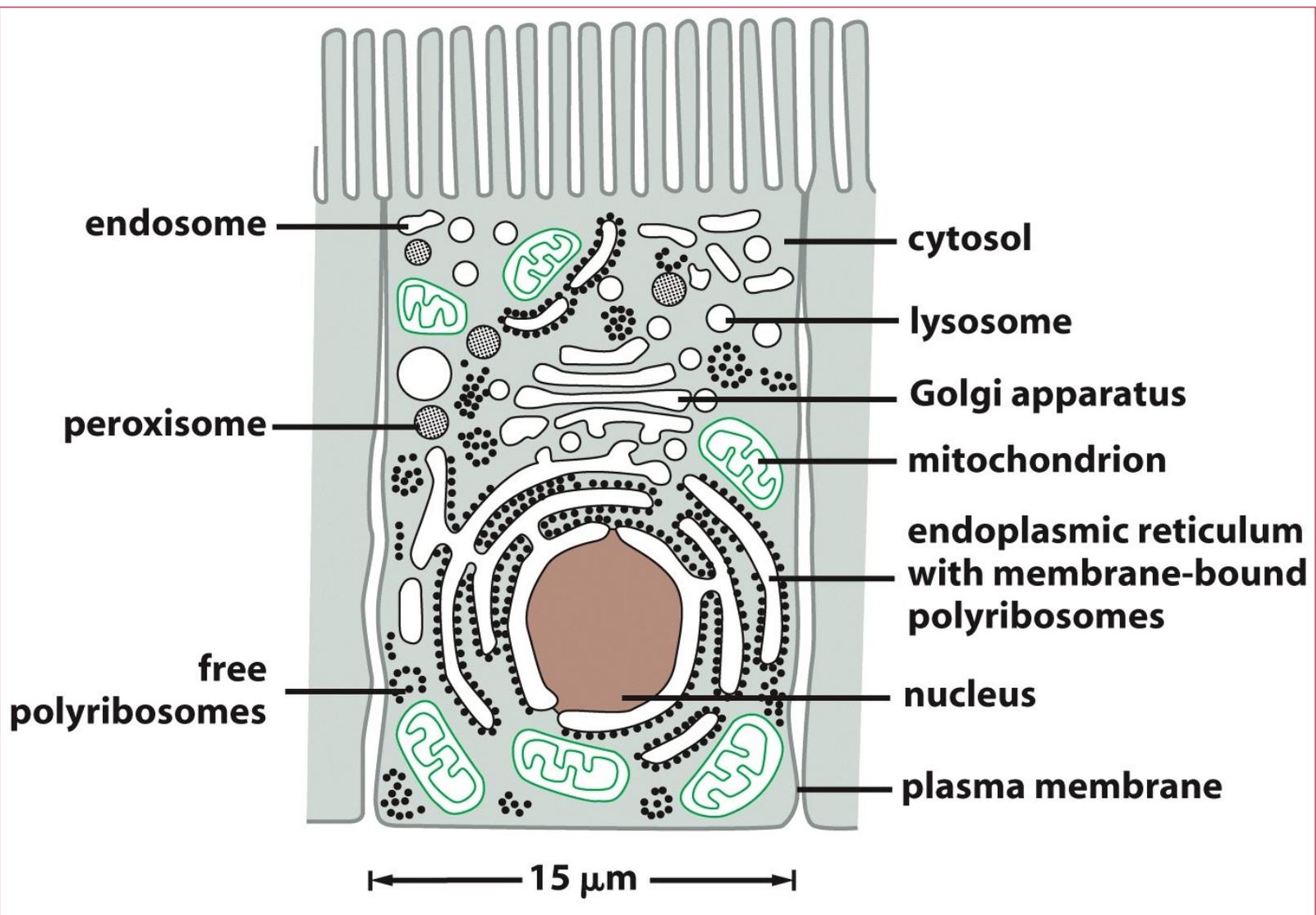


Hücreiçi Bölümler ve Proteinlerin Yerleşimleri



Birçok Biyokimyasal reaksiyon zara bağlı olarak gerçekleşir. Oksidatif fosforilasyon, fotosentez vb. Hücre içi zarlar, geniş ve sulu alanlar yaratır. Organel zarlarında spesifik proteinlerin bulunması gereklidir.

Figure 12-1 *Molecular Biology of the Cell* (© Garland Science 2008)

Table 12–1 Relative Volumes Occupied by the Major Intracellular Compartments in a Liver Cell (Hepatocyte)

INTRACELLULAR COMPARTMENT	PERCENTAGE OF TOTAL CELL VOLUME
Cytosol	54
Mitochondria	22
Rough ER cisternae	9
Smooth ER cisternae plus Golgi cisternae	6
Nucleus	6
Peroxisomes	1
Lysosomes	1
Endosomes	1

Table 12–2 Relative Amounts of Membrane Types in Two Kinds of Eucaryotic Cells

MEMBRANE TYPE	PERCENTAGE OF TOTAL CELL MEMBRANE	
	LIVER HEPATOCYTE*	PANCREATIC EXOCRINE CELL*
Plasma membrane	2	5
Rough ER membrane	35	60
Smooth ER membrane	16	<1
Golgi apparatus membrane	7	10
Mitochondria		
Outer membrane	7	4
Inner membrane	32	17
Nucleus		
Inner membrane	0.2	0.7
Secretory vesicle membrane	not determined	3
Lysosome membrane	0.4	not determined
Peroxisome membrane	0.4	not determined
Endosome membrane	0.4	not determined

*These two cells are of very different sizes: the average hepatocyte has a volume of about $5000 \mu\text{m}^3$ compared with $1000 \mu\text{m}^3$ for the pancreatic exocrine cell. Total cell membrane areas are estimated at about $110,000 \mu\text{m}^2$ and $13,000 \mu\text{m}^2$, respectively.

