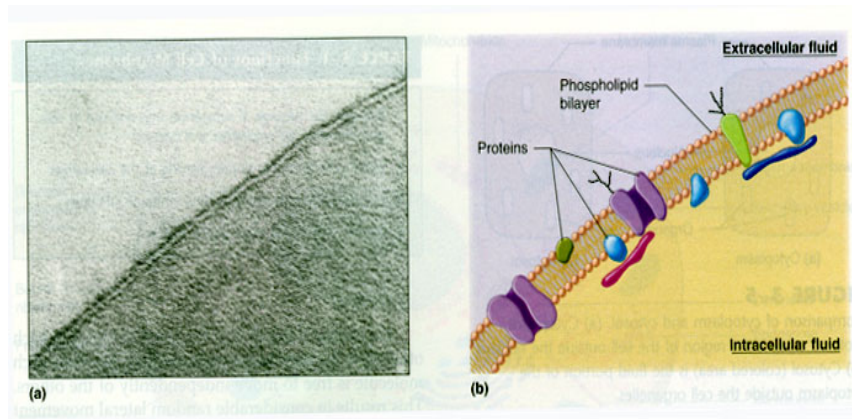


Plasma Membrane



3

Membrane Functions

- Barrier between inside and outside of cell
- Controls entry of materials- Transport
- Receives chemical and mechanical signals
- Transmits signals between intra- and extra cellular spaces
- Note the various proteins in figure

