Adipobiology
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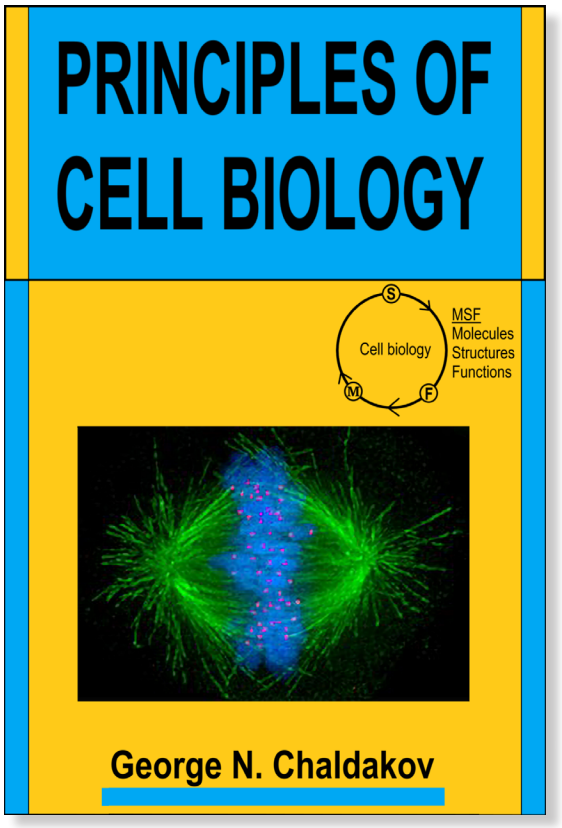
We're drowning in information and starving for knowledge.

Dr. Rutherford D. Rogers (1915-2015), American librarian

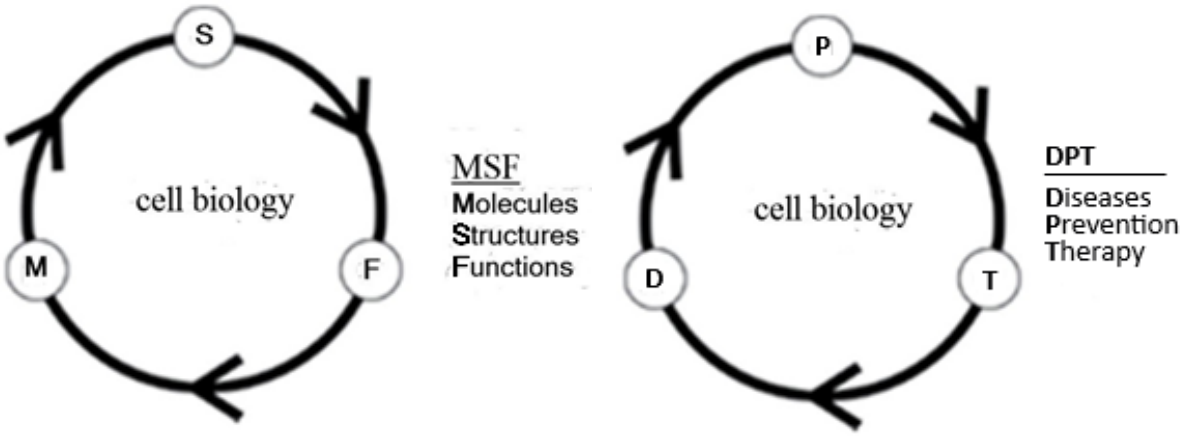


Using novel own didactic tools such as stream-of-associations (SOA), food for thought, eureka for thought, and intermezzo, *Principles of Cell Biology* e-book provides updated knowledge of the significance of cellular molecules, structures and functions (MSF) in basic and translational cell biology. In effect, an intellectual entertainment is produced that may enjoy your love of knowledge.

