

CELL BIOLOGY HISTORY

23Sept91, 26Sept94, 20Sept95, 25Sept 96, 24Sept01, 24Sept02, 24Sept03, 21Sept05, 19Sept07, 24Sept08, 22Sept09, 22Sept10, 21Sept11
B&D p 2-12 , BKH 5th, 1-13, BKH 6th, 1-13, BKHB 7th: 1-5, Hardin et al: 8th : 1-8

Dynamic nature of cell. They:

- | | |
|-------------------------|----------------------------|
| 1. grow | anabolism: synthesis |
| 2. reproduce | mitosis |
| 3. become specialized | differentiation |
| 4. respond to stimuli | chemotaxis |
| 5. adapt to environment | enzyme and gene regulation |

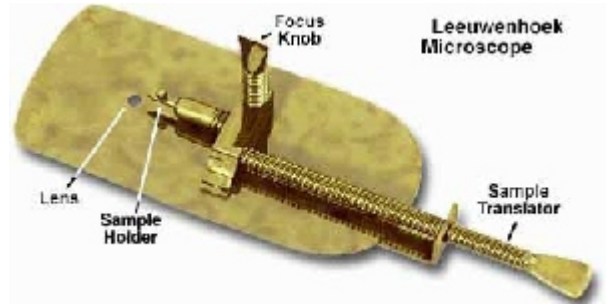
Cell biology formed by convergence of : 1. **cytology**

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2. **genetics**
3. **biochemistry**

HISTORY OF CYTOLOGY: (see p 5)

First **descriptive** then investigative. Dependant on new **technology**: microscope.



Leeuwenhoek's microscope

DESCRIPTIVE

Robert Hooke 1665, Curator of Instruments for Royal Society, viewed thin slices of cork under 30x lens, saw compartments, he called *cellulae* (They were empty, he had not idea of significance)

Antonie van Leeuwenhoek 1673 cloth merchant, developed improved **simple microscope** (300x), examined everything, illustrated, communicated to **Royal Society**, last quarter of 17th C.

INVESTIGATIVE:

Robert Brown 1833, English botanist, using improved lenses, noted that every orchid epidermis cell had round structure he termed **nucleus**

Matthias Schleiden 1838, German botanist, concluded all plant tissues are composed of cells
Also, the embryonic plant arose from a single cell.

Theodor Schwann 1839, German zoologist, examined cartilage which has good cellular definition concluded:

all animal tissues are composed of cells

He proposed two cell theory tenets, became unified cell theory:

UNIFIED CELL THEORY (three tenets):

- 1) **all organisms made of cells**
- 2) **cell is the basic unit of structure**

Karl Nägeli 1842, observed cell division in pollen

Koelliker 1852, identified four somatic tissue types (epithelial, connective, muscle, nervous)

Robert Remak 1855, noted div. was initiated in nucleus

Rudolf Virchow 1858, German Physiologist, concluded cells arose only by division of preexisting cells:

"Omnis cellula e cellula," adding 3rd tenet of cell theory:

- 3) **cells arise only from preexisting cells.**



Figure 1

TECHNOLOGICAL DEVELOPMENTS OF CYTOLOGY: (*cytos* = Gk, hollow vessel)

concerned with cell **structure**, depended initially on light microscope

microtome ["tiny-cut"] invented in 1870, allowed analysis of tissue structure (thin sections)

dyes developed in Germany 2nd half 19th C. They specifically stain particular components

optics improvements pushed to limit of resolution:

depends on wavelength = λ = 'lambda' (micrometer = micron = 10^{-6} m [nanometer = 10^{-9}])

$\lambda/2$ = theoretical resolution limit. Thus 400-700 nm lambda resolves 200-350 nm.

Cells often 20-40 microns, organelles, 0.2-2 microns.] therefore mag = 1000-1500x

Electron microscope invented in Germany, 1932.

Palade, Sjostrand and Porter used in early 1950s. limit of resol for electron 0.1-0.2 nm Magnification up to 100,000x.

Scanning tunneling microscope able to resolve general shape of DNA .