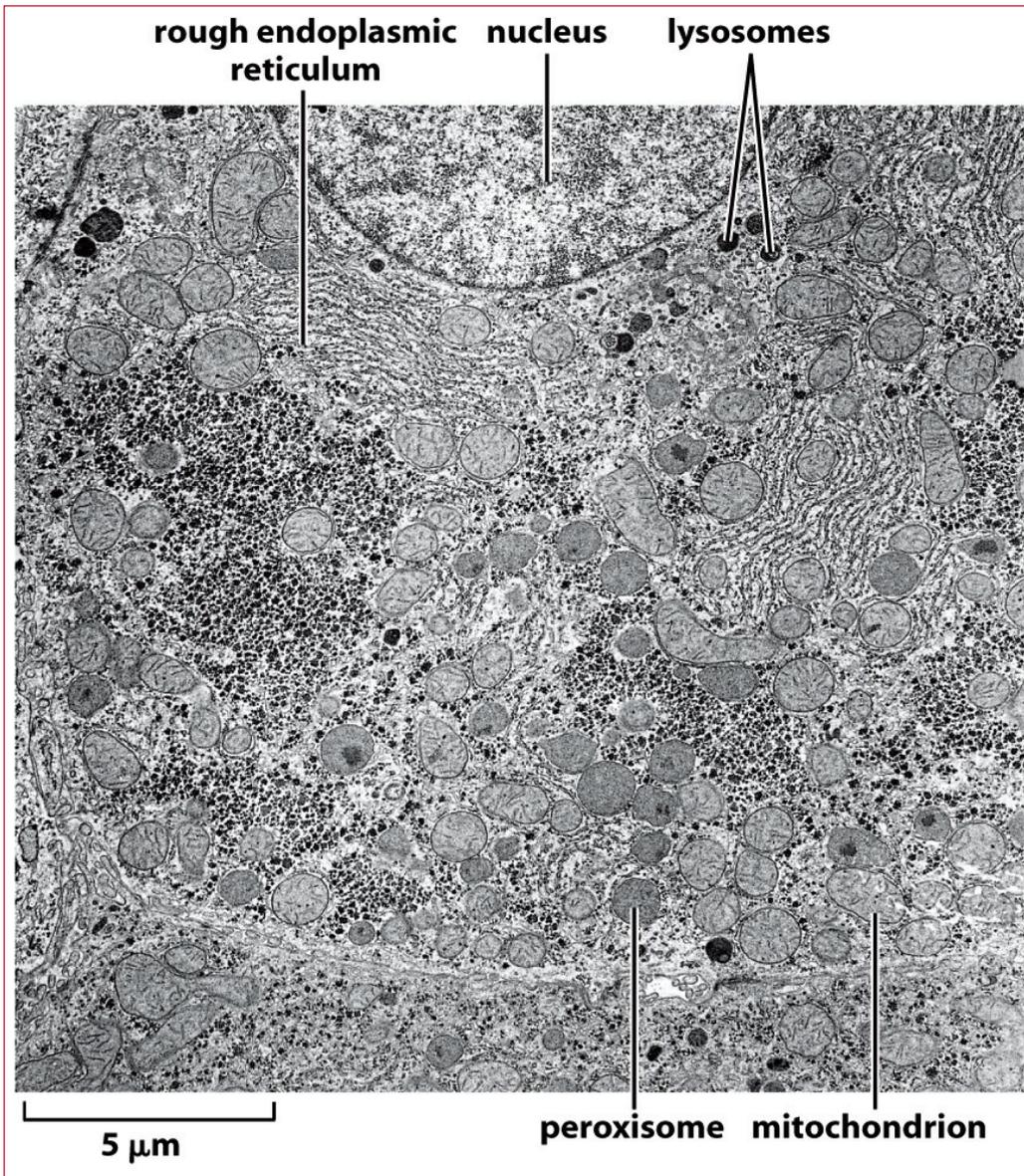
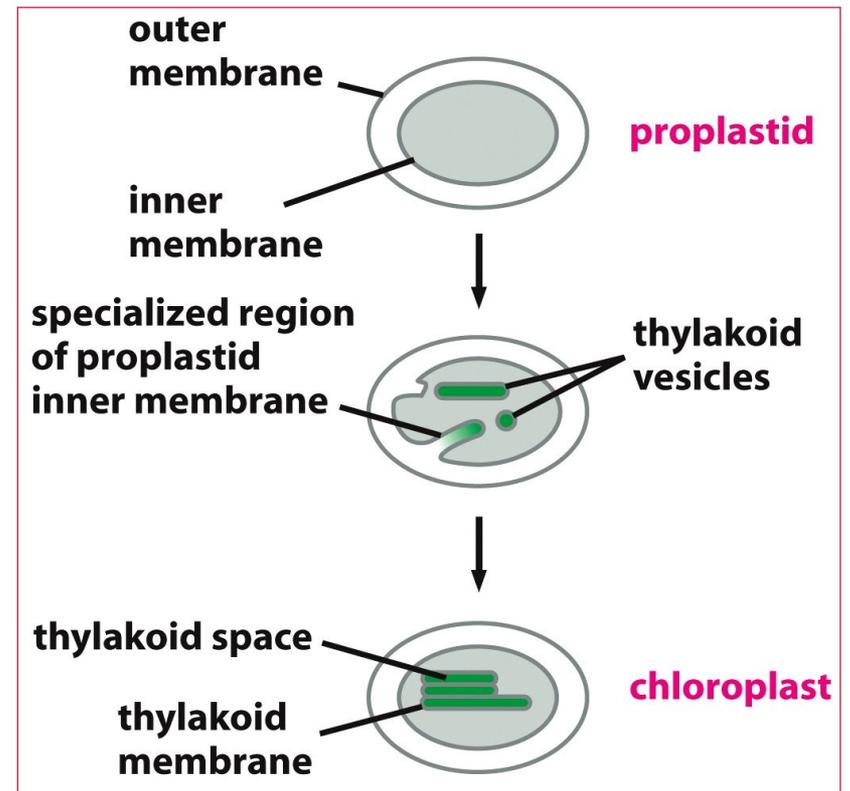
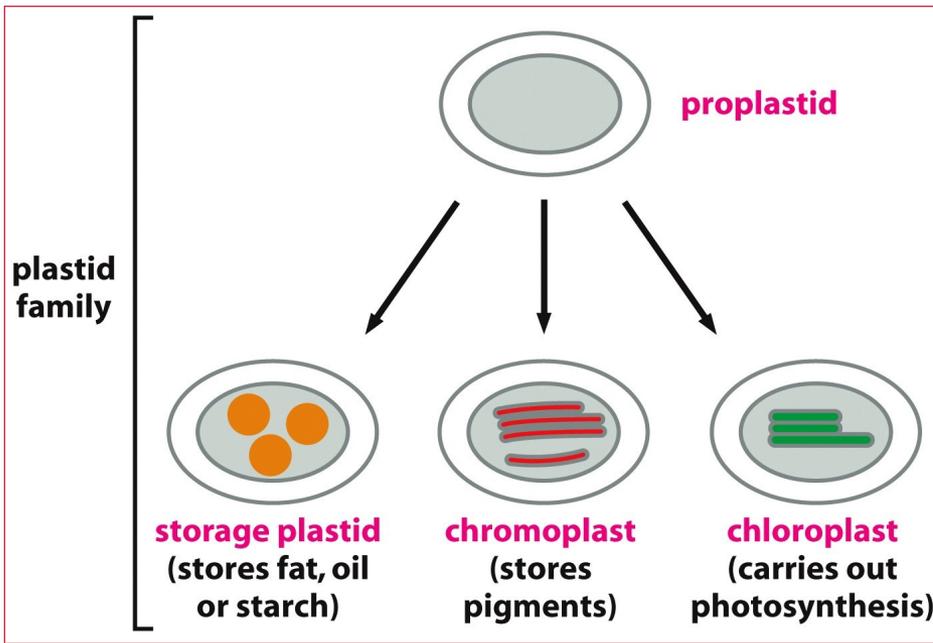
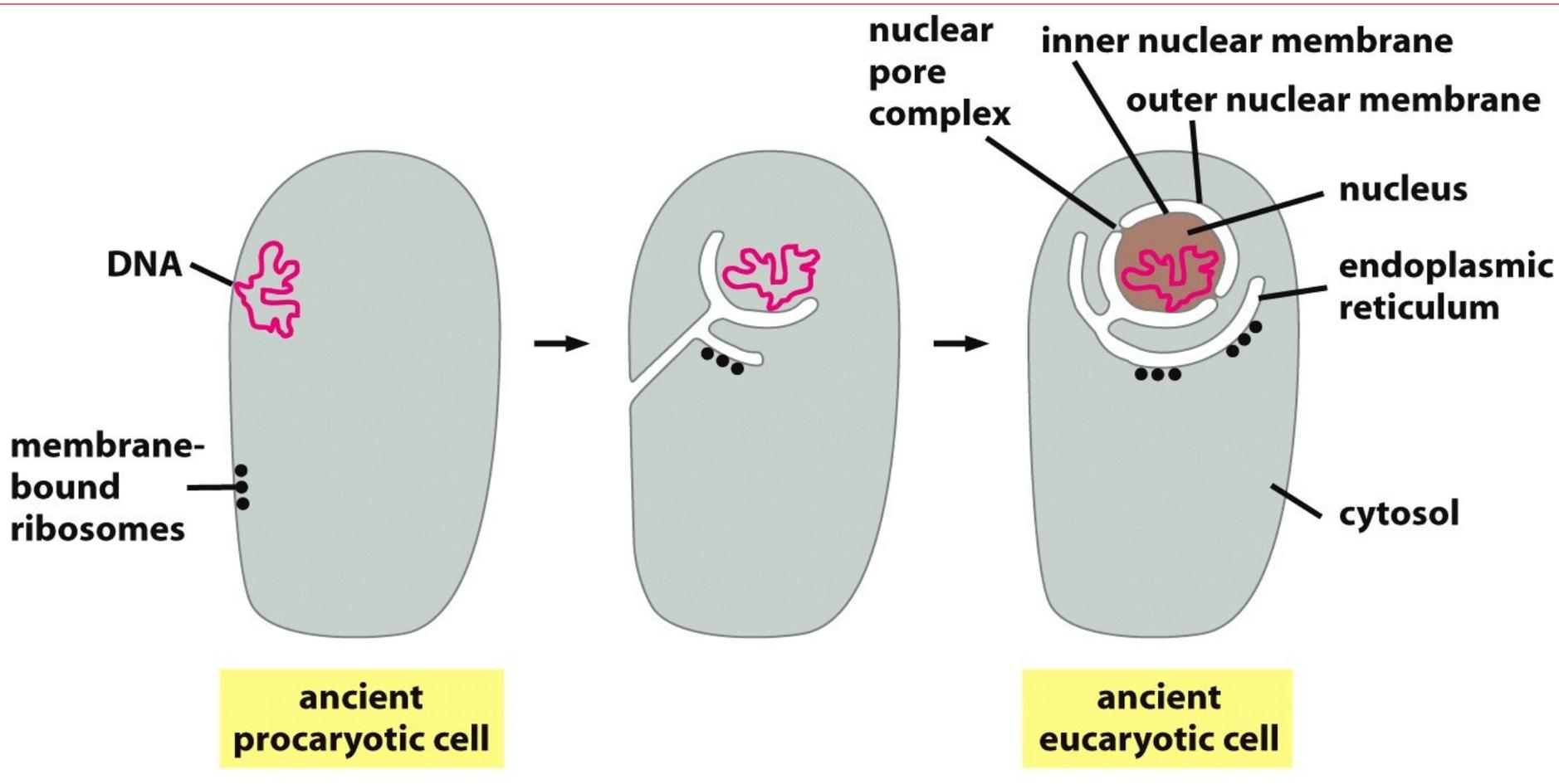


