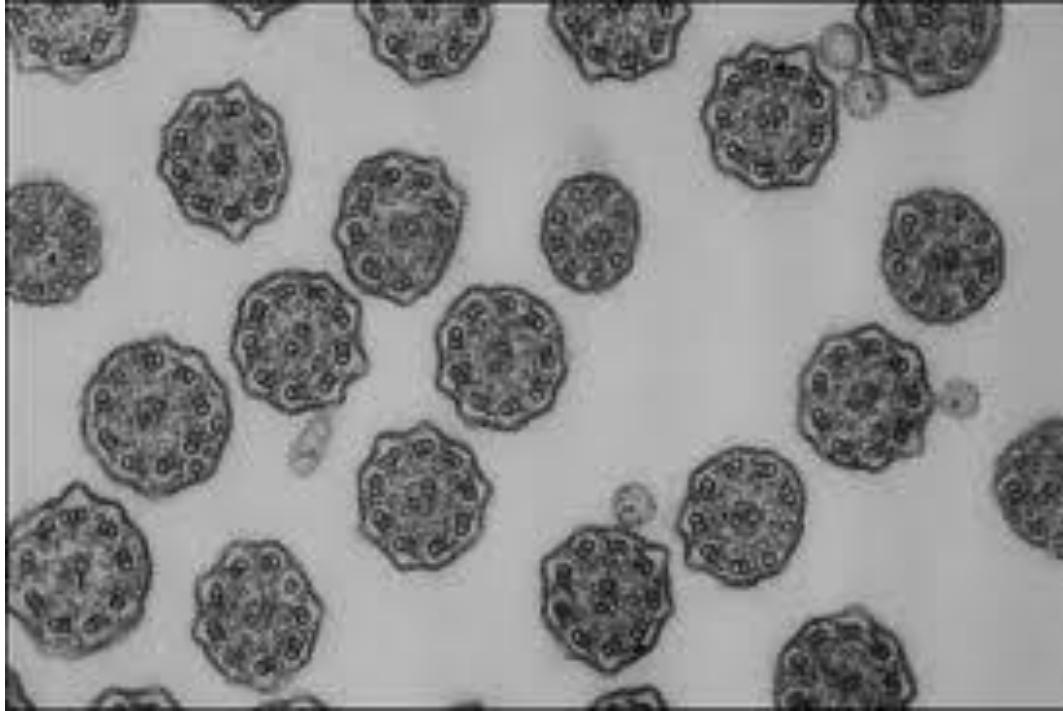
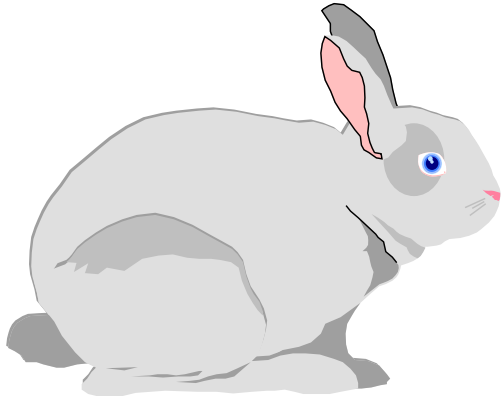




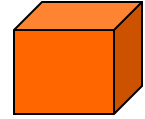
Ultrastruktura komórki

Mikroskopia elektronowa

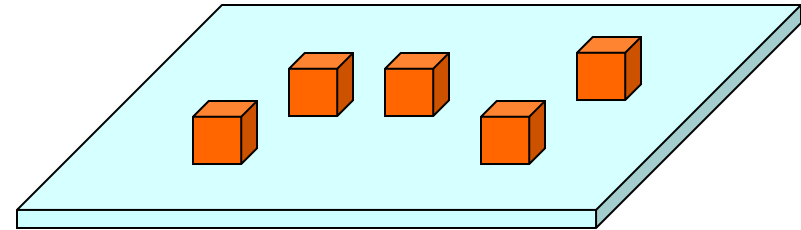
ETAPY PREPARATYKI W MIKROSKOPII ELEKTRONOWEJ TRANSMISYJNEJ



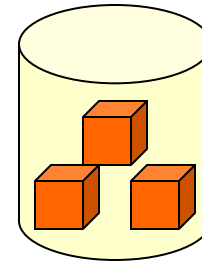
Pobieranie żywej tkanki



Docięcie fragmentów przeznaczonych
do utrwalenia

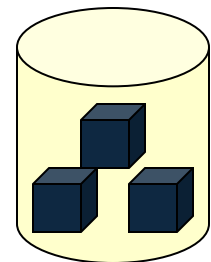


Utrwalanie np. w glutaraldehydzie



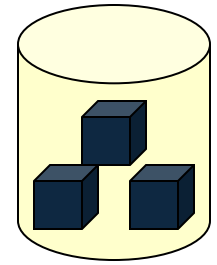
Płukanie tkanki w buforze

Utrwalanie i kontrastowanie w czterotlenku osmu



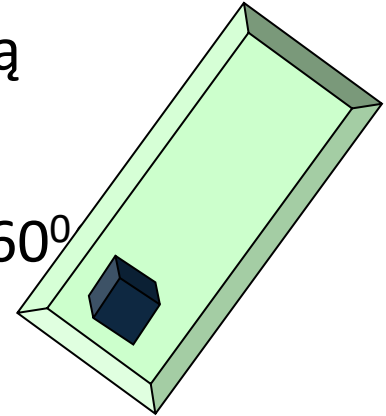
Płukanie tkanki w buforze

Odwadnianie w alkoholach o wzrastającym stężeniu



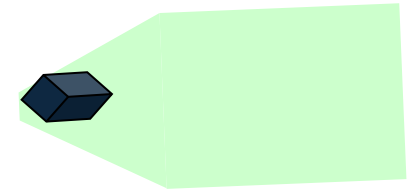
Przepojenie tkanki niepolimeryzującą żywicą

Zatopienie w żywicy epoksydowej polimeryzującej w 60°



Spolimeryzowany bloczek żywicy

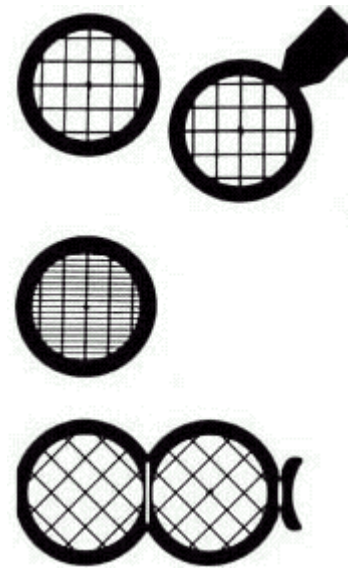
Bloczek przygotowany do krojenia

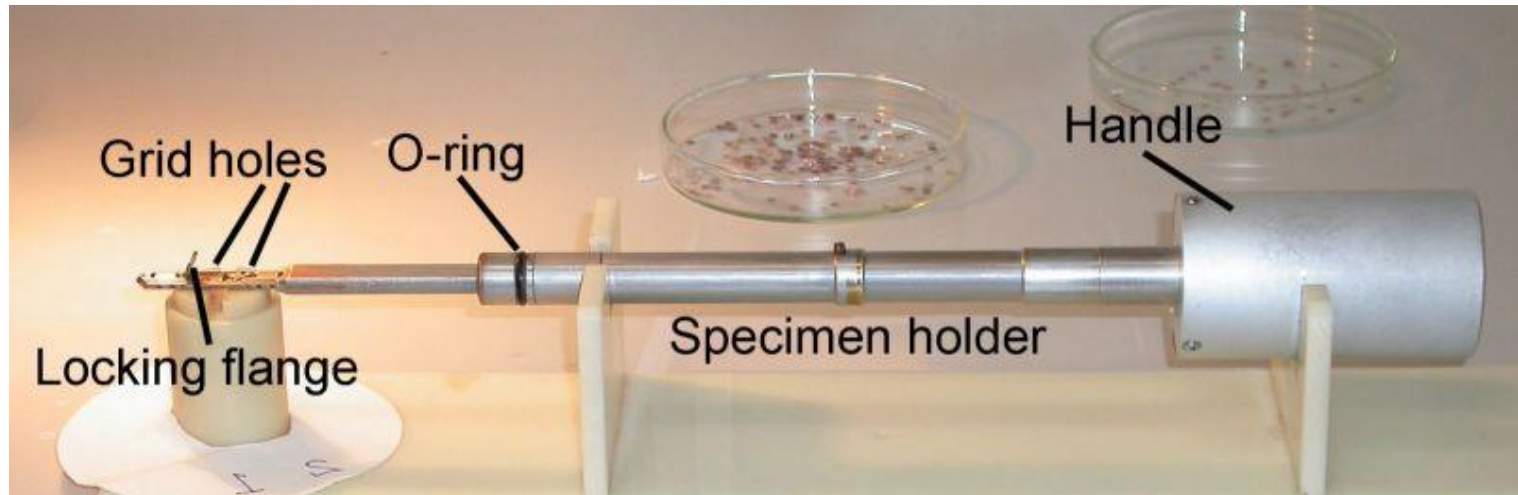
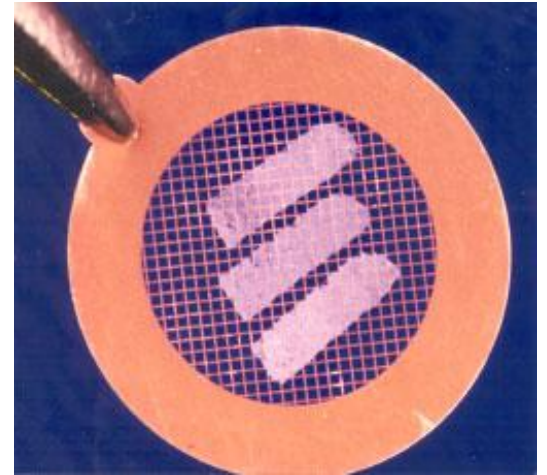
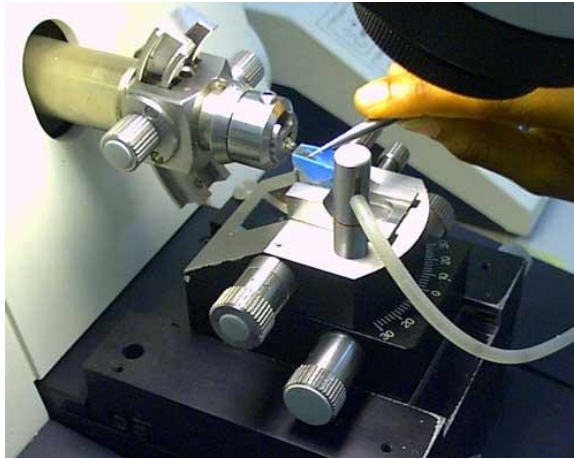


Krojenie i zbieranie skrawków na siatki miedziane



Kontrastowanie skrawków solami metali ciężkich





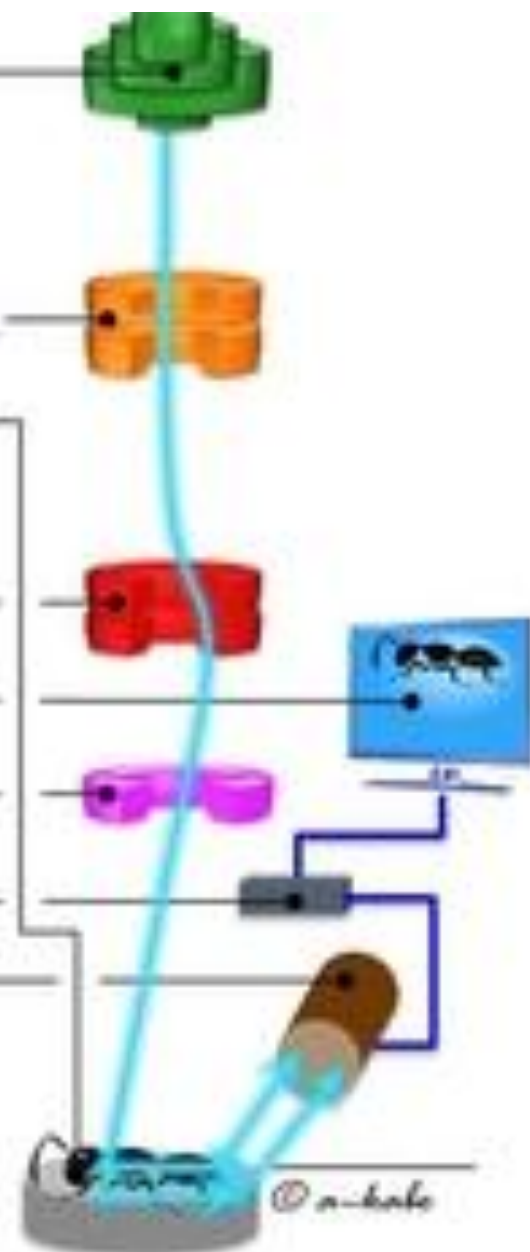
Reagowanie utrwalaczy i substancji kontrastujących z podstawowymi składnikami komórki

	Kwasy nukleinowe	białka	fosfolipidy	polisacharydy	tłuszcze
OsO ₄					 Nienasycone +
aldehydy					
octan uranylu					
związki ołowiu				 Glikogen +	
 Silna reakcja	 Umiarkowana reakcja	 Słaba lub brak reakcja			

Transmisyjny (TEM)



Skeningowy (SEM)





Ernst August Friedrich Ruska

1931 – 1933 – pierwszy mikroskop elektronowy

1939 – pierwszy komercyjnie dostępny mikroskop elektronowy, skonstruowany w zakładach Siemens-Reiniger-Werke AG - 'Siemens Super Microscope'

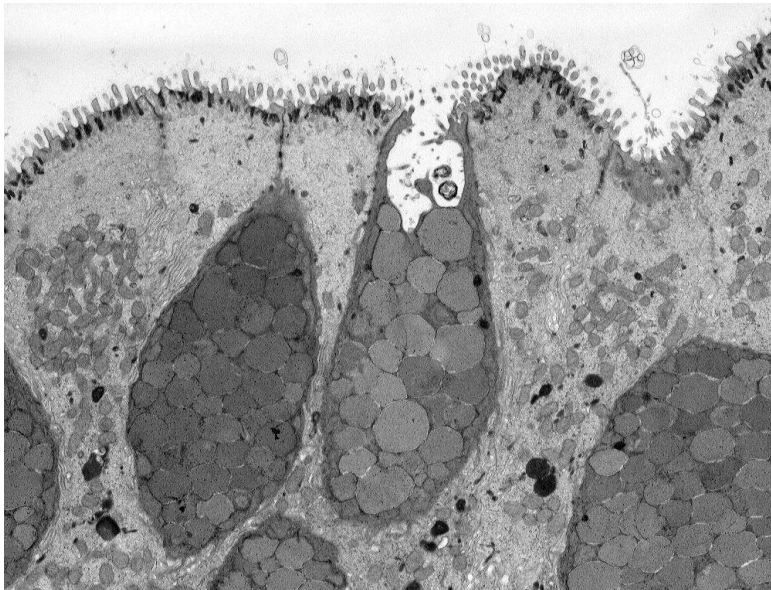
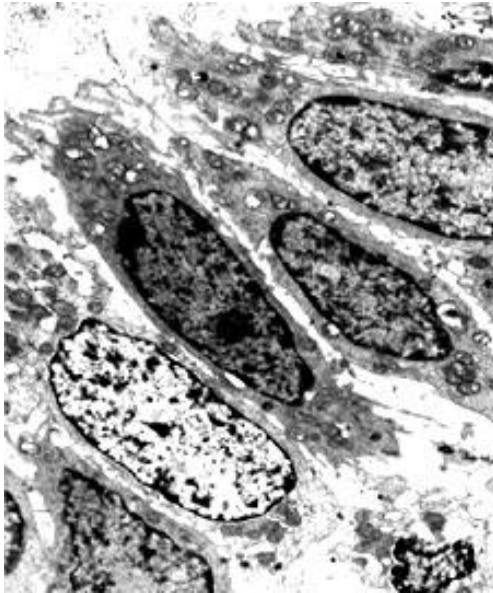
1986 – Nagroda Nobla wraz z Gerdem Binnigiem i Heinrichem Rohrerem

3 MV Ultra-High Voltage Electron Microscope

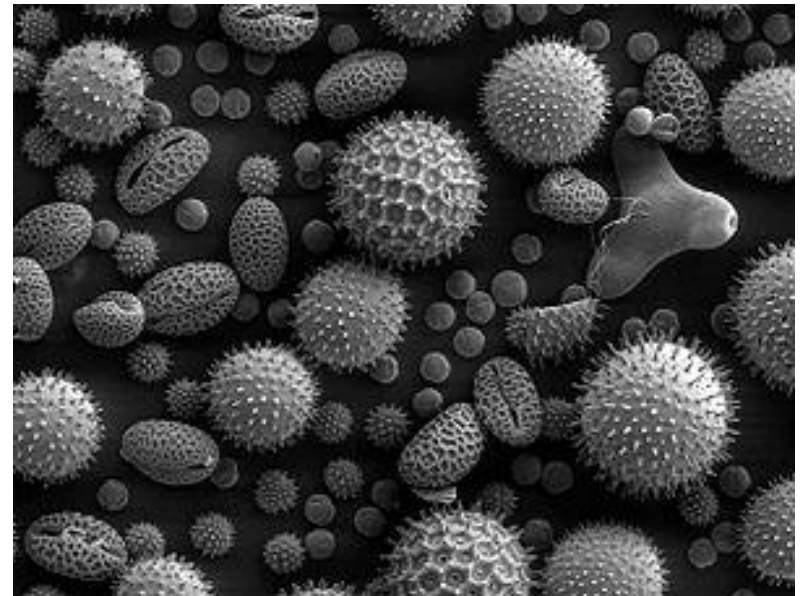


Model : H-3000 Height : 13.5 m Weight : 140 tons

Transmisyjny (TEM)



Skeningowy (SEM)

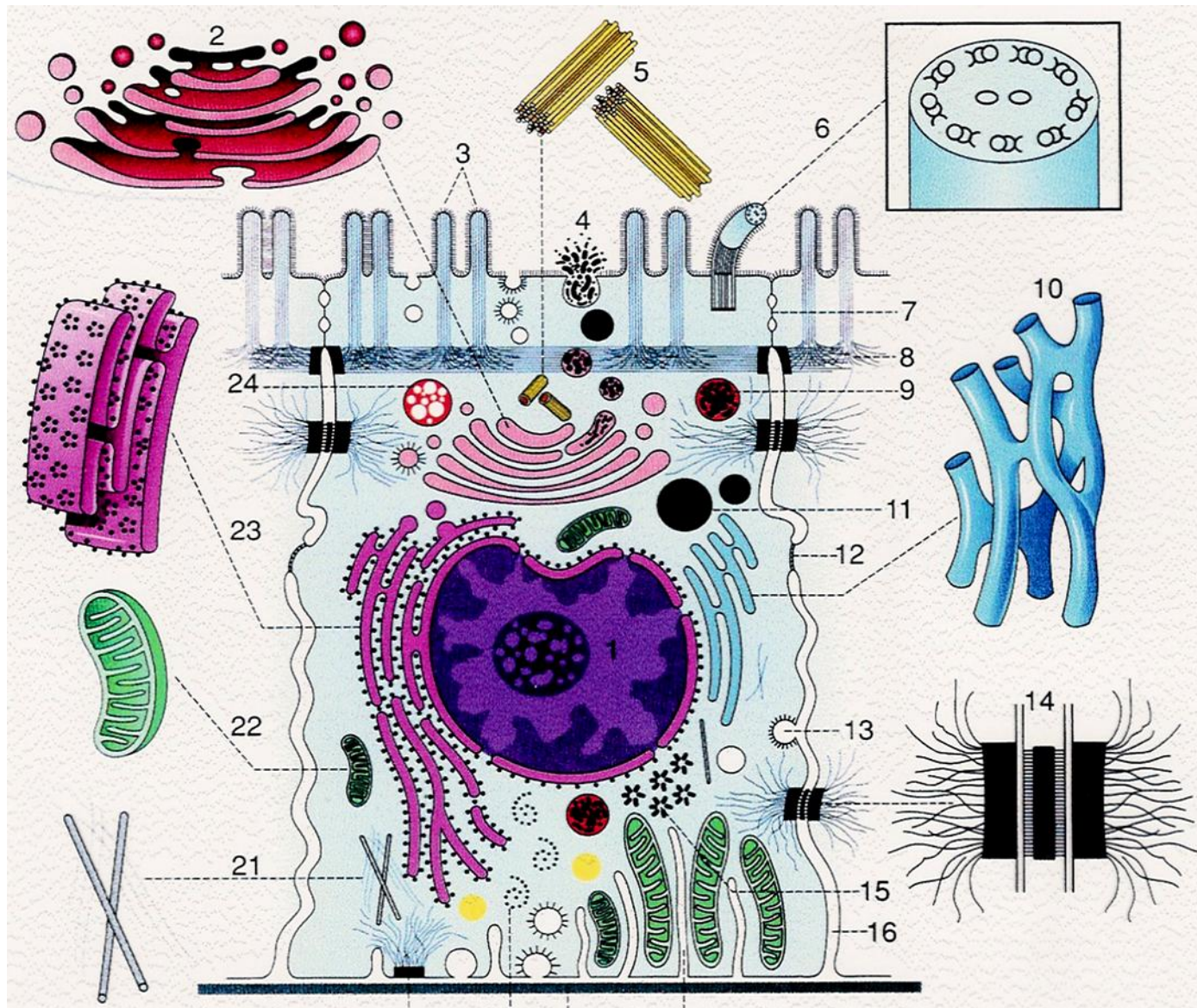


KOMÓRKA

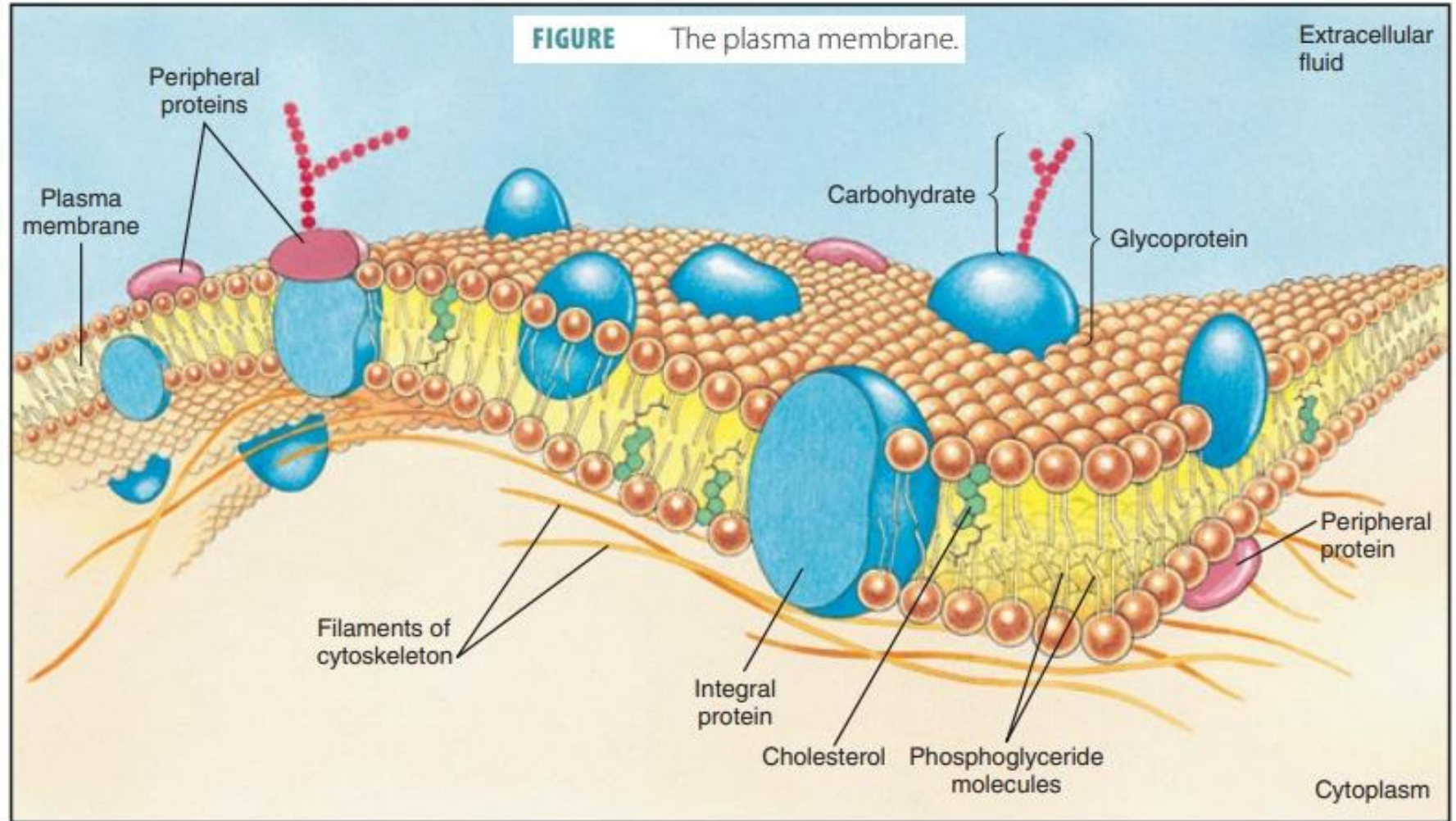
- najmniejsza jednostka strukturalno-czynnościowa organizmu
- bogatoelektrolitowy, wodny roztwór białek, węglowodanów, kwasów nukleinowych, oddzielony od otoczenia mieszaniną fosfolipidów

Komórka - Tkanka - **Organizm** (50 trylionów)

