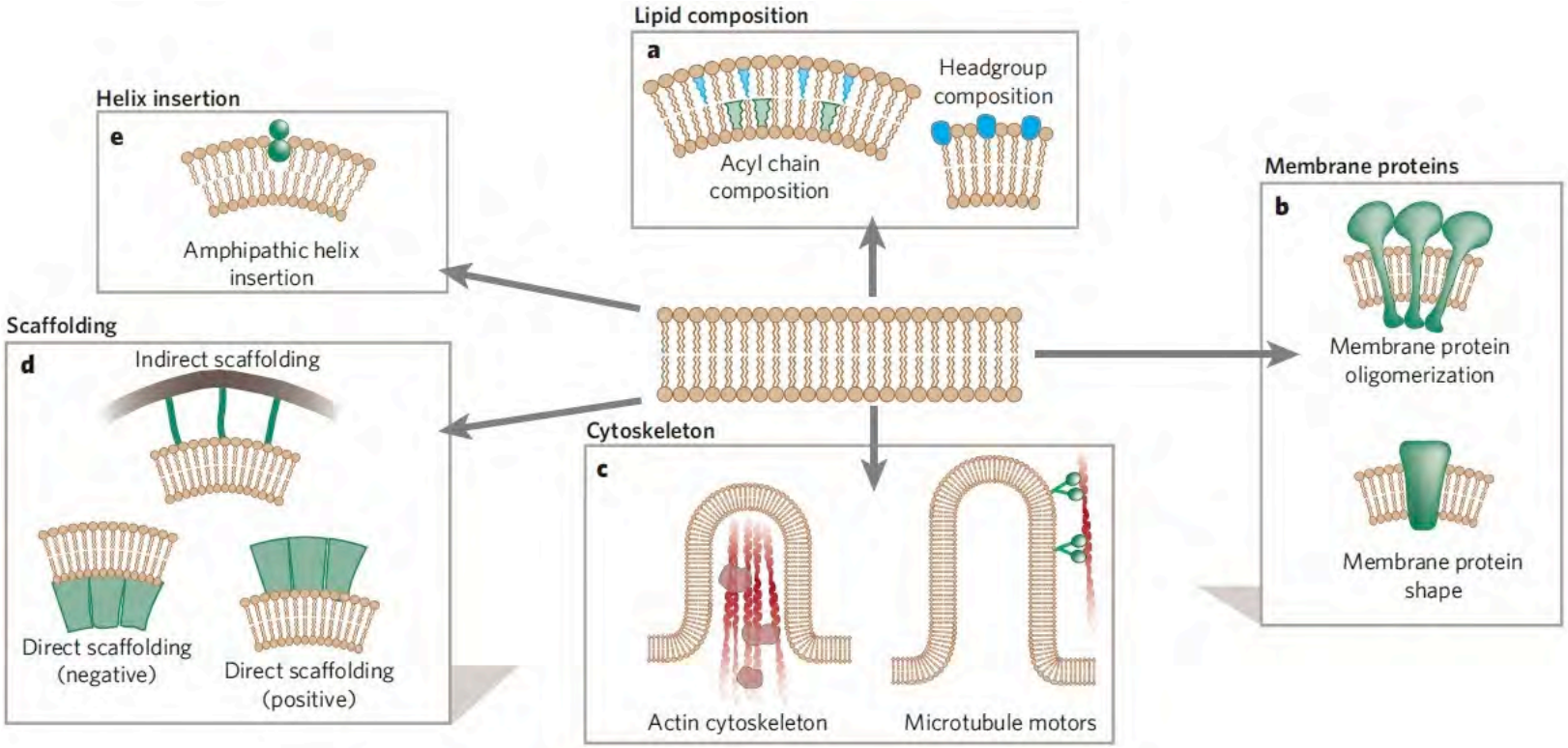
Membranes in Biology

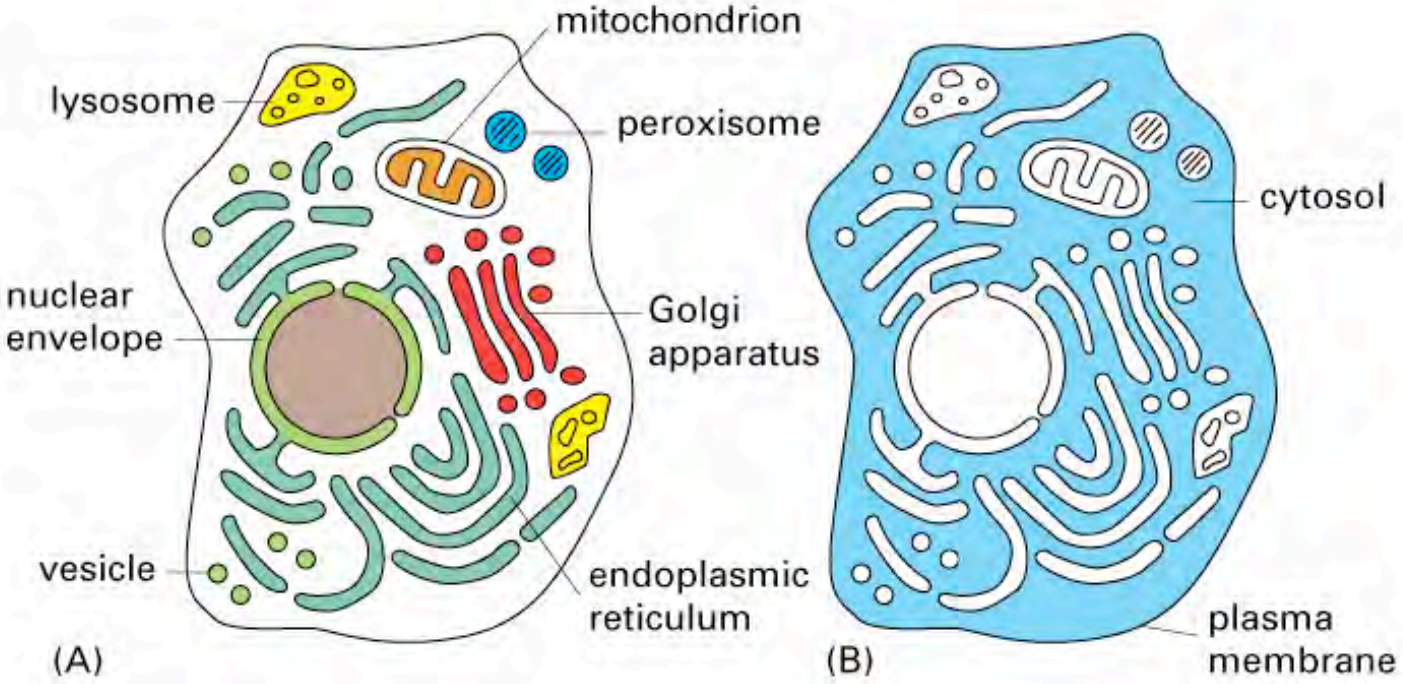
(McMahon)



