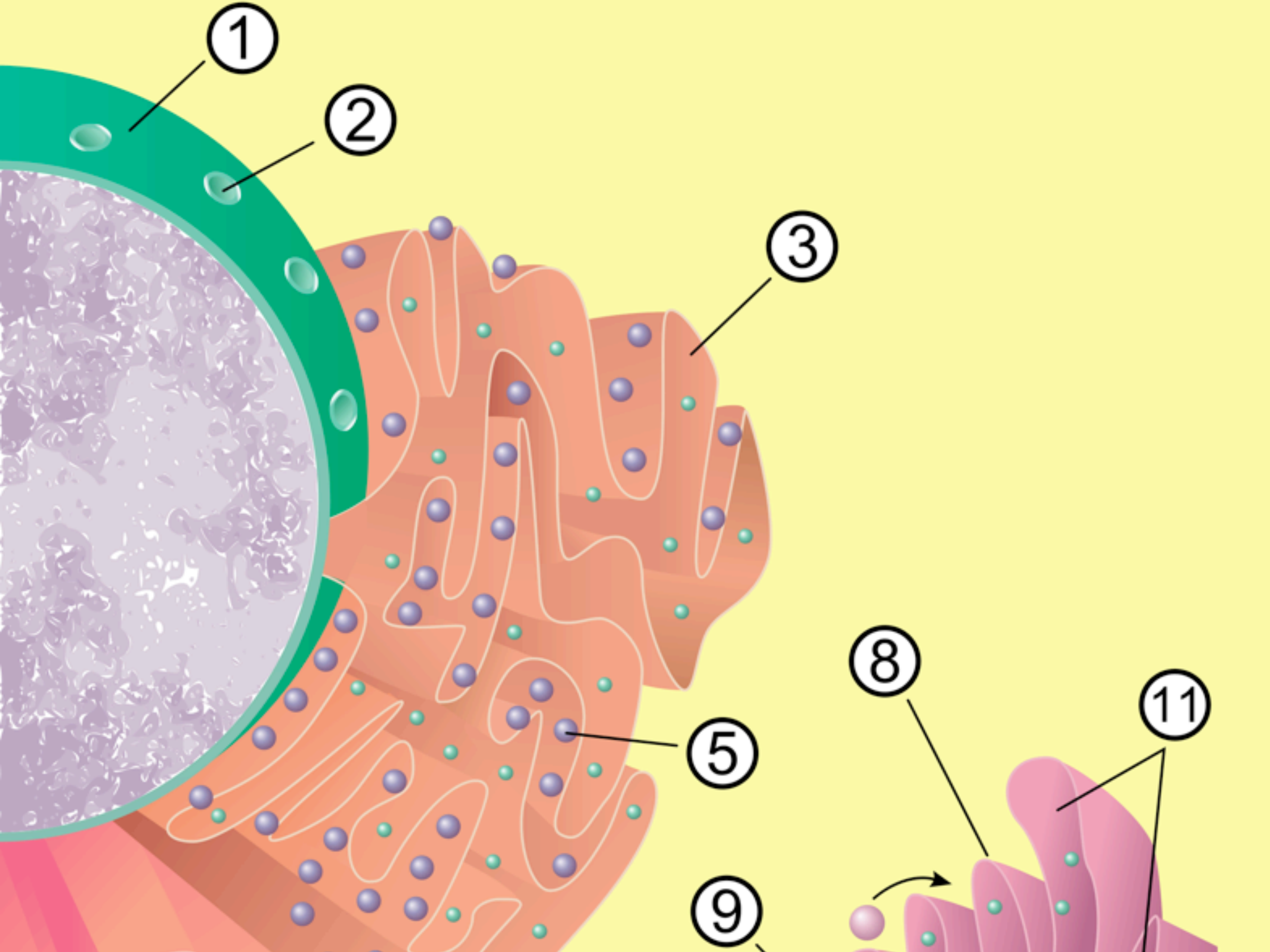
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Membrane Biochemistry

Lectures by

John F. Allen

School of Biological and Chemical Sciences, Queen Mary, University of London

jfallen.org/lectures

Queen Mary
University of London

Lectures by John F. Allen

Copies of materials and presentations

- Cell Biology and Developmental Genetics
- Membrane Biochemistry
- Membrane Proteins
- Inaugural lecture
- The Rudi Lemberg Lectures 2009

Other lectures

- Biomolecules of Life

Computer application programs, viewers, and readers. From external sites.