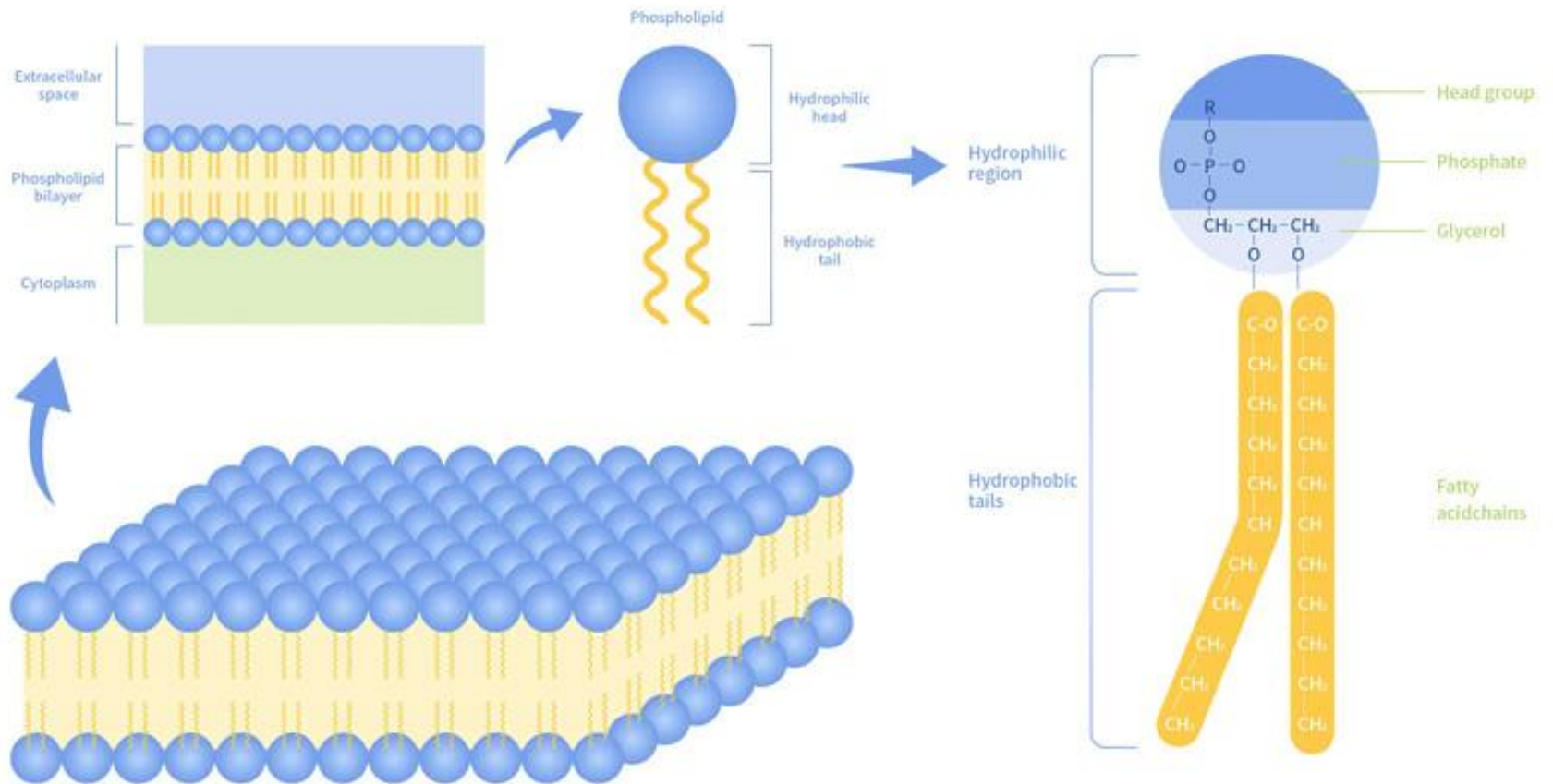
SCHEMAT BUDOWY KOMÓRKI



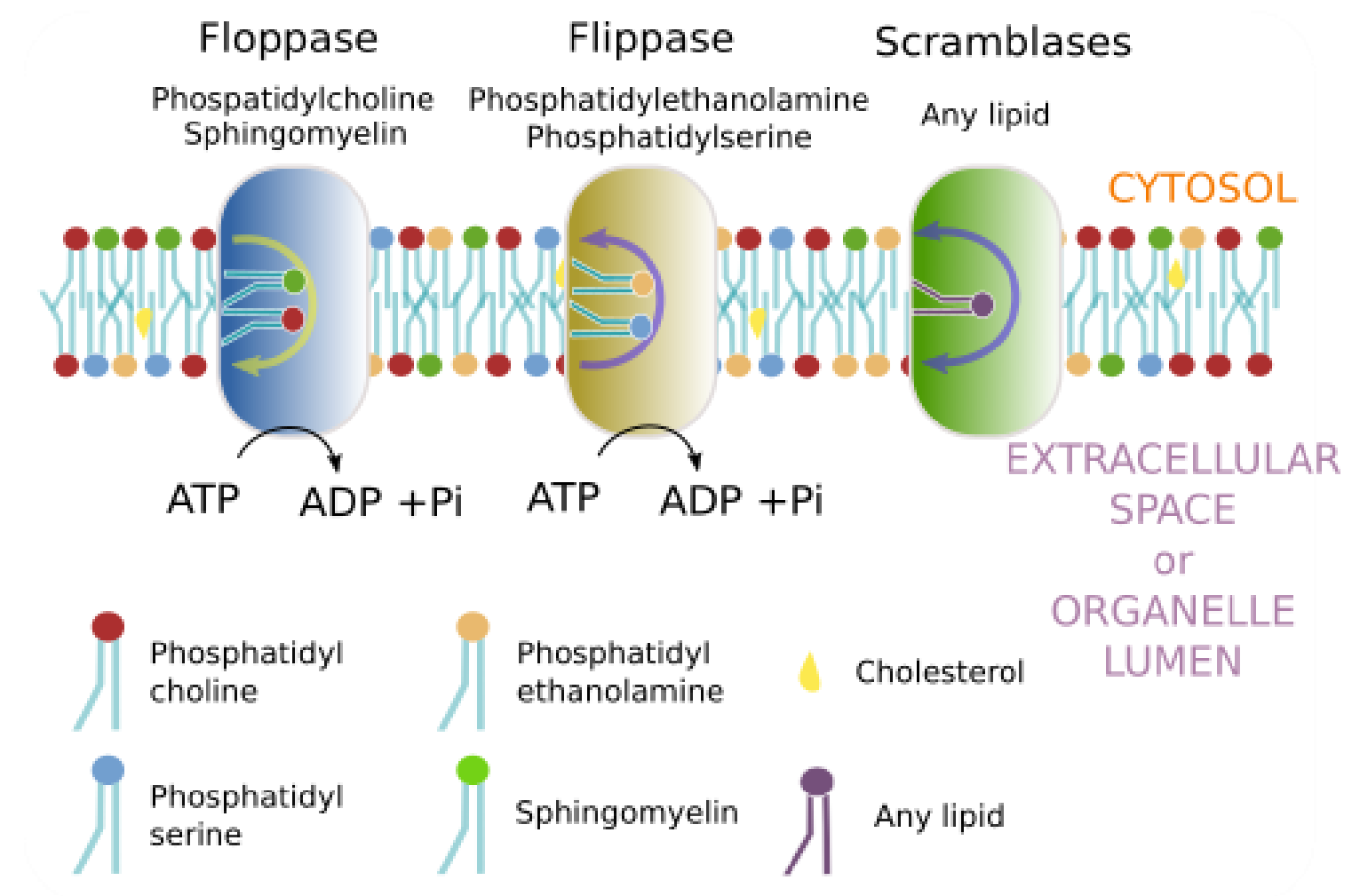
Błona komórkowa



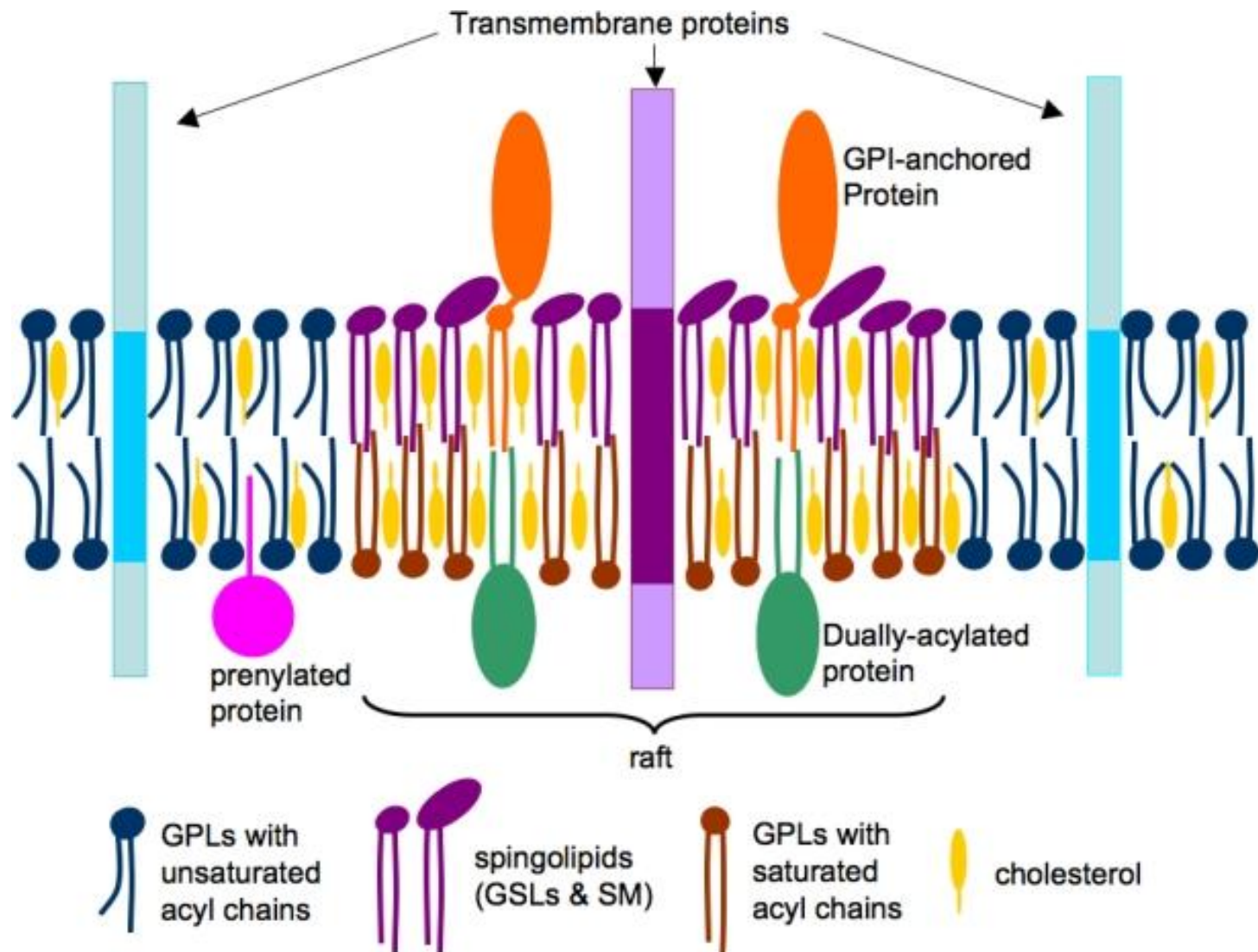
Fosfolipidy



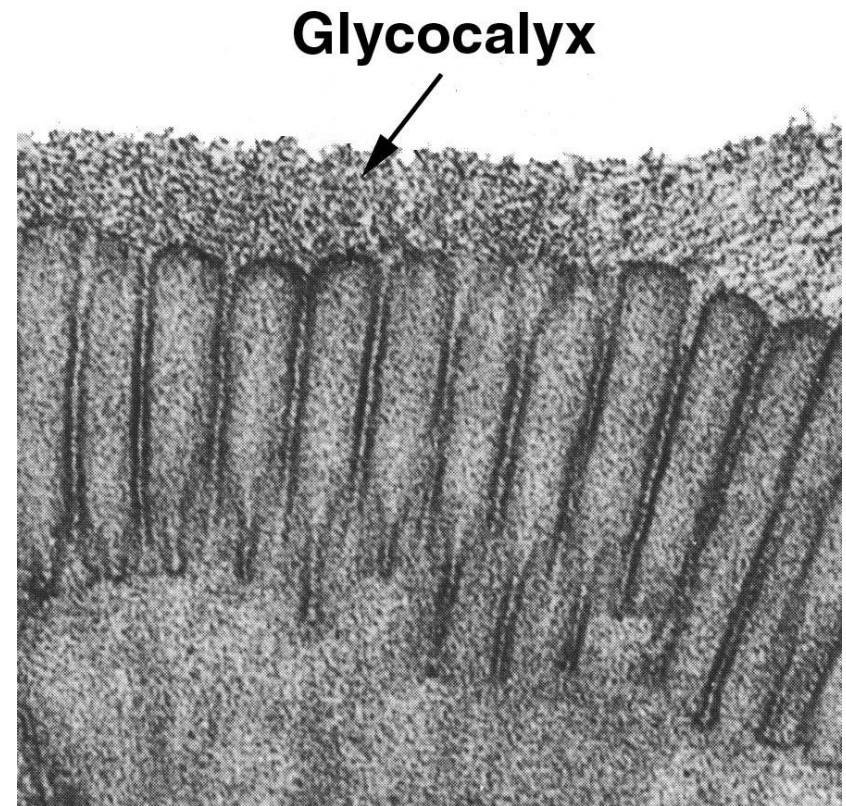
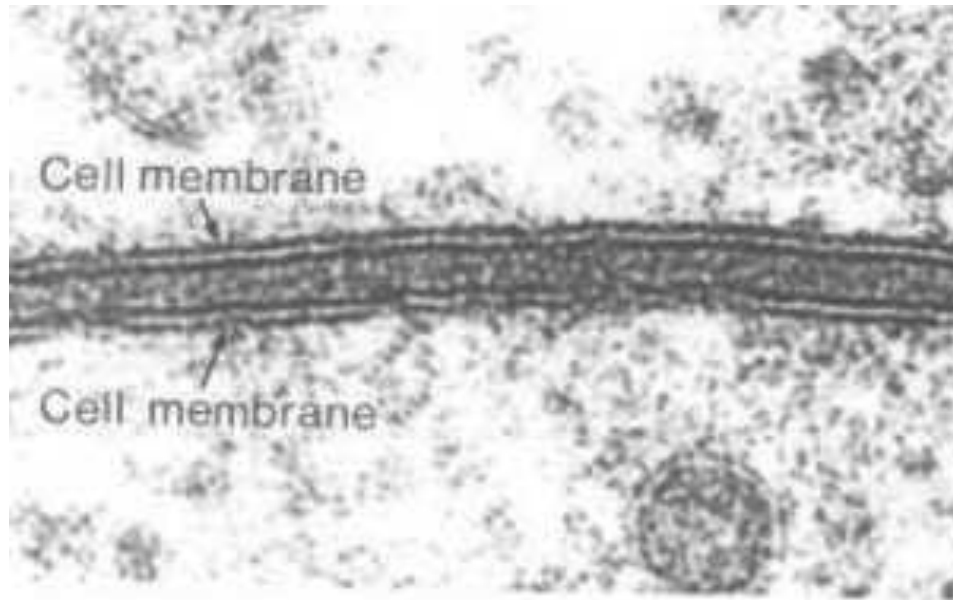
Asymetria błony



Cholesterol i tratwy lipidowe

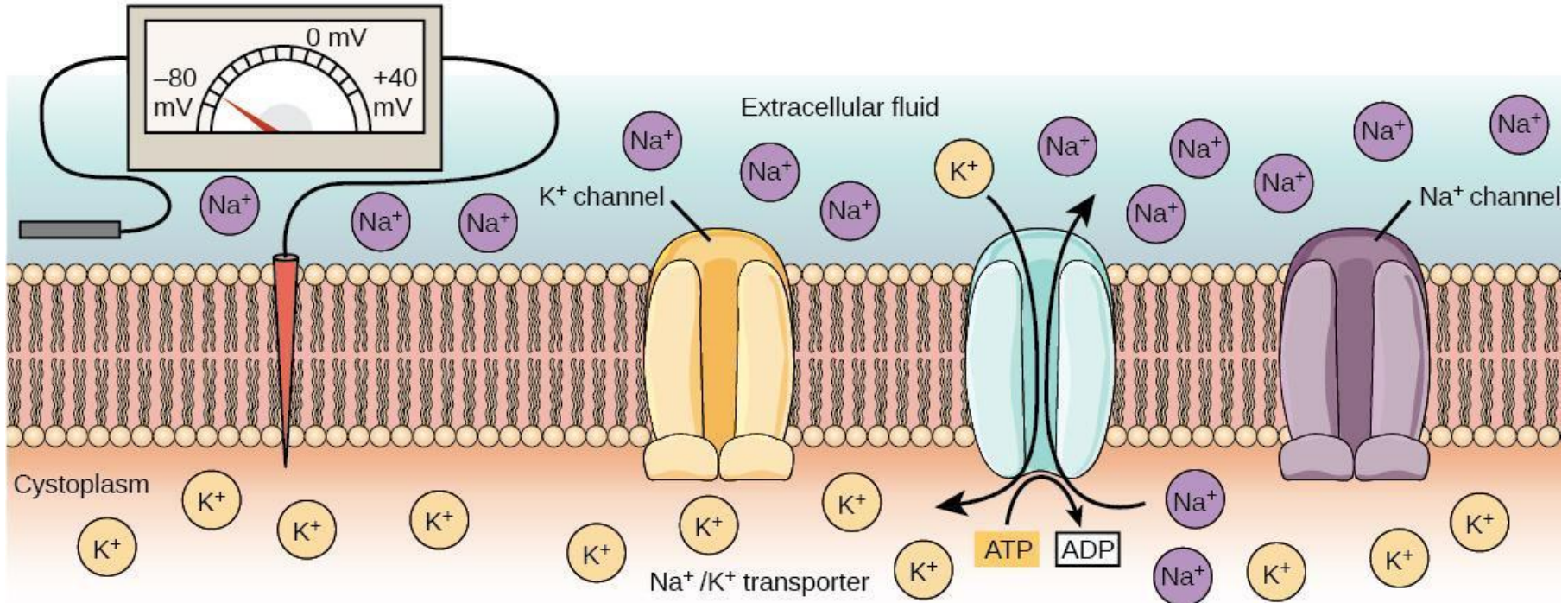


Glikokaliks



Ładunek błony

(a) Resting potential



**małe cząsteczki
hydrofobowe**

O_2
 CO_2
 N_2
benzen

**małe cząsteczki
polarne
bez ładunku**

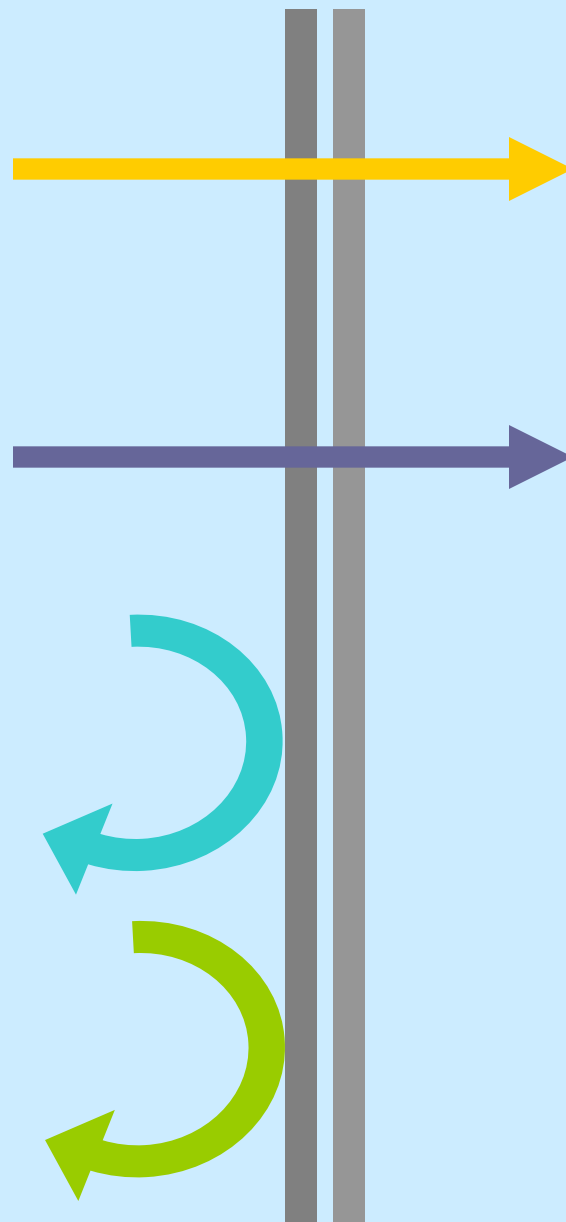
H_2O
glicerol
etanol

**większe cząsteczki
polarne
bez ładunku**

aminokwasy
glukoza
nukleotydy

jony

H^+ , Na^+
 HCO_3^- , K^+
 Ca^{2+} , Cl^-
 Mg^{2+}



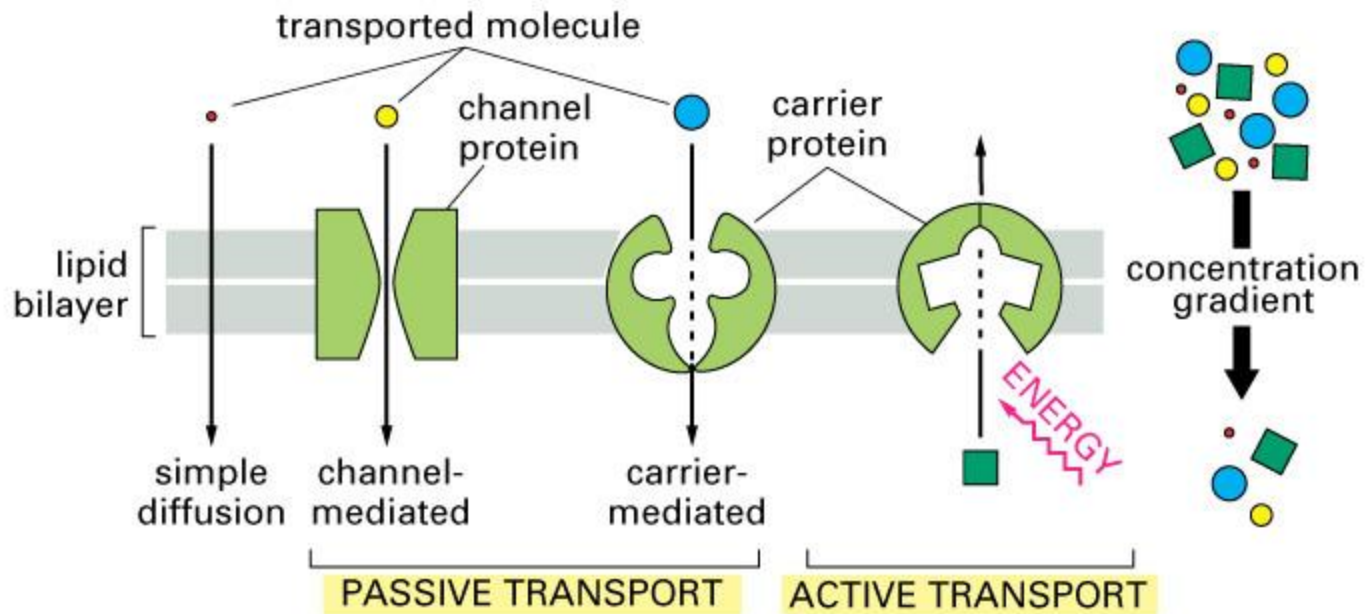
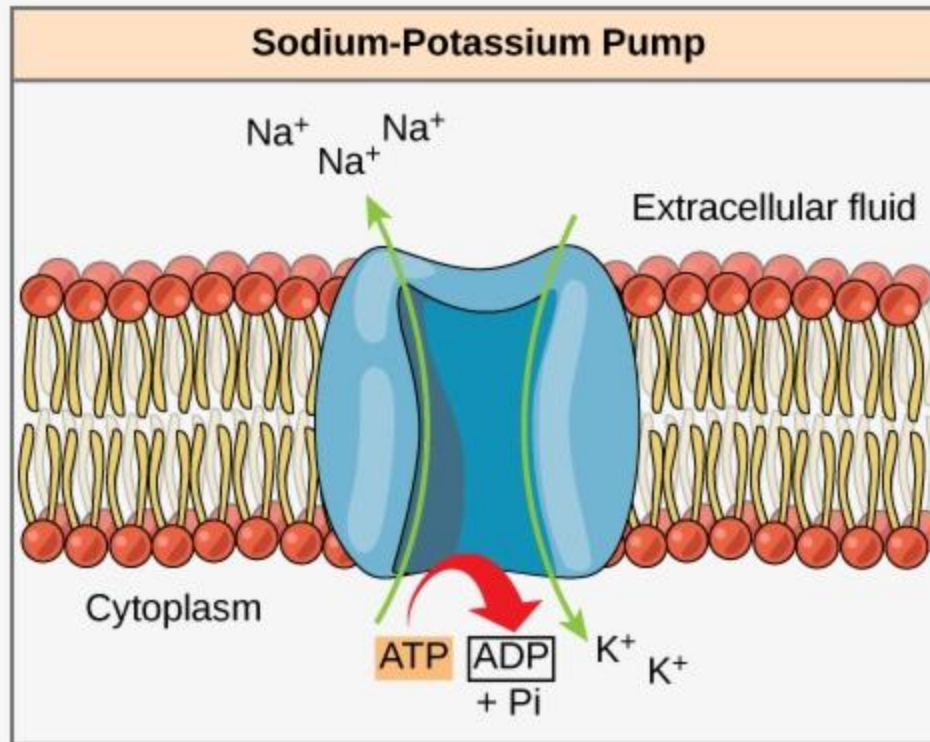
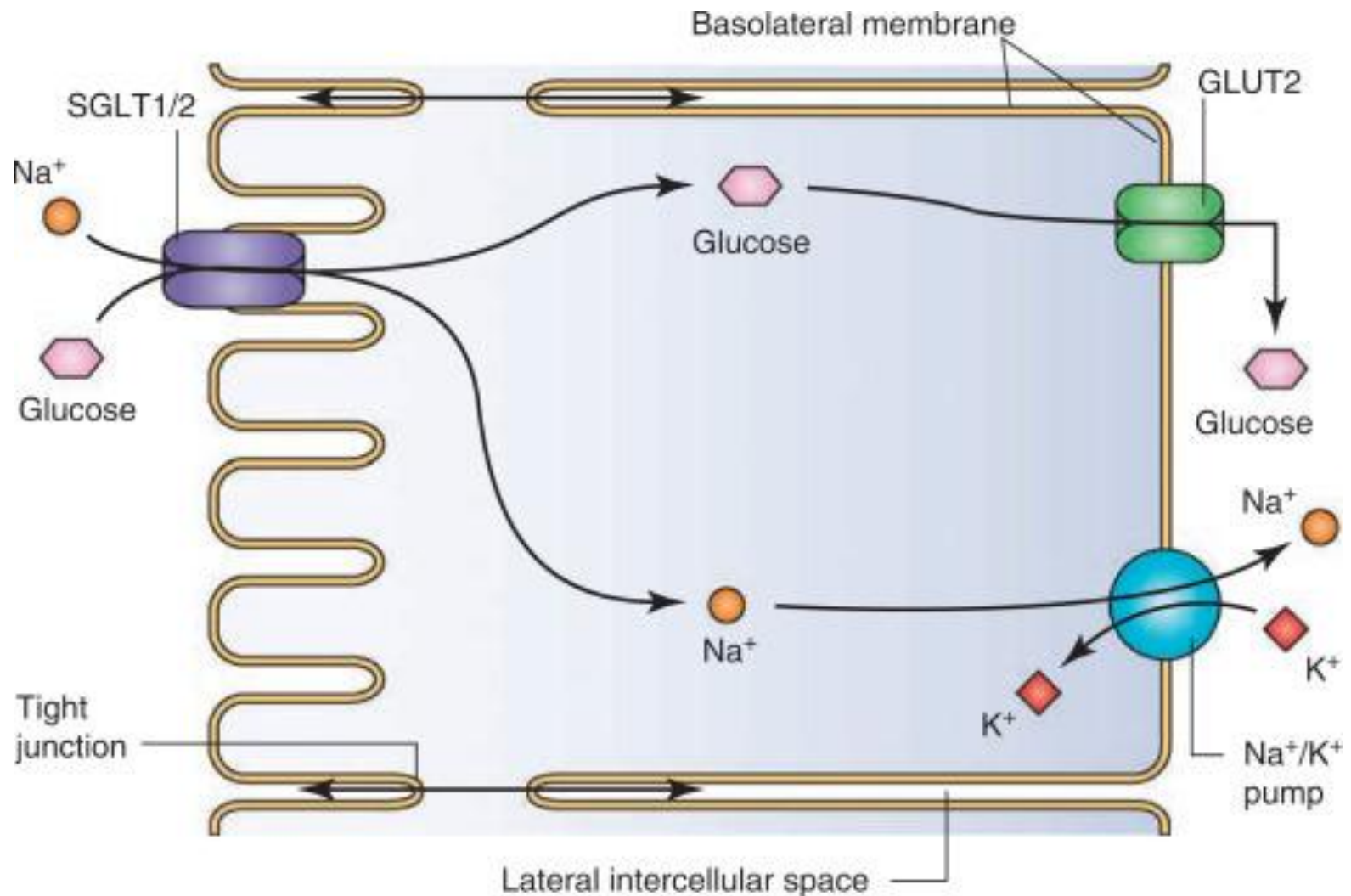


Figure 12-4 Essential Cell Biology, 2/e. (© 2004 Garland Science)