Rob Phillips

California Institute of Technology

Cells and Their Membranes



Cells and Their Membranes

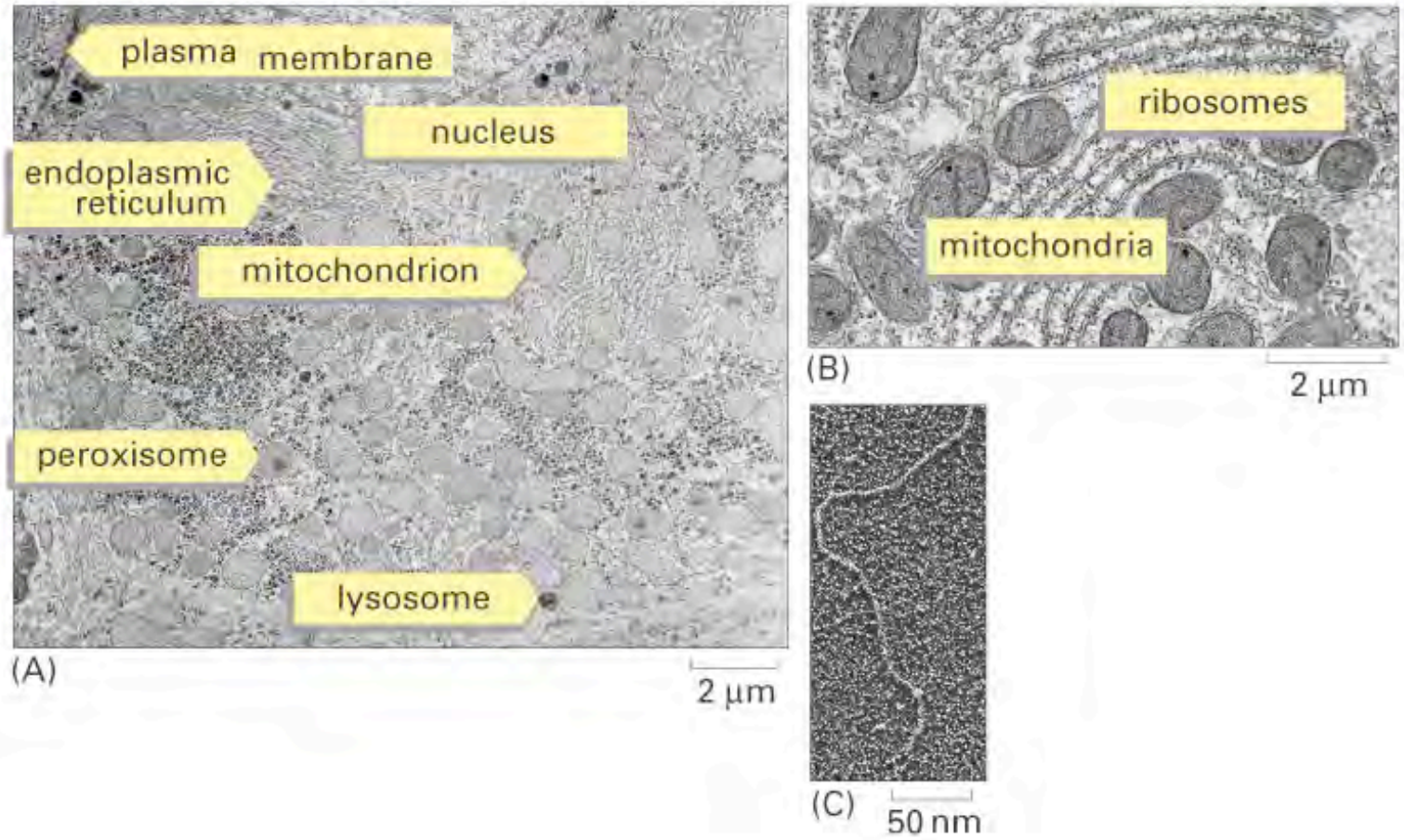


Figure 1-8 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Lipids

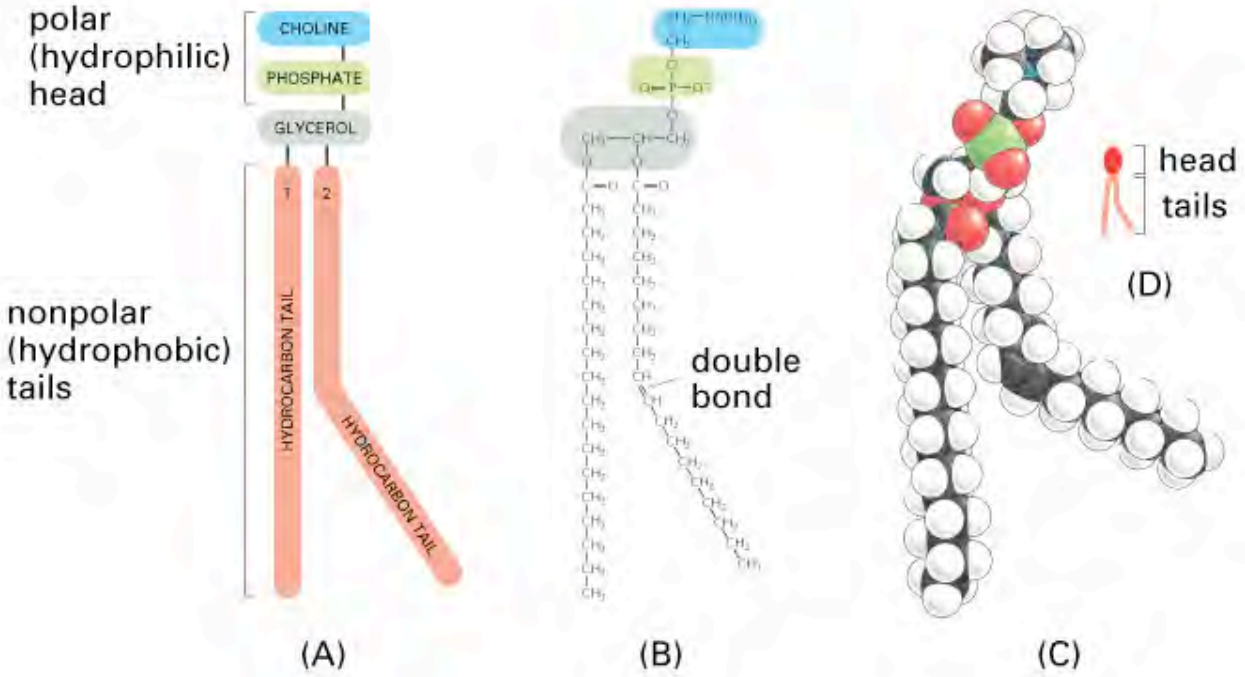


Figure 11-6 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Lipid Bilayers (In Vitro)

- ***Hydrophobic tails and polar head groups.***