To view, disseminate, and purchase this textbook, please use the links: PRINCIPLES OF CELL BIOLOGY George N. Chaldakov Amazon.com OR: https://www.amazon.com/PRINCIPLES-CELL-BIOLOGY-George-Chaldakov-ebook/dp/B09QZ4DQ6F/ref=sr_1_1?crid=1BW34R81M9Y3 9&keywords=chaldakov&qid=1642936501&sprefix=chaldakov%2Caps%2C139&sr=8-1

The main goal of the book is to provide state-of-the-science (SOS) knowledge of cell and (extracellular) matrix biology and its translation (bench-to-bedside) into the pathogenesis, prevention and therapy of diseases, being away from any descriptive details. The major concepts of the book are (i) cell-matrix unity, (ii) triarchic (MSF) essence of cell-matrix life, (iii) biomorphogenic (design) principles of cell and matrix structures, (iv) binary (switch on-off) and fractal nature of cell life, and (v) new classification of cell organelles.

Graphic abstract of the textbook



We encourage you to share the Amazon.com's link of this book with your students and colleagues. You may watch the author's *Principles of Cell Biology* introductory lecture: https://youtu.be/cNBY_ykbK3Q

Comment on *Principles of Cell Biology*

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The author George N. Chaldakov is internationally well-known scientist in cell and tissue biology with a great experience in these fields. Since five decades he has been performing fascinating teaching for students and postgraduates and became the most attractive and popular preclinical university professor of the Medical Universities in Bulgaria, also abroad. His great experience, collected during decades of its creative activity, allowed him to develop and publish new concepts of the teaching methodology. His first edition of Cell Biology textbook in Bulgarian being published in 1976, the second edition in 2014. And now, in December 2021, the first English edition of his *Principles of Cell Biology*, published in United Kingdom. The most important of them is to present the information in form that omit diverse details, but give the context of the knowledge as a whole, provided by molecular, structural and functional (MSF) significance in a translational (bench-to-bedside/B2B) way. This makes the teaching more understandable, interesting and makes it easier to learn and use in the clinical and research field.

This textbook provides an excellent description of the basic knowledge concerning MSF of cells and extracellular matrix of multicellular organisms. The applied didactics is new, progressive and allows first of all the easier understanding and learning of the complicated matter of cell biology. Understanding the basic knowledge is very decisive for the graduate and postgraduate education of a medical universities. The author succeeded in doing this very well. The textbook is very innovative, useful and can be warmly recommended not only for students in medicine, dental medicine and cell biology, but also for colleagues of different biomedical research and clinical fields.

Hopefully, this textbook could become an essential part of *Alma mater studiorum* (Mother who feeds us with knowledge). The author believes that after a thoroughly reading of *Principles of Cell Biology*, students would better understand the currently written and spoken language of Cell Biology.

Learning objectives-1

In effect, we will reach at the following fundamental conlusions about cellular life that could be a valuable teaching resource as well as a study aid for students:

• Cells-and-matrix are indivisible units of life of all multicellular organisms. It is taken as axiomatic at the educational level that cells are "unit of life" and "building blocks of life". However, the cells (except cells circulating in the blood, lymph, and cerebrospinal fluid) are surrounded by and linked to the matrix (ECM). When a cell is separated from the matrix, it becomes "homeless" and dies – **anoikiya, a type of programmed cell death**. An example of the cell-matrix unity is illustrated (Fig. 9).