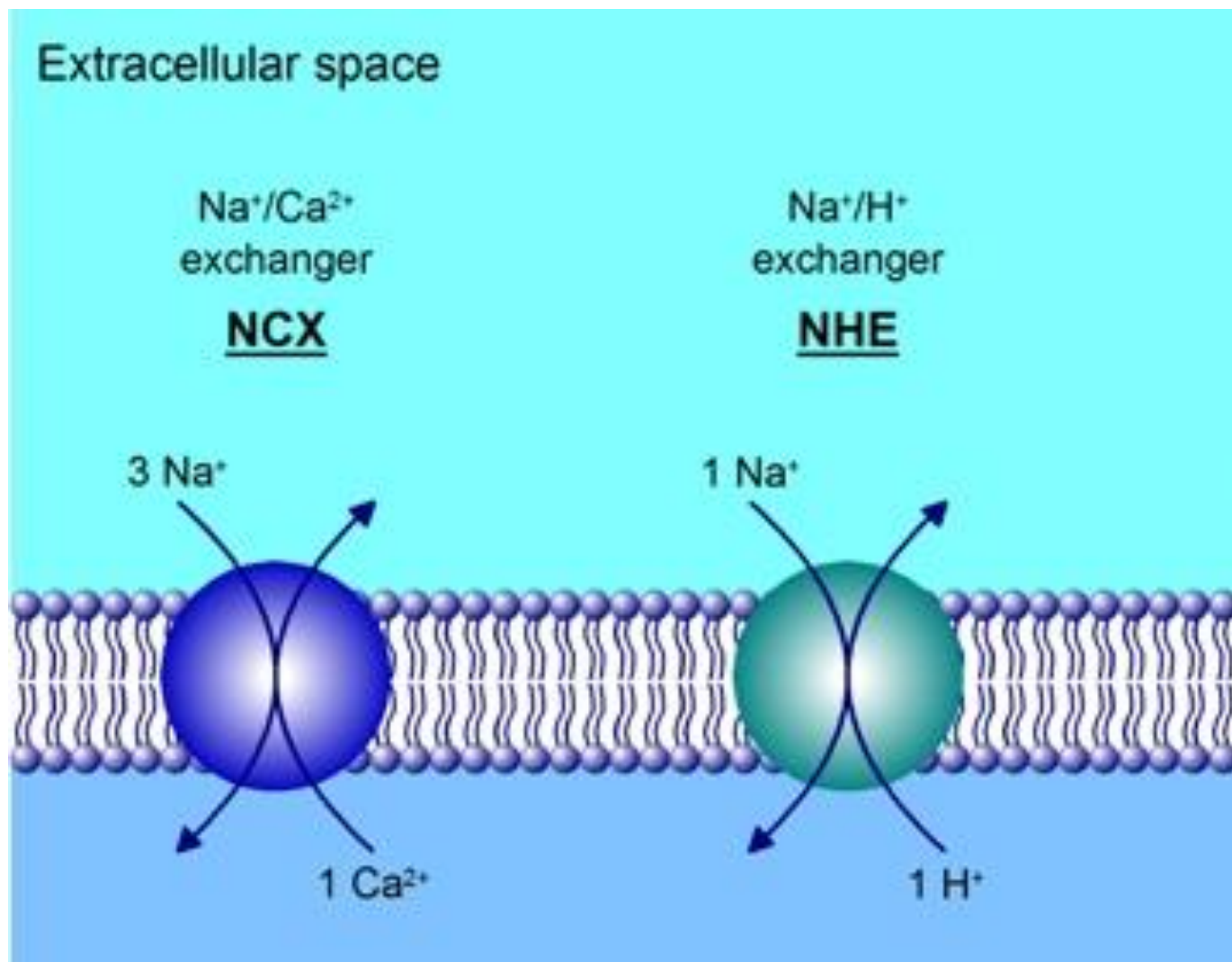
Transport aktywny pierwotny

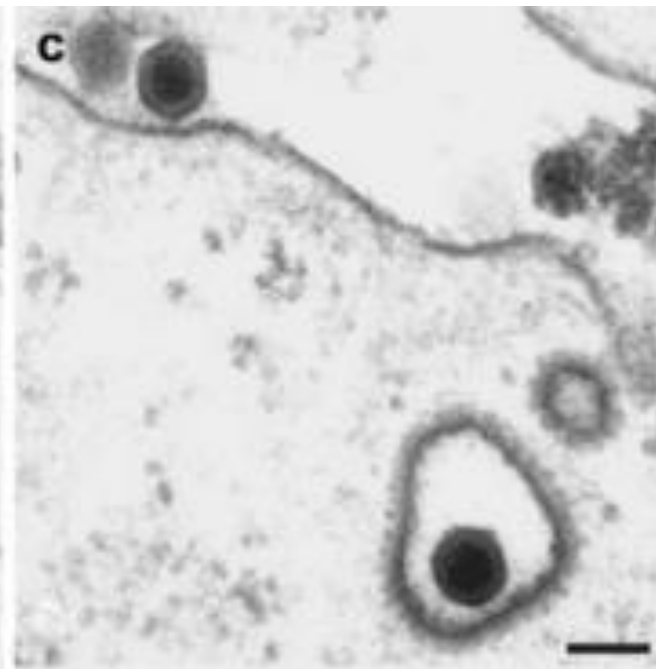
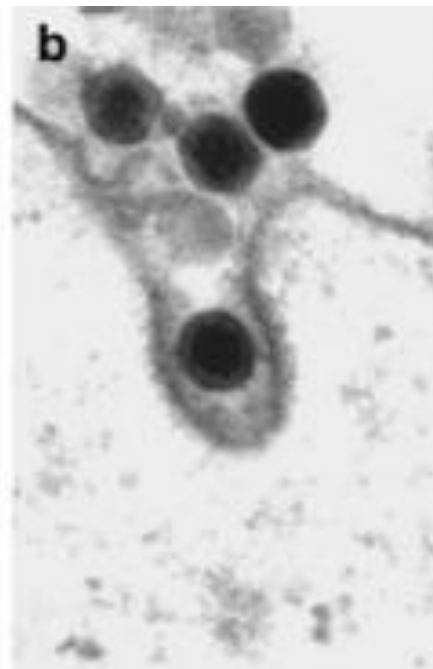
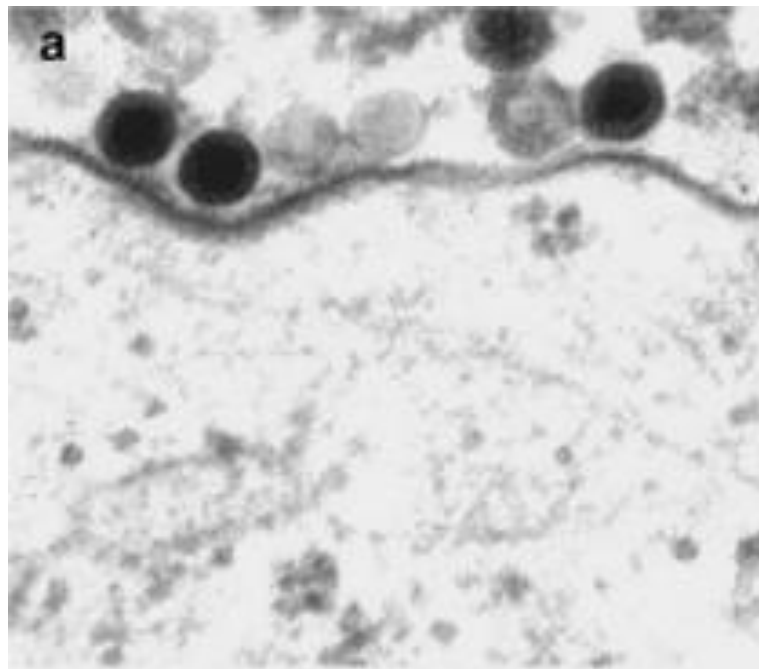
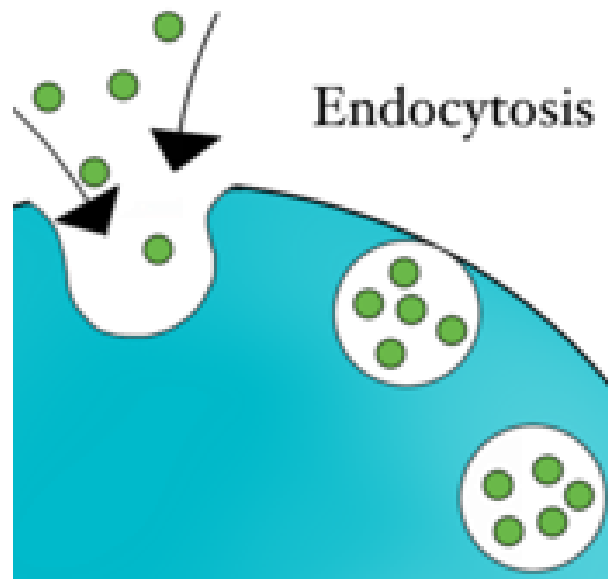


Transport aktywny wtórny - symport



Transport aktywny wtórny - antyport

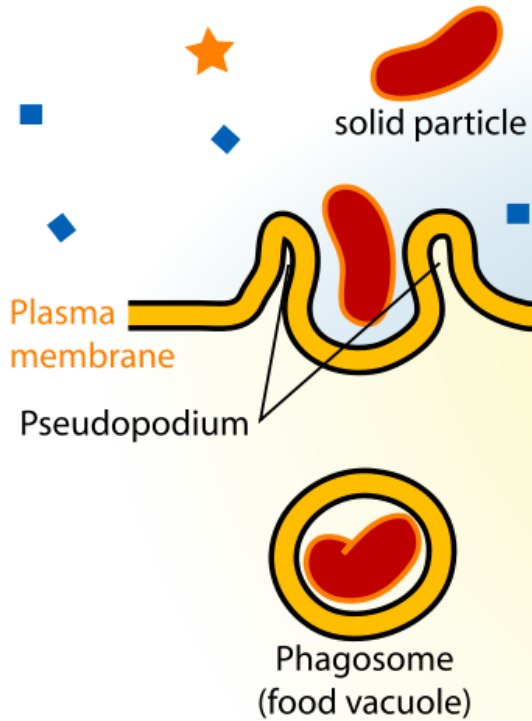




Typy endocytozy

Endocytosis

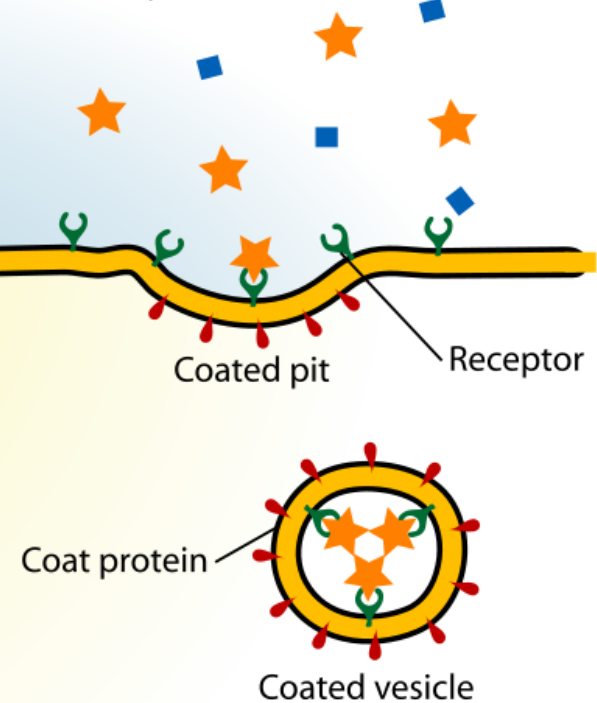
Phagocytosis



Pinocytosis

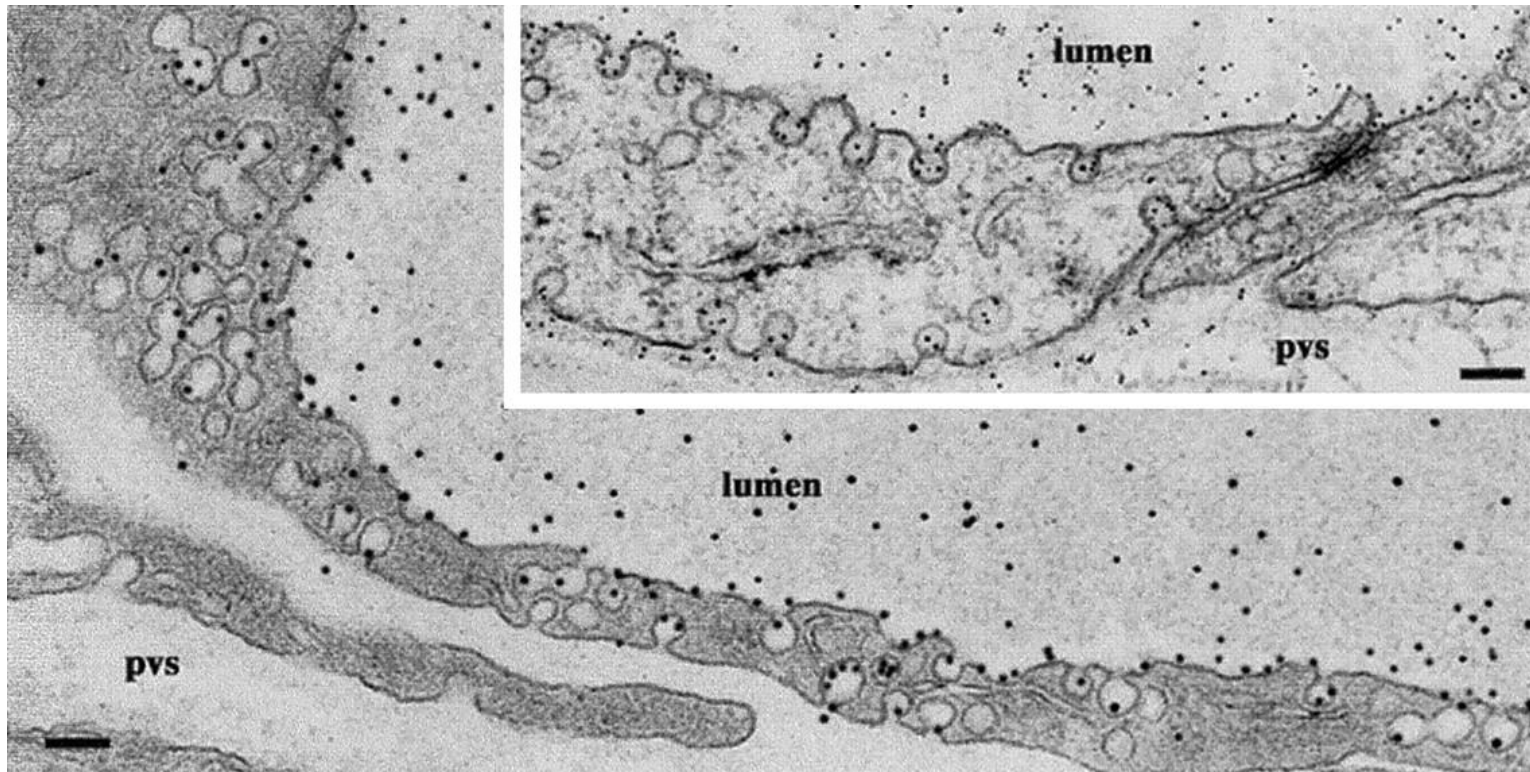


Receptor-mediated endocytosis



ENDOSOMY

- Błoniaste struktury cytoplazmy przybierające kształt zbiorników i cewek, powstają z pęcherzyków endocytarnych
- Biorą udział w endocytozie, segregacji i transporcie cząsteczek



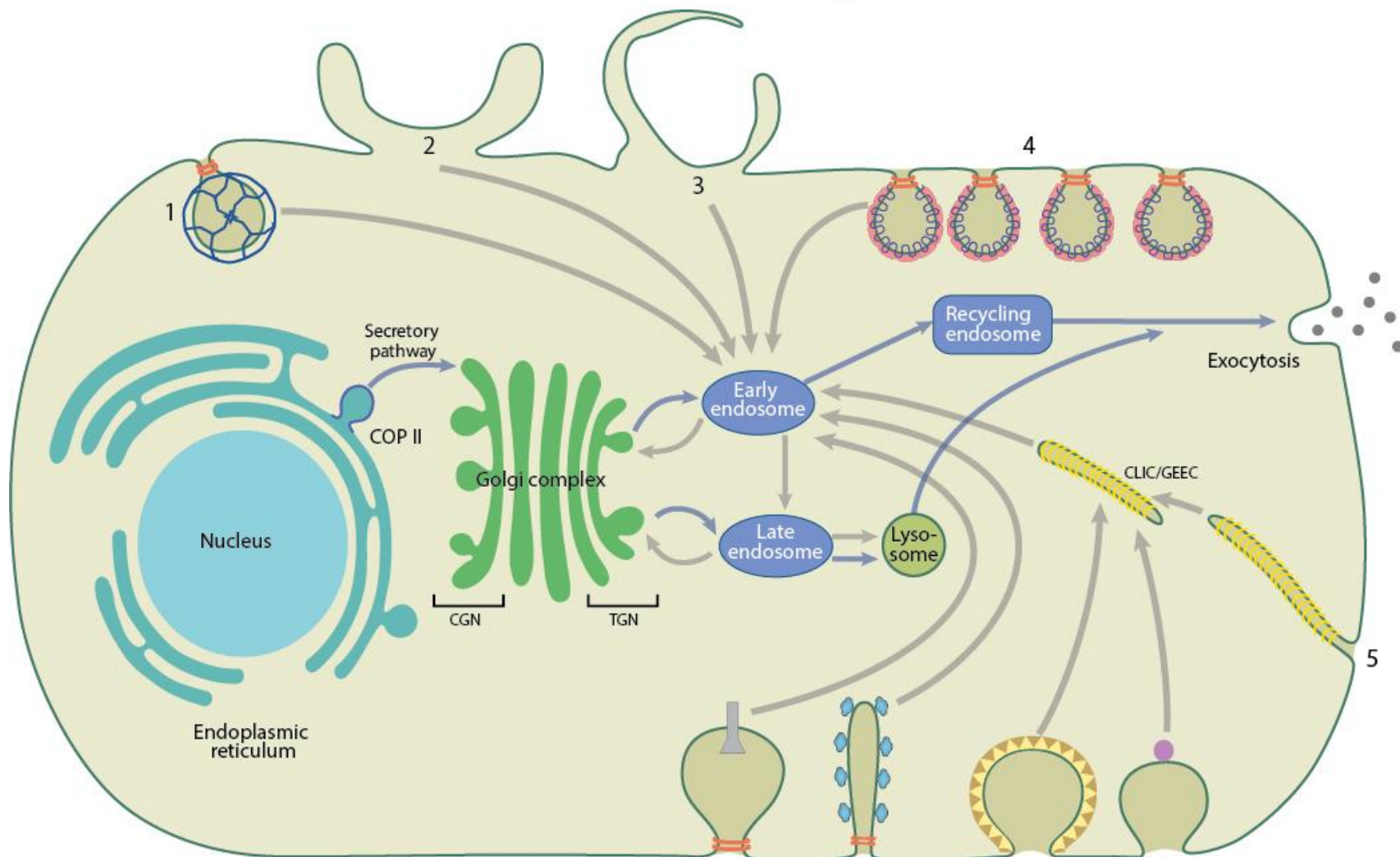
Pęcherzyki opłaszczane

Coated Vesicle	Coat Proteins*	Origin	Destination
Clathrin	Clathrin, AP1, ARF	TGN	Endosomes
Clathrin	Clathrin, AP2	Plasma membrane	Endosomes
COPI	COPI, ARF	Golgi apparatus	ER or Golgi apparatus
COPII	COPII (Sec13/31 and Sec23/24), Sar1	ER	Golgi apparatus
Caveolin	Caveolin	Plasma membrane	ER?

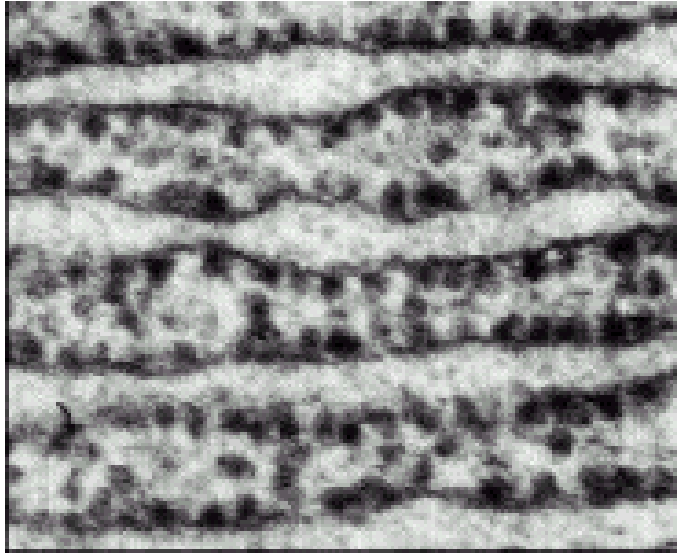
*ARF designates ADP ribosylation factor 1; AP1 and AP2 designate different adaptor protein complexes (also called assembly protein complexes).

Przedziały endosomalne

Membrane trafficking



SZORSTKA SIATECZKA ŚRÓDPLAZMATYCZNA



występowanie: wszystkie komórki jądrowe (-
plemnik)

Szczególnie obfita: komórki plazmatyczne,
komórki trzustki - bogata synteza białek na
eksport

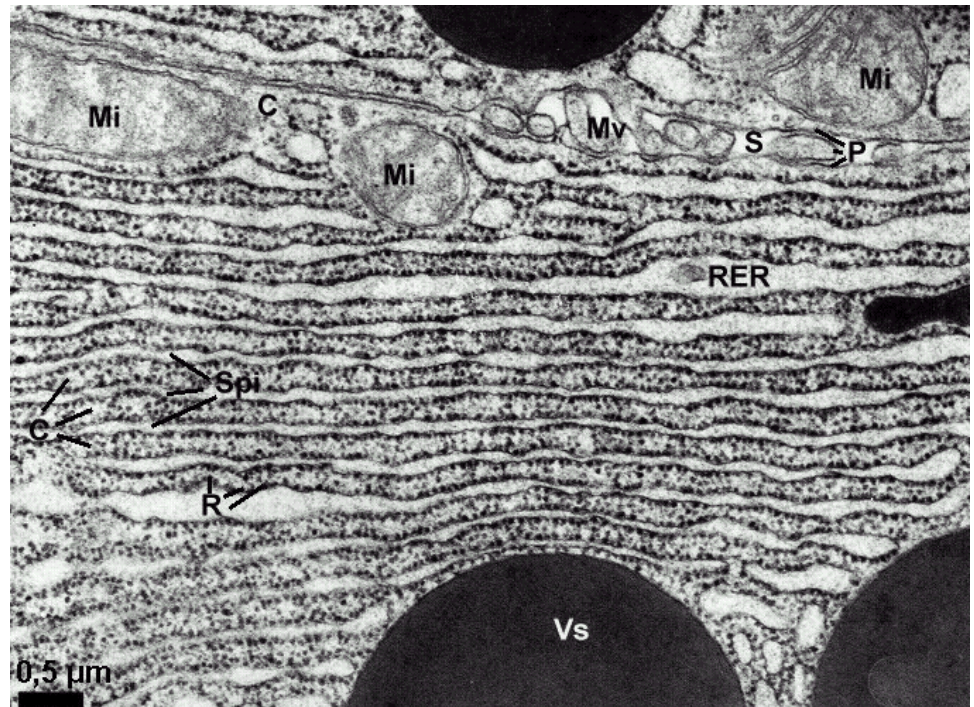
funkcja: synteza białek



pęcherzyki wydzielnicze (COP)



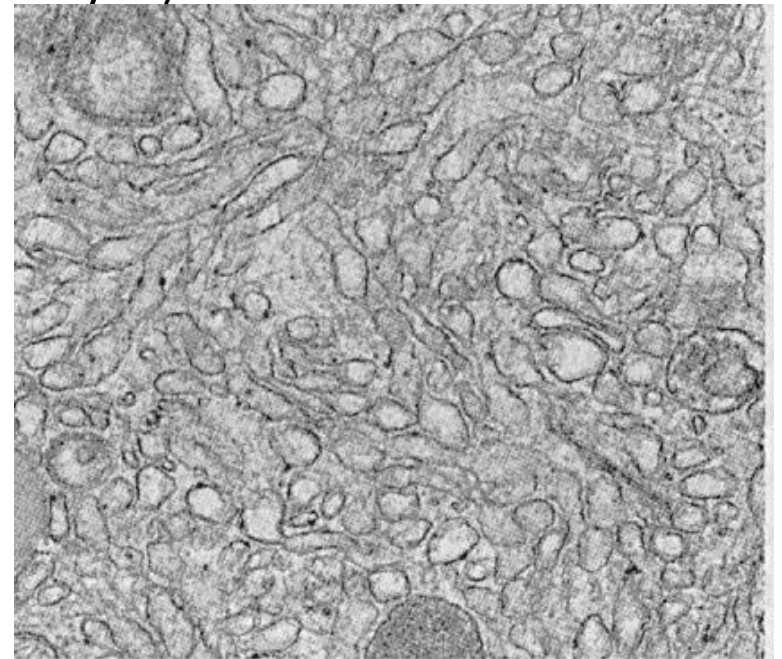
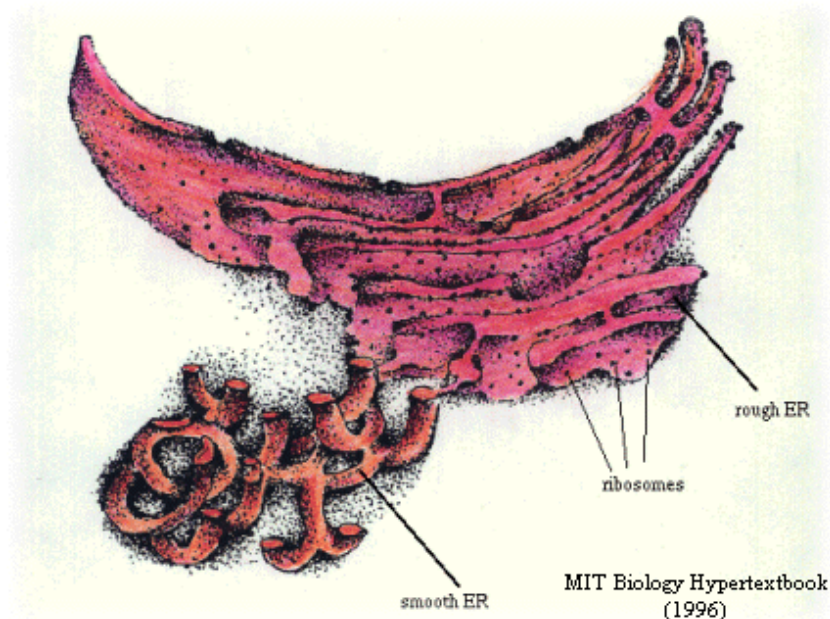
aparat Golgiego