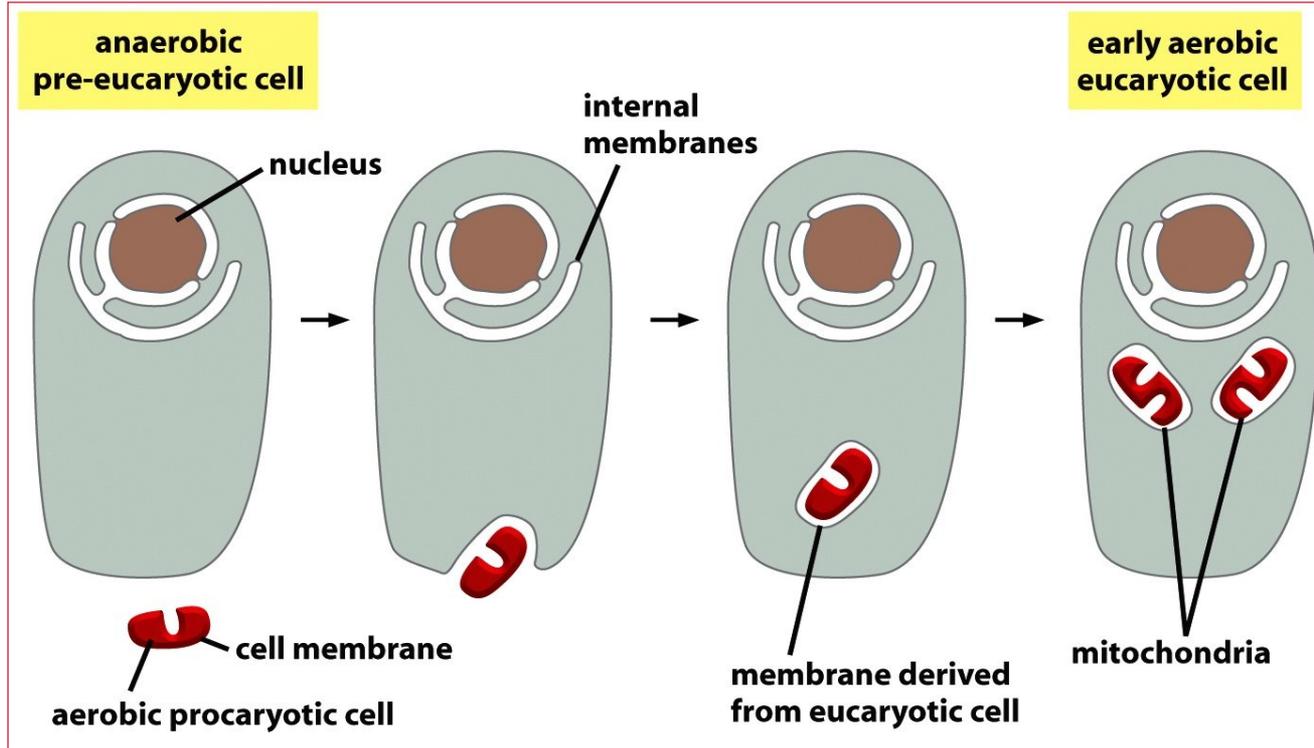
Figure 12-2 *Molecular Biology of the Cell* (© Garland Science 2008)



- İlk ökaryot öncülünde, zarlı organel bulunmadığı plazma zarı iyon pompalanması, ATP sentezi, protein salgılanması, lipid sentezi gibi işlemlere aracılık eder.
- İç zarların evrimi işlevlerin özelleşmesini de sağlamıştır.