- Adobe Reader
- OpenOffice.org
- Quicktime Viewer

John F. Allen web page

Queen Mary
University of London

Lectures in Membrane Biochemistry

Course web pages

Membrane Biochemistry web pages

General reference

Cell and Molecular Biology: Concepts and Experiments
Gerald Karp. Fifth Edition 2008. John Wiley & Sons Inc.

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Further reading

- Chemiosmotic coupling: The cost of living. By Peter Rich. (.pdf file, 80 kb)
- Power for Life. Review of Nick Lane's book "Power Sex Suicide...." (.pdf file, 416 kb)
- N,K-ATPase. Page of Mark Hilge at Protein Biophysics, Nijmegen
- ATP Synthase. Group Pages of John Walker at the MRC Mitochondrial Biology Unit, Cambridge

SBS908 Membrane biochemistry [edit]

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My details and advisees
All SBCS staff
All SBCS modules

Useful links
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SBCS intranet
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QMUL intranet
QMUL webmail
QMUL Blackboard

My web pages
SBS908 (edit)
SBS922 (edit)
John Allen (edit)

My modules
SBS908
SBS922

Admin
Staff
Students
Programmes
Modules
Ext circumstances

Course organiser: Prof Conrad Mullineaux

Lecturers: Prof. Conrad Mullineaux (13 lectures), Prof. John Allen (9 lectures)

The structures and functions of biological membranes are introduced through an examination of key concepts including the structures of lipids, the structures of membrane proteins, membrane dynamics and methods for their study, intra- and intercellular signalling, protein import/export through membranes, endocytosis and exocytosis, coupling membranes, the chemiosmotic hypothesis, and membrane transport. Lecture material is supported by relevant practical experiments.

Course Text

Karp, G. 'Cell and Molecular Biology' Fifth ed. (2008) published by John Wiley and Sons.

Course outline and lecture schedule:

please download the document Membio Lects 2011.doc (see link below)

Practicals (to be organised by Prof Mullineaux):

The practical sessions will take place in weeks 10 and 11 (Tuesday, Wednesday, Thursday and Friday afternoons, 2-5 pm). Each student will complete 4 sessions (either Tuesday and Thursday afternoons or Wednesday and Friday afternoons). A document introducing the practical sessions will be available for download and **you are strongly advised to read it carefully before the first practical session.**

View home page
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Email students
All SBS908
See *view module* above for practical and tutorial group mailing lists.

Attachments

The maintainers of this page have provided the following files for you to view and/or download. To download a file, right click on its link and choose to save it to your hard drive:

- Course outline and schedule 2011/12
- Dummy Exam Paper
- Lecture 1 - 26/9/11
- Lecture 2 - 26/9/11
- Lecture 3 - 3/10/11
- Lecture 4 - 3/10/11
- Lecture 5 - 10/10/11
- Lecture 6 - 10/10/11
- Lecture 7 - 17/10/11
- Lecture 8 - 17/10/11
- Recommended further reading 1 - DM Engelman (2005) Nature 438, 578-580
- Short answer questions from the May 09 exam
- Specimen MCQs

Practicals and tutorials

This module has the following practicals and tutorials:

- 1: Mini project I
- 2: Mini project II
- 3: Mini project III
- 4: Mini project IV

Page maintained by: Prof John Allen, Ms Veronica Comper, Prof Conrad Mullineaux, Mr Jayden van Horik; updated 9 days ago

Queen Mary
University of London

Lectures in Membrane Biochemistry

Course web pages

Membrane Biochemistry web pages

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- N,K-ATPase. Page of Mark Hilge at Protein Biophysics, Nijmegen
- ATP Synthase. Group Pages of John Walker at the MRC Mitochondrial Biology Unit, Cambridge

Animations

- The pump cycle of Na,K-ATPase. By Mark Hilge at Protein Biophysics, Nijmegen
- Animation. From Light to ATP. By O. Fritsche and W. Junge, University of Osnabruck. (.avi file, 17.7 mb)
- Molecular animations of ATP synthase. From the research group of John Walker at the MRC Mitochondrial Biology Unit, Cambridge
- Animation. Powering the Cell: Mitochondria. From BioVisions at Harvard University