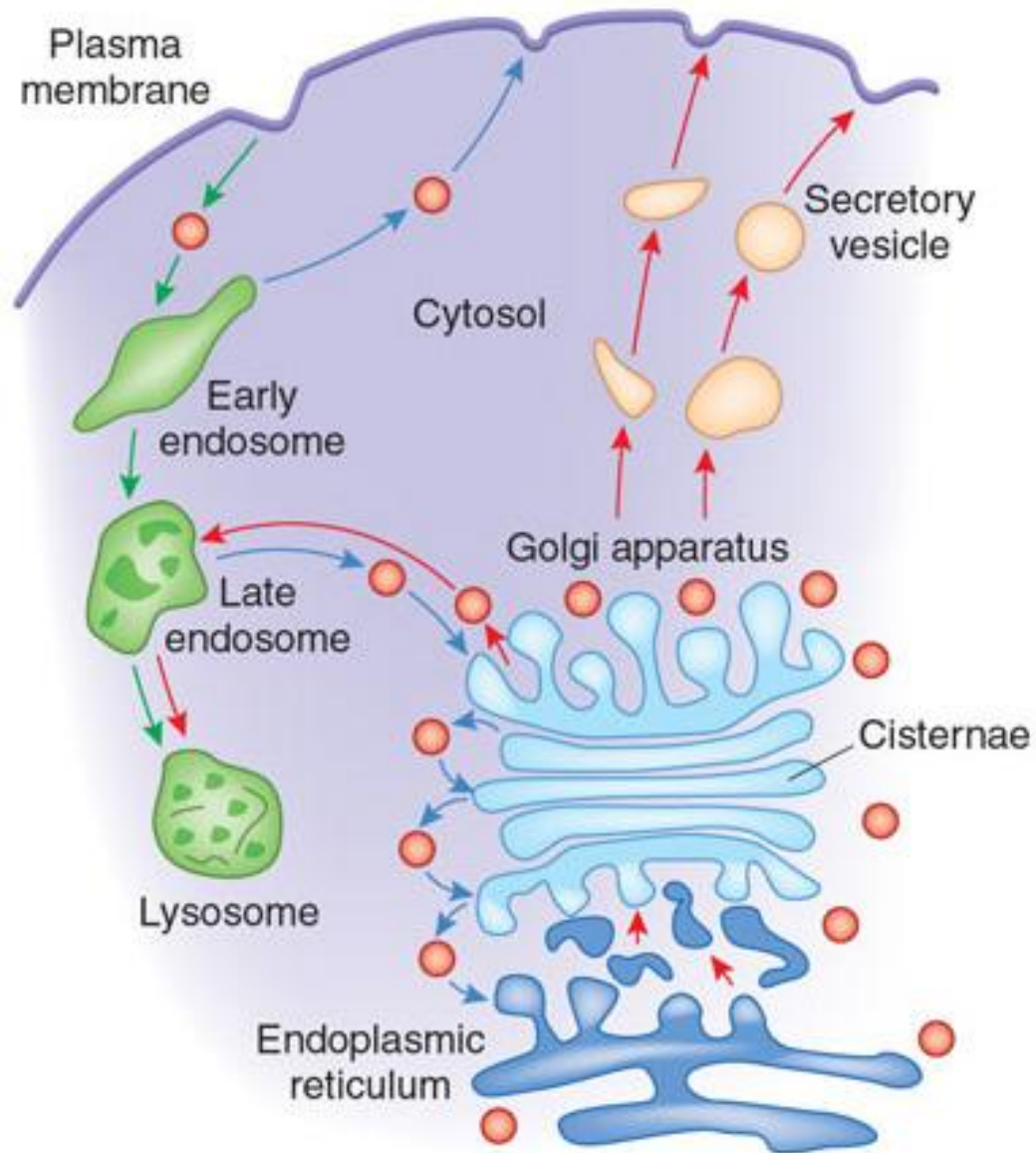
GŁADKA SIATECZKA ŚRÓDPLAZMATYCZNA

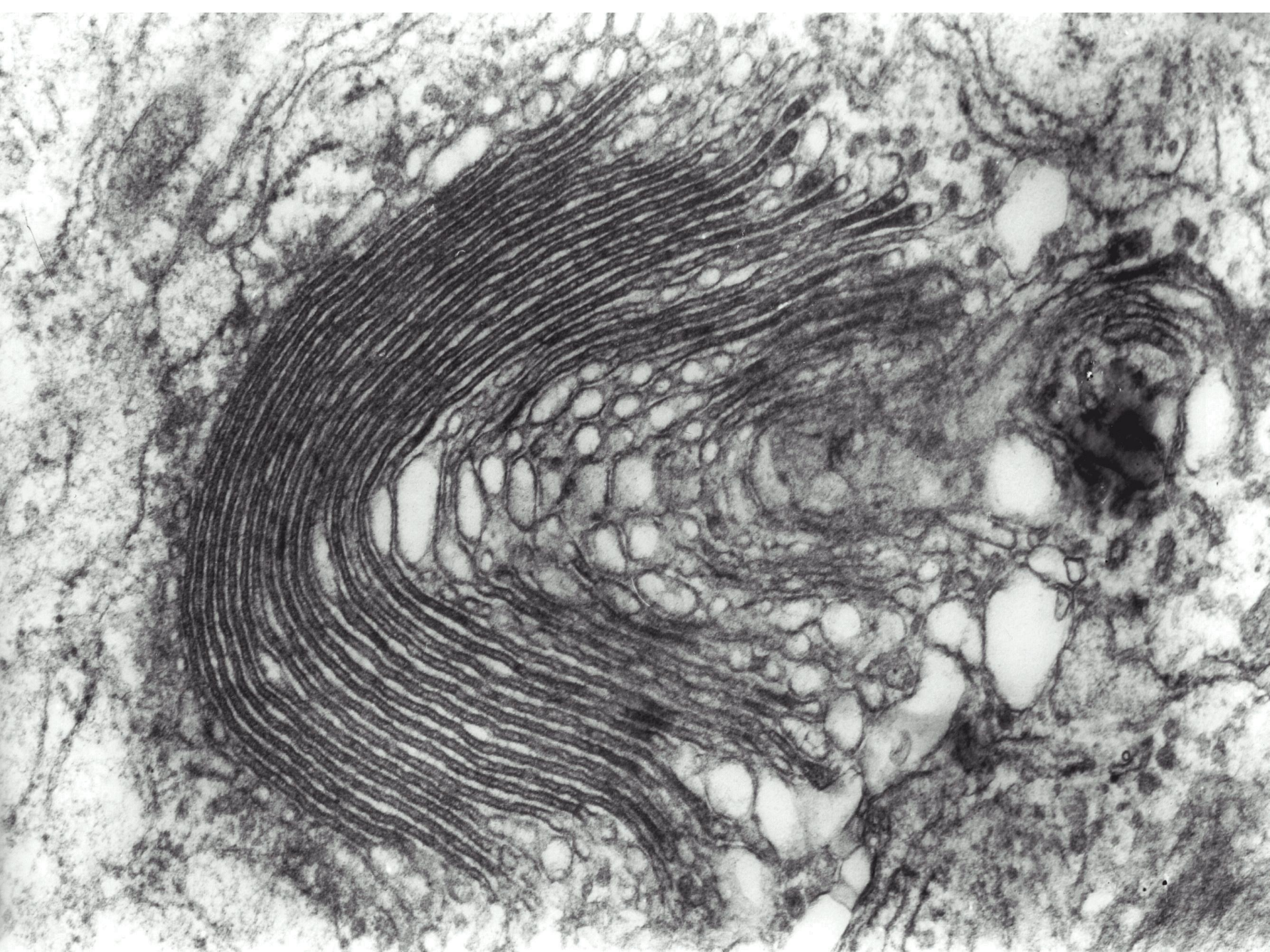
funkcje:

- * *metabolizm tłuszczów (wątroba - lipidy lipoprotein, nadnercza, jajnik, jądro - hormony steroidowe)*
- * *detoksykacja szkodliwych metabolitów i ksenobiotyków
hydroksylacja, dealkilacja, dehalogenizacja,
utlenianie azotu ksenobiotyków, dołączanie grup hydrofilnych
(siarczanowe, glukuronowe)*
- * *gromadzenie i magazynowanie Ca^{2+} (kalsekwestryna)*



APARAT GOLGIEGO





LIZOSOM

Lysosome Structure

Single-Wall
Membrane

Enzyme
Complexes

Figure 1

Heterogeneity of lysosomes

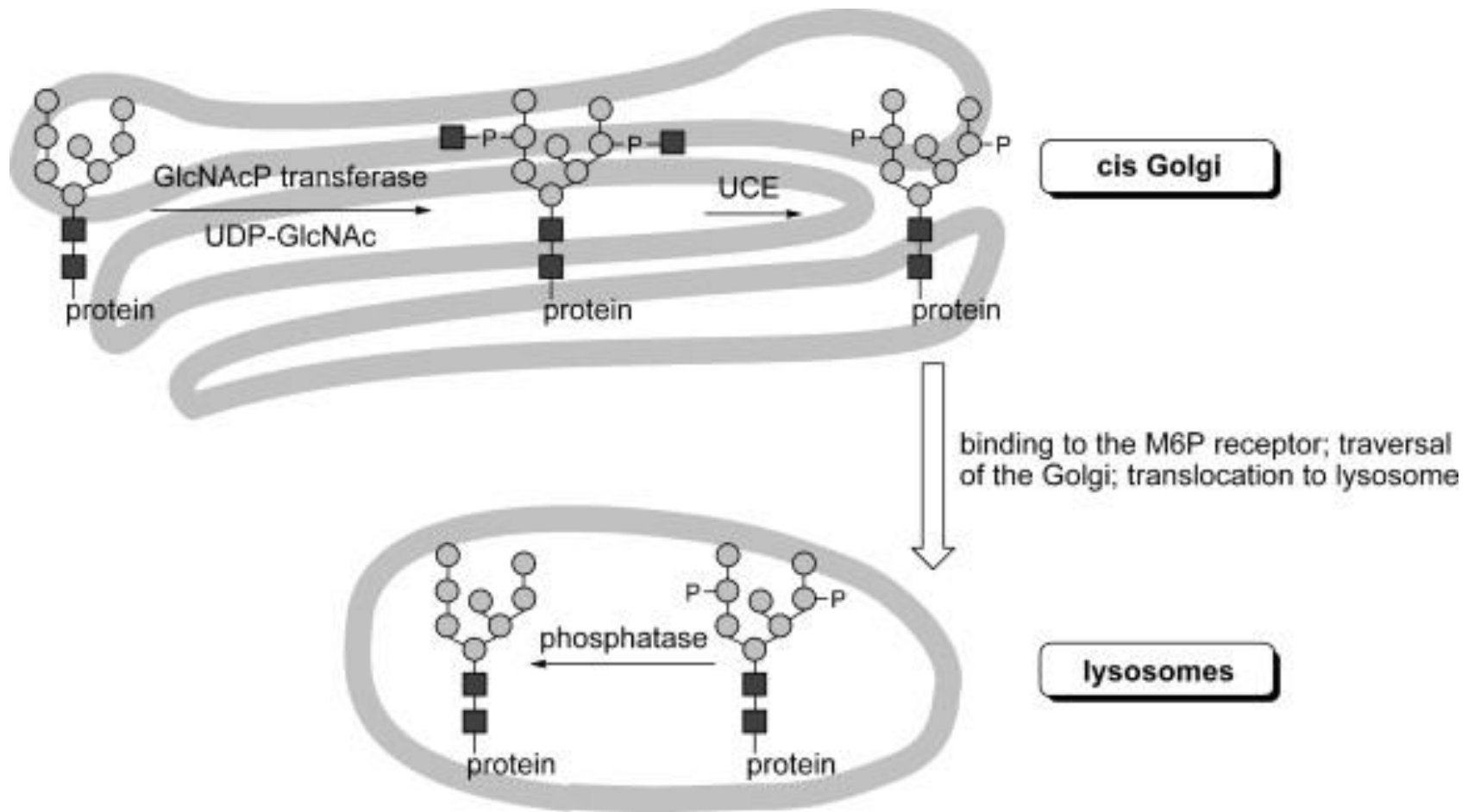
Błona lizosomów: * pompa protonowa (*pH 5*)

* przepuszczalna dla produktów hydrolaz

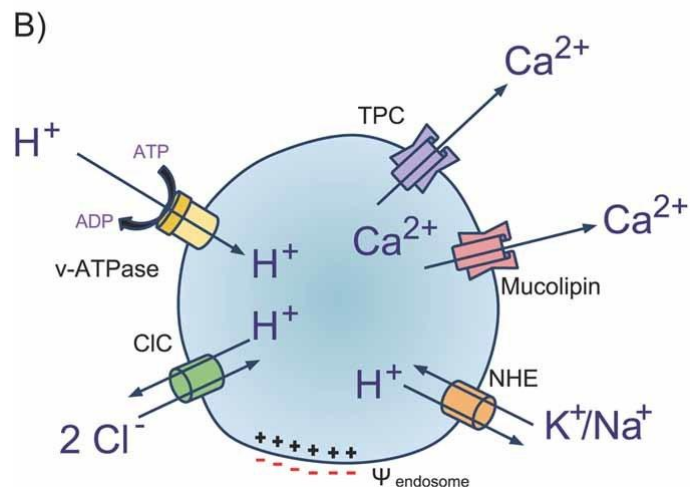
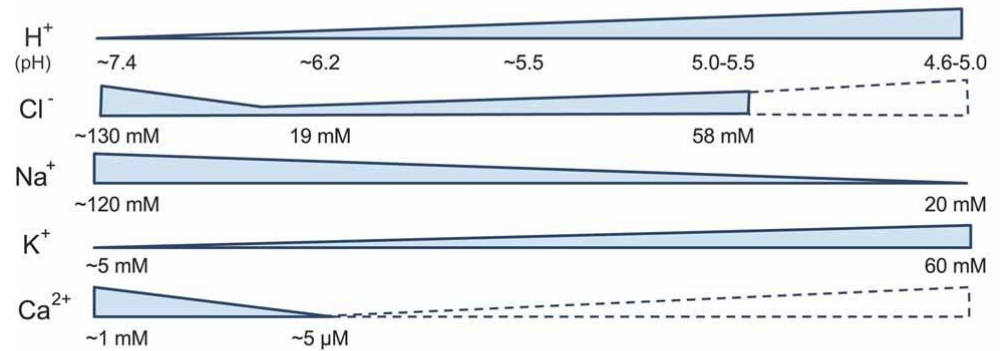
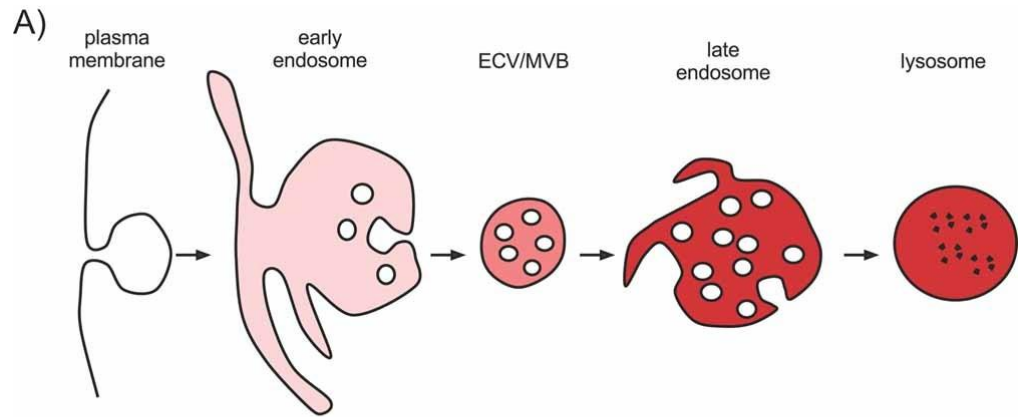
Zawartość: proteaza, lipaza triacyloglicerylowa,
glikozydaza, nukleaza, fosfataza, sulfataza

Funkcja: trawienie wewnątrzkomórkowe

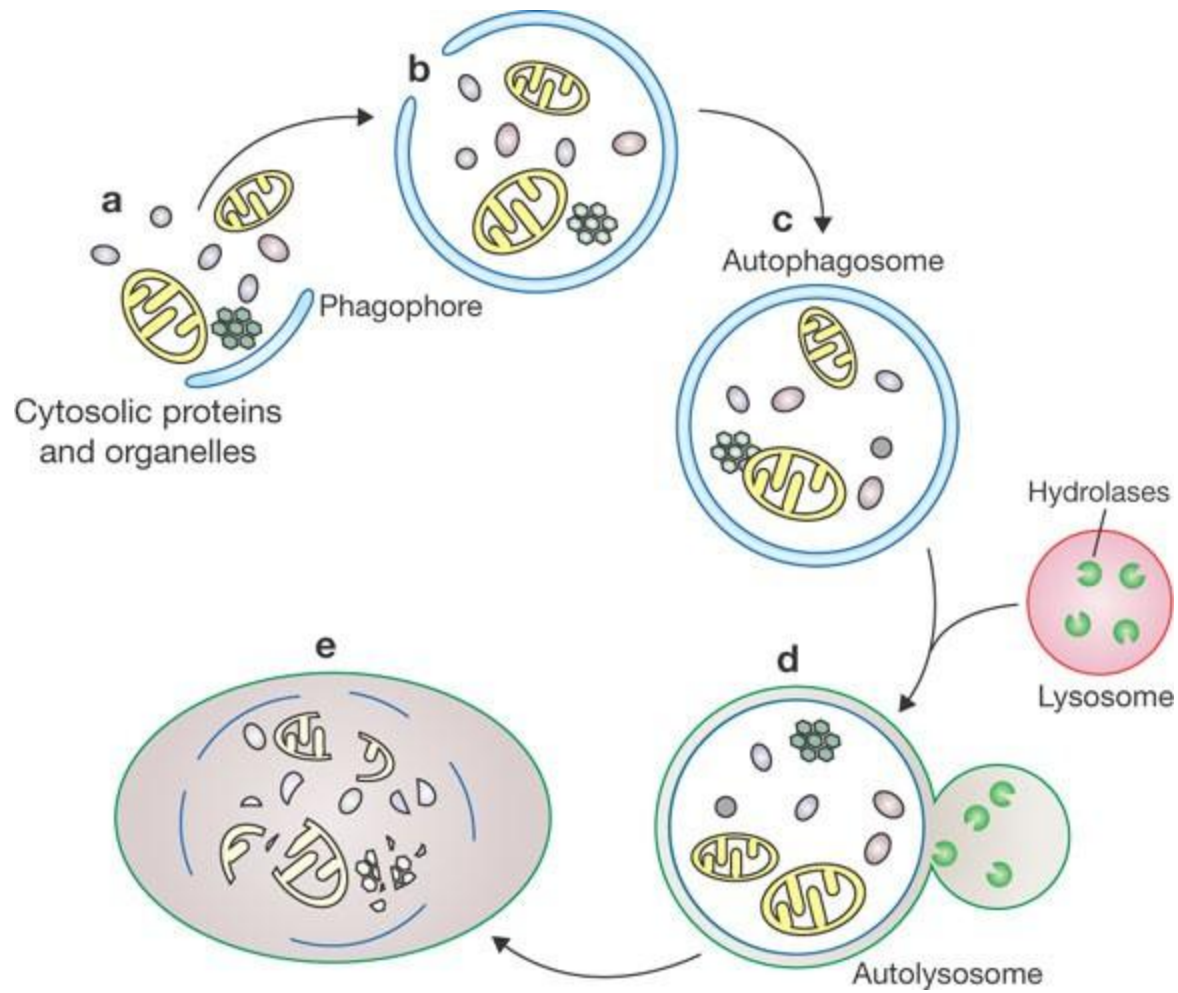
LIZOSOM – mannozo-6-fosforan



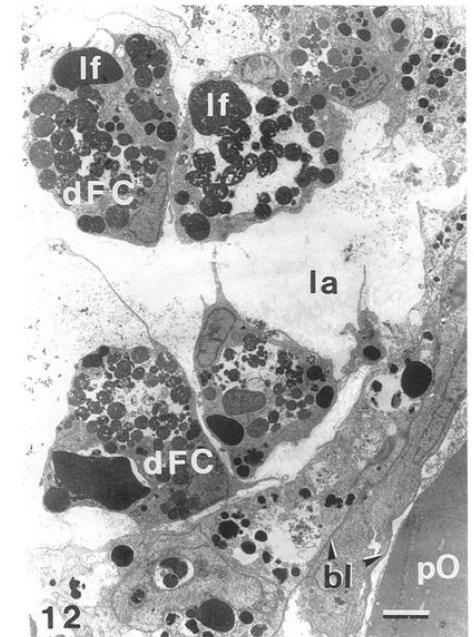
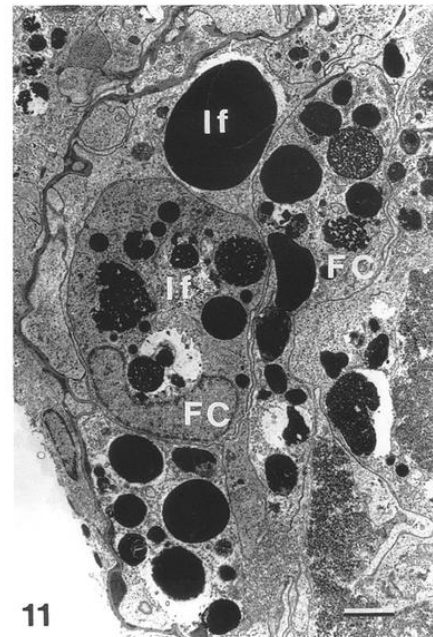
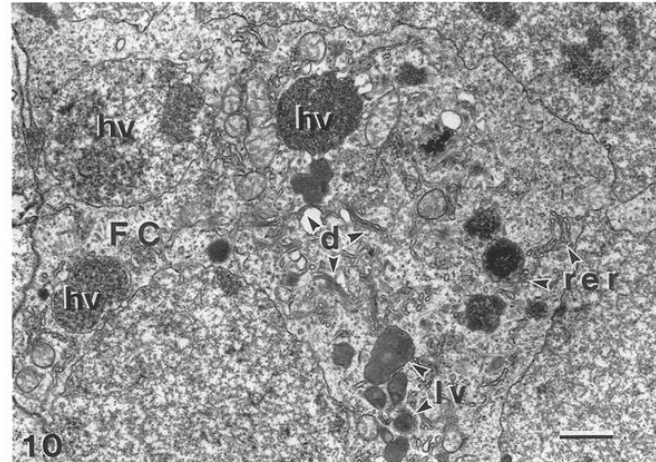
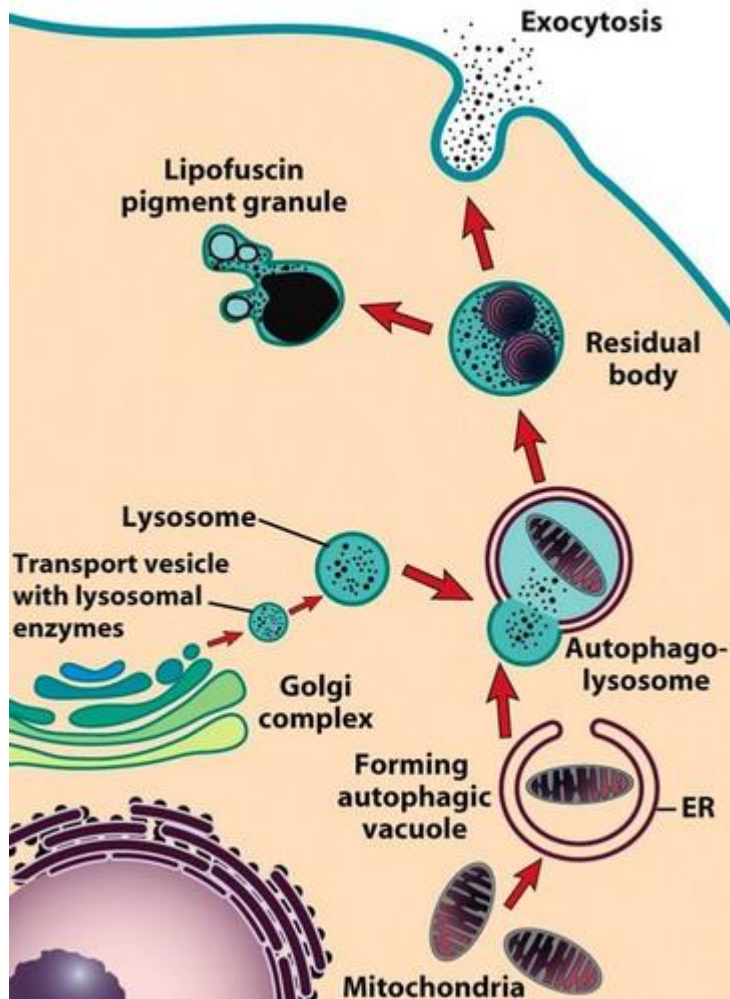
LIZOSOM – kontrola pH