- Ökaryotik diğer hücre kısımları da benzer şekilde meydana gelmiş olabilir. Bu durum ER, golgi, endozomlar, lizozomlar içinde geçerlidir.



- Kendi genomu olan hücreler ise endosimbiyotik teoriye göre diğer bir hücre tarafından yutulan bakteriden geldiği kabul edilmektedir.

Mitokondri ve plastidlerin iç zarları bakterinin plazma zarına karşılık gelmektedir.

1. Çekirdek gözenek bileşikleri yoluyla iletişim kuran çekirdek ve sitozol
2. Salgılama ve endositik yollarda işlev gösteren tüm organeller
3. Mitokondri ve Plastidler

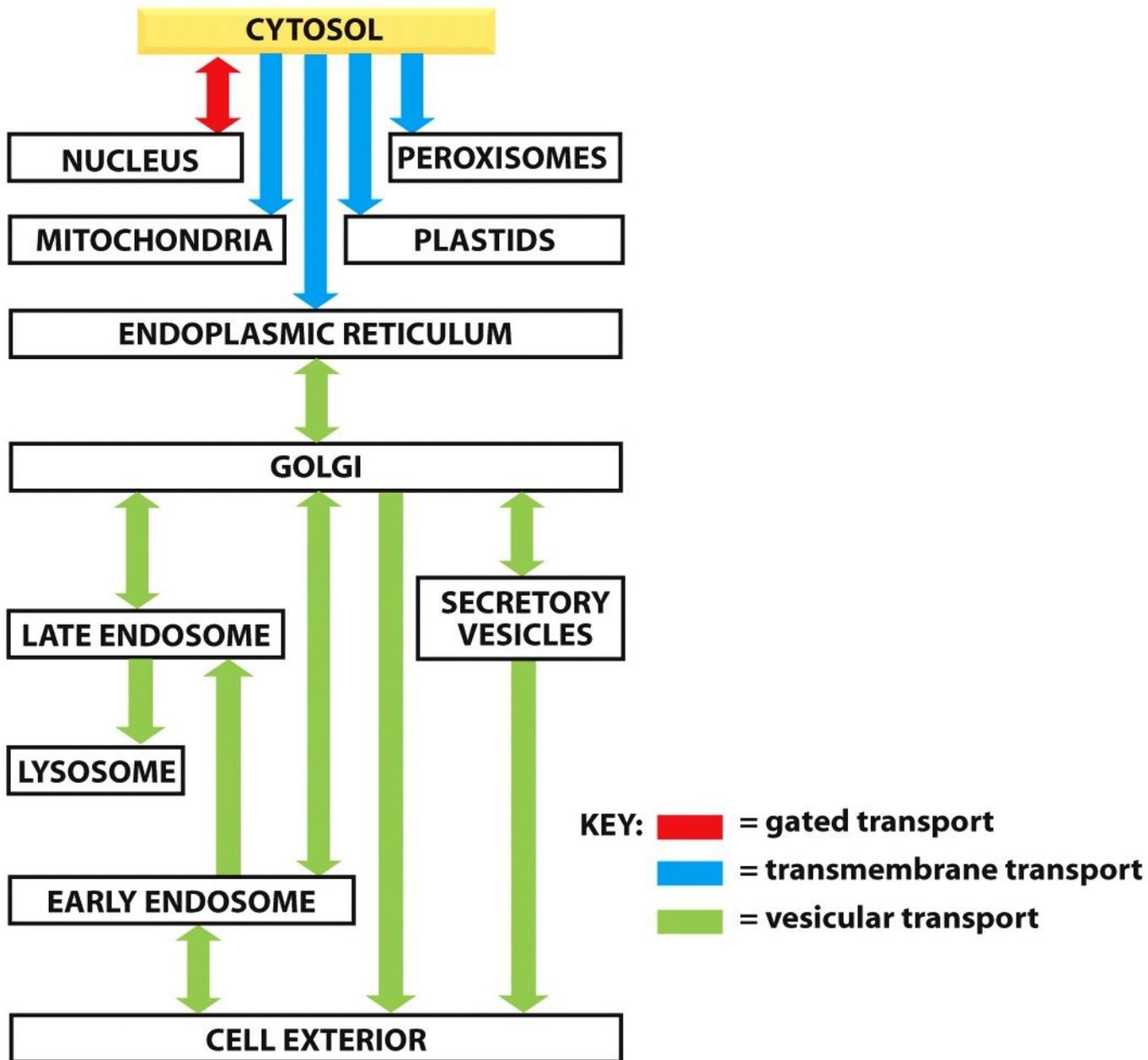


Figure 12-6 *Molecular Biology of the Cell* (© Garland Science 2008)