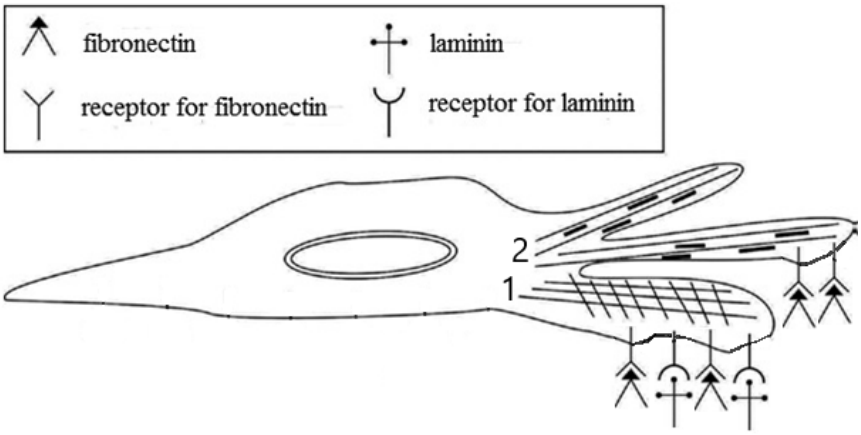


Figure 9. *Schematic illustration of the unity of cell-matrix at MSF level. Depicted are lamellipodia (***1***) and filopodia (***2***) – cell's "feet" (Greek* podos), *plasmalemmal projections of the leading edge of a cell, walking on matrix road* via *the interaction of matrix ligands (fibronectin and laminin) and plasmalemmal receptors. We may call lamellipodia and filopodia* ***"Johnnie Walker structures".*** *Note, lamellipodia and filopodia are shown separately although, filopodia are, in fact, thin extensions emerging from lamellipodia.* ***Lamellipodia and filopodia are plasmalemmal-cytoskeletal structures (fractalosomes)*** *that play essential roles for cell mobility such as (i) axon growth and guidance seeking its synaptic contacts in the developing brain, (ii) cancer cell invasion and metastasis, and (iii) repair (closure) of skin wounds, involving keratinocytes (keratin protein-rich cells) and fibroblasts (fibers-producing cells). They move at speeds of 10–20 μm/min over the matrix route. Further studies on Mechanobiology of Cell Walk would rely on fresh thought-lines of students and young teachers.*

• Biomorphogenic principles (BMP)

First BMP: Membrane compartmentalization (Figs. 10, 11).

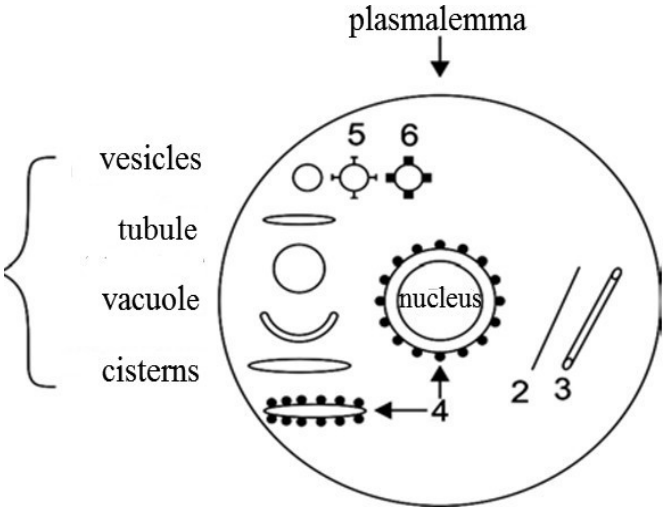


Figure 10. *Schematic illustration of three levels of* ***membrane compartmentalization****: plasmalemma (arrow at the top),* ***nucleolemma*** *(double membrane), and* ***endomembranes. 5****. Clathrin-coated vesicles.* **6.** *Caveolin-coated vesicle (caveosome). The membranous structures shown at left are components of the membrane-bound organelles. Examples of nonmembrane-bound organelles:* **2***. Filament;* **3***. Microtubule;* **4.** *Polysomes (polyribosomes) attached to the outer nuclear membrane (***4***) and to a cistern of rough endoplasmic reticulum (***4***). Note, tubule (left) is a membrane-bound, whereas microtubule (***3***) is a non-membrane-bound cytoskeletal structure (organelle).*