Autofagolizosom



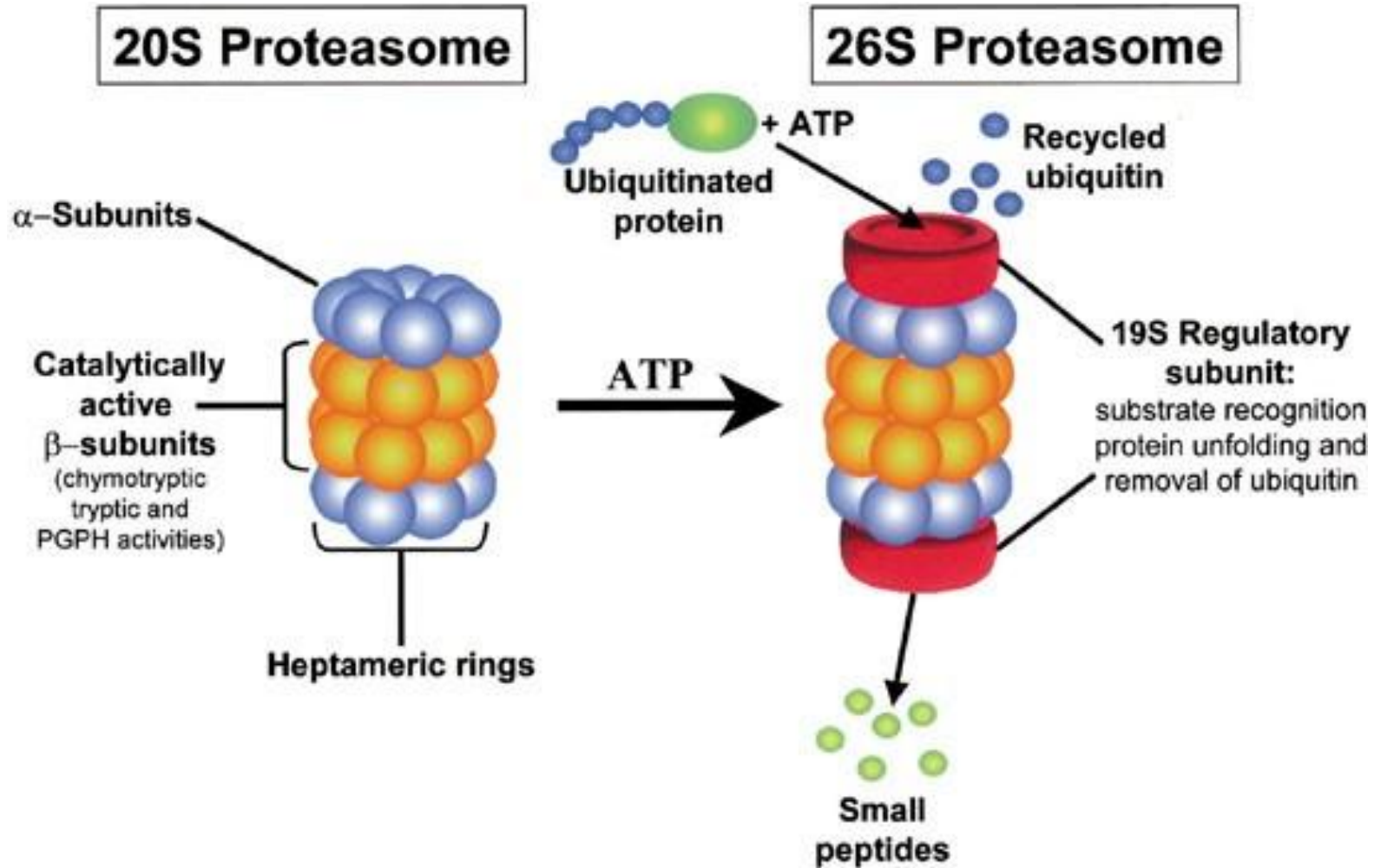
LIZOSOM – ciałko resztkowe, lipofuscyna



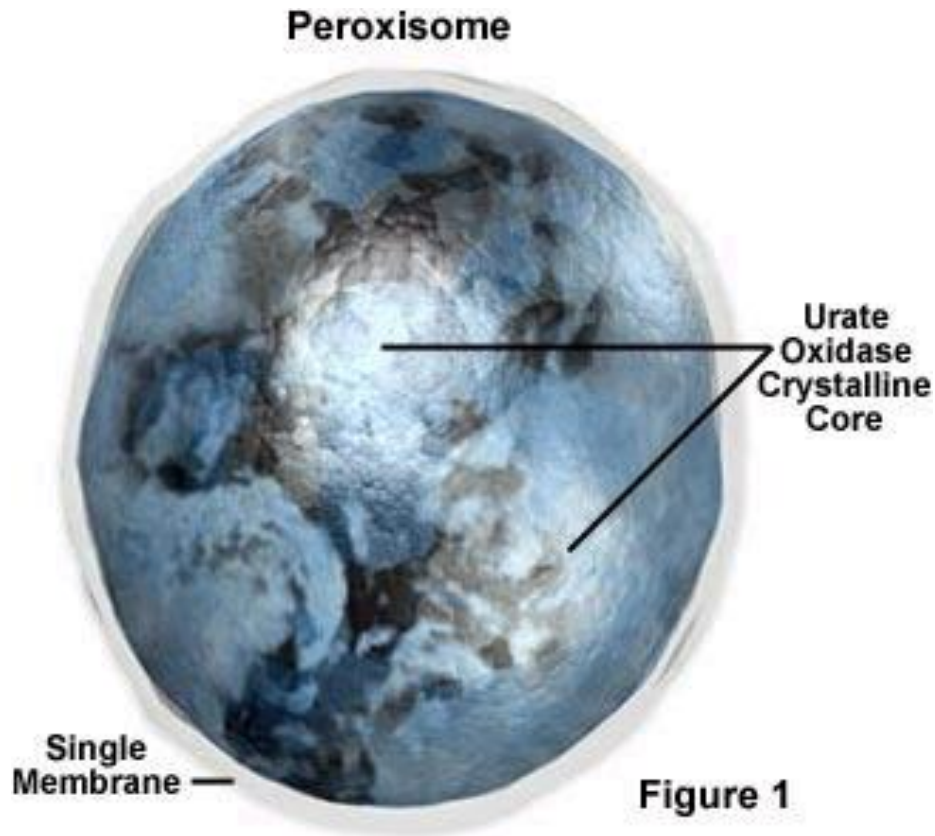
11

12

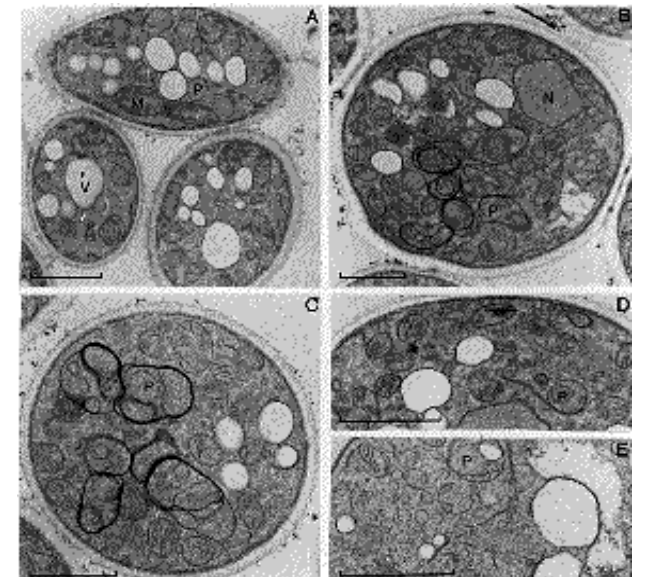
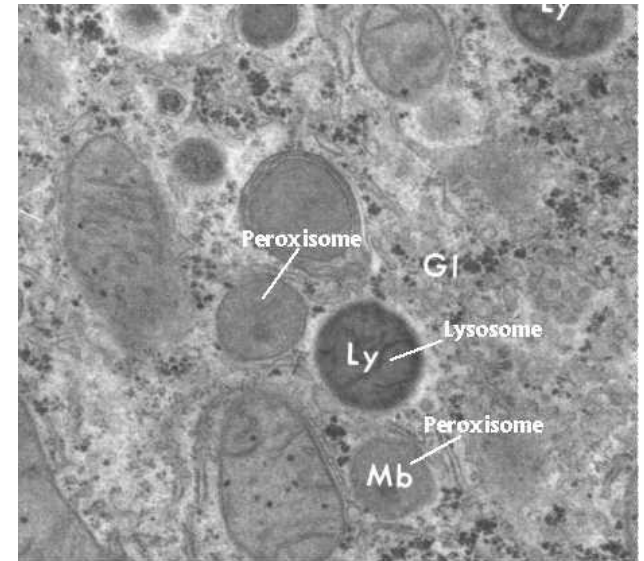
PROTEASOM



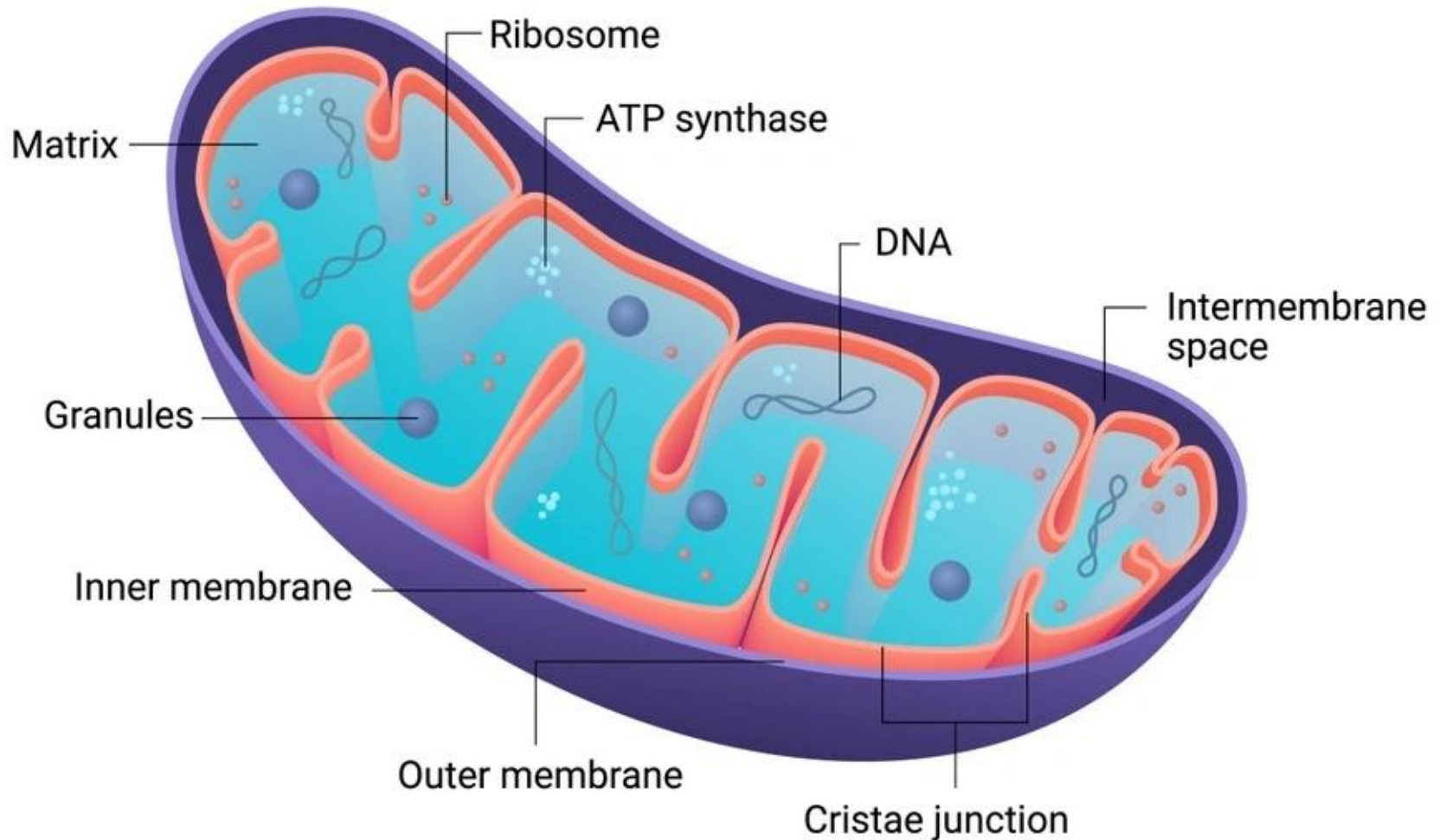
PEROKSYSOM



Zawierają: katalazę, oksydazę D-aminokwasów, oksydazę moczanową

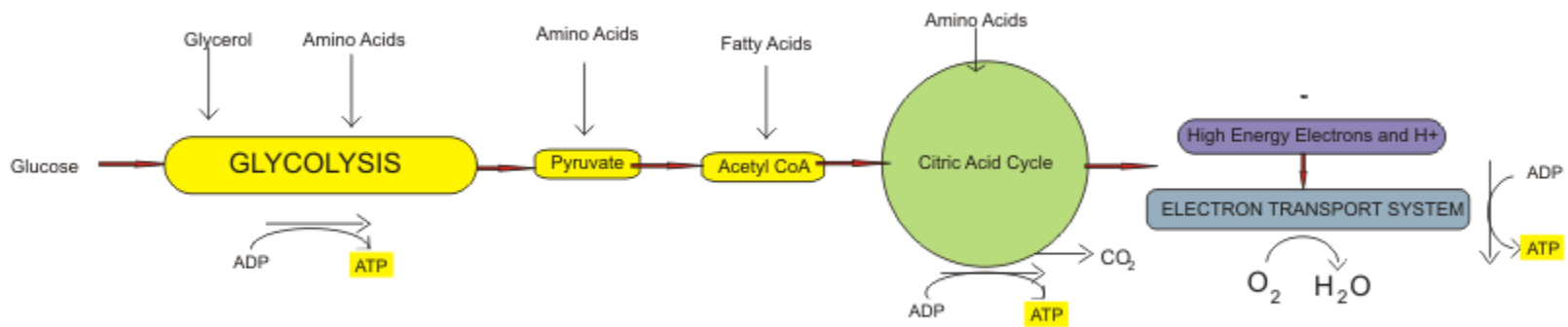


Mitochondrion



Funkcje mitochondrium:

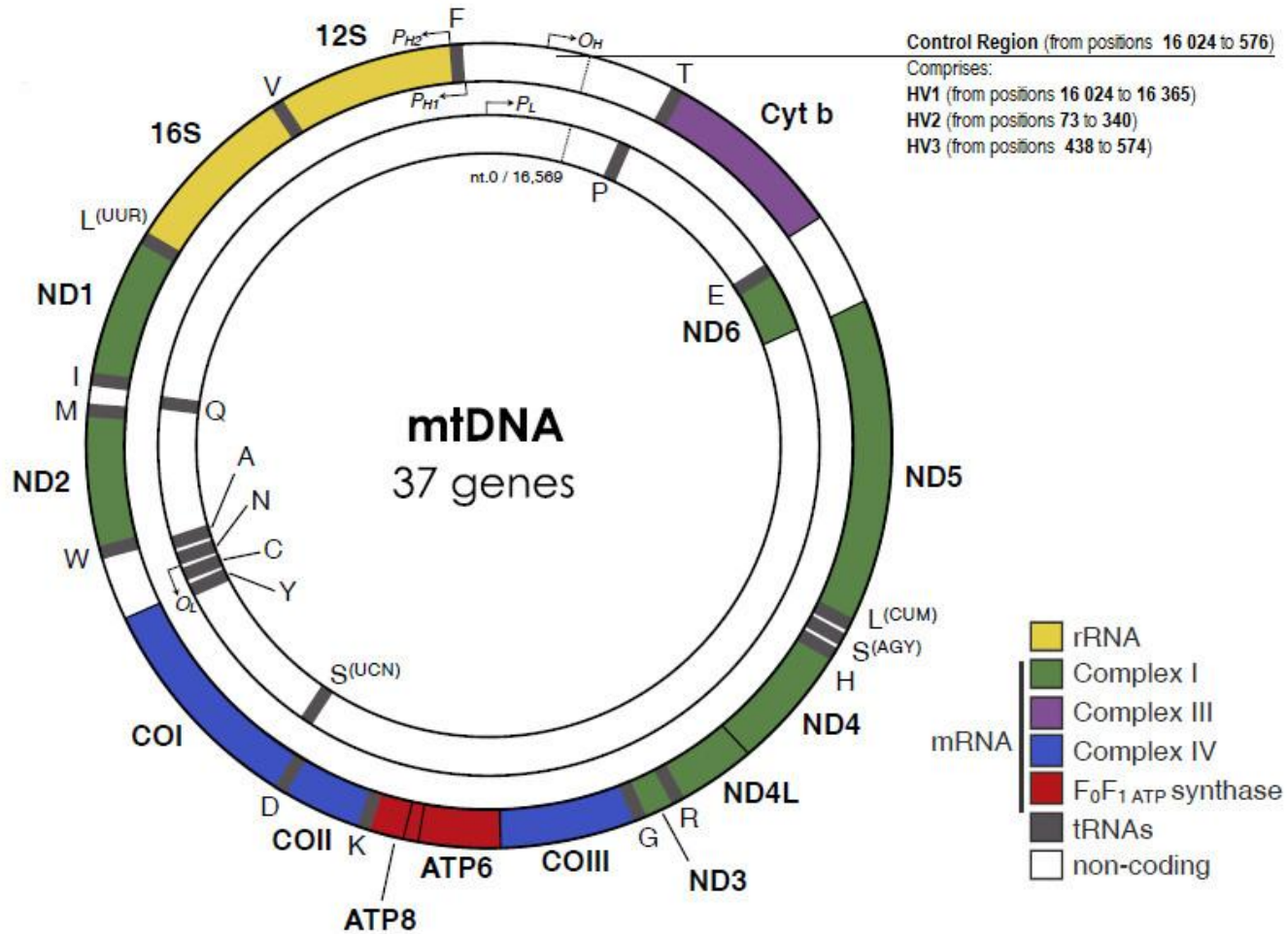
1. Produkcja ATP
2. Apoptoza
3. Produkcja ciepła



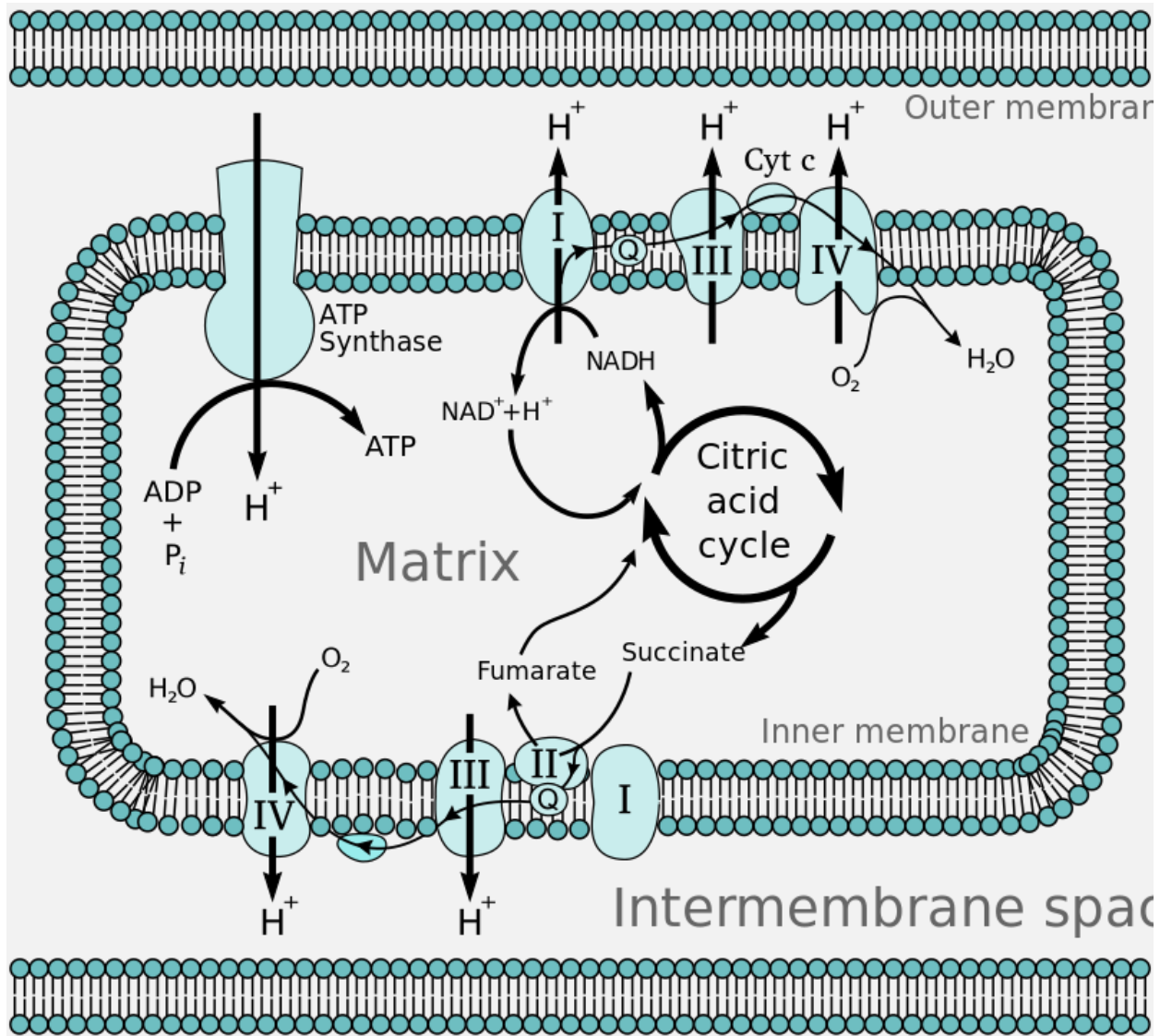
ATP Production Pathways

Frank Boumphrey M.D. 2009

Mitochondrialne DNA



Łańcuch oddechowy i syntaza ATP



Termogenina (UCP-1) – produkcja ciepła

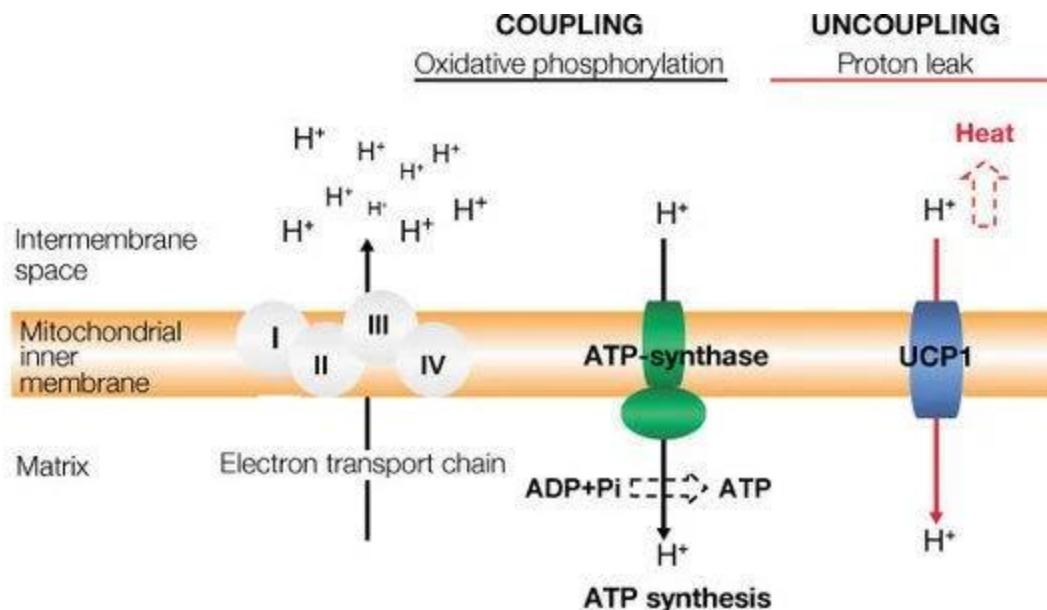
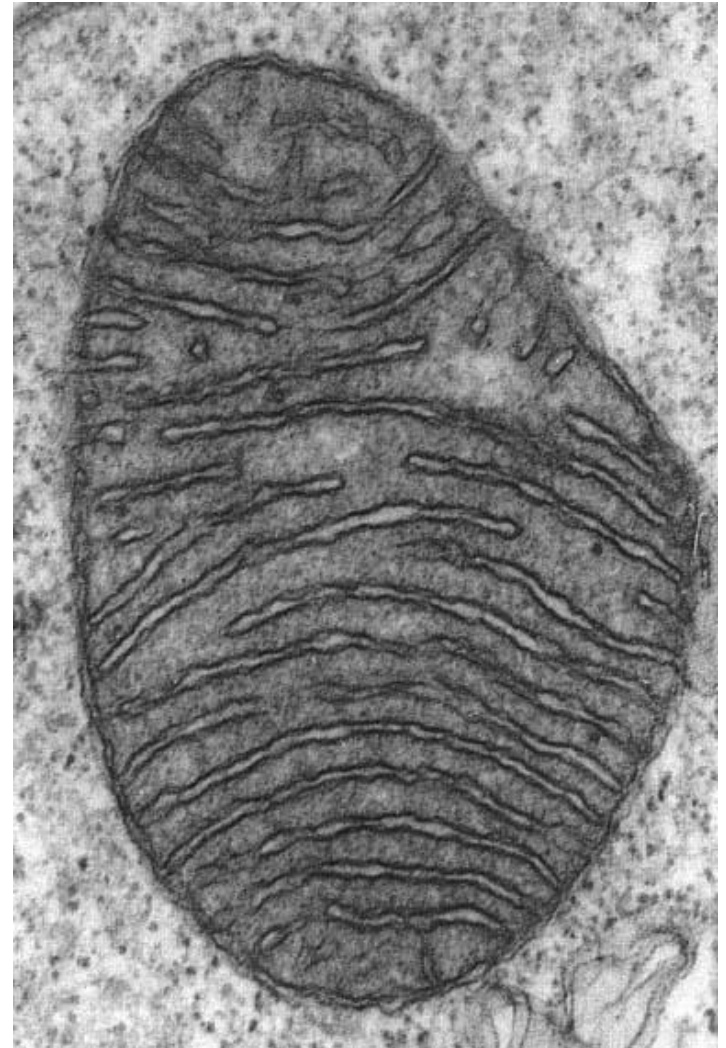


Figure 1. UCP1 location and function in the mitochondrial respiratory chain (MRC). Numbers I-IV corresponds to the MRC complexes. ATP-synthase is the fifth complex of the MRC. During respiration, protons are pumped through the MRC complexes, and a proton gradient is generated. The energy of the proton gradient drives the synthesis of ATP by the ATP-synthase complex. UCP1 catalyzes a regulated re-entry of protons into the matrix, uncoupling the MRC and, consequently, reducing ATP synthesis and generating heat.



BIAŁKA CYTOSZKIELETU

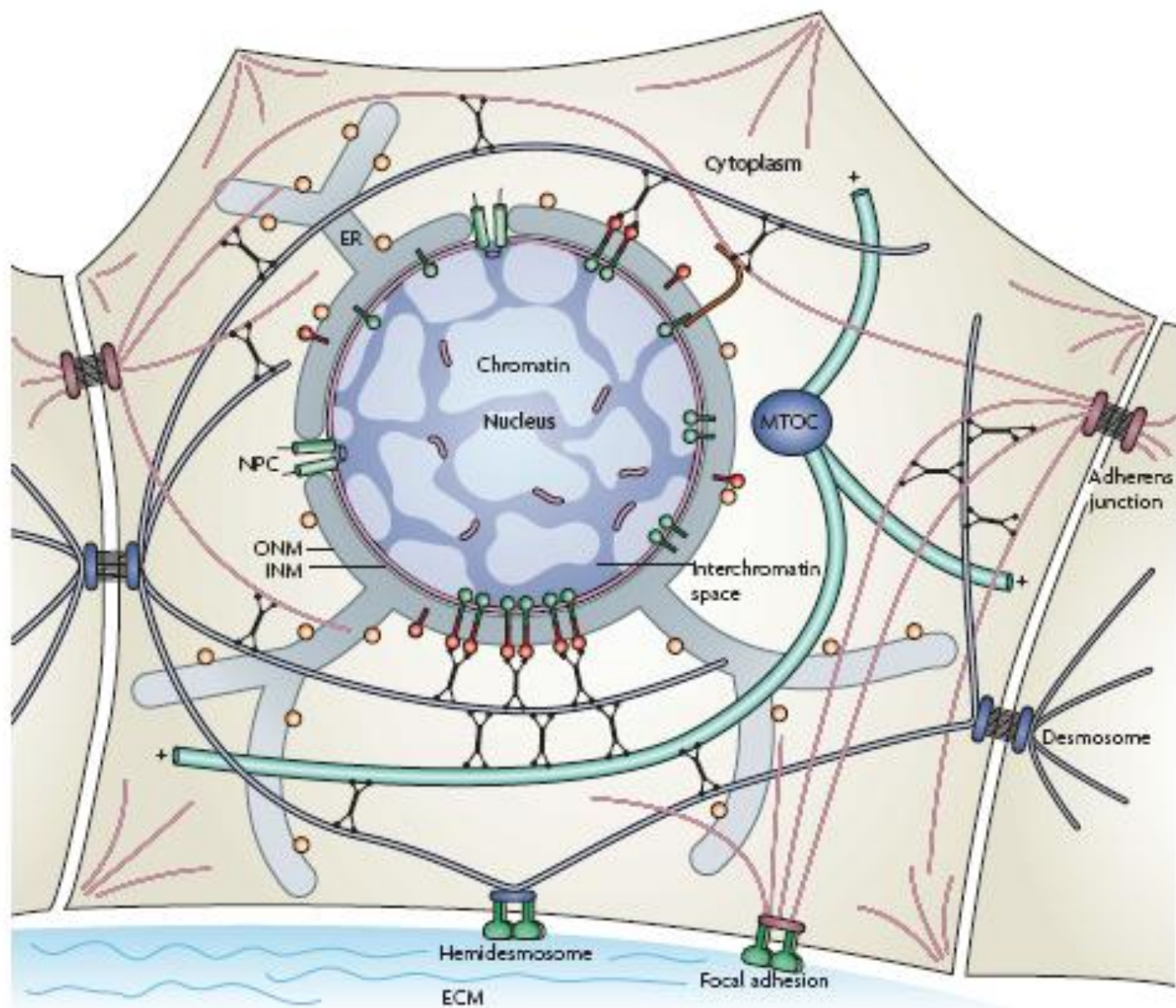
- MIKROFILAMENTY**

(Miofilamenty aktynowo-miozynowe)