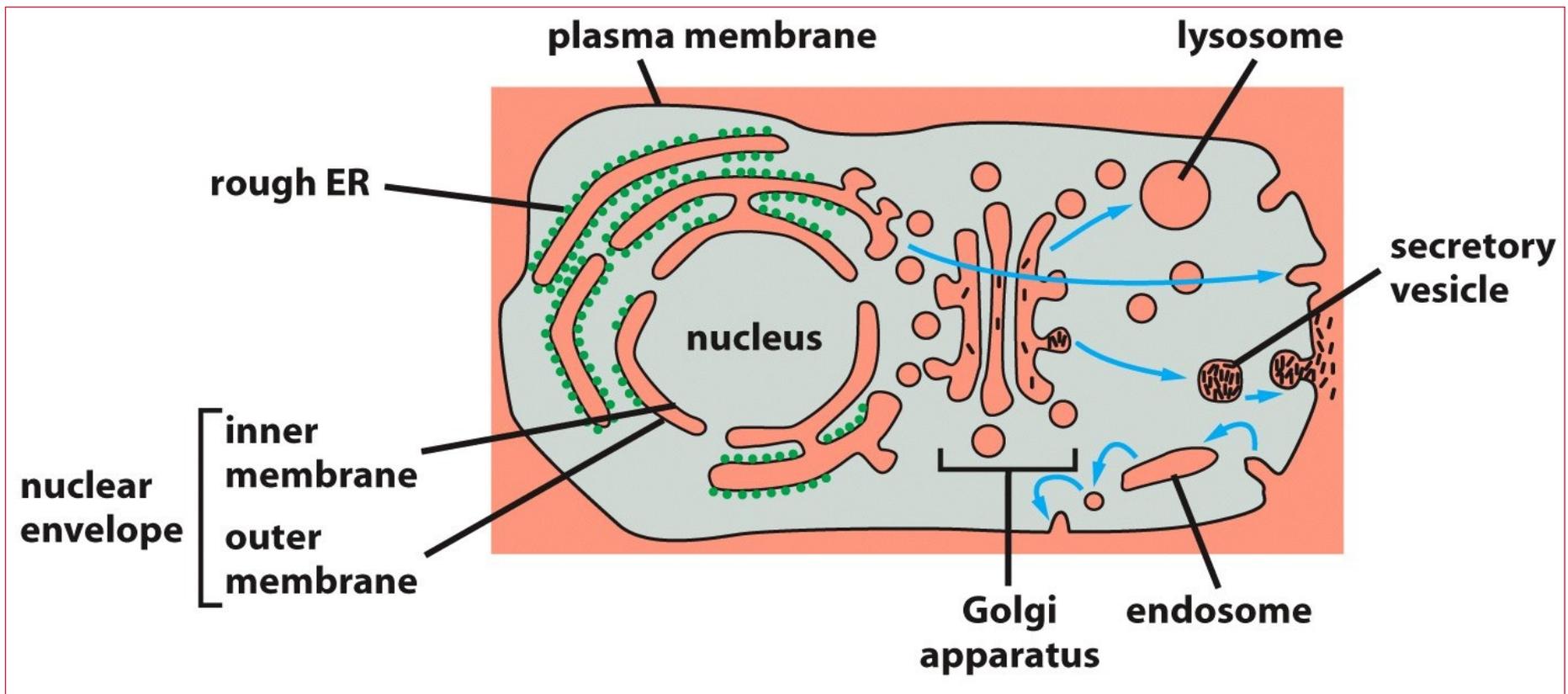
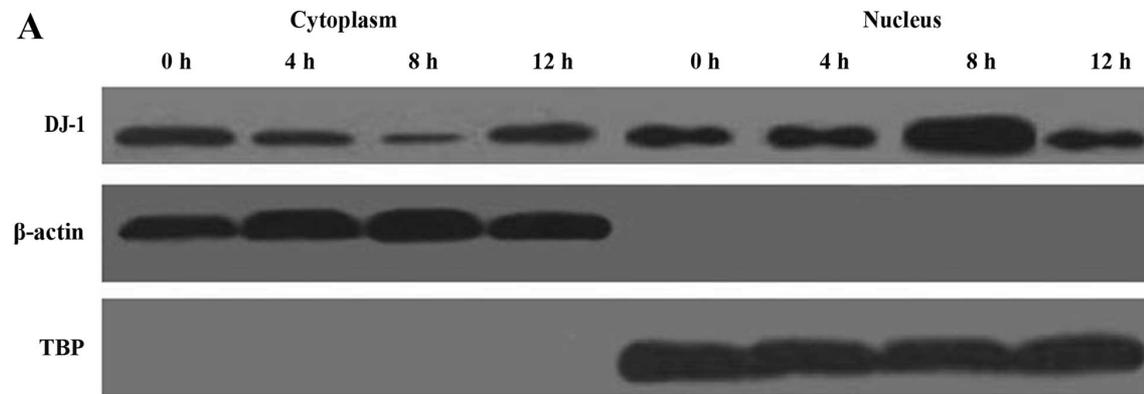


Figure 12-5 *Molecular Biology of the Cell* (© Garland Science 2008)



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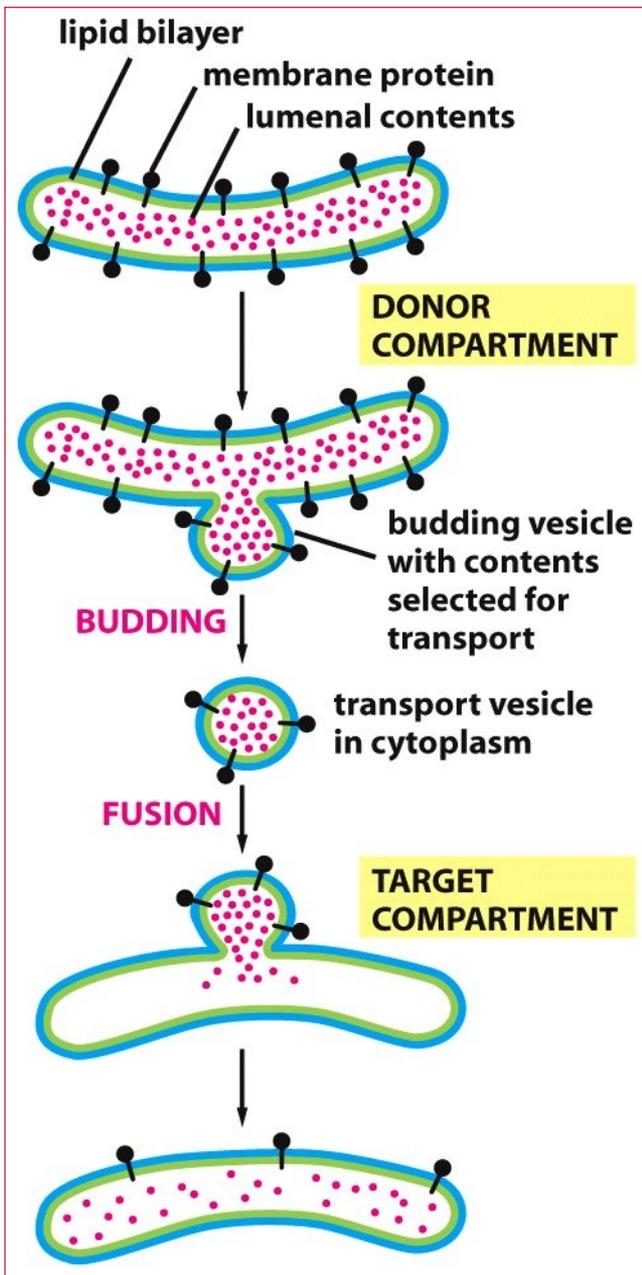
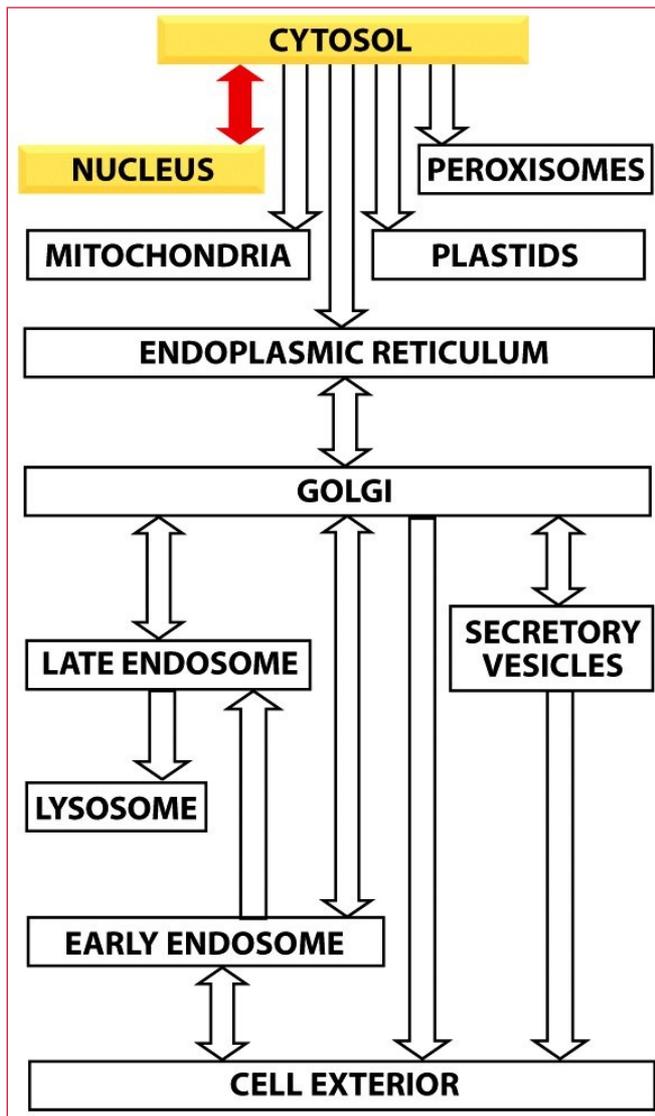


Figure 12-7 *Molecular Biology of the Cell* (© Garland Science 2008)



- Proteinler ribozomlarda sentezlendikten sonra yerleşimlerine yönlendirme işleme tasnif sinyalleri ile yapılır. Tasnif dizileri olmayan proteinler ise sitozolde kalırlar.