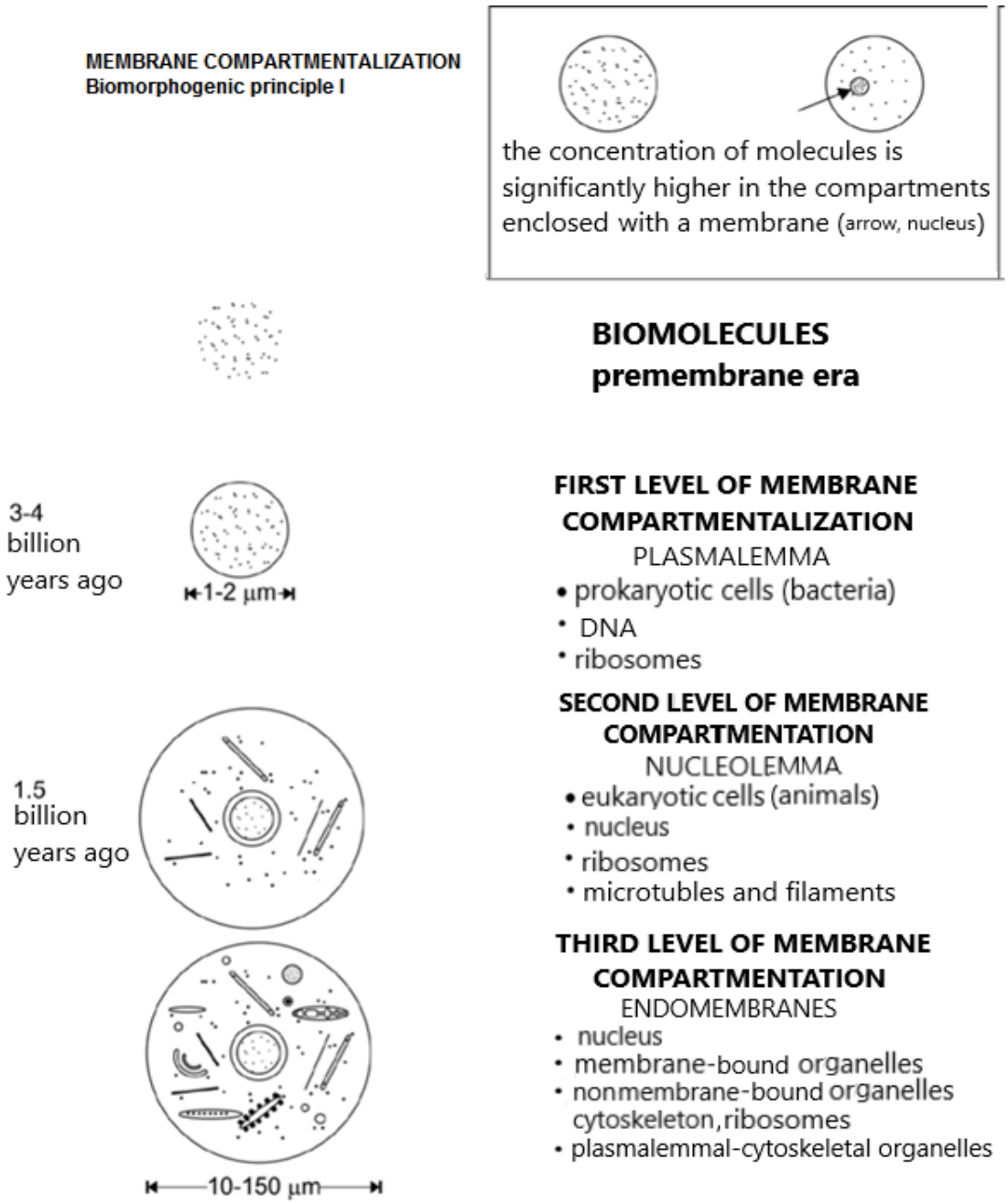
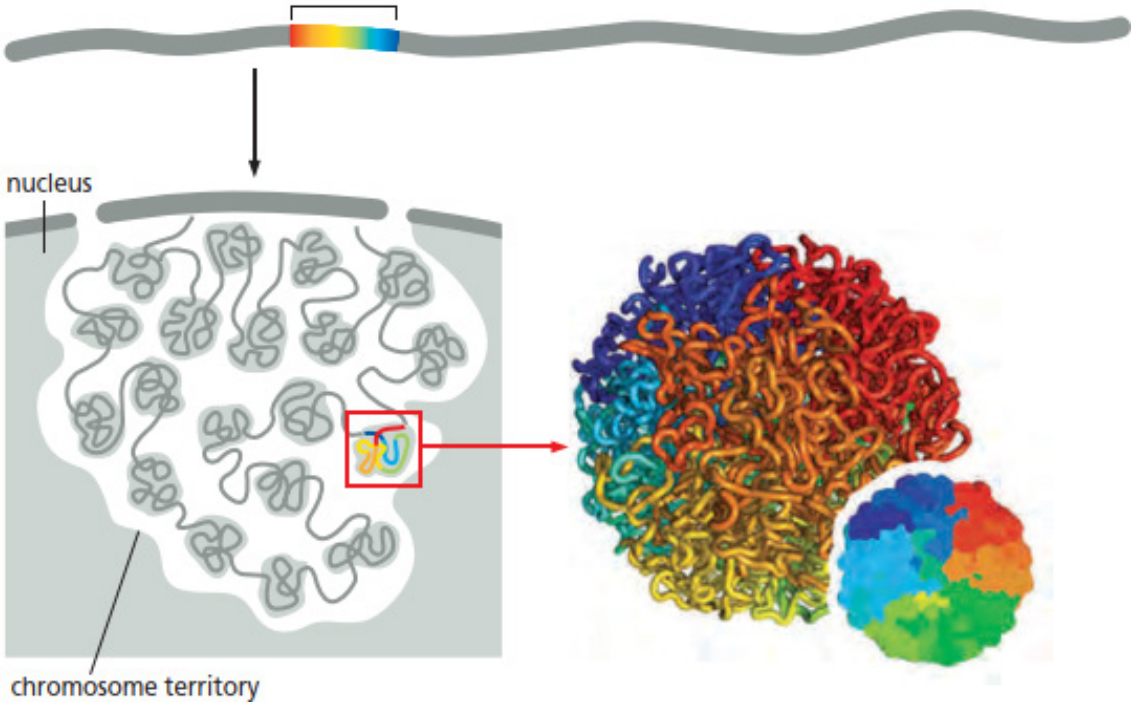