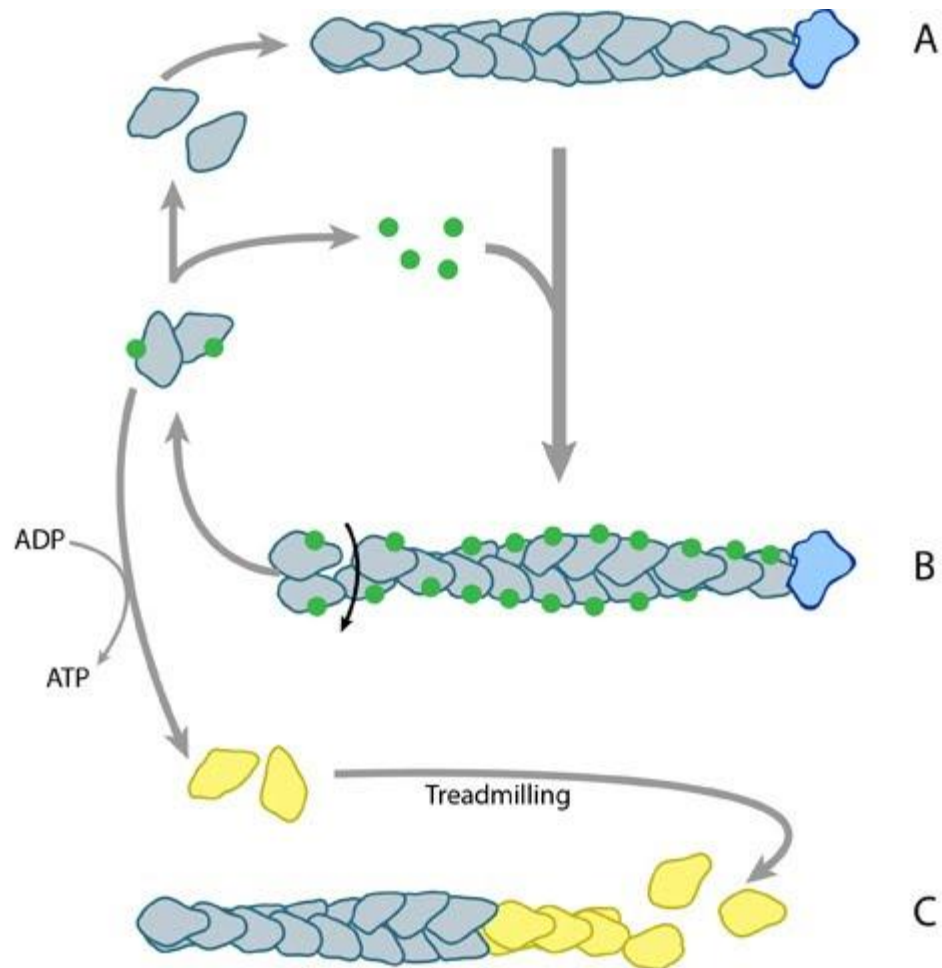
- FILAMENTY POŚREDNIE**

**(Laminy jądrowe, neurofilamenty,
keratyny)**

- MIKROTUBULE**



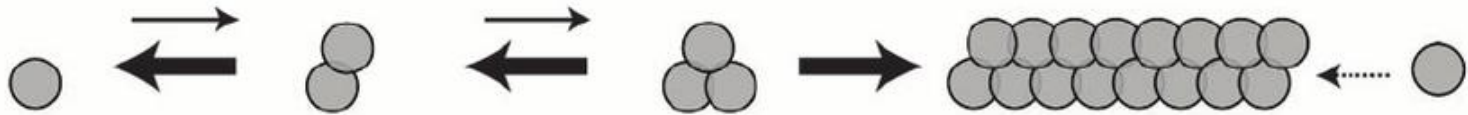
Filamenty aktynowe



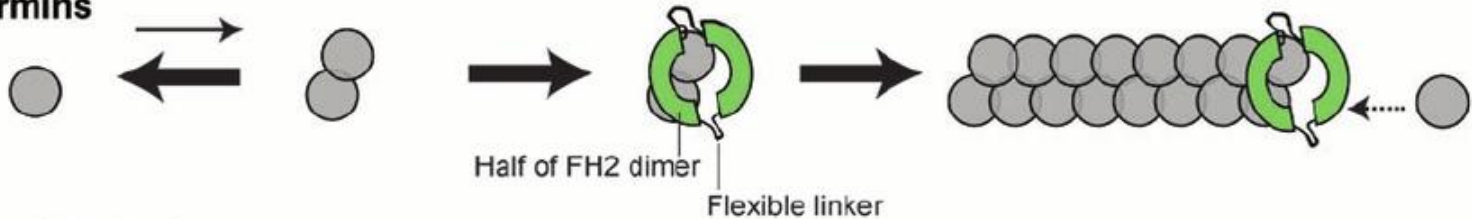
	ATP - actin		ADP - actin		ADF /cofilin		Capping protein
---	-------------	---	-------------	---	--------------	---	-----------------

Filamenty aktynowe – inicjacja polimeryzacji

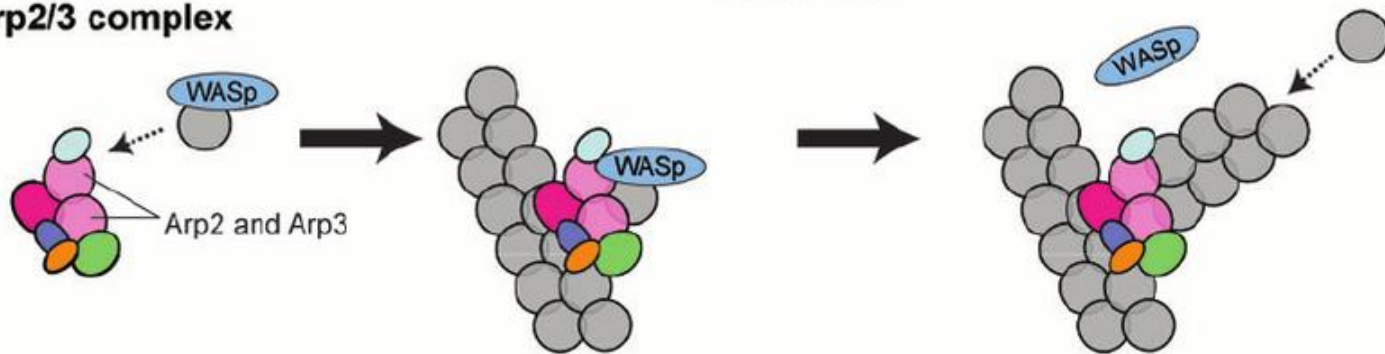
Spontaneous nucleation



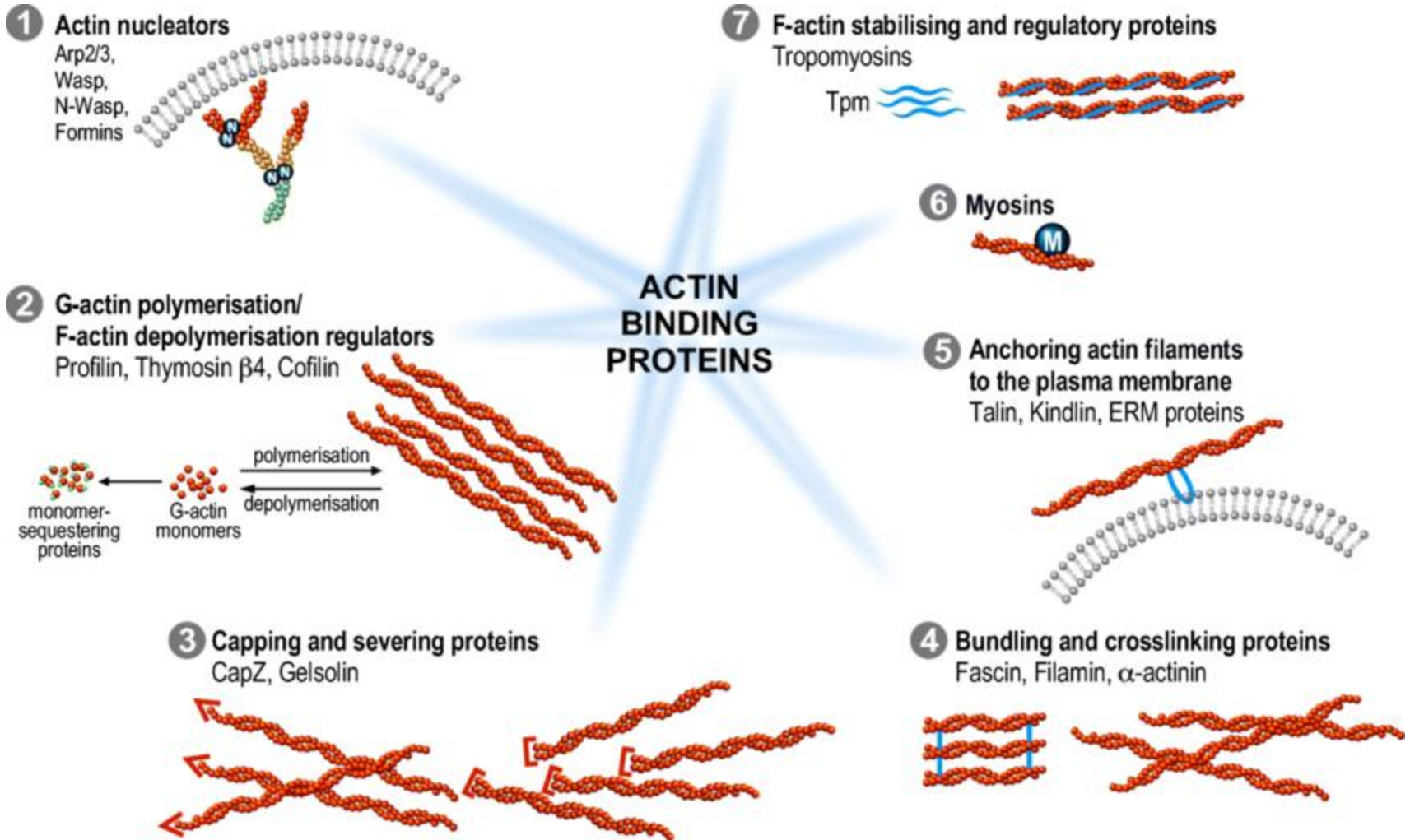
Formins



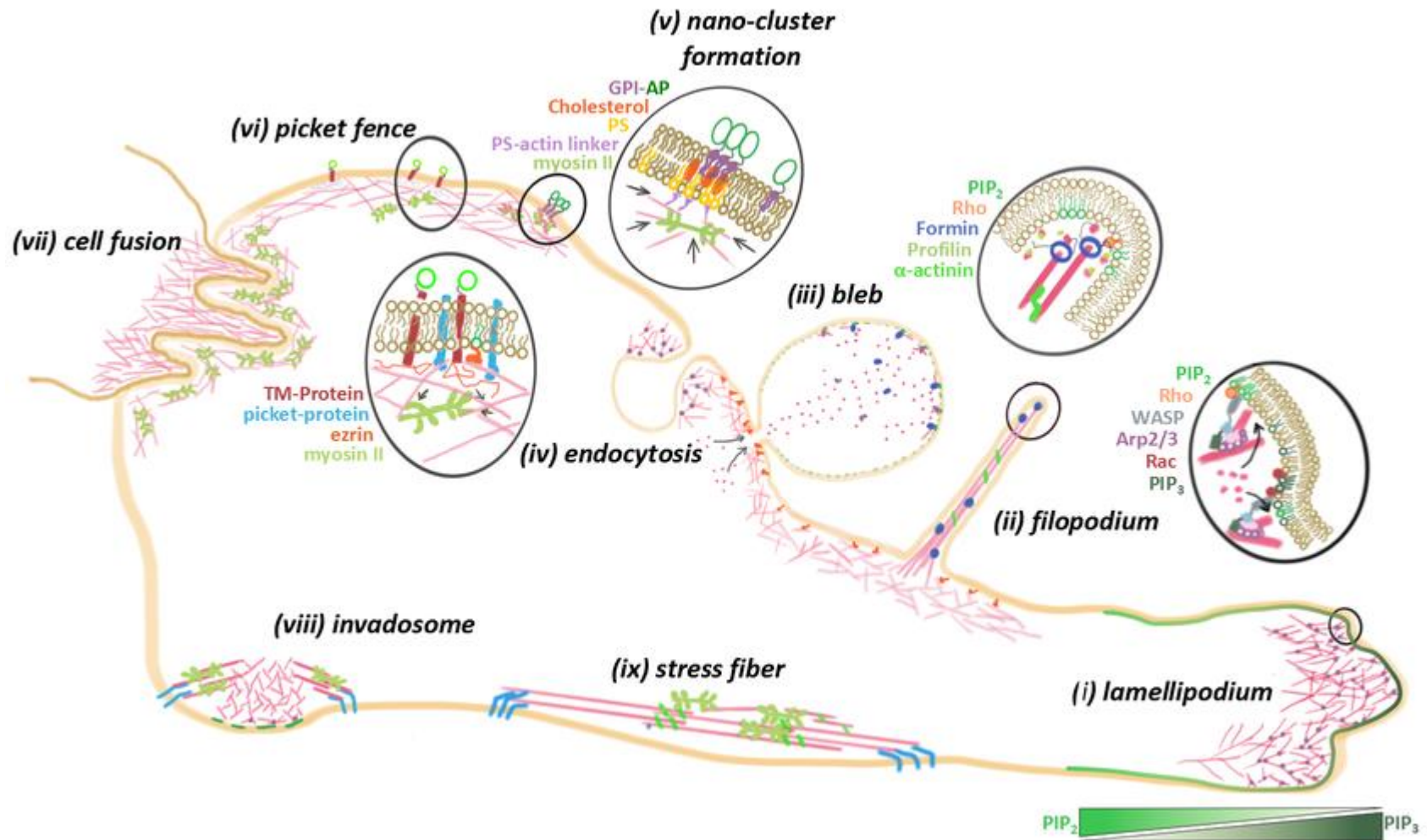
Arp2/3 complex



Białka wiążące aktynę (ABP - actin binding proteins)

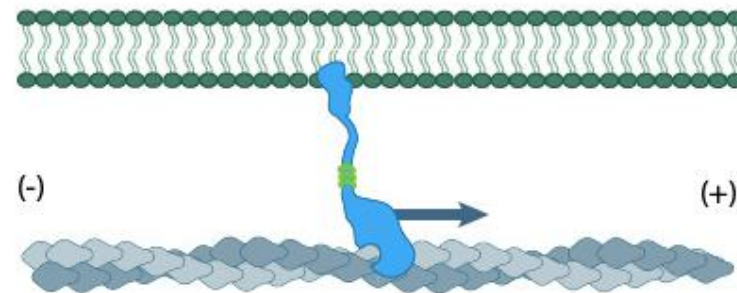


Struktury komórkowe wytwarzane przez filamenty aktynowe

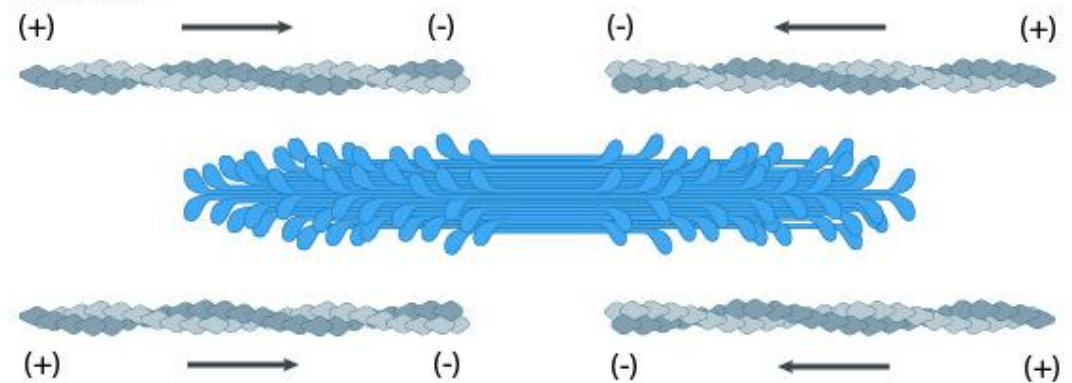


Typy miozyn

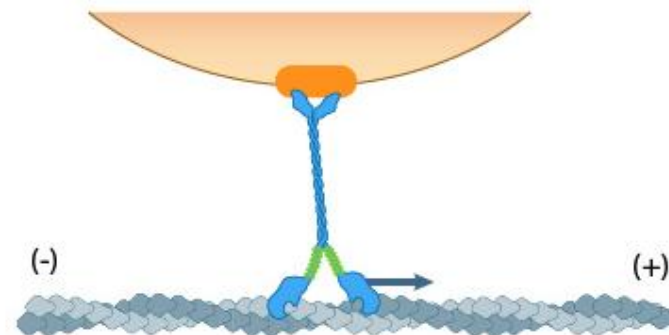
A. Myosin I

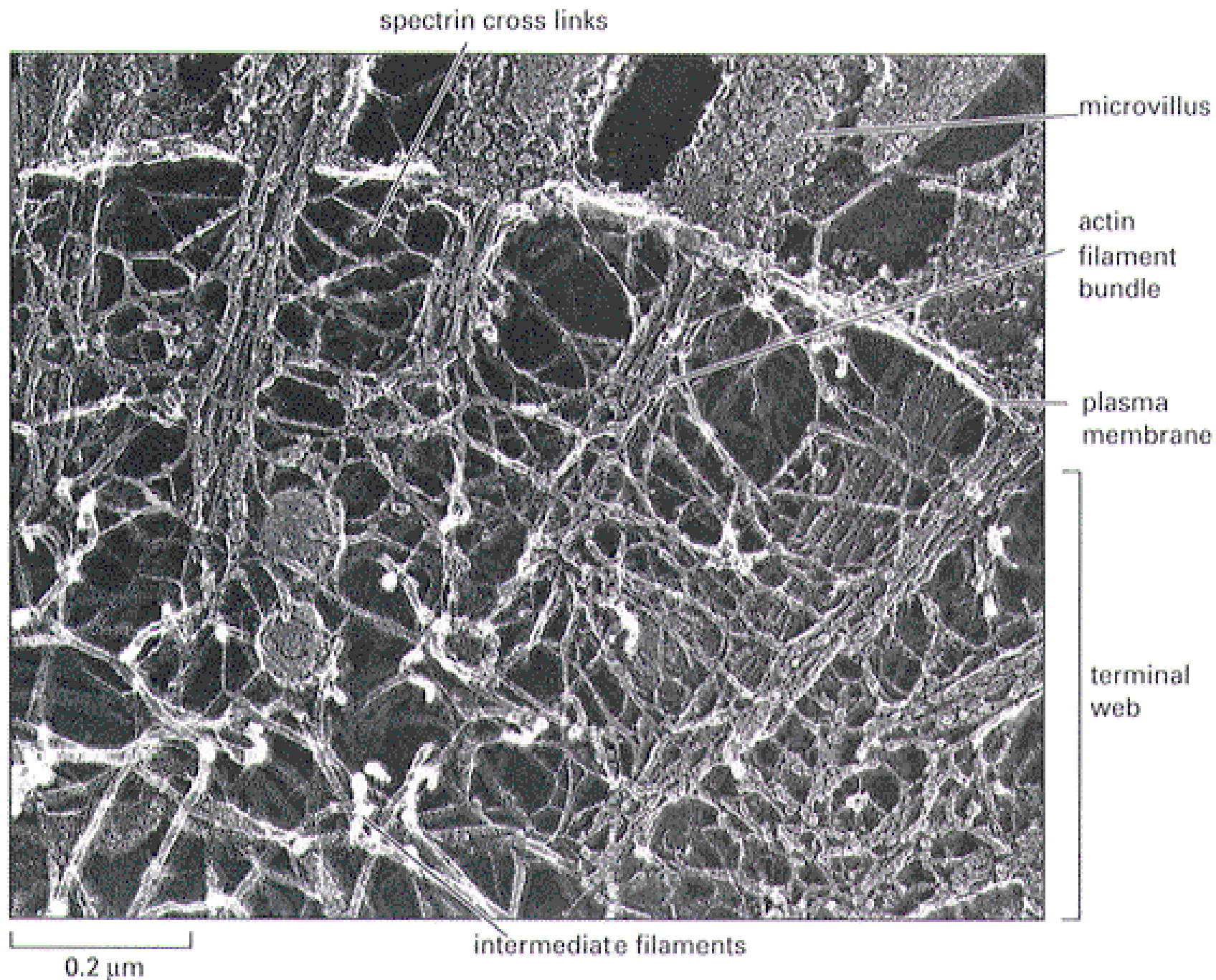


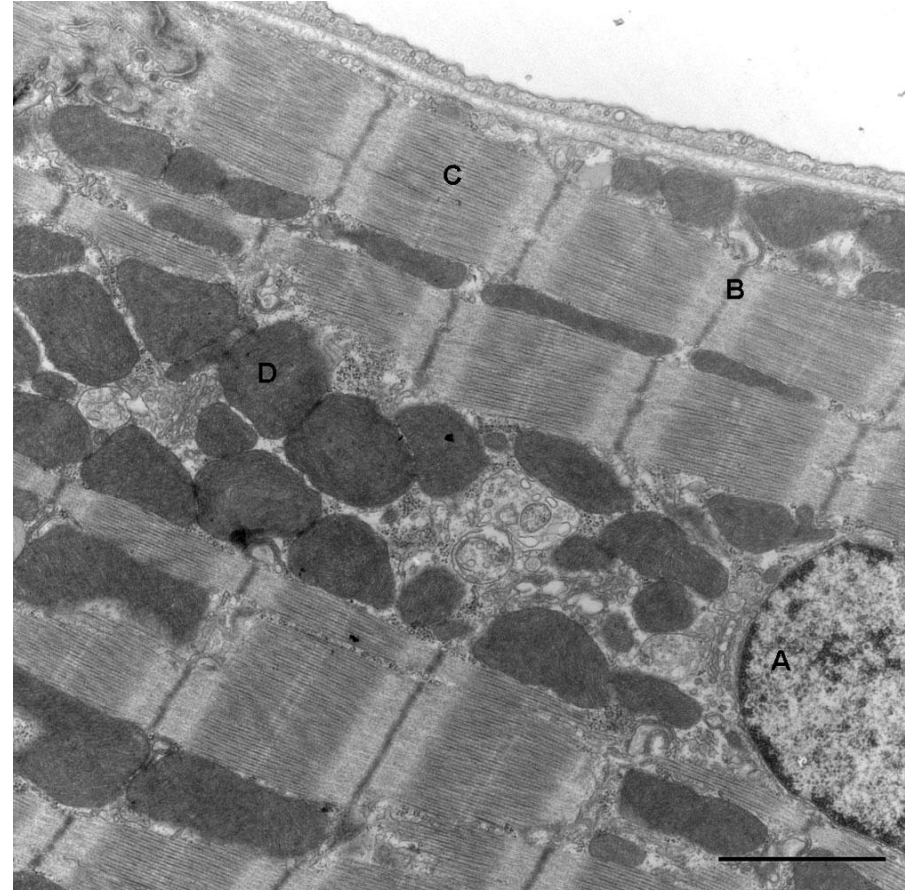
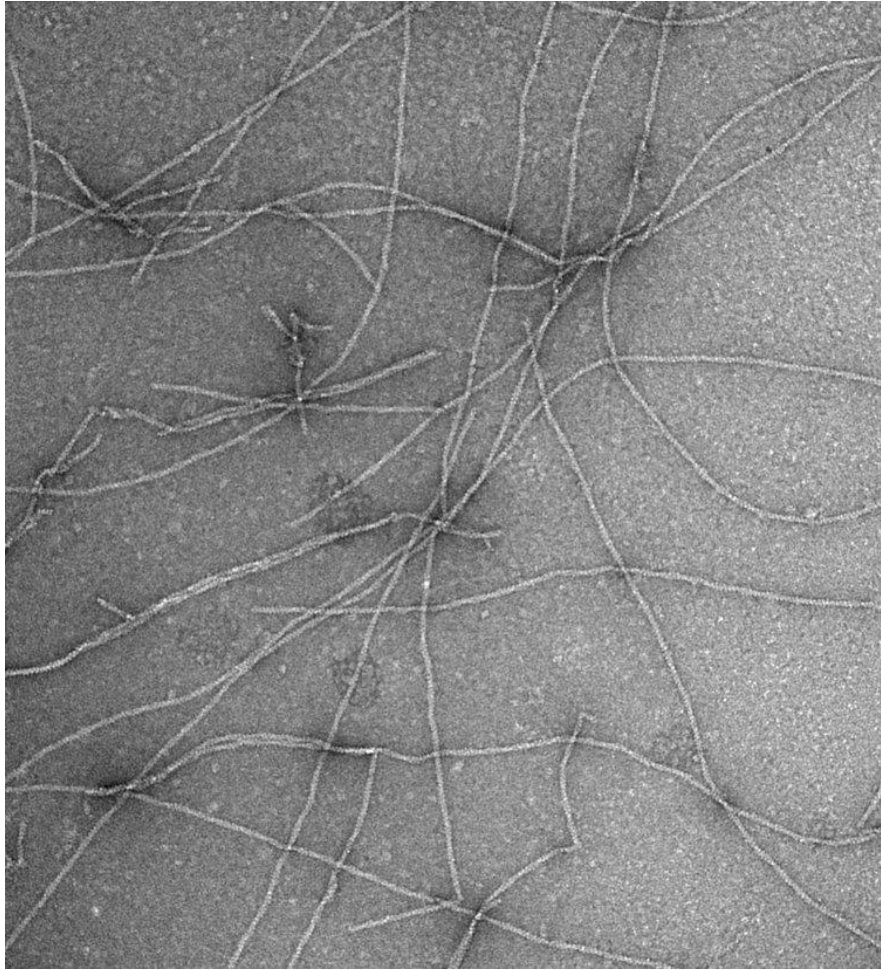
B. Myosin II