- ***Favorable for lipids to spontaneously assemble to form bilayers.***

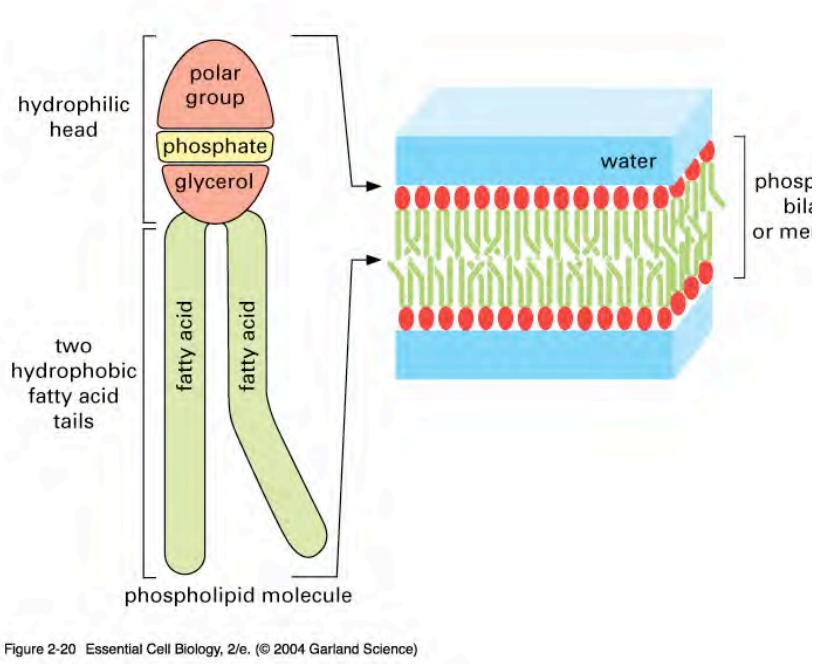
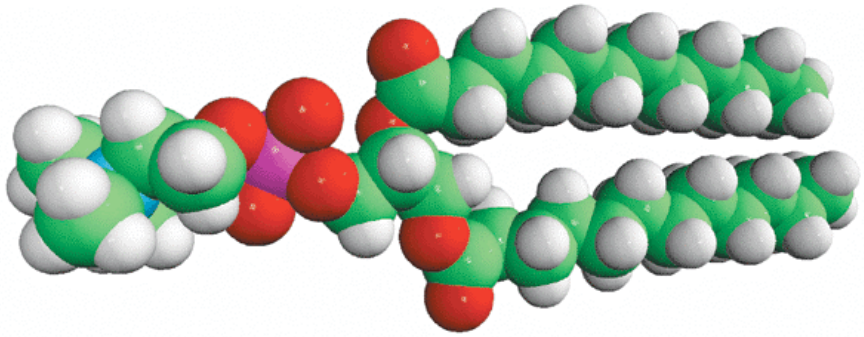
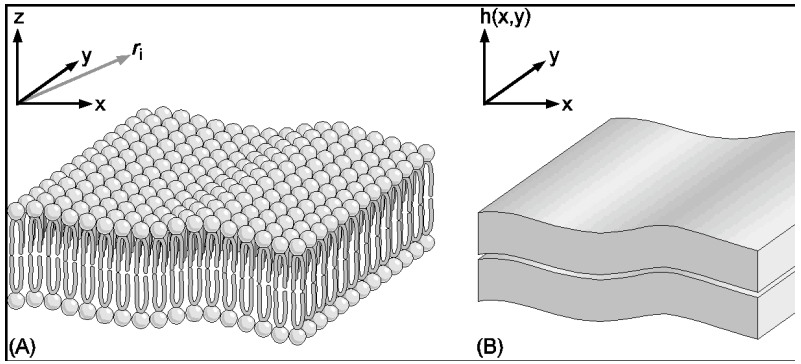


Figure 2-20 Essential Cell Biology, 2/e. (© 2004 Garland Science)



(Avanti Polar Lipids)

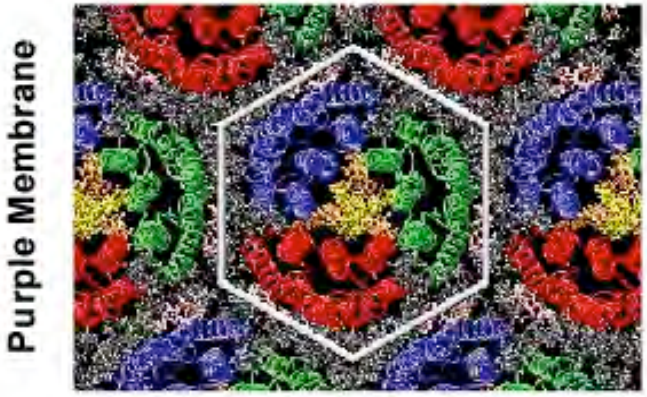


Molecular ***Continuu***

Membranes In Vivo

- ***Real biological membranes contain many different lipids & transmembrane proteins!***