Figure 11. *Membrane compartmentalization has three levels in the evolution leading to Cell sapiens and, respectively, Homo sapiens.*

Second BMP: Membrane fractalization BMP is involved in the formation of fractalosomes (e.g., microvilli and kinocilia) and fractal structures (glycocalyx and sarcolemmal invaginations in skeletal myocytes). Further in the text you shall learn that the fractalization BMP is also related to the morphology of endoplasmic reticulum as well as Golgi complex as shown by the original drawings of "internal reticular apparatus" by Camillo Golgi. In the same SOA: the following should be considred too – the folded nature of proteins and hyaluronic acid (hyaluronan, an anionic, nonsulfated glycosaminoglycan) as well as DNA (interphase chromosome) – the latter is folded into a shape termed **fractal globule**, as shown below:



From: Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P. *Molecular Biology of the Cell.* 6th edition. 2015. Garland Science, London, New York.

Third BMP: Membrane flow through a fission-fusion pattern (Figs. 18, 19).

Panta rhei (everything flows) **Heraclitus** (535-475 BC), including cell membranes – you may write an essay entitled "Membrane rheology in cell biology".

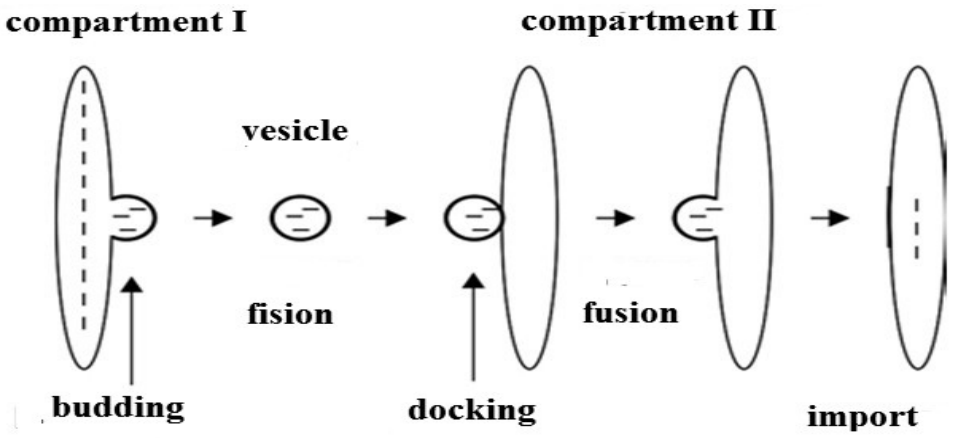


Figure 18. *Schematic representations of membrane fission-fusion (membrane trafficking) in the third biomorphogenic principle.*