C. Myosin V







FILAMENTY POŚREDNIE

typ I - kwaśna keratyna - NABŁONEK

typ II - obojętna i zasadowa keratyna - NABŁONEK

typ III - desmina - MIĘŚNIE

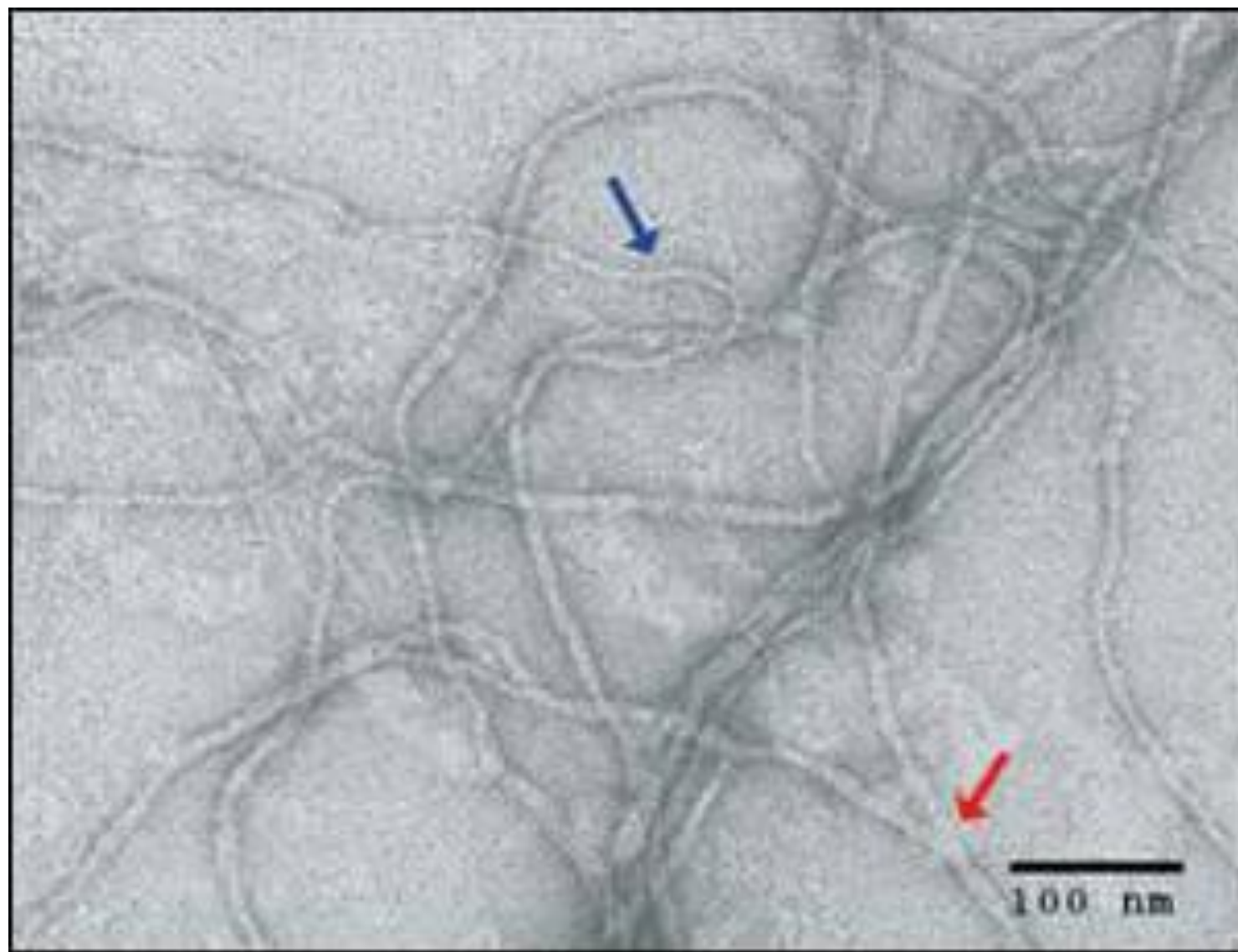
- wimentyna - MEZENCHYMA

- kwaśne włókniste białko tkanki glejowej (GFAP) - GLEJ

typ IV - neurofilamenty - NEURONY

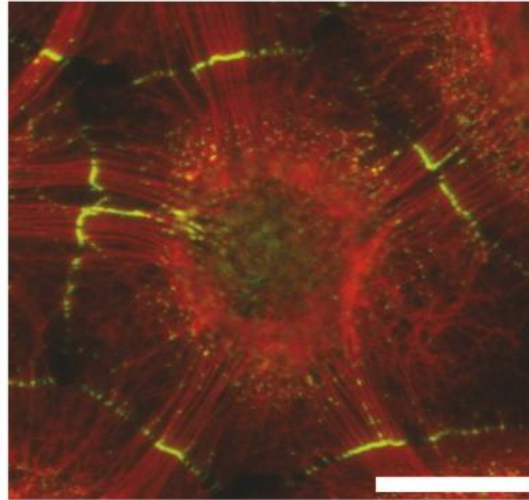
typ V - filamenty laminowe - BLASZKA JĄDROWA

typ VI - filamenty nestynowe – NEURONALNE KOMÓRKI MACIERZYSTE

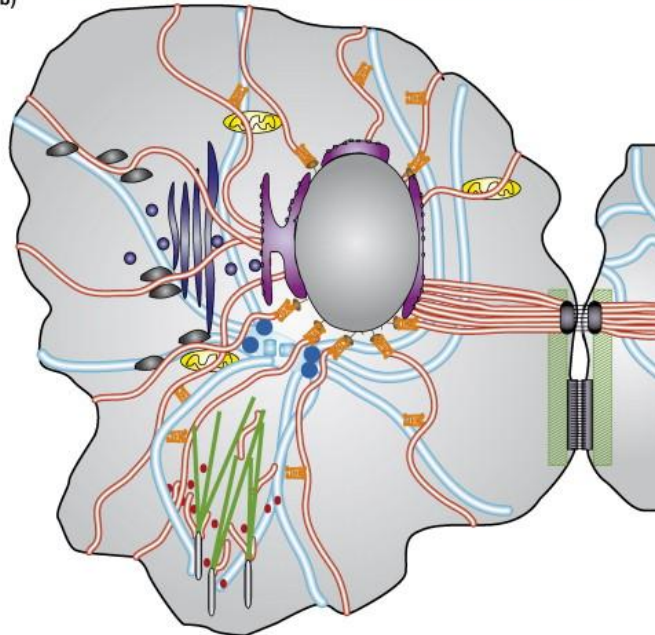


FILAMENTY POŚREDNIE - funkcja

(a)

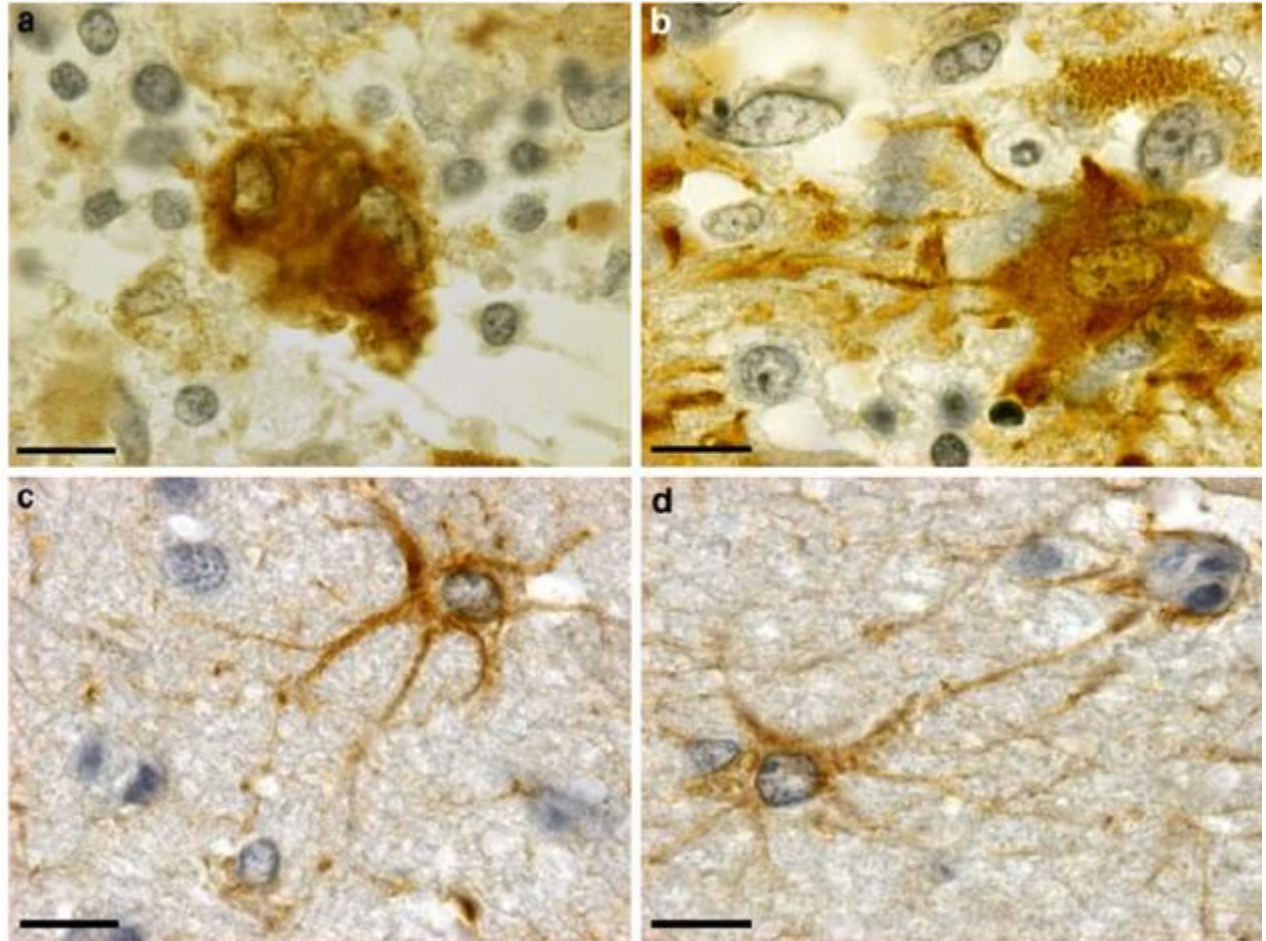


(b)

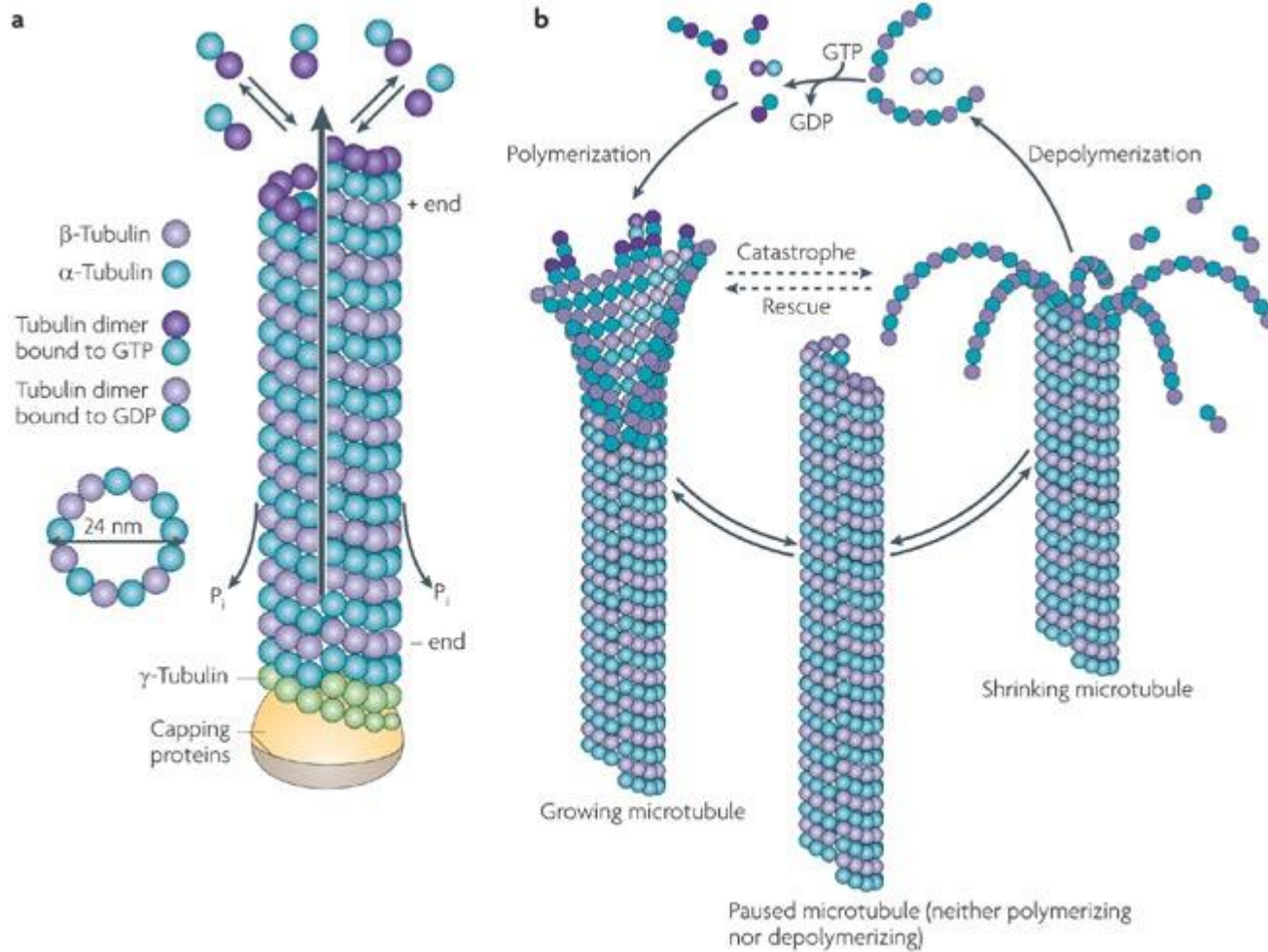


FILAMENTY POŚREDNIE - diagnostyka

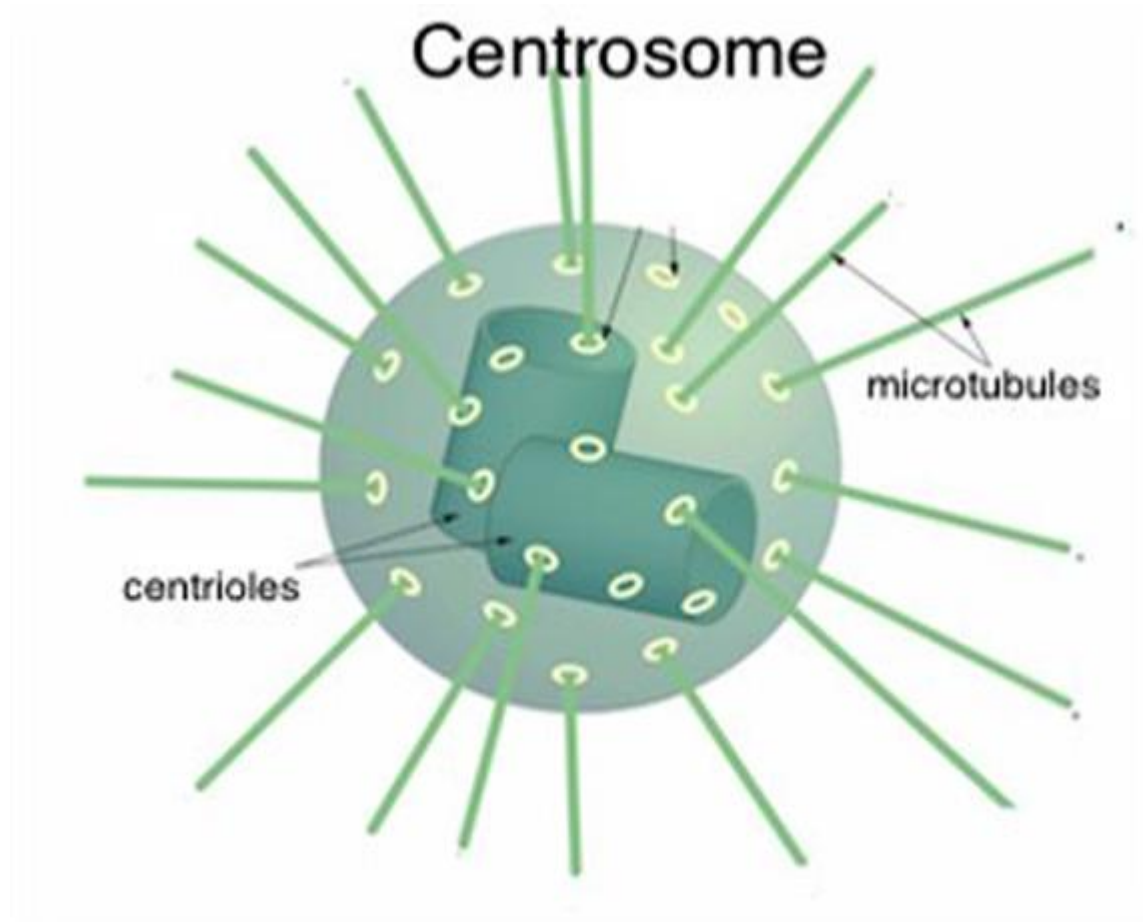
Fig. 5 V_HH immunolabeling of GFAP in astrocytoma.
a, b Abnormal astrocytes in the tumor. **c, d** Reactive astrocyte at the periphery of the tumor.
Scale bar 10 μm

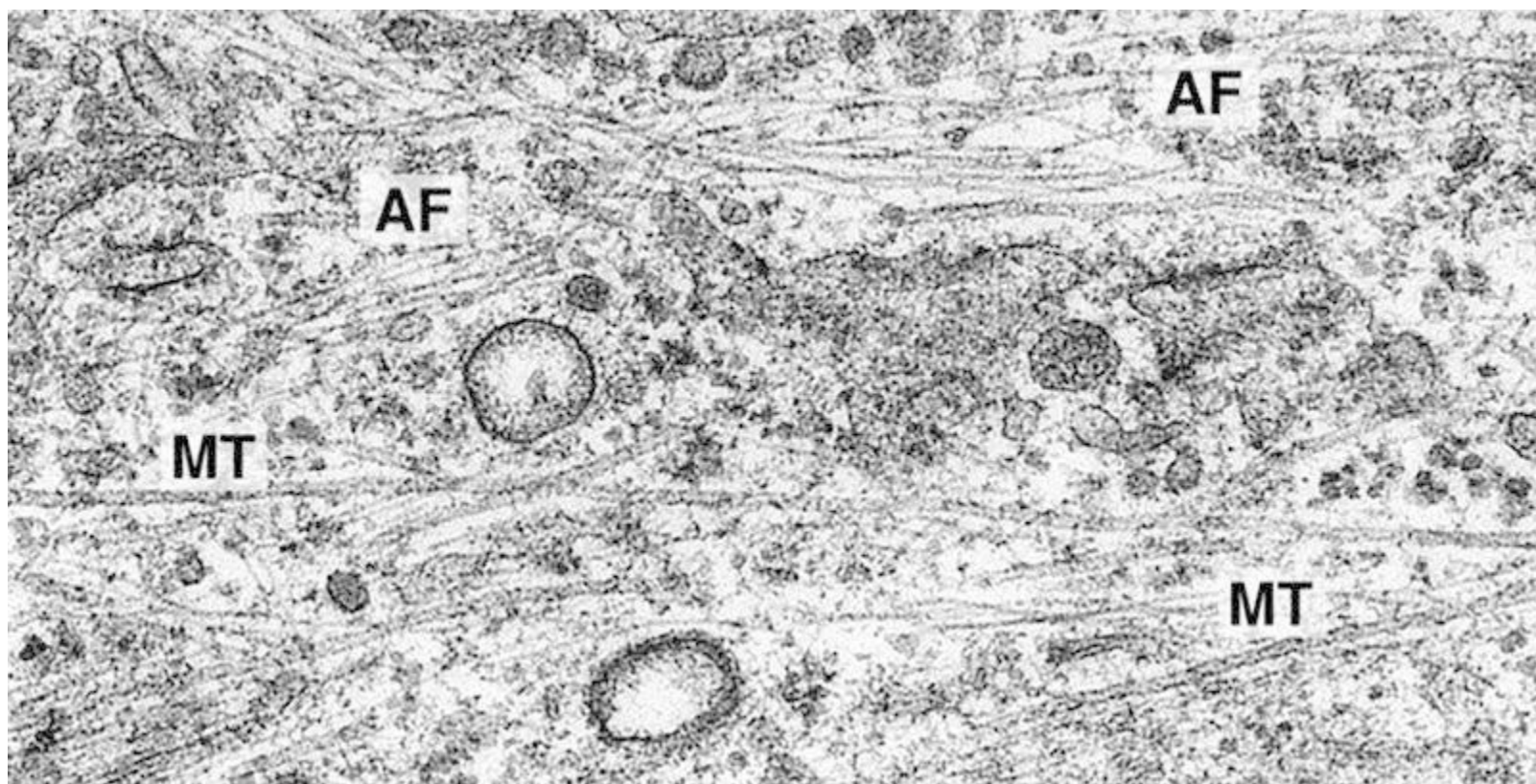


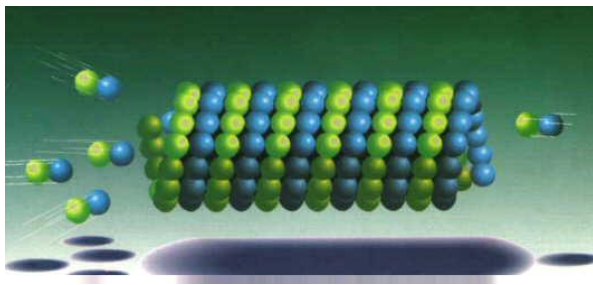
MIKROTUBULE



Centrosom

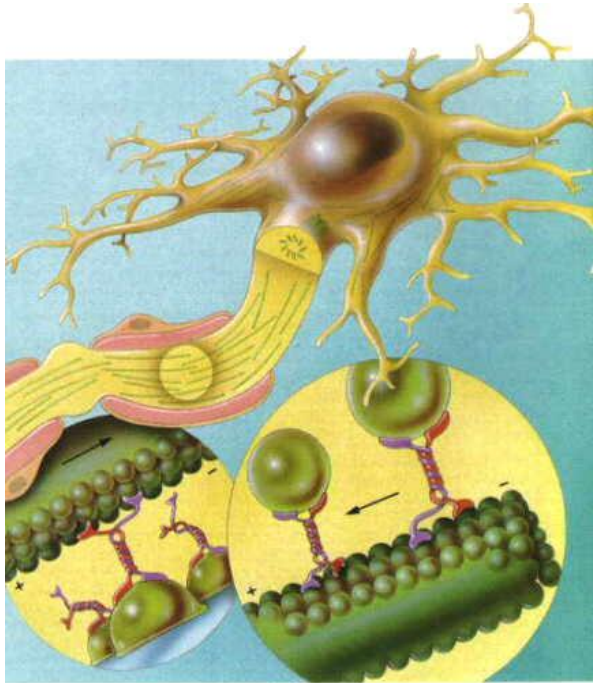






Białka towarzyszące mikrotubulom

MAP:

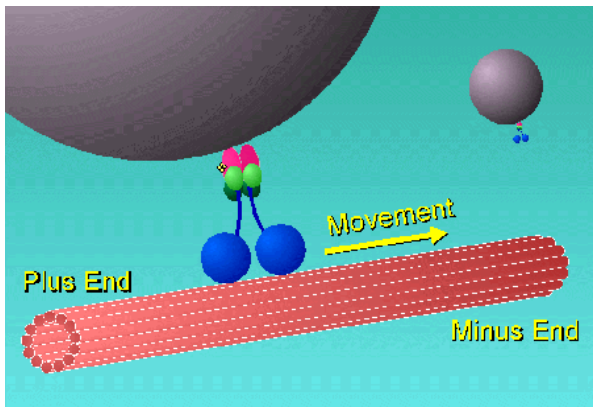


MAP stabilizujące

- * białko tau (większość komórek, aksony)
- * MAP 2 (dendryty)
- * kateniny (łączą mikrotubule z innymi elementami cytoszkieletu)

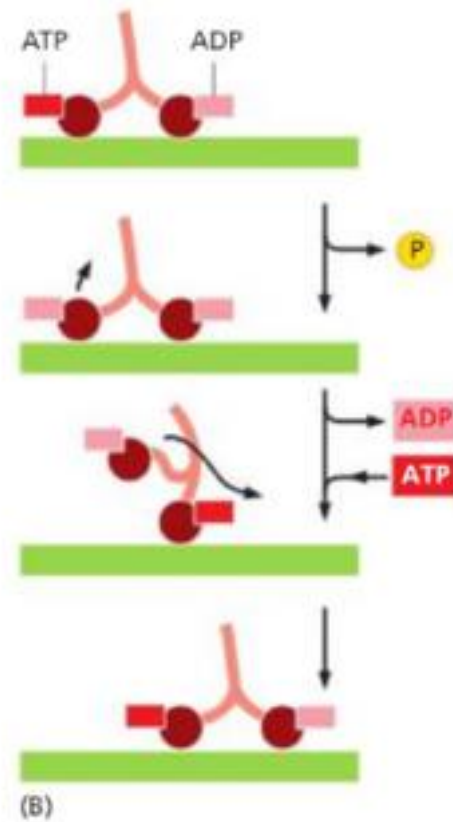
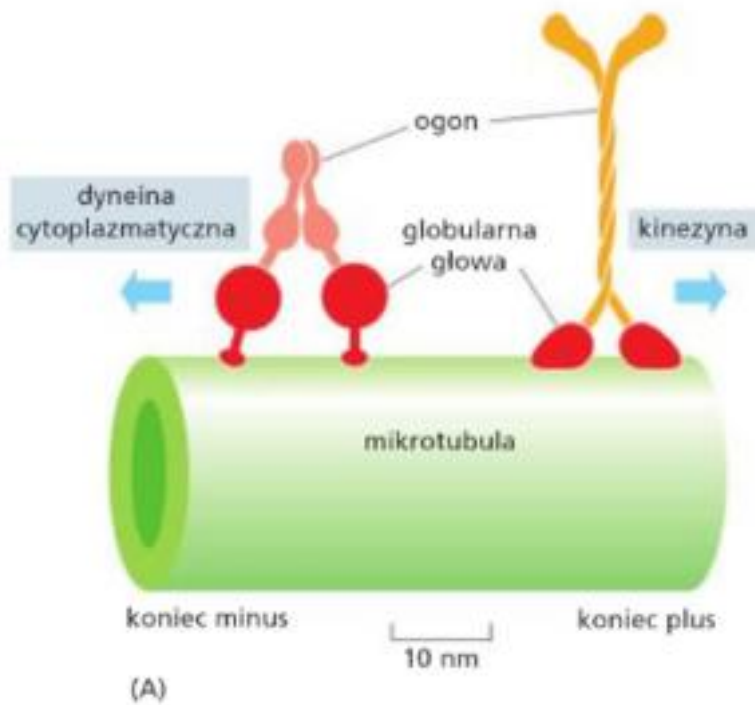
MAP czapeczkujące

MAP motoryczne umożliwiające ruch na mikrotubulach

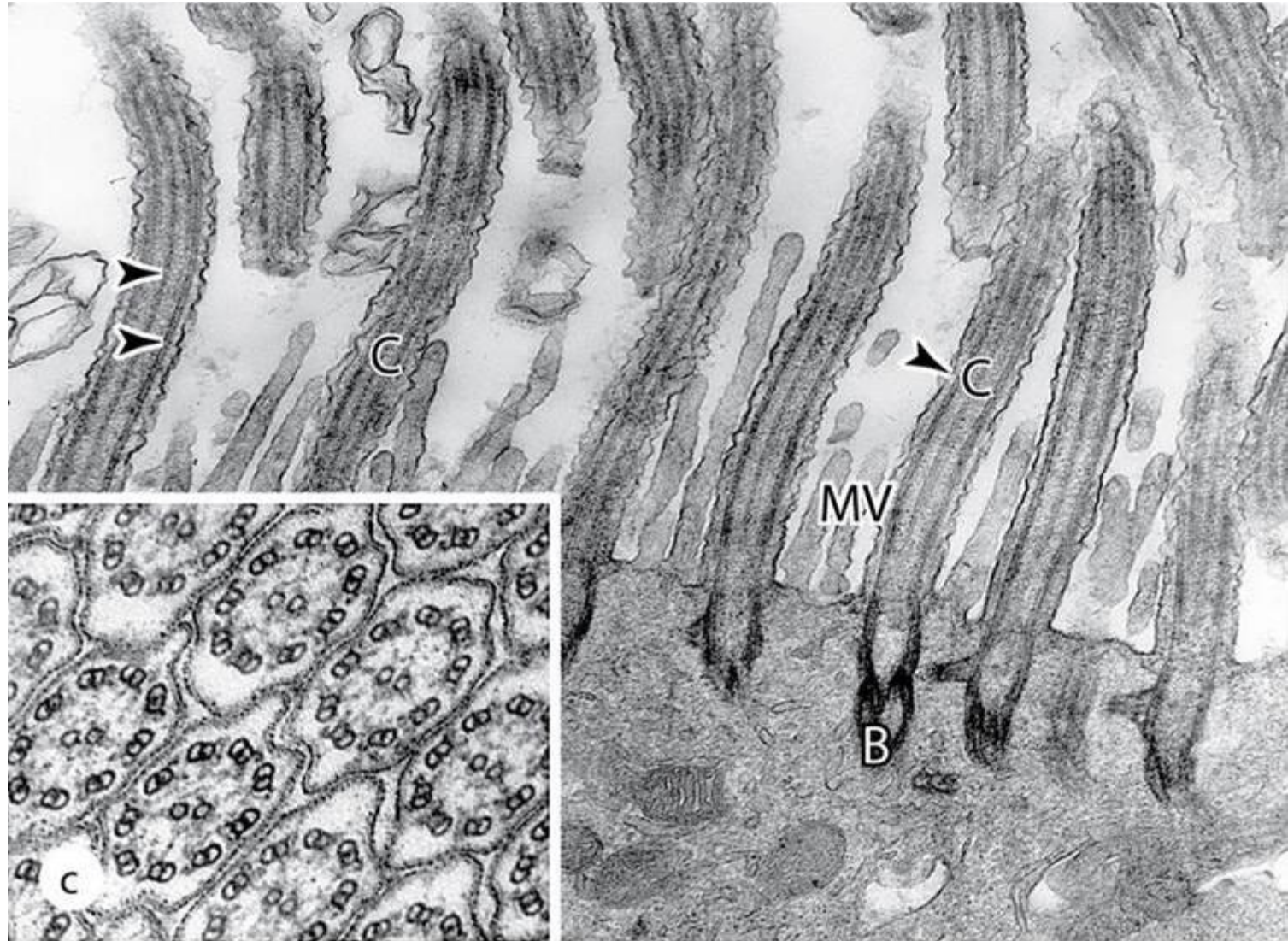


- * kinezyzna (od minusa do plusa)
- * dyneina (od plusa do minusa)
- * dynamina, KAR3, NCD