4

Plasma Membrane

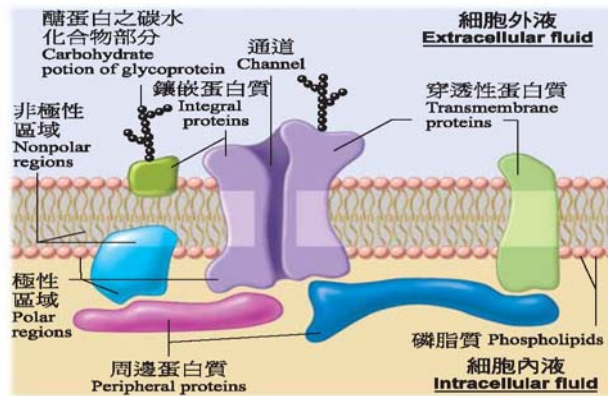


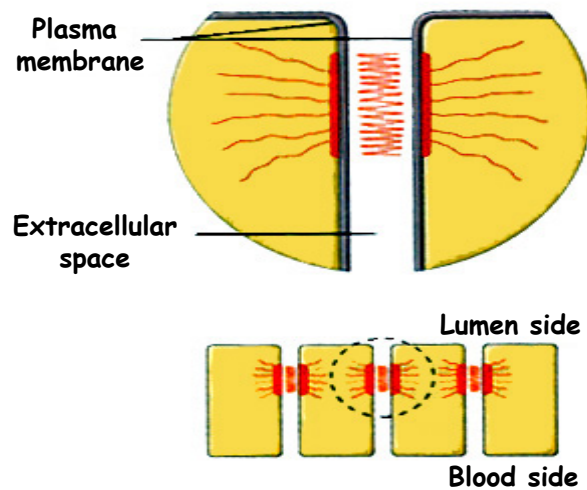
圖 1-7

鑲嵌蛋白質、周邊蛋白質與磷脂質雙分子層的相關位置。為了清晰，所以圖中將膽固醇分子予以忽略。

5

Membrane Junctions

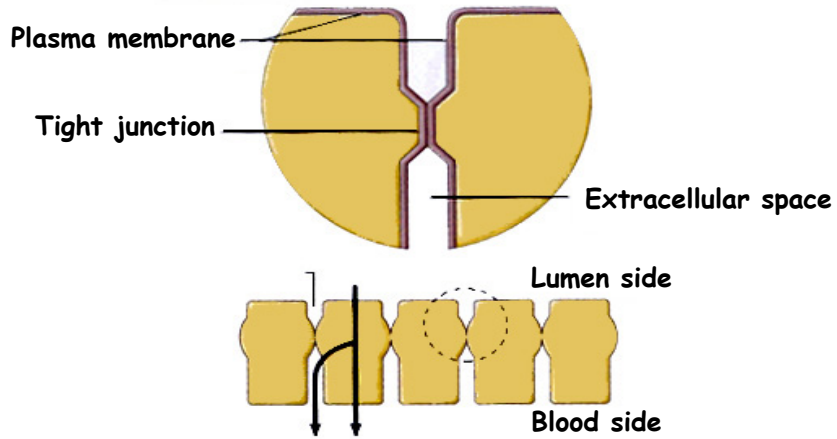
Desmosome



6

Membrane Junctions

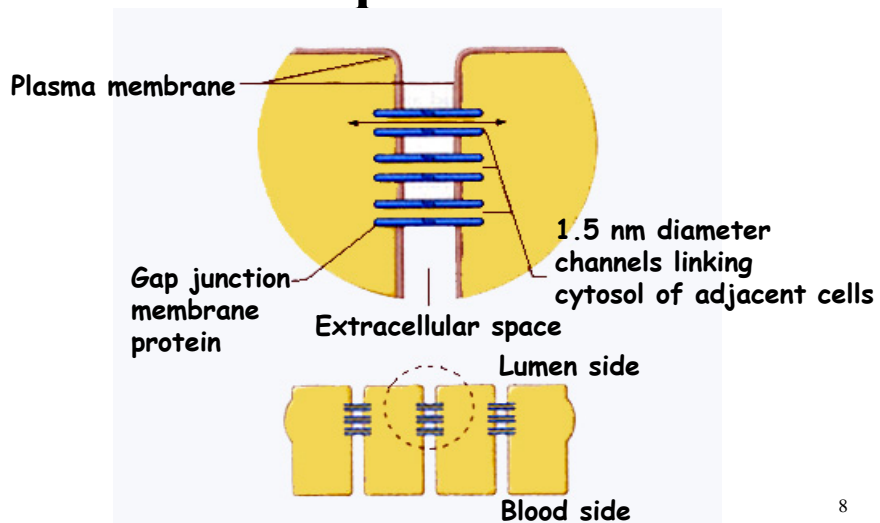
Tight Junction



7

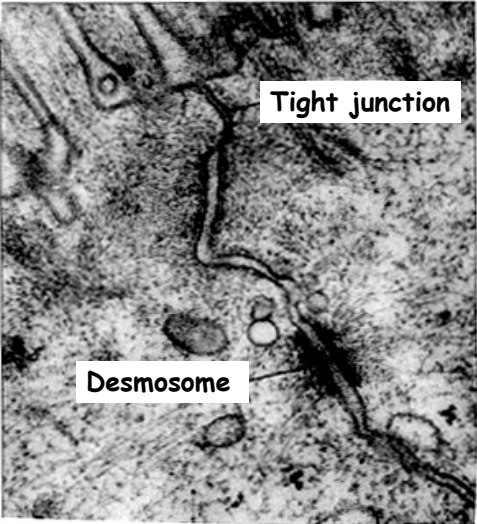
Membrane Junctions

Gap Junction



8

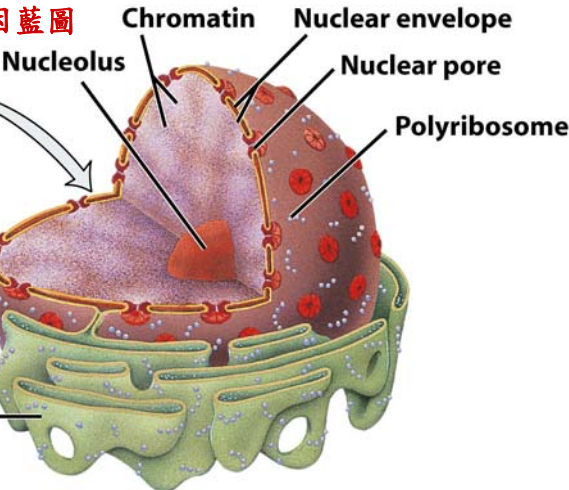
Membrane Junctions



9

Nucleus

導引蛋白質合成
作為細胞複製時的基因藍圖



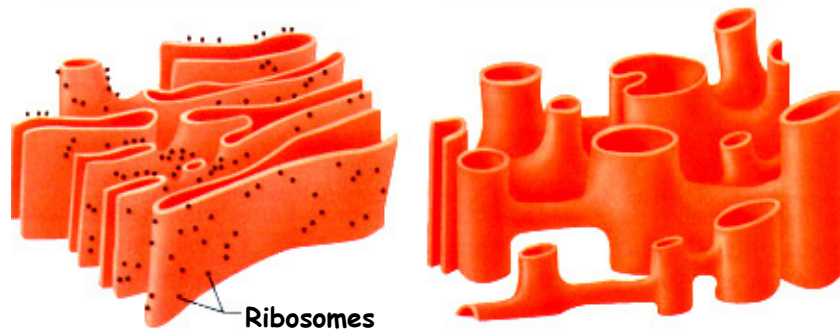
Details of the nucleus

Figure 3-17 part 1 Introduction to the Human Body, 7/e
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Endoplasmic Reticulum

Granular endoplasmic reticulum

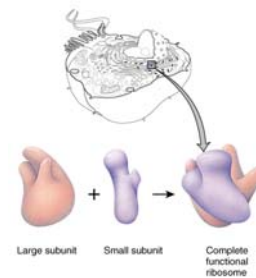
Agranular endoplasmic reticulum



11

Ribosomes

- Large + small subunits
 - made in the nucleolus