	Purple Membrane	Human
M_L/M_P	0.2	3-4



Biophysics Group UIUC

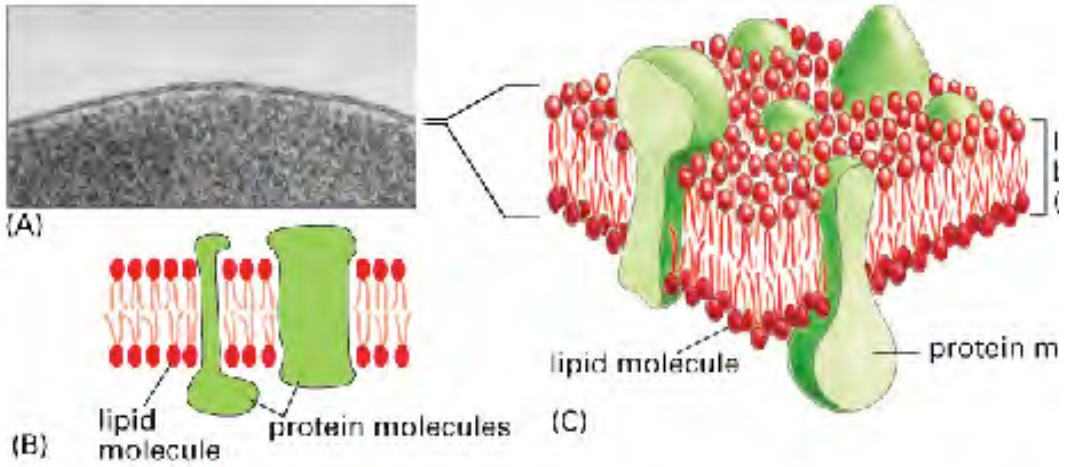


Figure 10–1. Molecular Biology of the Cell, 4th Edition.

The Complexity of Real-World Membranes

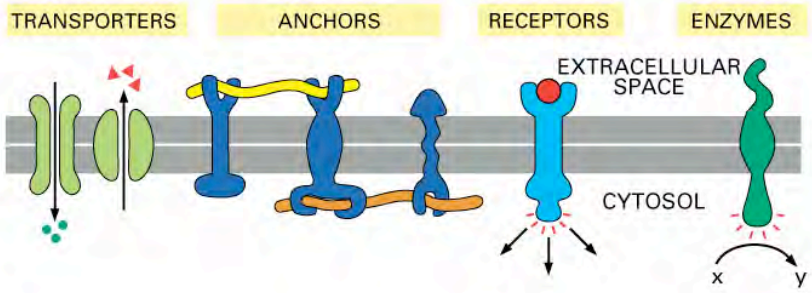


Figure 11-20 Essential Cell Biology, 2/e. (© 2004 Garland Science)

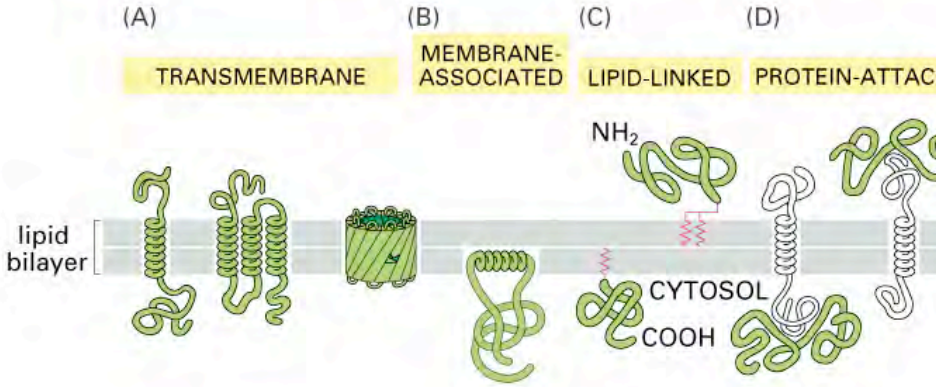


Figure 11-21 Essential Cell Biology, 2/e. (© 2004 Garland Science)