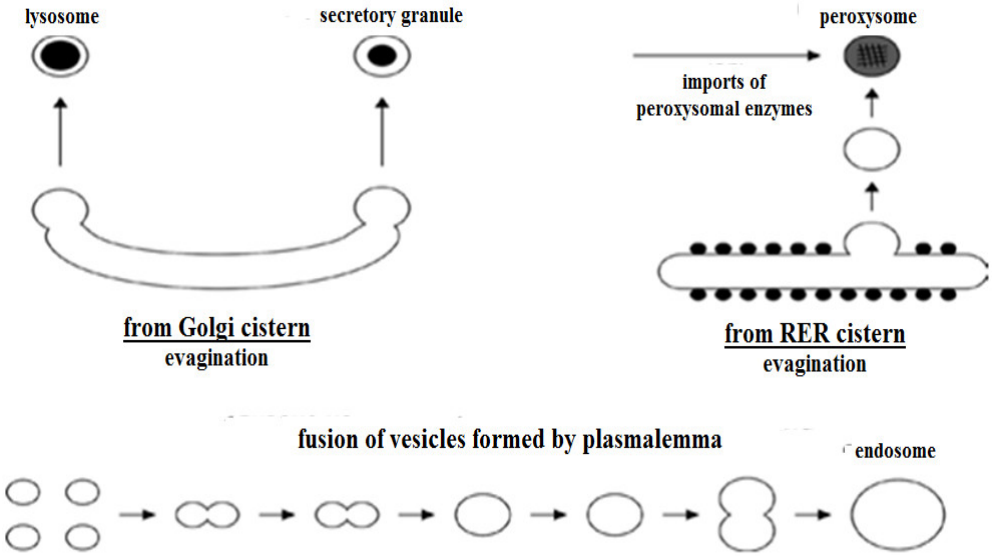


Figure 19. *Scheme of membrane flows forming an endosome, a lysosome, a secretory granule (vacuole), and a peroxisome. Further in the text you shall learn that the membrane fission-fusion BMP also works for the renewal of mitochondria.*

Fourth BMP: Assembly-disassembly of molecules that composed various organelles – an example with actin-AF (Fig. 20):

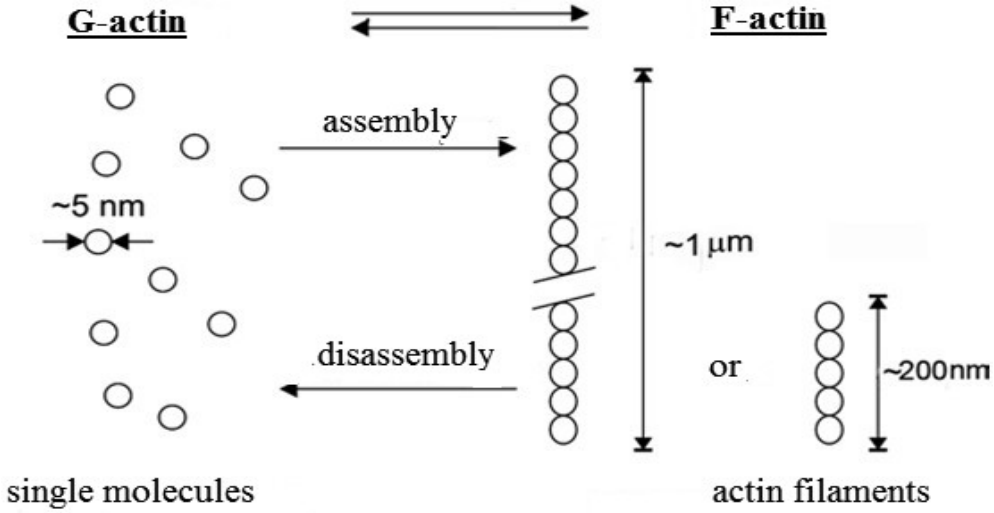


Figure 20. G, *globular;* F, *filamentous. Scheme presenting an example of the fourth biomorphogenic principle: assembly and disassembly of G-actin and F-actin protein. However, actin filaments (AF) are composed not of actin only.* **Q:** *How many proteins compose AF?* **A:** *Troponin, actin, and tropomyosin (TAT), TT being not depicted here. Other examples of assembly-disassembly BMP include: (i) tubulin and microtubules, (ii) clathrin and clathrin-coated vesicles, and (iii) caveolin and caveolae.*

Fifth BMP: Assembly and package of matrix molecules (Fig. 21).