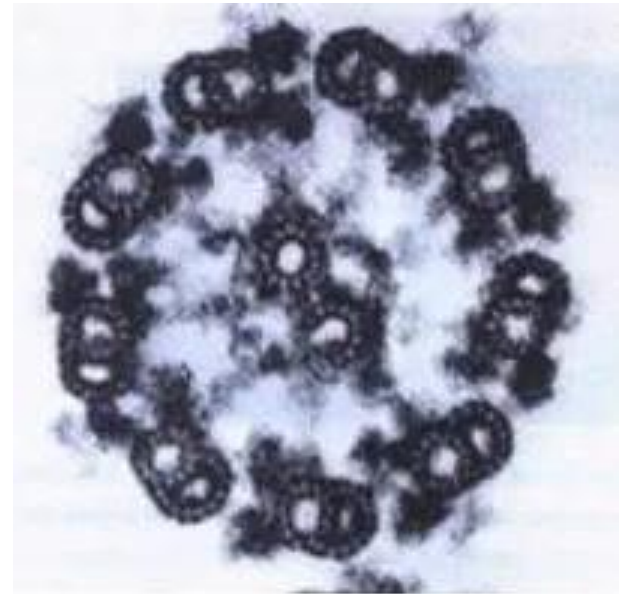
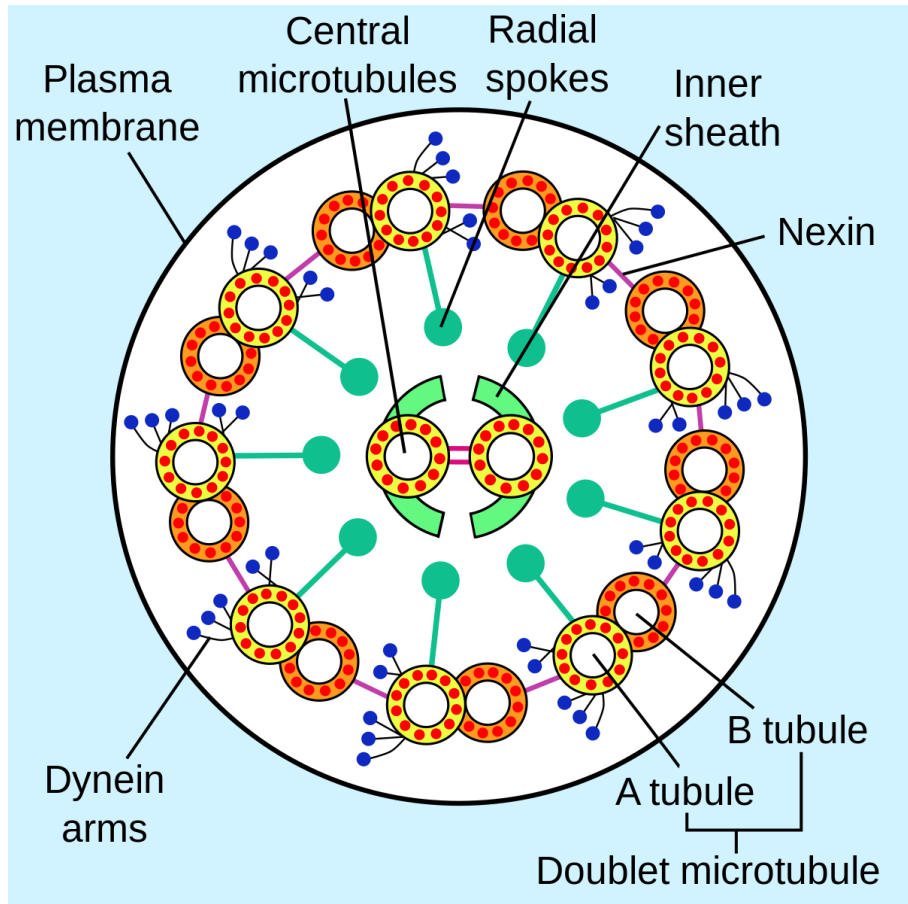
Kinezyrna i dyneina



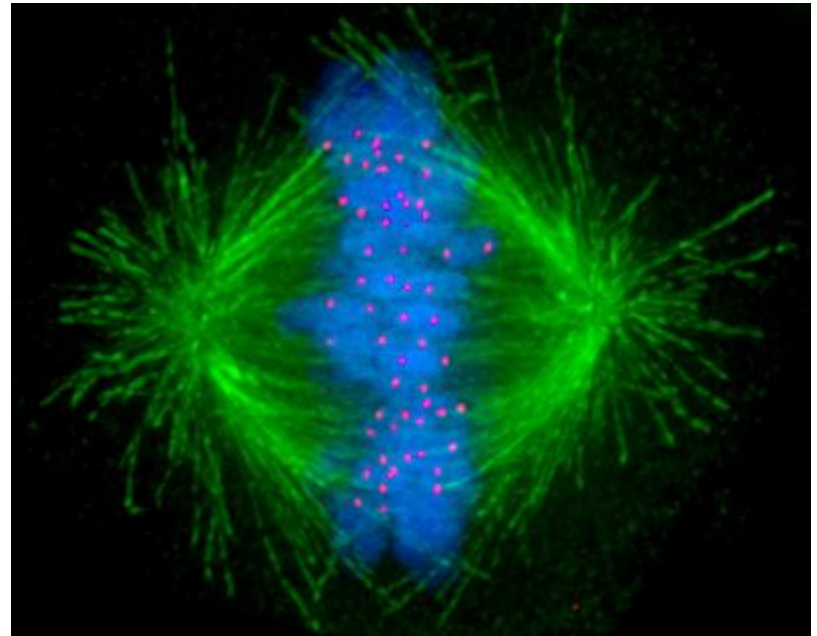
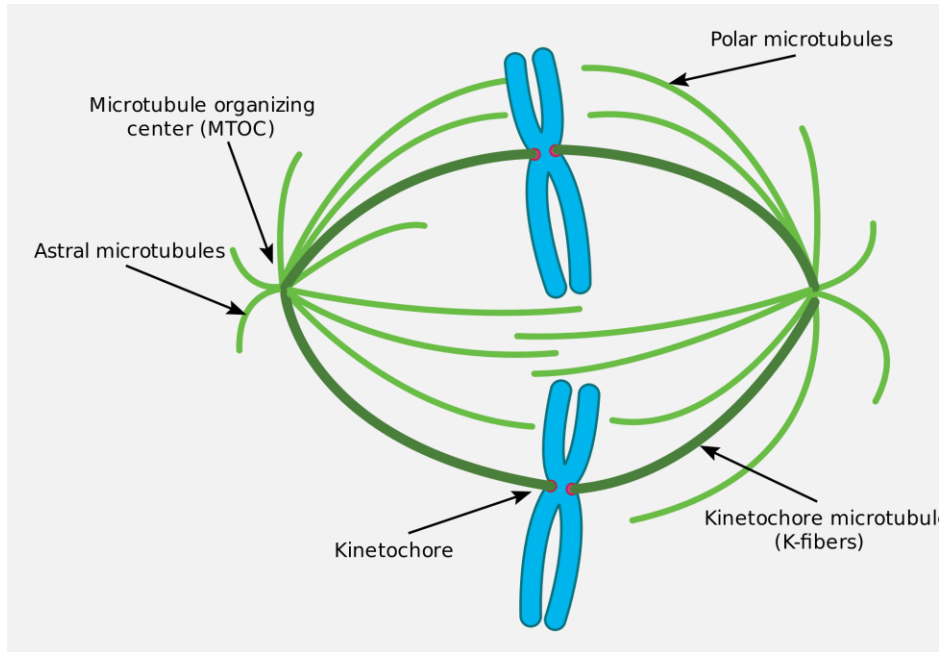
Rzęski



Rzęski - aksonema

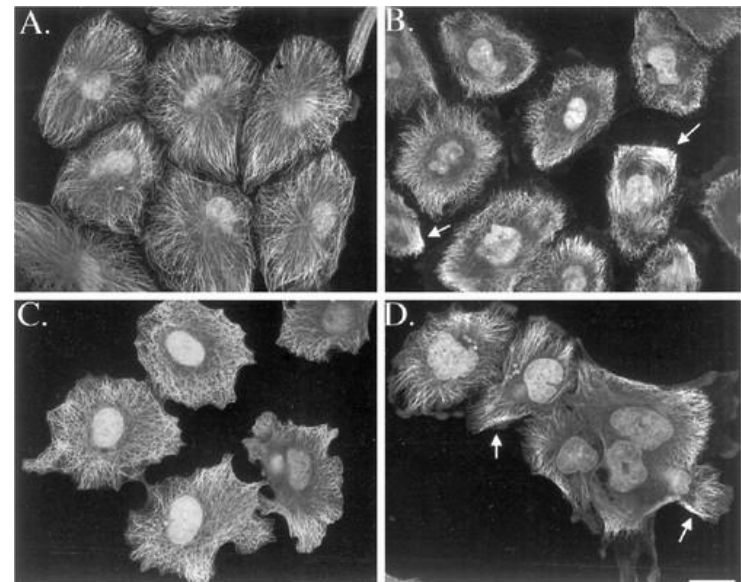
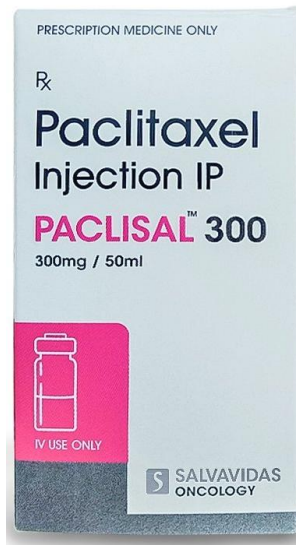
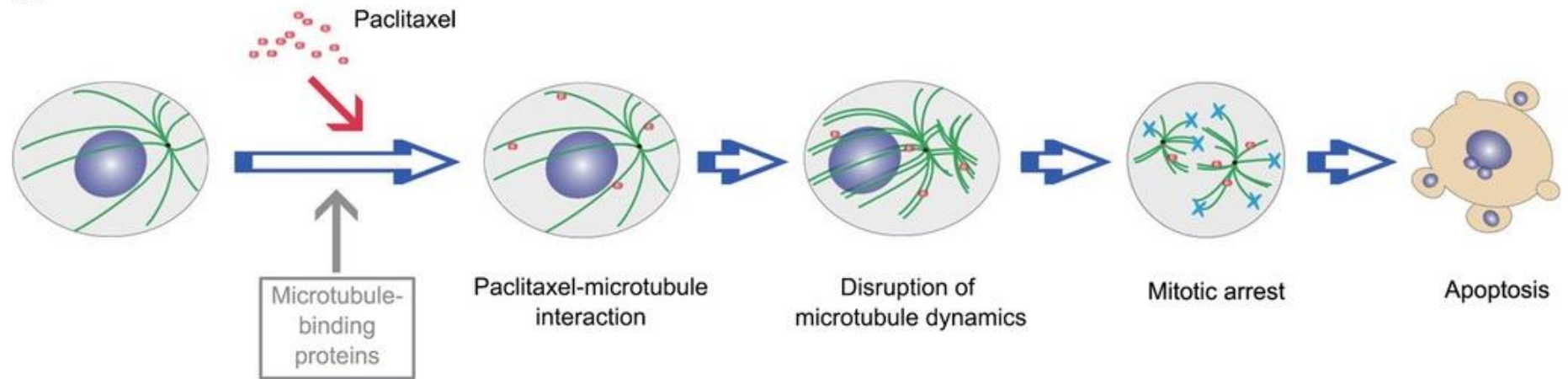


Wrzeciono podziałowe

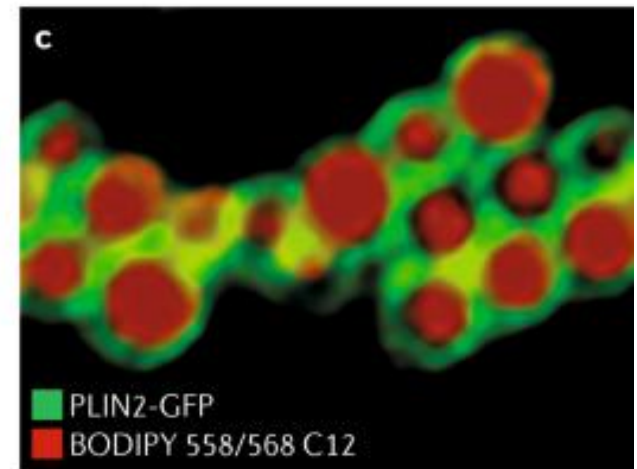
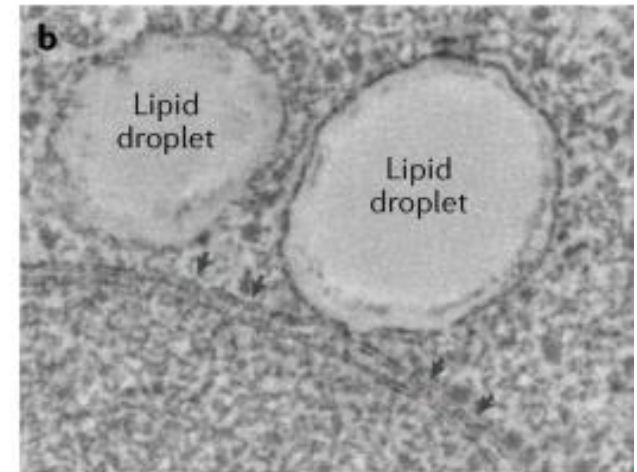
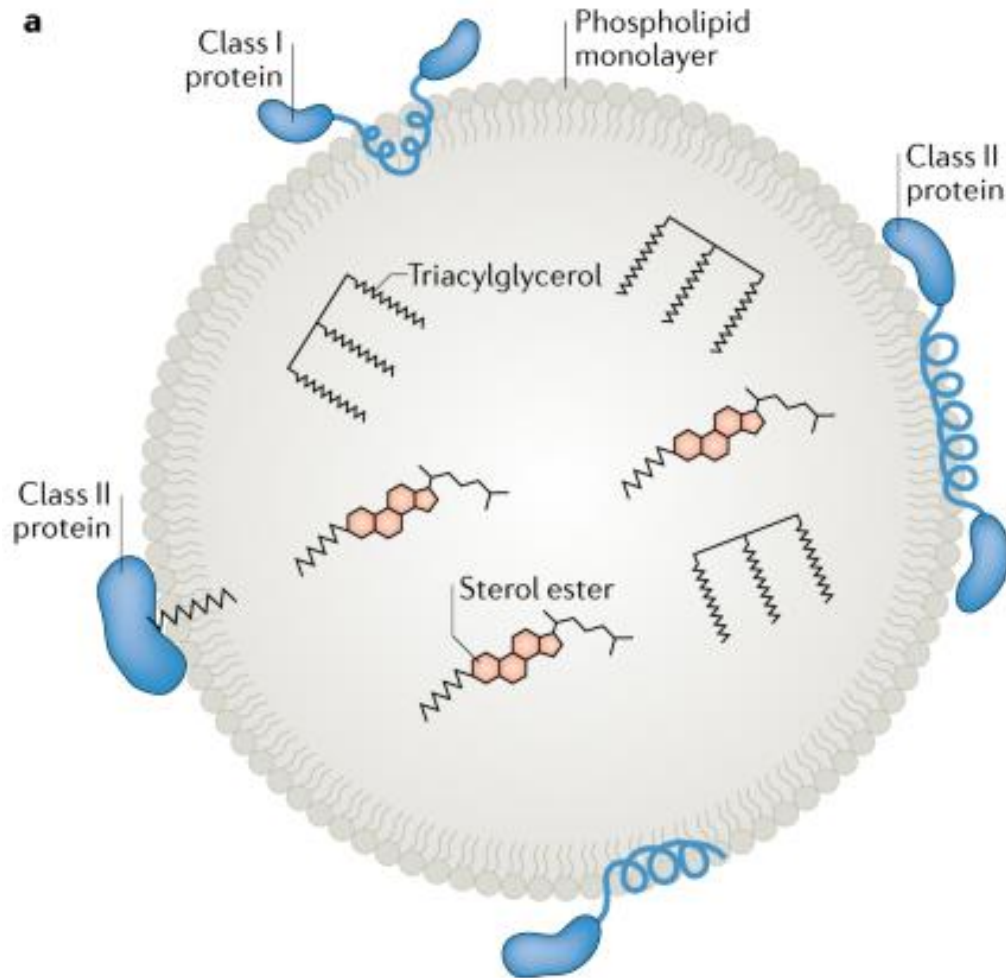


Wrzeciono podziałowe - taksol

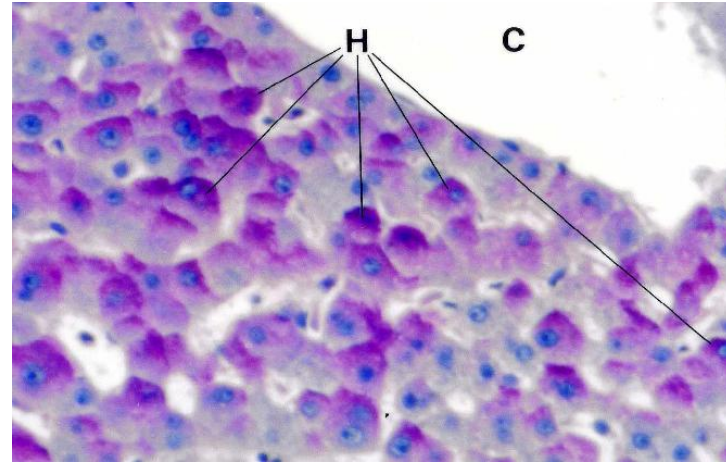
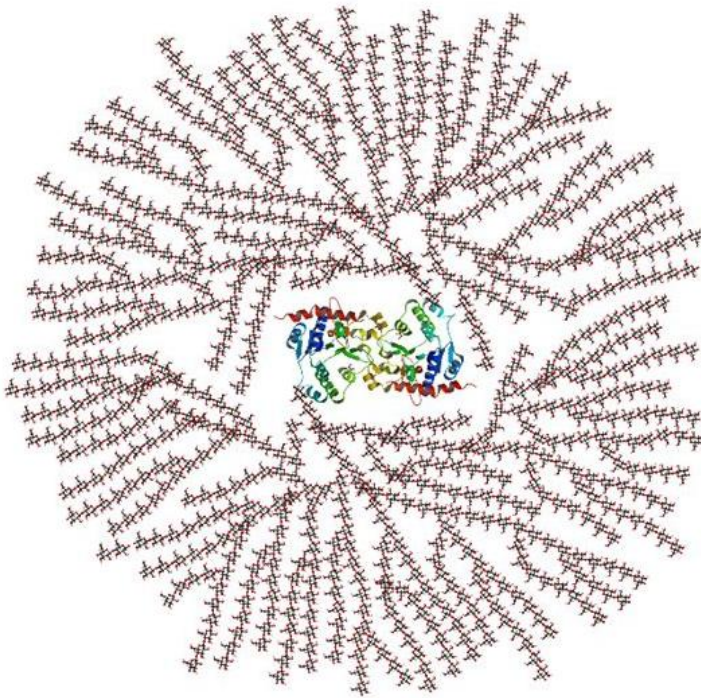
C



Wtręty komórkowe – krople lipidowe



Wtręty komórkowe – ziarna glikogenu



Glycogen granules

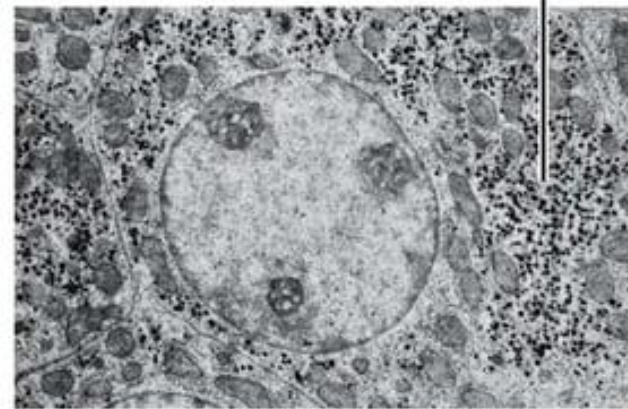
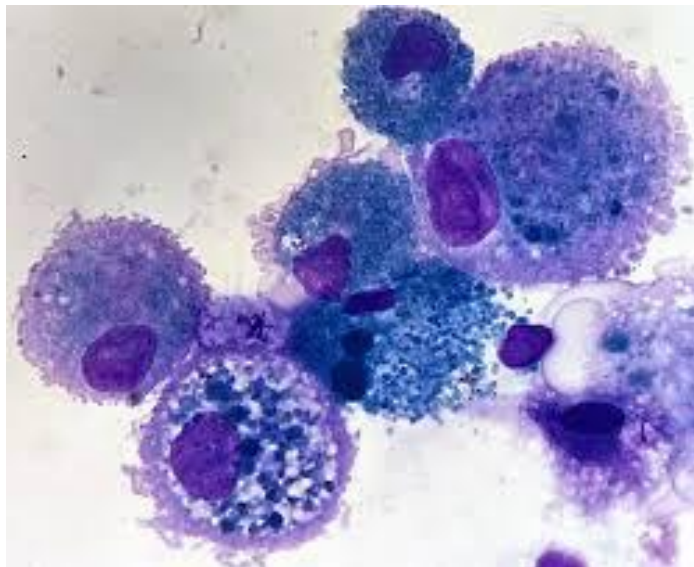
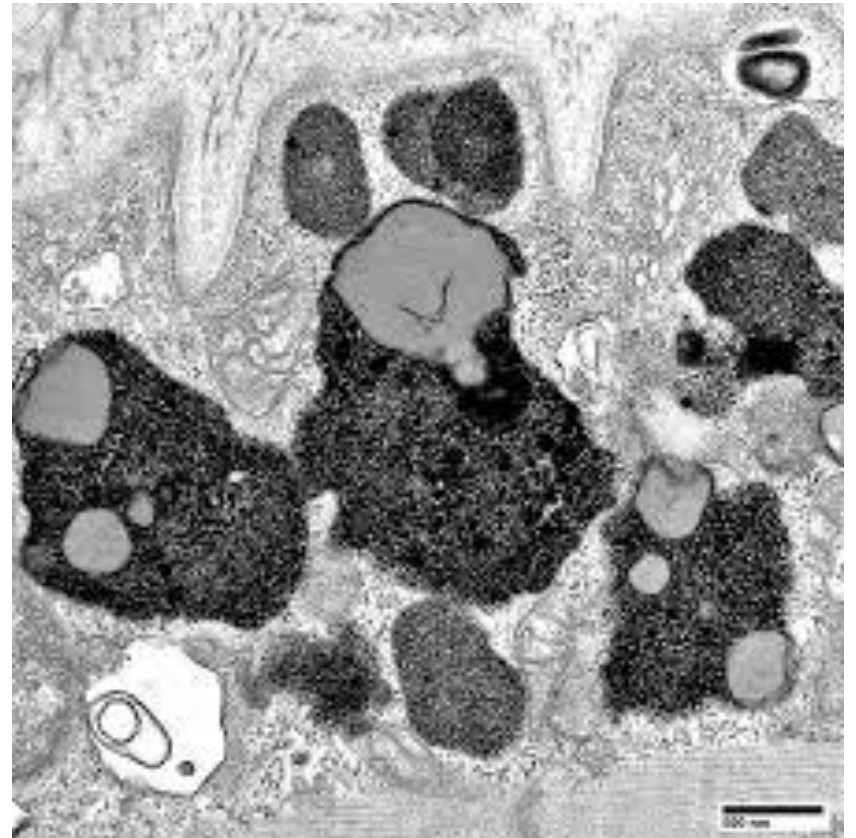
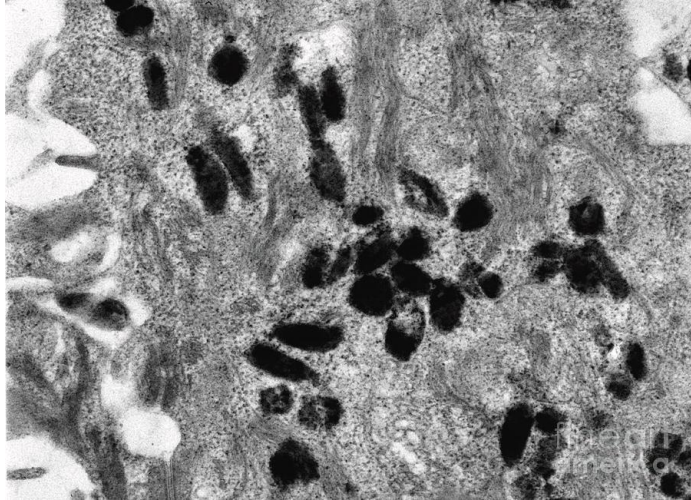
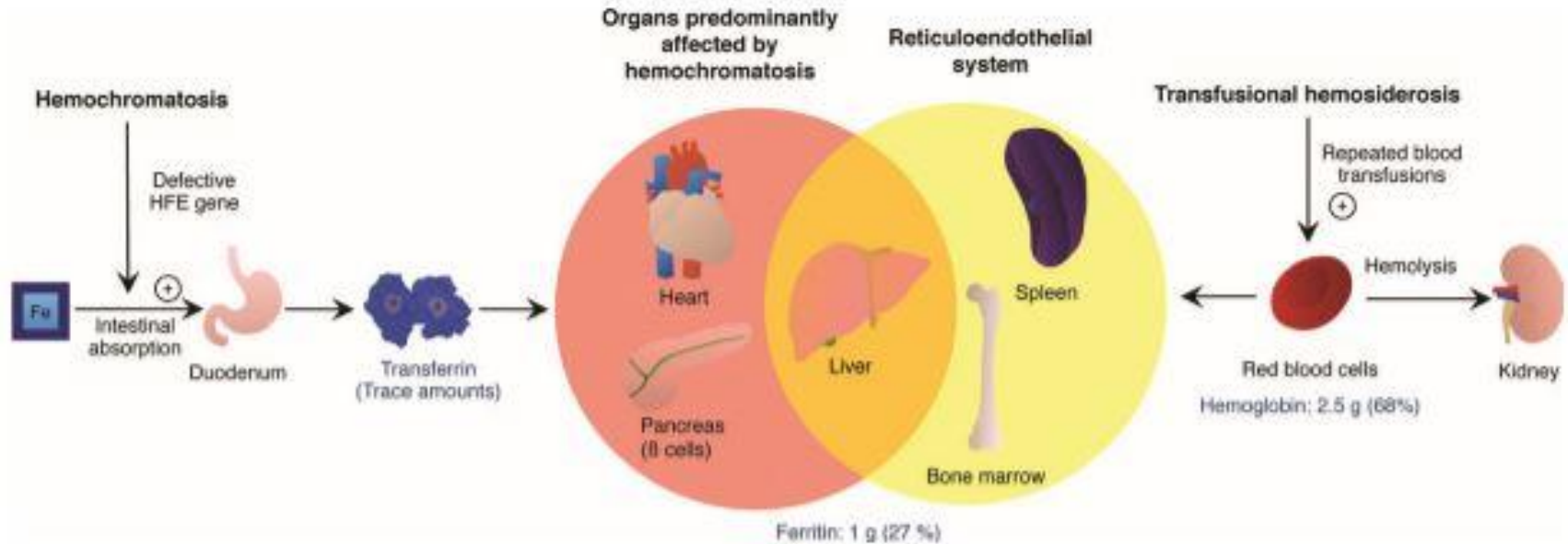


Figure 21.3
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Hemosyderoza versus hemochromatosa



Hemochromatoza