The Motility of Proteins in Membranes

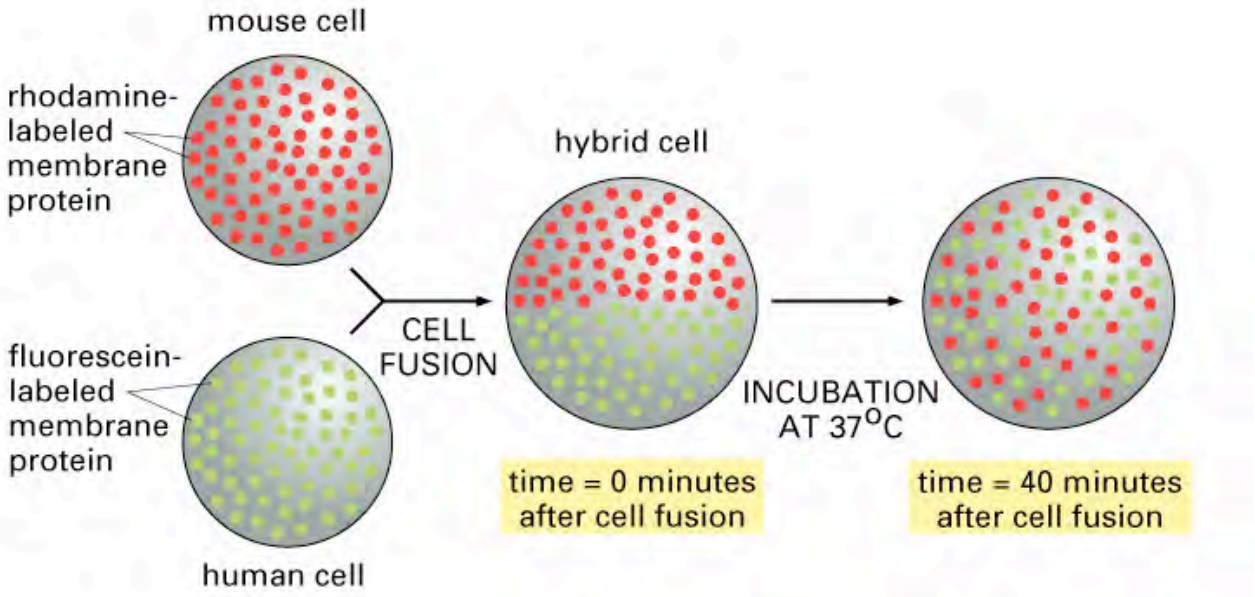
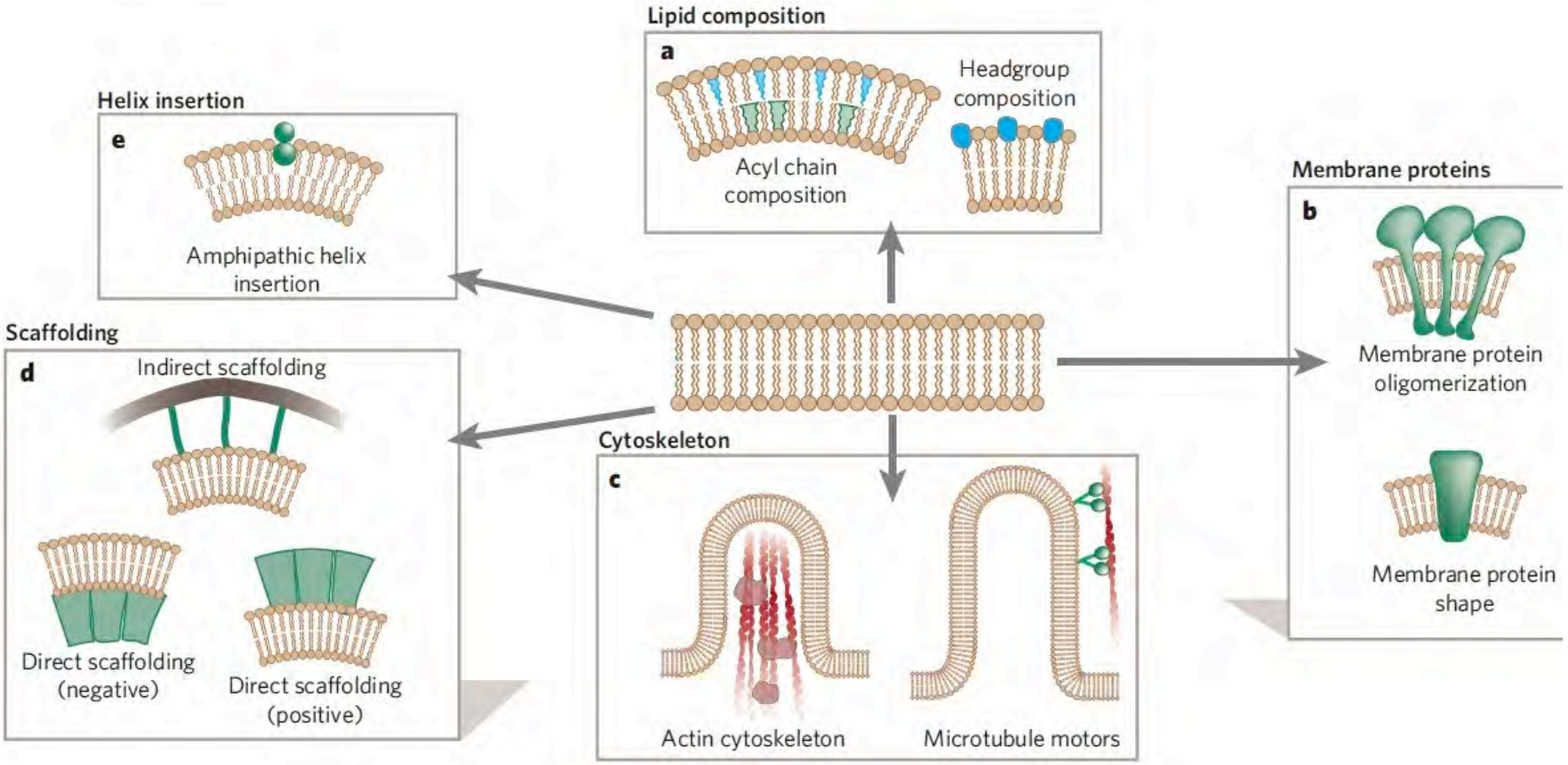


Figure 11-34 Essential Cell Biology, 2/e. (© 2004 Garland Science)