Table 12-3 Some Typical Signal Sequences

FUNCTION OF SIGNAL SEQUENCE	EXAMPLE OF SIGNAL SEQUENCE
Import into nucleus	-Pro-Pro- Lys-Lys-Lys-Arg-Lys -Val-
Export from nucleus	-Leu-Ala-Leu-Lys-Leu-Ala-Gly-Leu-Asp-Ile-
Import into mitochondria	⁺ H ₃ N-Met-Leu-Ser-Leu- Arg -Gln-Ser-Ile- Arg -Phe-Phe- Lys -Pro-Ala-Thr- Arg -Thr-Leu-Cys-Ser-Ser- Arg -Tyr-Leu-Leu-
Import into plastid	⁺ H ₃ N-Met-Val-Ala-Met-Ala-Met-Ala- Ser -Leu-Gln- Ser-Ser -Met- Ser-Ser -Leu- Ser -Leu- Ser-Ser -Asn- Ser -Phe-Leu-Gly-Gln-Pro-Leu- Ser -Pro-Ile- Thr -Leu- Ser -Pro-Phe-Leu-Gln-Gly-
Import into peroxisomes	- Ser-Lys -Leu-COO ⁻
Import into ER	⁺ H ₃ N-Met-Met-Ser-Phe-Val-Ser-Leu-Leu-Leu-Val-Gly-Ile-Leu-Phe-Trp-Ala-Thr- Glu-Ala-Glu -Gln-Leu-Thr- Lys -Cys- Glu -Val-Phe-Gln-
Return to ER	- Lys-Asp-Glu -Leu-COO ⁻

Some characteristic features of the different classes of signal sequences are highlighted in color. Where they are known to be important for the function of the signal sequence, positively charged amino acids are shown in *red* and negatively charged amino acids are shown in *green*. Similarly, important hydrophobic amino acids are shown in *white* and hydroxylated amino acids are shown in *blue*. ⁺H₃N indicates the N-terminus of a protein; COO⁻ indicates the C-terminus.

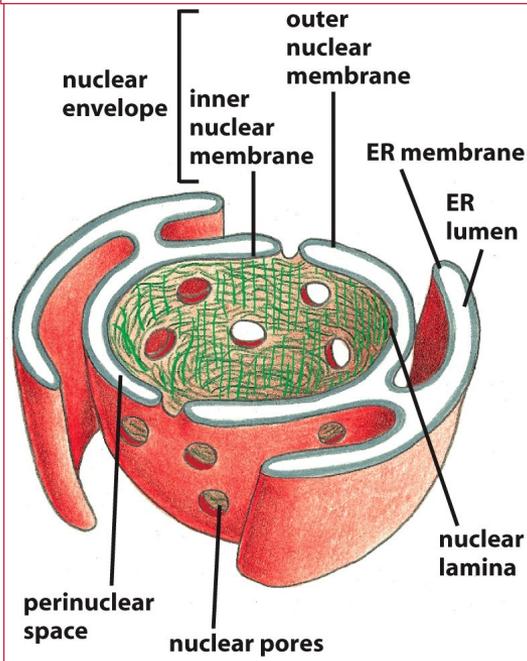
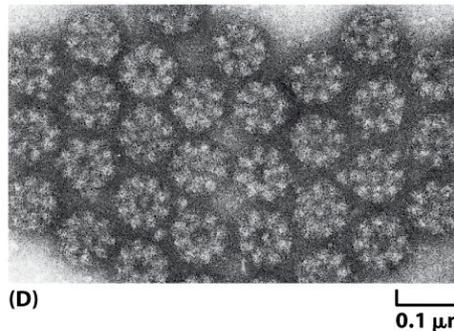
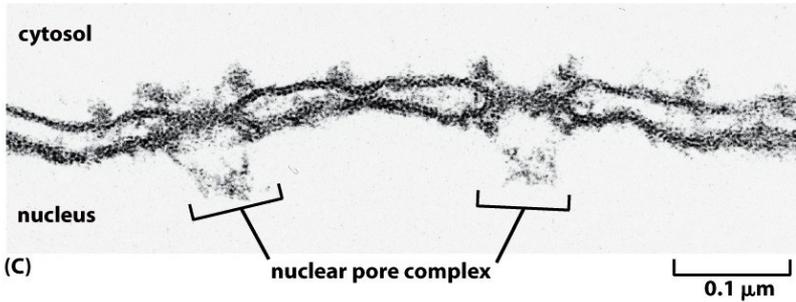
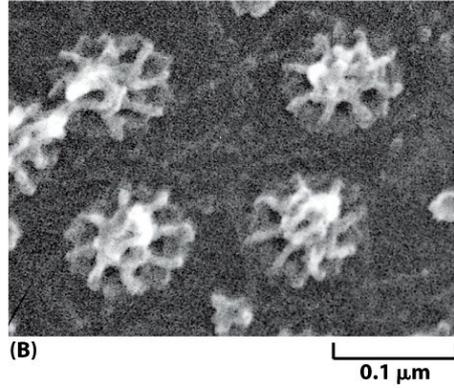
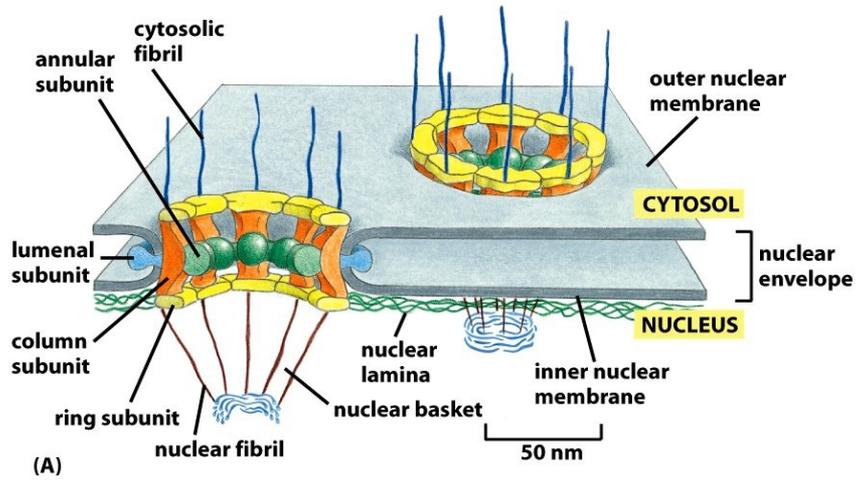
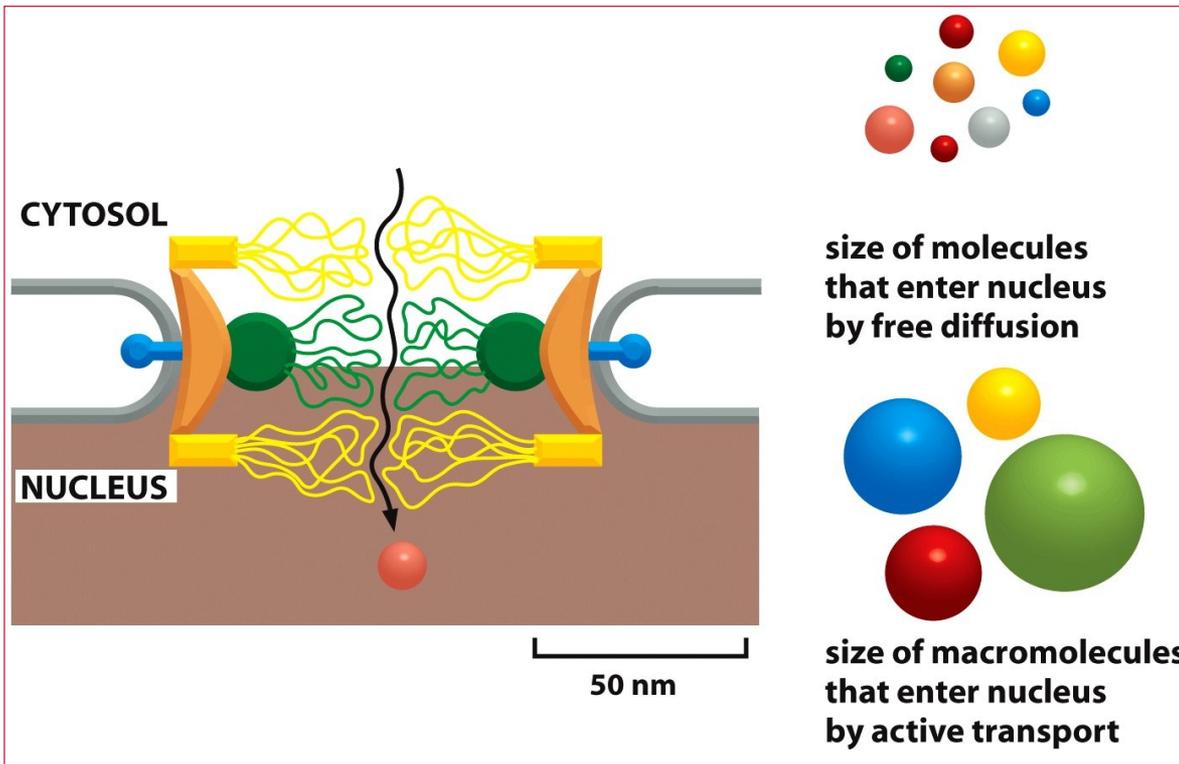