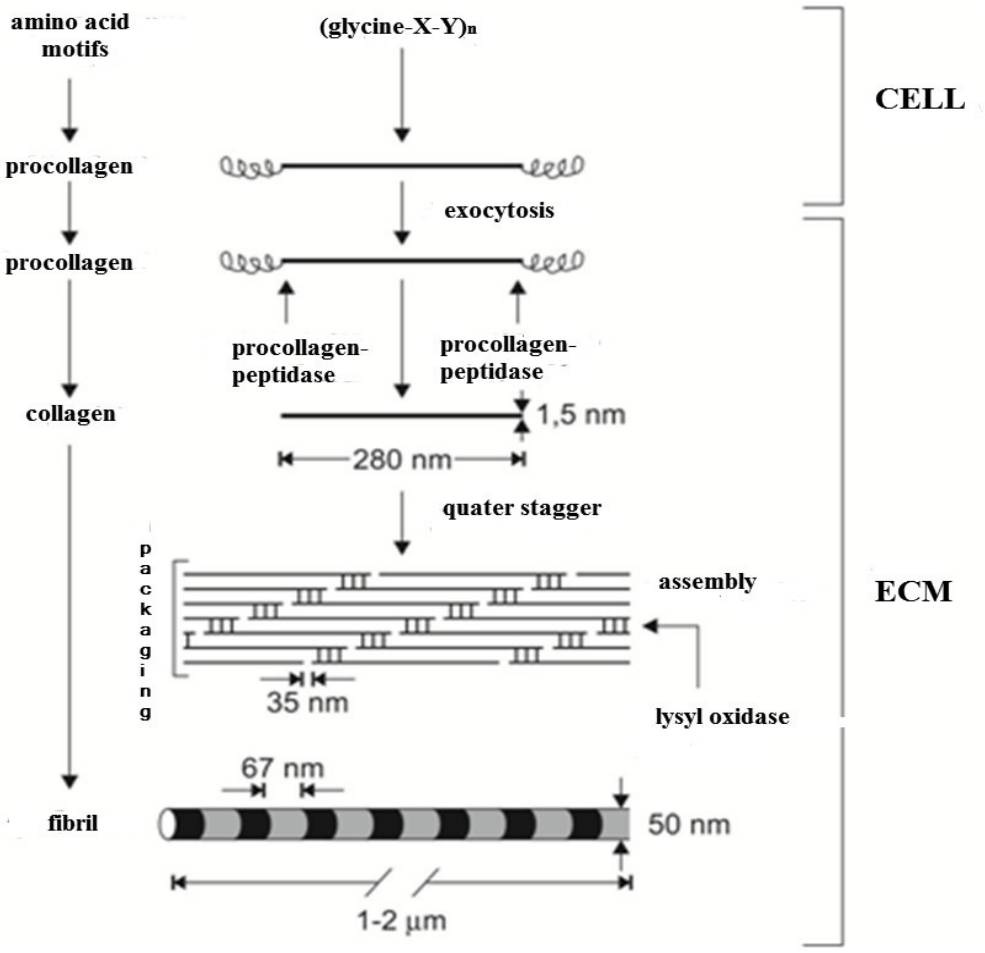


Figure 21. *Schematic representations of the fifth biomorphogenic principle, exemplified by (i) intracellular synthesis of procollagen, (ii) extracellular enzymatic processing of procollagen leading to (iii) a specific assembly and packaging (quarter stagger) into a collagen fibril. The assembly of many fibrils forms a collagen fiber (not depicted here).*

• Eukaryotic cells are membrane-compartmentalized creatures living in a symbiosis with cytoskeleton and ECM. Numerous functions are conducted by them, critically dependent on (i) energy supplied by mitochondria, and (ii) Ca^{2+} released from smooth endoplasmic reticulum (SER) and calcisomes.