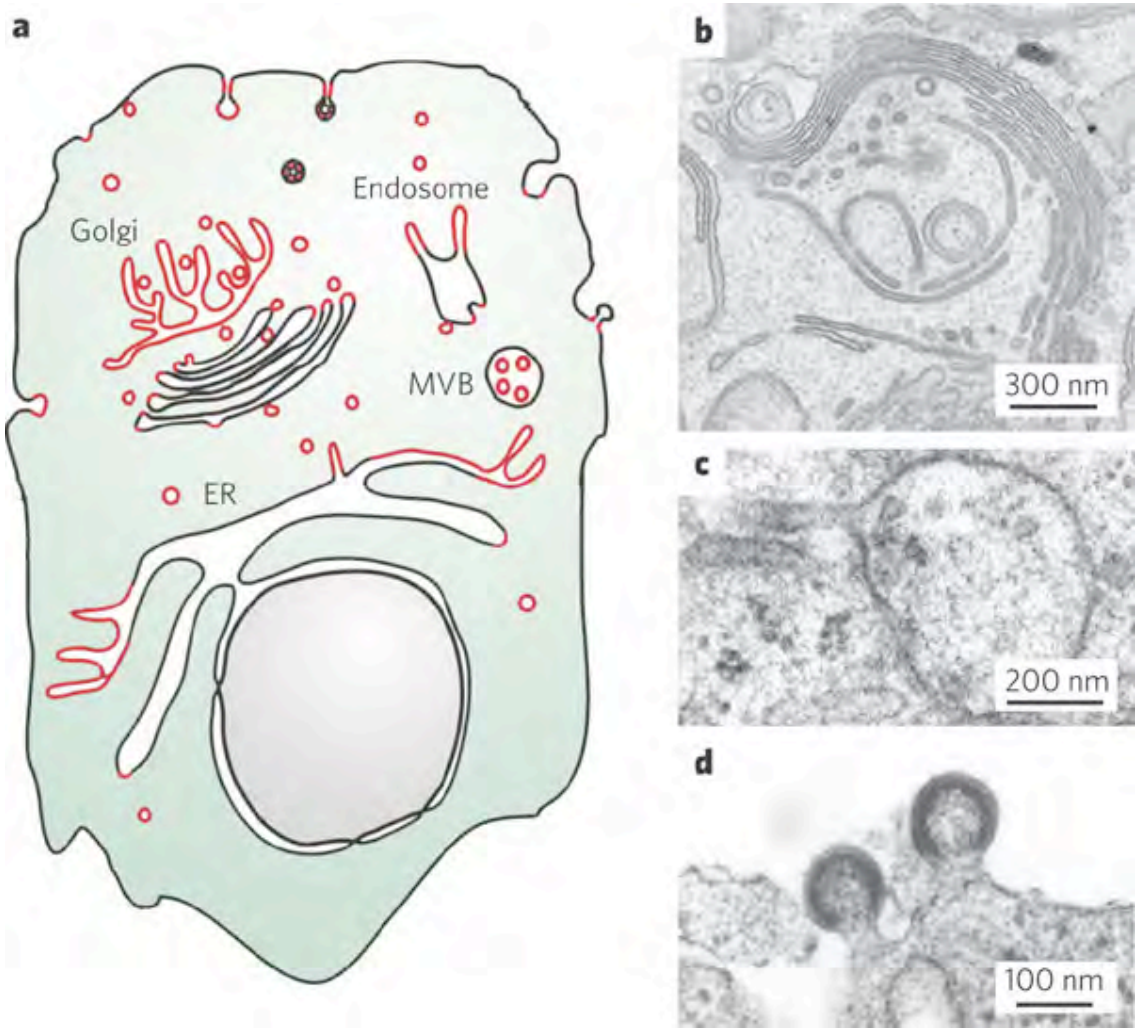
Membrane Deformation in Biology

(McMahon)



Membrane Deformation in Biology

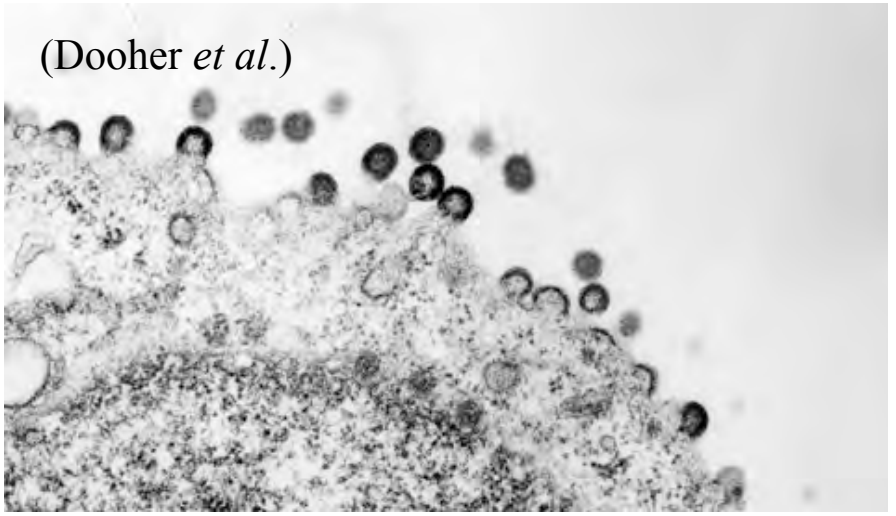
(McMahon)



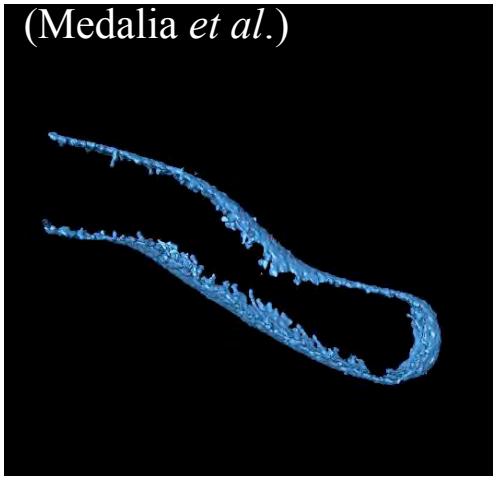
Quantitative Tools for Tomography: Viral Budding as an Example

