


Fig: 3-dimensional view of G.C.

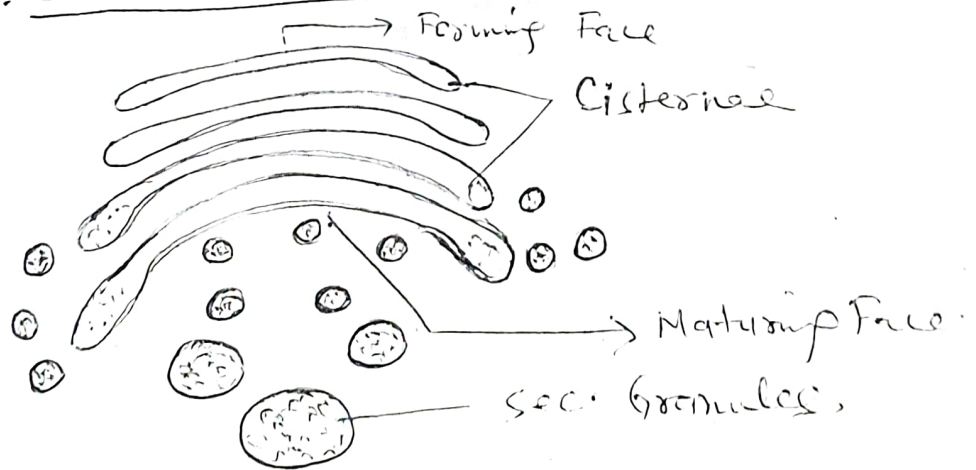


Fig: Various components of G.C.

#### I. CISTERNAE

- arranged parallelly or may be arranged concentrically  $\bar{c}$  a concave & convex face.
- stacks of cisternae are differentiated bet<sup>n</sup>.

"mating face" & a "maturing face".

- F. Face / prox. face (convex) is on out<sup>side</sup> & the M. <sup>face</sup> ~~side~~ is on the opposite side.
- It is believed that smooth membs. of ER bud off vesicles which then become arranged on the F. face & form a fenestrated plate.
- On the M. face, vacuoles are formed by dilation & pinching off the edge of cisternae.
- Gisternal units are placed 200-300 Å<sup>o</sup> apart.

## II. TUBULES & VESICLES:

- On the convex surface of G.C., there is a system of small vesicles & tubules which are more easily recognised by "-ve staining".
- ~~X~~ - These tubules converge upon G.C. forming thus, a kind of fenestrated plate.]

## III. LARGE VESICLES:

- the stack of cisternae generally encloses a region of cytoplasm containing large vacuoles.
- Its diff. regions exhibit diff. affinities to stains. On this basis, Richardson & Bourne have differentiated it into —

- Out<sup>er</sup> osmic & argenlophilic
- Inner osmic & argenlophobic regions.

~~X~~ [But, Backer (1944) distinguished it into: —

- Neutral red vacuoles
- dense lipid containing substance.
- diffused " "
- Golgi products.]

~~The~~ Further, the membs. of G.C. are essentially "Unit Membranes" & differentiated into an inner & an out<sup>er</sup> memb., which are separated by an "intramembranous space".

|                    |   |                       |       |
|--------------------|---|-----------------------|-------|
| Each memb.         | → | 60-70 Å <sup>o</sup>  | thick |
| space in cisternae | → | 60-90 Å <sup>o</sup>  |       |
| " " vacuoles       | → | 60-200 Å <sup>o</sup> |       |
| & " " vesicles     | → | 30-40 Å <sup>o</sup>  |       |

## CHEM. COMPOSITION

- Golgi memb<sup>s</sup> are "lipo-proteous" in nature
- earlier reports show the +ve of phospholipids, ribo-nucleic acids (RNA), acid phosphates & alk. phosphates.
- +ve of "lecithin" & "cephalin" in the G.C. of nerve cells as described by Backer (1944).
- Cain has reported the +ve of "carotenoids" in the G.C. of *Limnaea* & planorbis.
- Imp. enzymes found in it are:→
  - a. ADPase
  - b. TPPase (Thiamine Pyrophosphatase)
  - c.  $Mg^{+2}$  ATPase
  - d. Acid - phosphatase
  - e. UDP-N-acetyl glycoamine transferase
  - f. ~~Gl~~ Galactosyl transferase
  - g. 5' - Nucleotidase.
  - h. Glu-6 - phosphatase.

## FUNCTIONS OF G.C.

[There has been great controversy regarding functions of G.C. but its vital importance has long been realised]. Presently, following functions are attributed:→

### ① Production of Cellular Secretion:

[It is, by far, the commonest function of G.C. & to a cytologist] secretion involves a no. of discrete steps:→

- a. incorporation of raw materials by passive transport, active tr., pinocytosis & phagocytosis.
- b. synthesis of molec<sup>s</sup> of higher mole. wt. from these raw materials.
- c. extrusion of synthesized products.

This process of secretion is a complex process involving almost all organelles & its