Relevant Nobel prizes

- 1906 Nobel Prize in Physiology or Medicine to Camillo Golgi and Santiago Ramón y Cajal
- 1974 Nobel Prize in Physiology or Medicine to Albert Claude, Christian de Duve and George E. Palade
- 1978 Nobel Prize in Chemistry to Peter Mitchell
- 1988 Nobel Prize in Chemistry to Johann Deisenhofer, Robert Huber and Hartmut Michel
- 1997 Nobel Prize in Chemistry to Paul D. Boyer, John E. Walker and Jens C. Skou
- 1999 Nobel Prize in Physiology or Medicine to Günter Blobel

John F. Allen web page

Lectures | Membrane Biochemistry | Membrane Proteins | Cell Biology and Developmental Genetics | Inaugural Lecture | Rudi Lemberg Lectures

The Endomembrane System

The Endomembrane System

Exocytosis and endocytosis

The Nobel Prize in Physiology or Medicine 1906
Camillo Golgi, Santiago Ramón y Cajal

The Nobel Prize in Physiology or Medicine 1906

Camillo Golgi

Santiago Ramón y Cajal

Camillo Golgi

Born: 7 July 1843, Corteno, Italy

Died: 21 January 1926, Pavia, Italy

Affiliation at the time of the award:
Pavia University, Pavia, Italy

Prize motivation: "in recognition of their work on the structure of the nervous system"

CAMILLO GOLGI

The neuron doctrine - theory and facts

Nobel Lecture December 11, 1906

At a point of time that the results of black staining had hardly started to become generally known, while I had already for about ten years achieved results much better in terms of clarity than those which had attracted attention elsewhere, the idea that cells and nerve cells formed an anatomical unit became much more acceptable to the mind in a far more objective way than that made possible by previous studies. The concept then developed that the cell body and all its processes make up one independent elementary organism which is not joined to others but merely contiguous with them. Waldeyer perceived the existence of such a unit and called it the neuron. In an effort to use the word neuron with the meaning given it by its creator, I must quote in its entirety Waldeyer's own description in a lecture which he gave in 1891 on the latest research into the anatomy of the nervous system. On page 52 of this publication Waldeyer says: "The nervous system is made up of in- numerable nerve units (neurons) which are anatomically and genetically independent of each other. Each nerve unit is composed of three parts: the body, the fibre, and the terminal branches. Physiological conduction can take place just as well from the body to the terminal branches as in the other direction. Motor impulses can only be transmitted from the body to the nerve terminals, while sensory impulses can travel in either direction."

CAMILLO GOLGI

The neuron doctrine - theory and facts

Nobel Lecture December 11, 1906

We thus arrive with regard to my studies to what I have called the endo cellular reticular apparatus. This structure is illustrated by Figs. 11, 12 and 13, which show nerve cells from the intervertebral ganglia of the horse, and by Fig. 14 which shows a cell of the same type from the dog. In showing these pictures here, I must repeat what I have persistently said before, that is, that the significance of these structures still represents an unsolved problem.