- ***Tomography producing wide range of images of deformed membrane systems.***

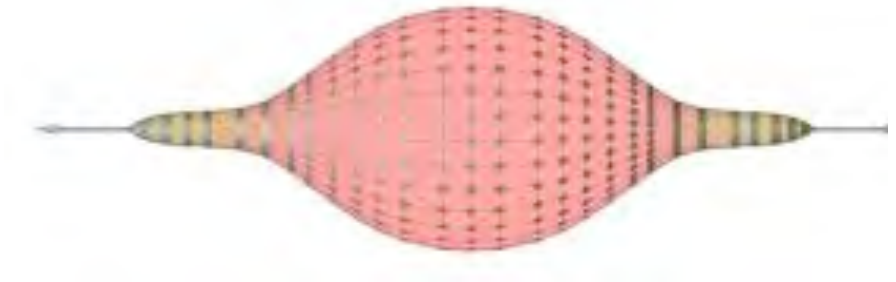
HIV Budding



Observed Membrane Deformation During Cell Movement



Calculated Deformation of Vesicle Due to Actin Polymerization



Vesicle Transport

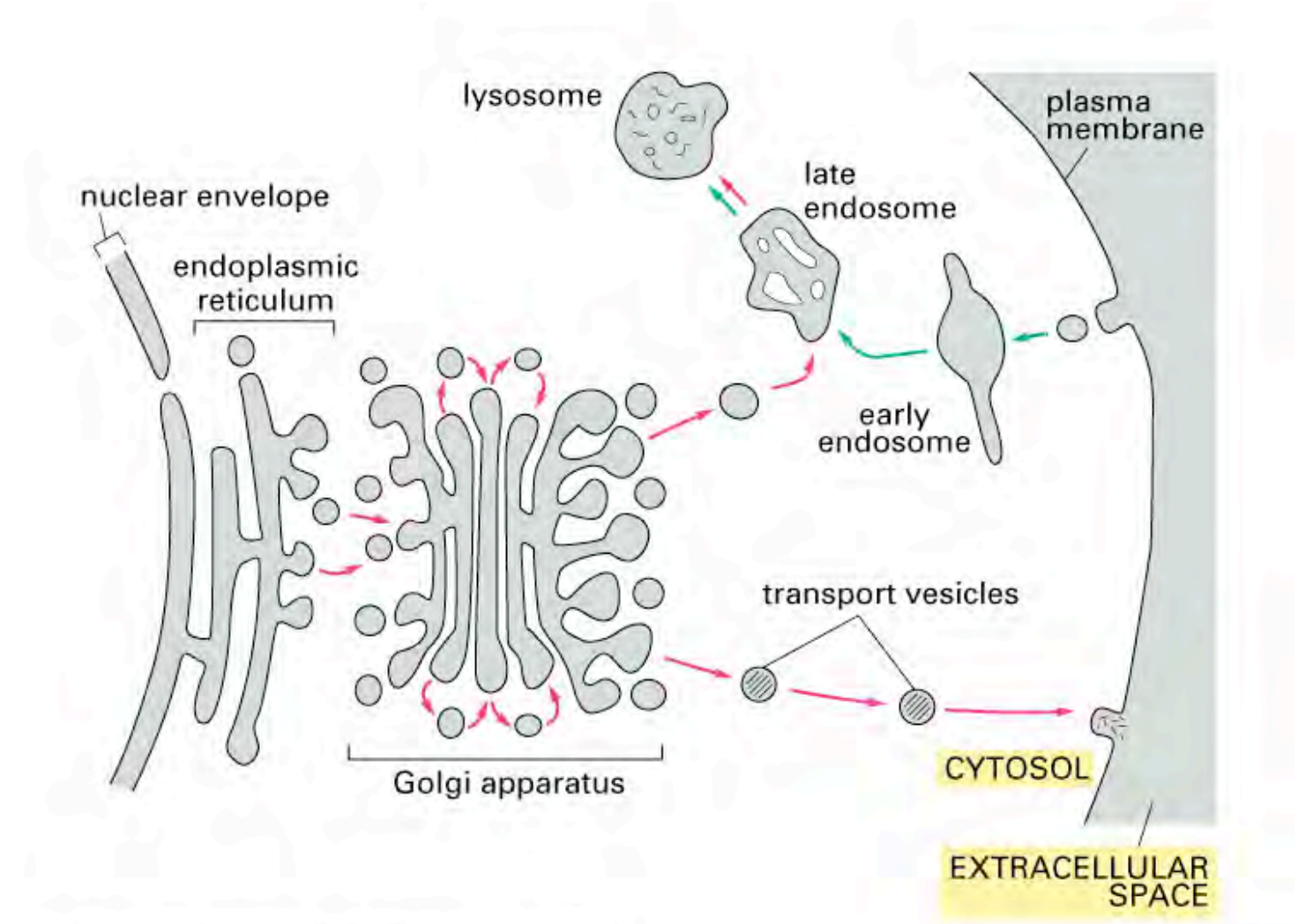
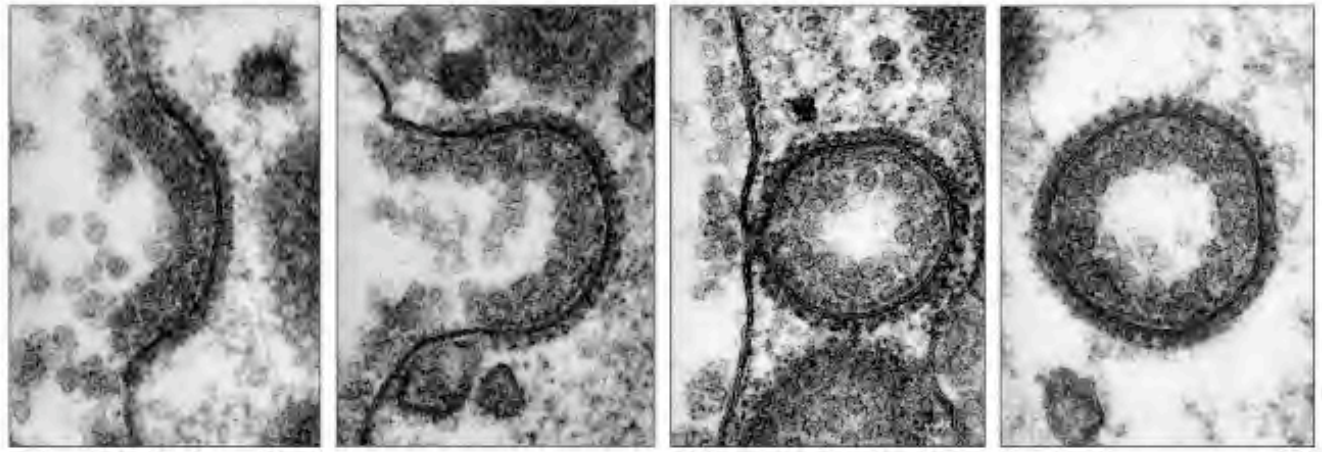


Figure 15-17 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Vesicle Transport: Clathrin Coating



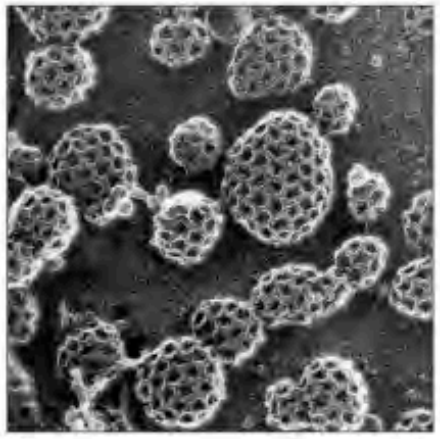
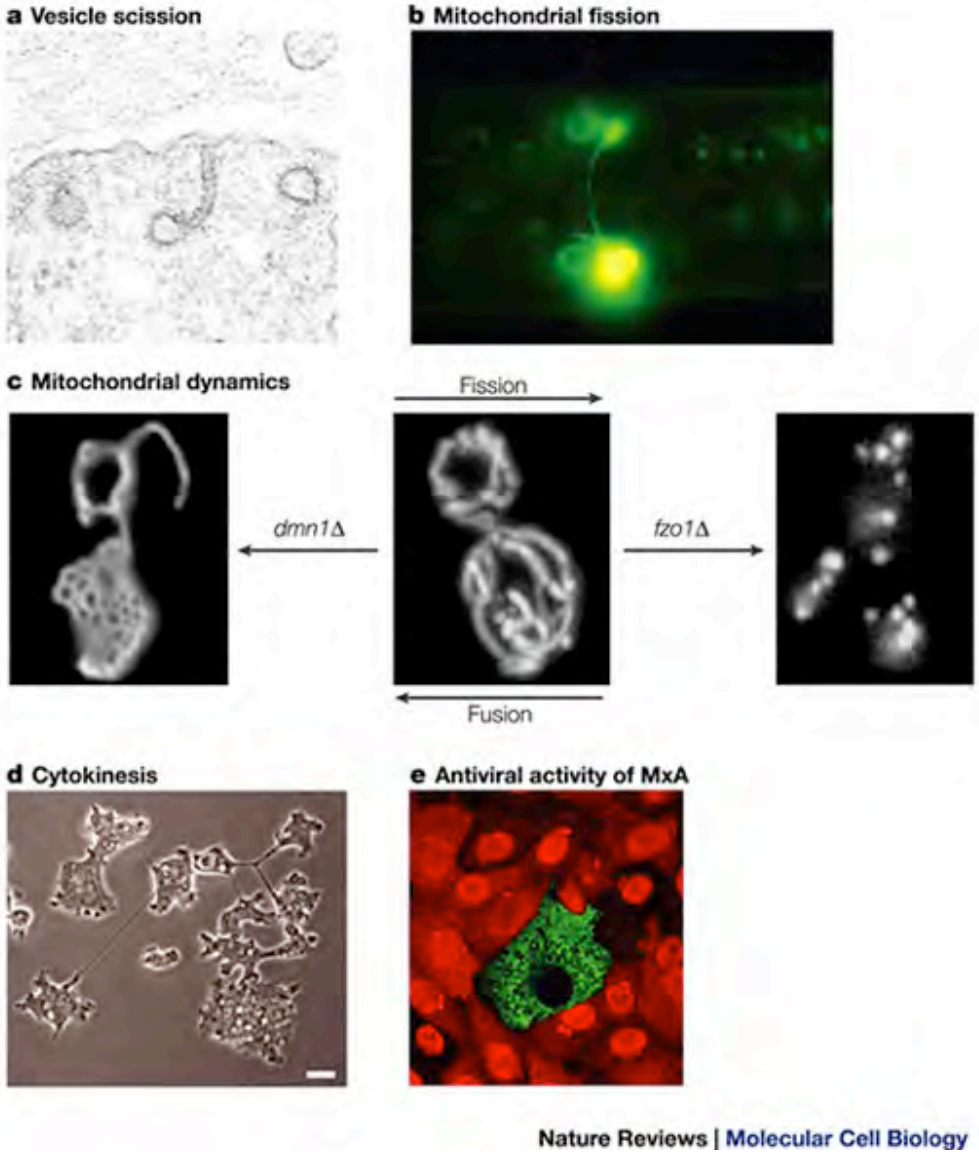