 - assembled in the cytoplasm
- Packages of Ribosomal RNA & protein
- Free ribosomes are loose in cytosol
 - synthesize proteins found inside the cell
- Membrane-bound ribosomes
 - attached to endoplasmic reticulum or nuclear membrane
 - synthesize proteins needed for plasma membrane or for export
 - 10 to 20 together form a polyribosome
- Inside mitochondria, synthesize mitochondrial proteins

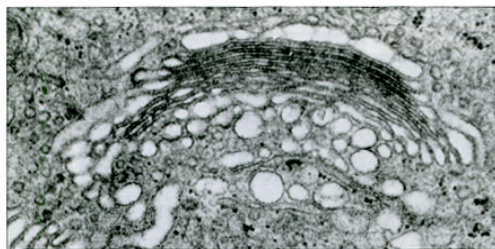


Transcription & Translation

- In nucleus
- RNA polymerase transcribes DNA into RNA
 1. messenger RNA (mRNA)
 - Directs synthesis of polypeptide
 2. Ribosomal RNA
 - Part of ribosomes
- Transfer RNA (tRNA)
 - Carries amino acids to ribosome for reaction
- Requires 3 different RNAs
 - Message RNA -from nucleus (mRNA)
 - Transfer RNA to carry amino acids (tRNA)
 - Ribosomes to do the actual work containing ribosomal RNA (rRNA)