Fig. 11

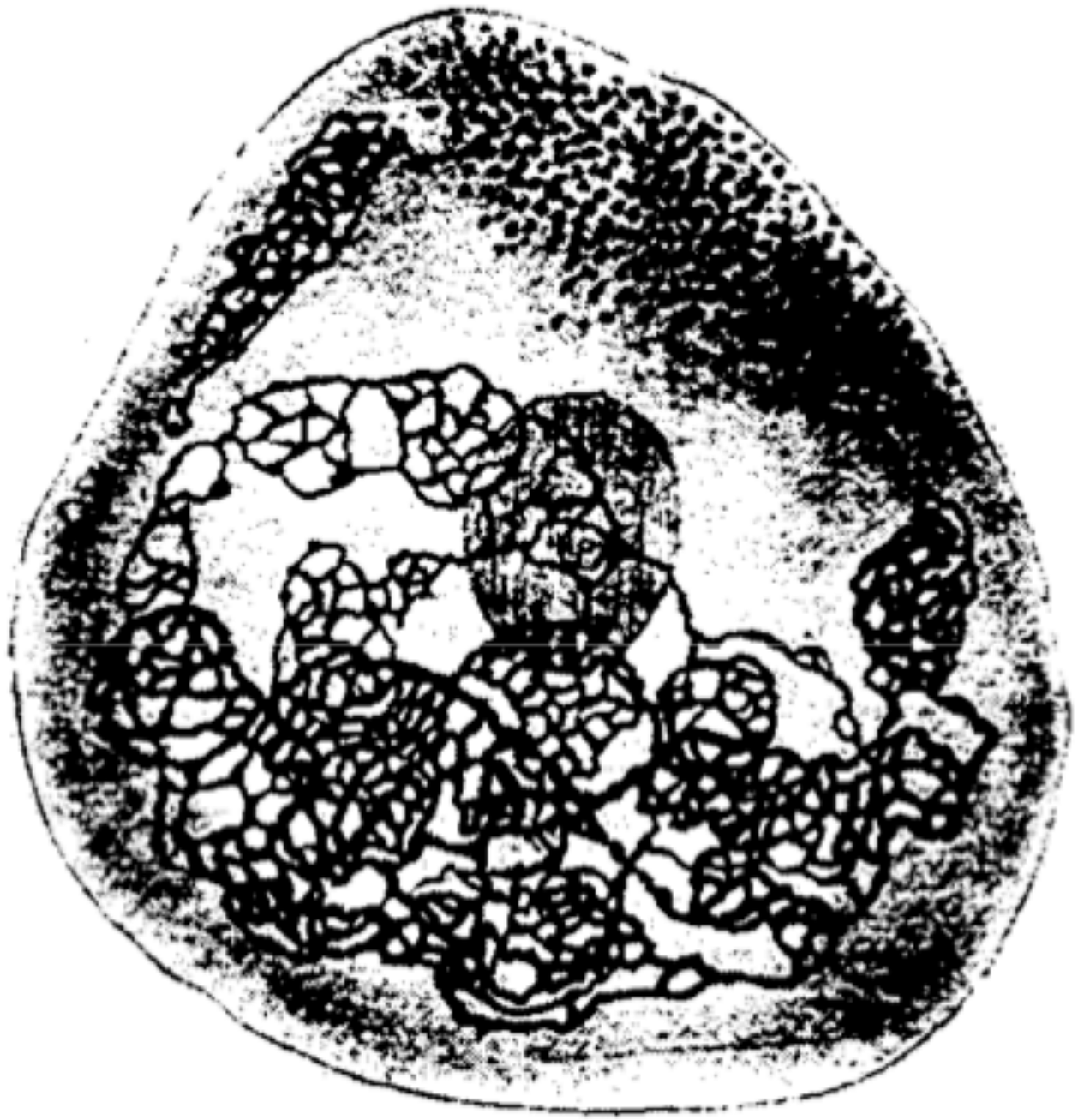


Fig.12

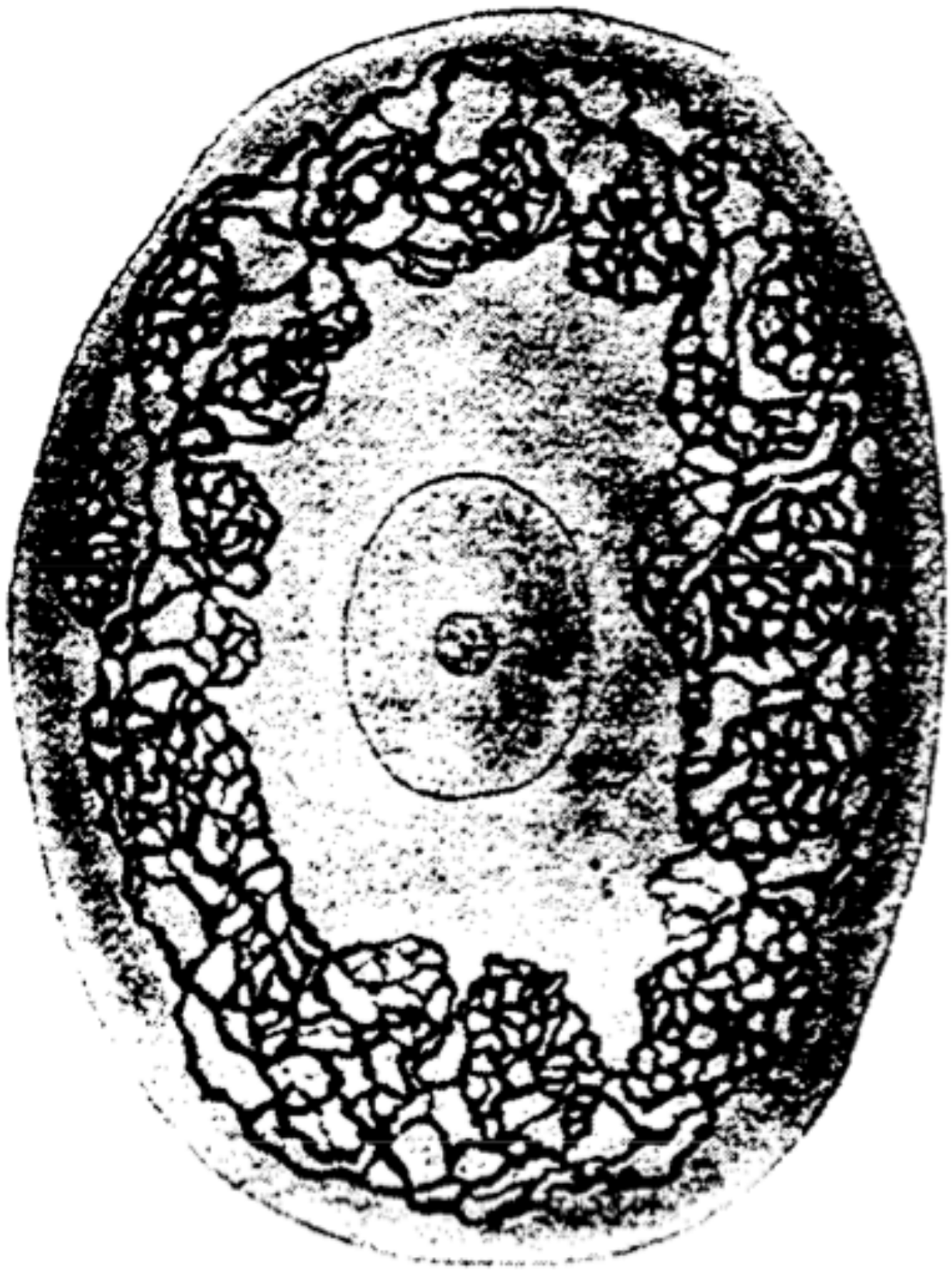


Fig.13

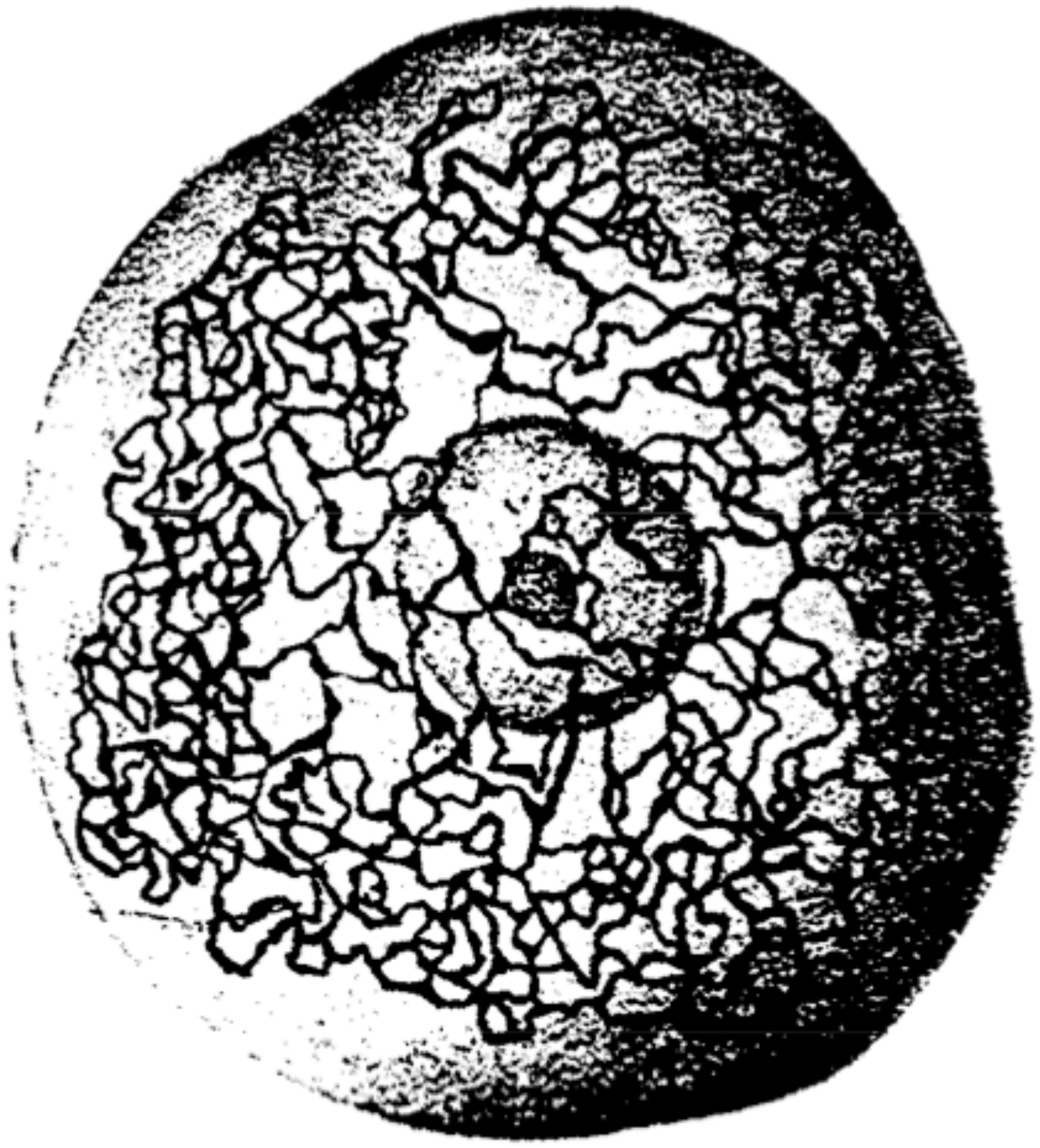


Fig.14

CAMILLO GOLGI

The neuron doctrine - theory and facts

Nobel Lecture December 11, 1906

The conclusion of this account of the neuron question, which has had to be rather an assembly of facts, brings me back to my starting-point, namely that no arguments, on which Waldeyer supported the theory of the individuality and independence of the