Figure 12-9 *Molecular Biology of the Cell* (© Garland Science 2008)

Nükleoporin

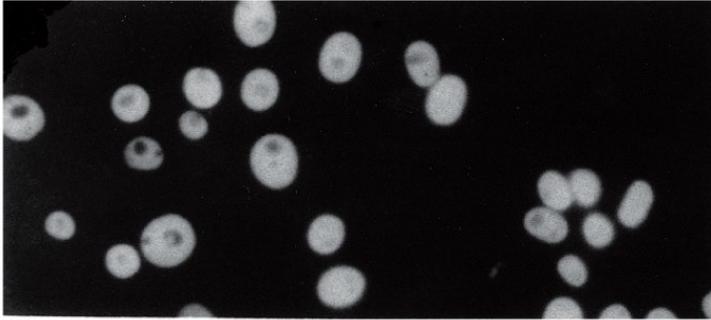


Çekirdekte 4000 kadar nükleoporin bulunur. Bölünme sırasında kromatine paketlenmek üzere çekirdeğe yaklaşık 100 histon molekülü girmektedir.

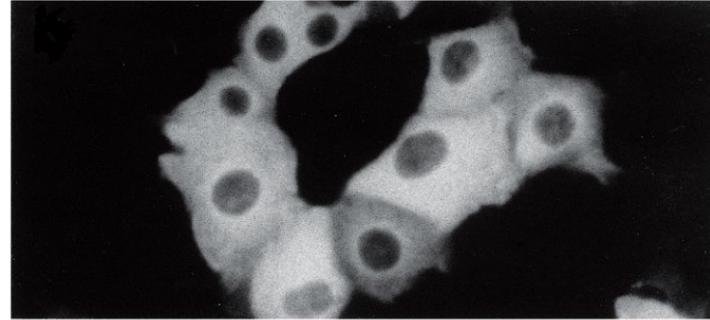
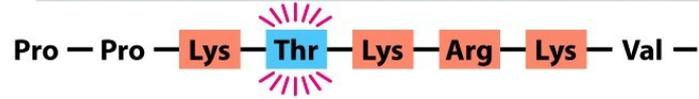


5kDa < çok hızlı, 17 kDa 2 dk'da dengelenir, 60 kDa'dan büyük moleküllerin girmesi çok zordur. Yeni oluşturulan ribozom altbirimleri ve DNA, RNA pol. gibi 100-200kDa'luk büyük molekülleri