13

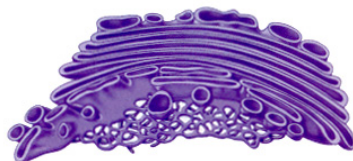
Golgi Apparatus



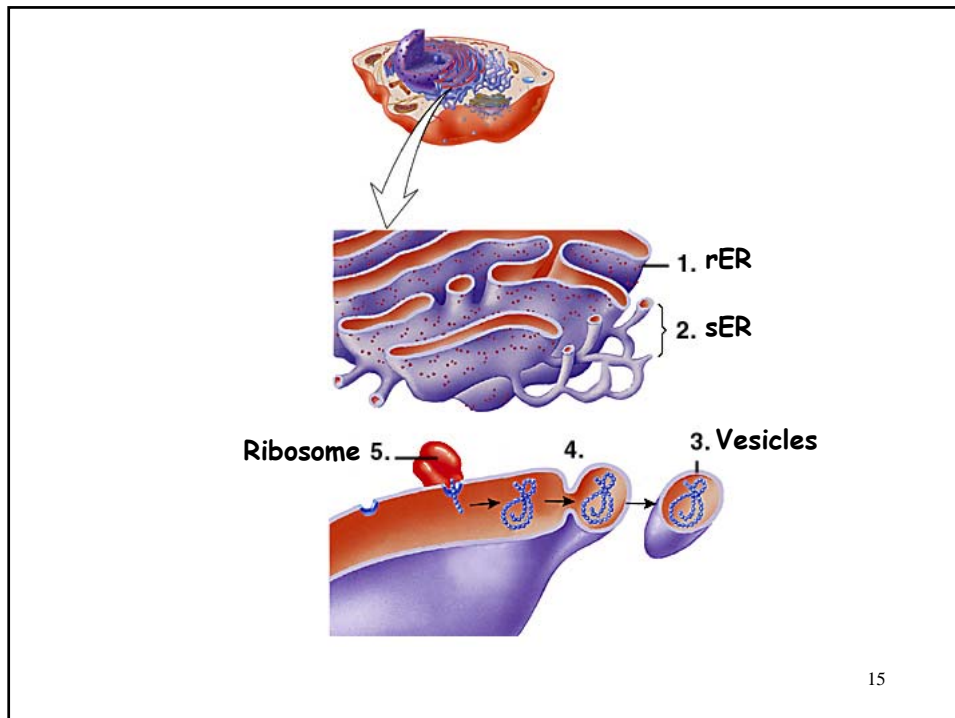
Golgi apparatus

Structure: Series of cup-shaped, closely opposed, flattened, membranous sacs, associated with numerous vesicles. Generally, a single Golgi apparatus is located in the central portion of a cell near its nucleus.

Function: Concentrates, modifies, and sorts proteins arriving from the granular endoplasmic reticulum prior to their distribution, by way of the Golgi vesicles, to other organelles or their secretion from cell.



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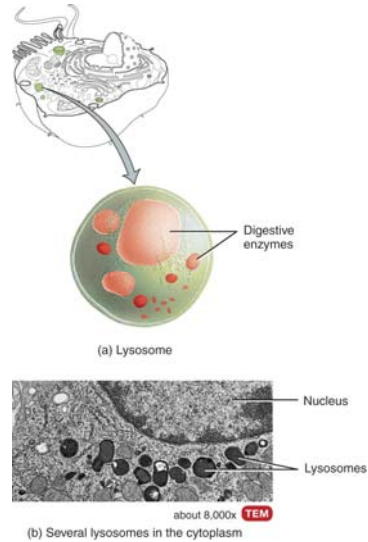
Cystic Fibrosis

- Deadly inherited disorder
- **Chloride ion pump protein** is not properly secreted from the golgi or rough ER
- Result is an imbalance in the transport of fluid and ions across the plasma membrane
 - buildup of thick mucus outside of certain cells
 - respiratory and digestive problems

Lysosomes

- Membranous vesicles
 - formed in Golgi complex
 - filled with digestive enzymes
 - pumps in H^+ ions until internal pH reaches 5.0

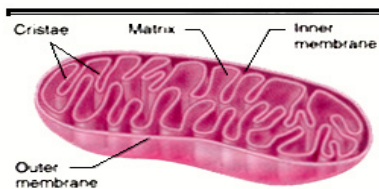
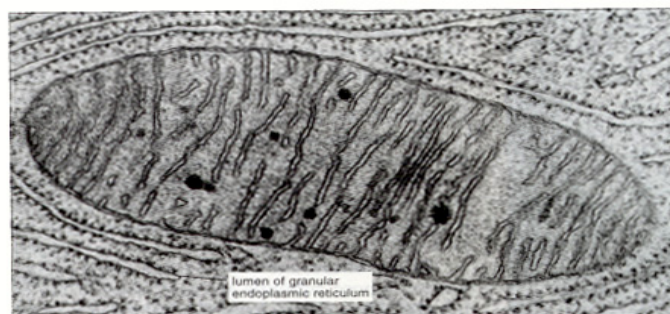
- Functions
 - digest foreign substances
 - autophagy (autophagosome forms)
 - recycles own organelles
 - autolysis
 - lysosomal damage after death



Tay-Sachs Disorder

- Affects children of eastern European-Ashkenazi descent
 - seizures, muscle rigidity, blind, demented and dead before the age of 5
- Genetic disorder caused by absence of single lysosomal enzyme
 - enzyme normally breaks down glycolipid commonly found in nerve cells
 - as glycolipid accumulates, nerve cells lose functionality
 - chromosome testing now available

Mitochondrion



Mitochondrion

Structure: Rod- or oval-shaped body surrounded by two membranes. Inner membrane folds into matrix of the mitochondrion, forming cristae.