Figure 15-18 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Dynamin and Vesicle Fission



(McMahon)

Ion Channels and Transient Permeability

- *Channels open in response to a variety of different stimuli.*
- *Key mechanisms are voltage gating, ligand binding-induced gating and mechanical tension in the membrane.*

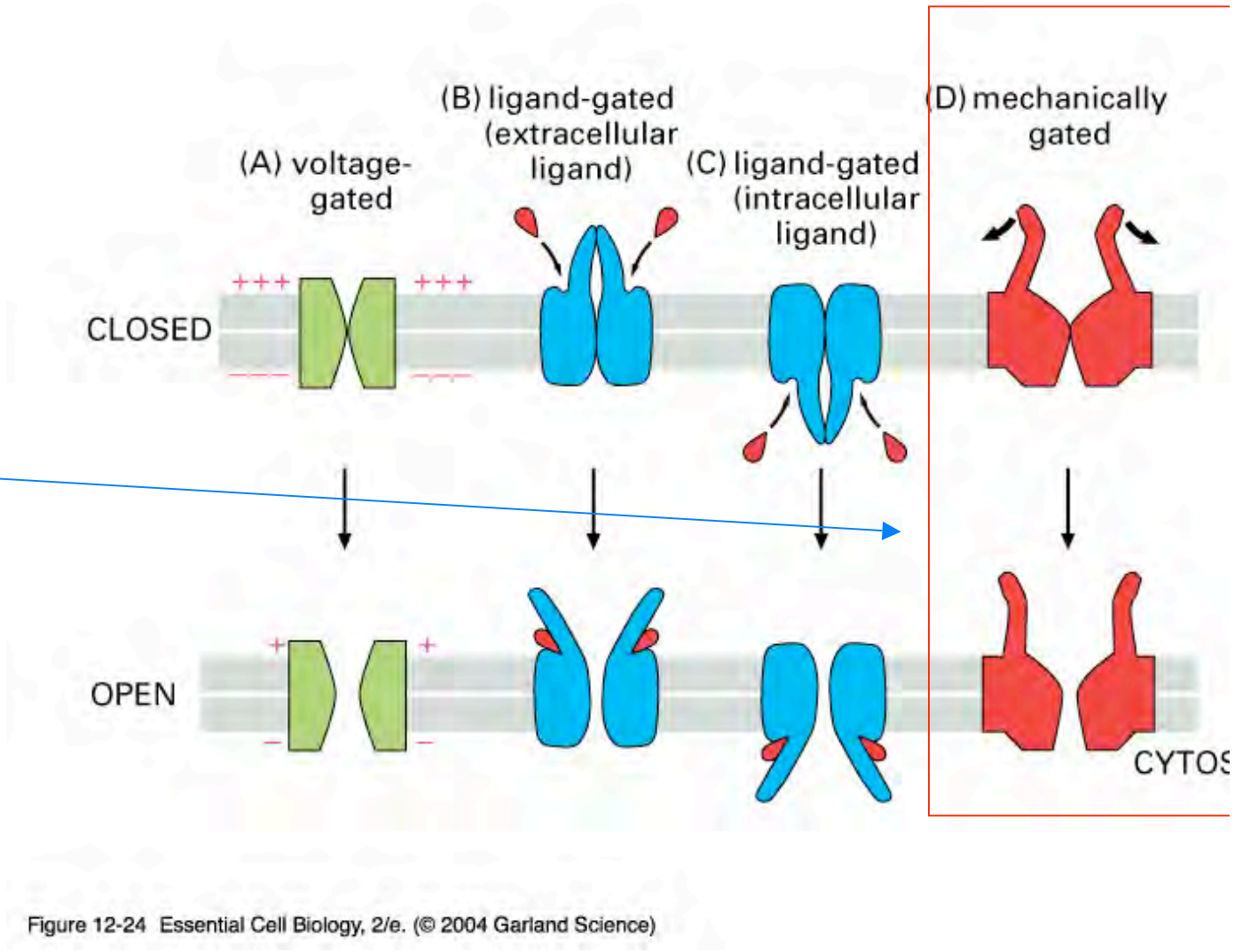


Figure 12-24 Essential Cell Biology, 2/e. (© 2004 Garland Science)

Physics of Viral Budding

(http://www.aids-info.ch/e_te/aas-e-imm.htm)