(A) LOCALIZATION OF T-ANTIGEN CONTAINING ITS NORMAL NUCLEAR IMPORT SIGNAL



(B) LOCALIZATION OF T-ANTIGEN CONTAINING A MUTATED NUCLEAR IMPORT SIGNAL

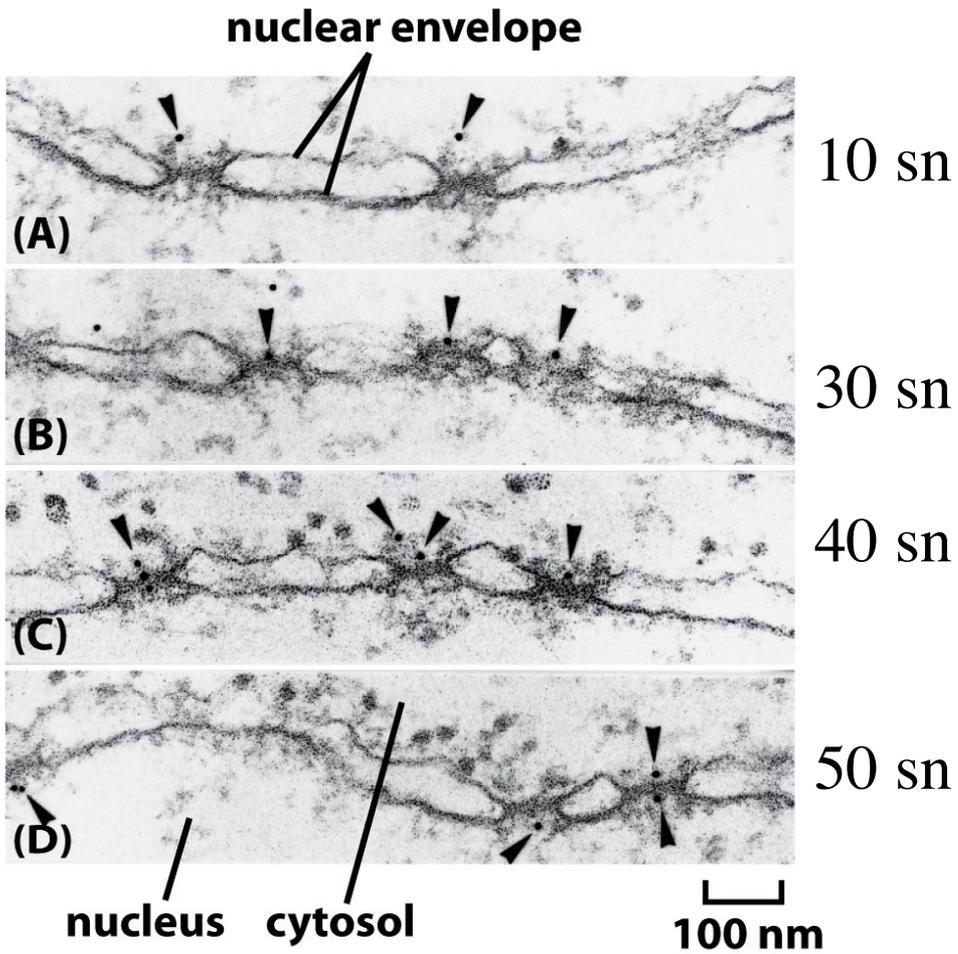


Proteinlerin çekirdeğe girişlerinde NLS dizileri gereklidir. Pozitif yüklü lizin ve arjininden zengin dizilerdir. Farklı diziler de bulunabilmektedir.

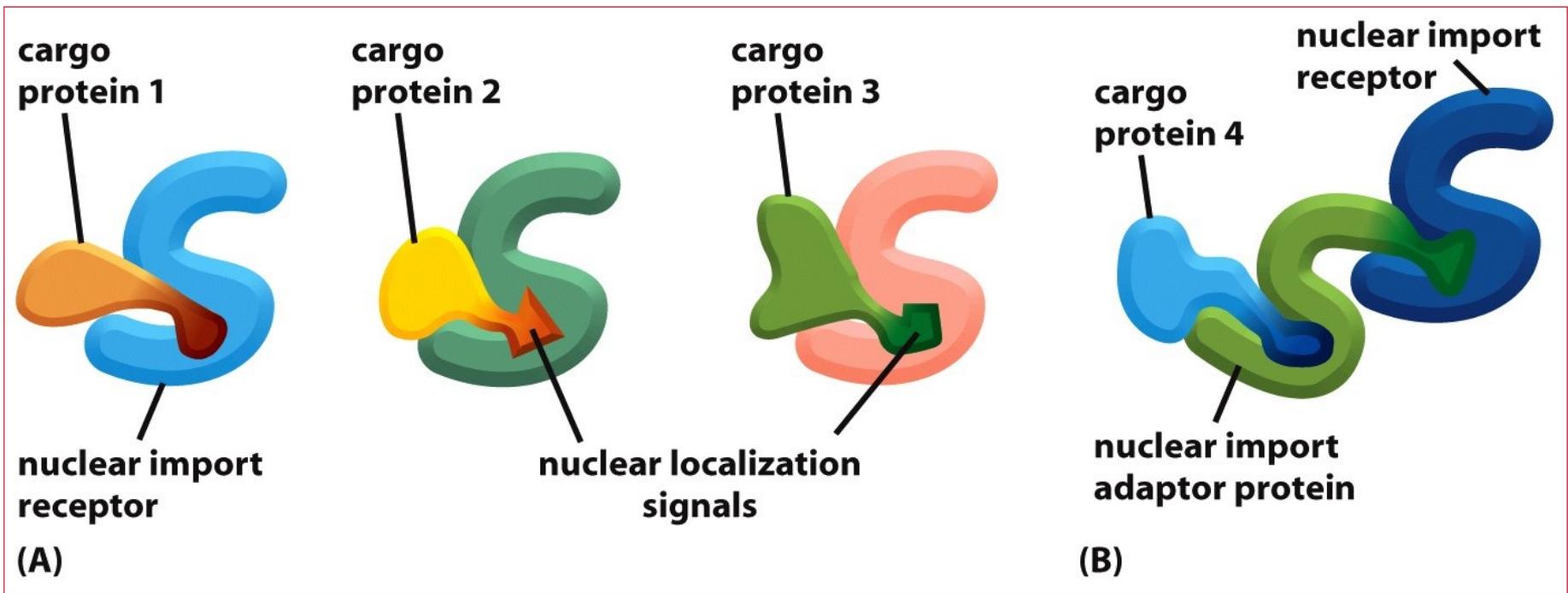
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Export from nucleus	-Leu-Ala-Leu-Lys-Leu-Ala-Gly-Leu-Asp-Ile-
Import into mitochondria	⁺ H ₃ N-Met-Leu-Ser-Leu-Arg-Gln-Ser-Ile-Arg-Phe-Phe-Lys-Pro-Ala-Thr-Arg-Thr-Leu-Cys-Ser-Ser-Arg-Tyr-Leu-Leu-
Import into plastid	⁺ H ₃ N-Met-Val-Ala-Met-Ala-Met-Ala-Ser-Leu-Gln-Ser-Ser-Met-Ser-Ser-Leu-Ser-Leu-Ser-Ser-Asn-Ser-Phe-Leu-Gly-Gln-Pro-Leu-Ser-Pro-Ile-Thr-Leu-Ser-Pro-Phe-Leu-Gln-Gly-
Import into peroxisomes	-Ser-Lys-Leu-COO ⁻
Import into ER	⁺ H ₃ N-Met-Met-Ser-Phe-Val-Ser-Leu-Leu-Leu-Val-Gly-Ile-Leu-Phe-Trp-Ala-Thr-Glu-Ala-Glu-Gln-Leu-Thr-Lys-Cys-Glu-Val-Phe-Gln-
Return to ER	-Lys-Asp-Glu-Leu-COO ⁻

Some characteristic features of the different classes of signal sequences are highlighted in color. Where they are known to be important for the function of the signal sequence, positively charged amino acids are shown in red and negatively charged amino acids are shown in green. Similarly, important hydrophobic amino acids are shown in white and hydroxylated amino acids are shown in blue. ⁺H₃N indicates the N-terminus of a protein; COO⁻ indicates the C-terminus.



Altın kaplı parçacıklarla proteinlerin çekirdeğe girişi gösterilmiştir. Membranın aksine proteinler tamamen katlanmış konformasyonda bu sulu ve geniş gözenekten geçerler.



NLS sinyallerinin çekirdek import reseptörleri tarafından tanınması gereklidir. NLS'ler çekirdek reseptörleri ile spesifiktir.