Function: Major site of ATP production, O_2 utilization, and CO_2 formation. Contains enzymes of Krebs cycle and oxidative phosphorylation.

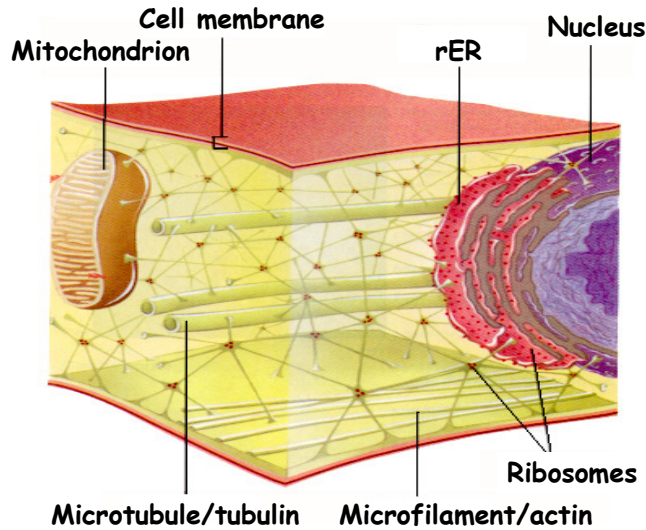
19

Cytoskeleton

- Network of protein filaments throughout the cytosol
- Functions
 - cell support and shape
 - organization of chemical reactions
 - cell & organelle movement
- Continually reorganized

20

Cytoskeletal Filaments



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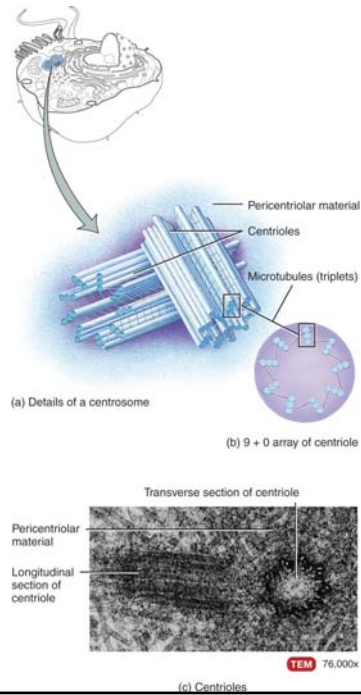
Cytoskeletal Filaments

- Microfilaments
 - thinnest filaments (**actin**)
 - locomotion & division
 - support microvilli
- Intermediate filaments
 - several different proteins
 - anchor organelles
- Microtubules
 - large cylindrical structures (composed of **tubulin**)
 - flagella, cilia & centrosomes

Figure 3-11 Introduction to the Human Body, 7/e
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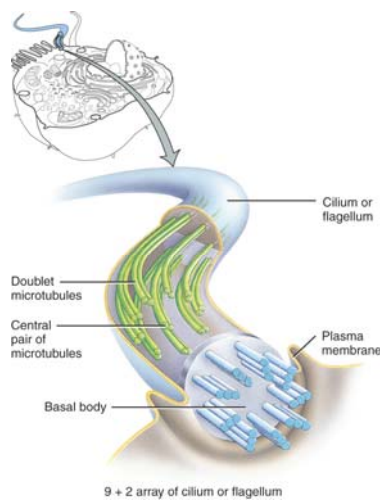
Centrosome



- Found near nucleus
- Pericentriolar area
 - formation site for mitotic spindle and microtubules
- Centrosome
 - 2 centrioles(90 degrees to each other)
 - 9 clusters of 3 microtubules (9+0 array)
 - role in formation of cilia & flagella

23

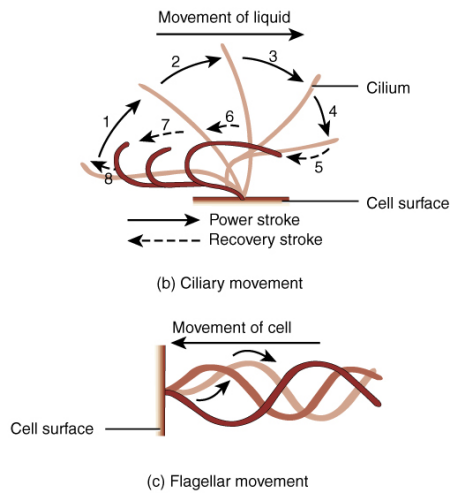
Cilia and Flagella



- Structure
 - pairs of microtubules (9+2 array)
 - covered by cell membrane
 - basal body is centriole responsible for initiating its assembly
- Differences
 - cilia
 - short and multiple
 - flagella
 - longer and single

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Movement of Cilia and Flagella



■ Cilia

- stiff during power stroke but flexible during recovery
- many coordinated together
- airways & uterine tube

■ Flagella

- single flagella wiggles in a wavelike pattern
- propels sperm forward

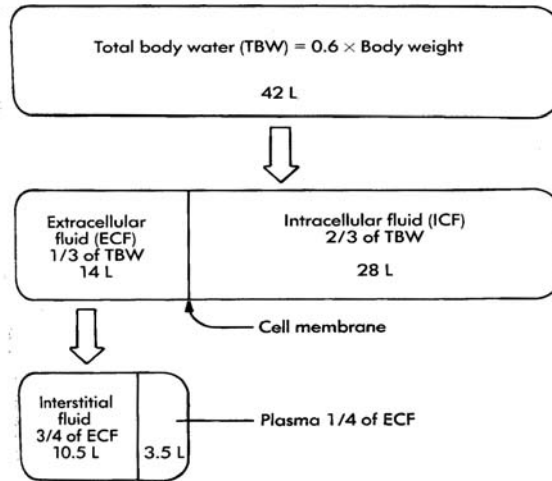
25

Body Fluid Compartments

- The body fluid contained inside the body cell is called intracellular fluid (**ICF**). The fluid outside of the body cell is called extracellular fluid (**ECF=internal environment=homeostasis**).
- The fluid found in the microscopic spaces between cells of tissues is called the **interstitial fluid (80%)**. The ECF in the blood vessels is called **plasma(20%)**, and in the lymphatic vessels it is called lymph.
- The interstitial fluid contains gases, nutrients, ions, and other substances needed for maintaining life.

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Total Body Water



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ECF & ICF

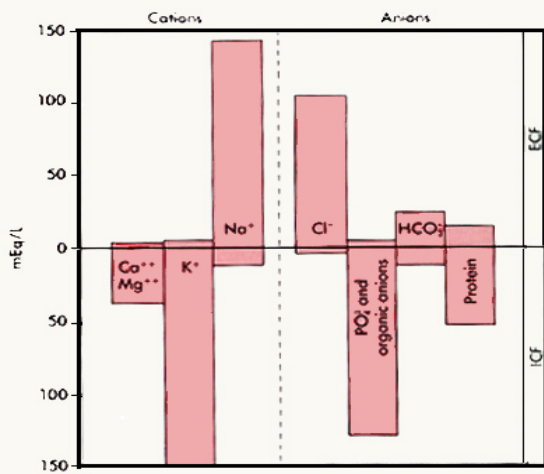


表 2-1 細胞外液與細胞內液之組成

	細胞外濃度 (單位: mM)	細胞內濃度* (單位: mM)
鈉離子 Na ⁺	145	15
鉀離子 K ⁺	4	150
鈣離子 Ca ²⁺	2.5	1.5
鎂離子 Mg ²⁺	1.5	12
氯離子 Cl ⁻	110	10
碳酸氫根離子 HCO ₃ ⁻	24	10
磷酸根 P _i	2	40
胺基酸 Amino acids	2	8
葡萄糖 Glucose	5.6	1
ATP	0	4
蛋白質 Protein	0.2	4

*組織不同，細胞內液之濃度也不一樣，上面的濃度是大部分細胞的標準值。上面列出之細胞內外濃度不能表示該物質之自由態的濃度，因為有些與蛋白質結合或在胞器內。例如，自由態的細胞外與細胞漿之鈣離子濃度分別只有 1 mM 及 0.0001 mM。

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