neuron, will stand examination. We have seen, in fact, how we lack embryological data and how anatomical arguments, either individually or as a whole, do not offer any basis firm enough to uphold this doctrine. In fact, all the characteristics of nerve process, protoplasmic process and cell-body organization which we have examined seem to point in another direction.

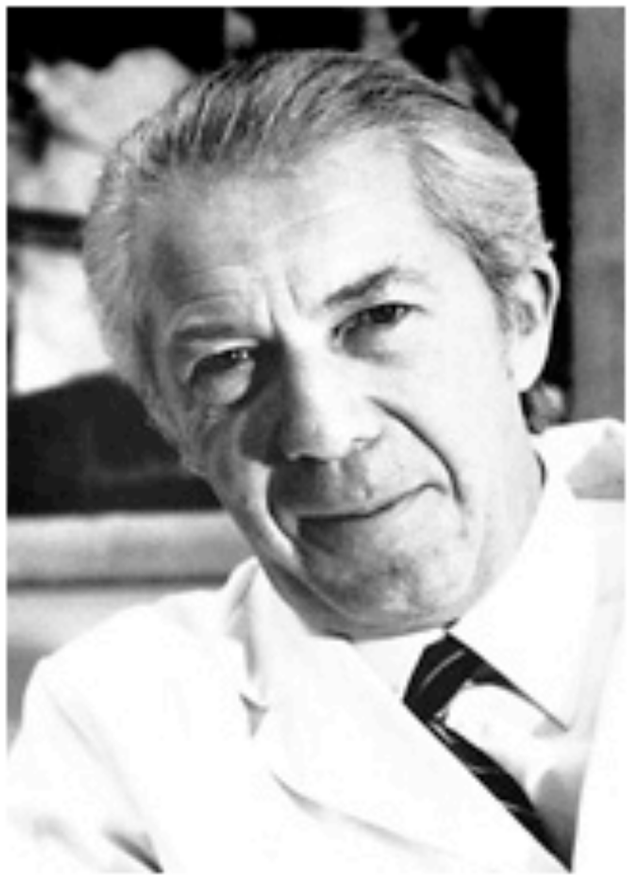
http://nobelprize.org/nobel_prizes/medicine/laureates/1906/golgi-lecture.pdf

The Nobel Prize in Physiology or Medicine 1974

Albert Claude, Christian de Duve, George E. Palade

- **The Nobel Prize in Physiology or Medicine 1974**
- Nobel Prize Award Ceremony
- Albert Claude
- Christian de Duve
- George E. Palade

Albert Claude



Christian de Duve

George E. Palade

The Nobel Prize in Physiology or Medicine 1974 was awarded jointly to Albert Claude, Christian de Duve and George E. Palade *"for their discoveries concerning the structural and functional organization of the cell"*.

Cells.... Plant

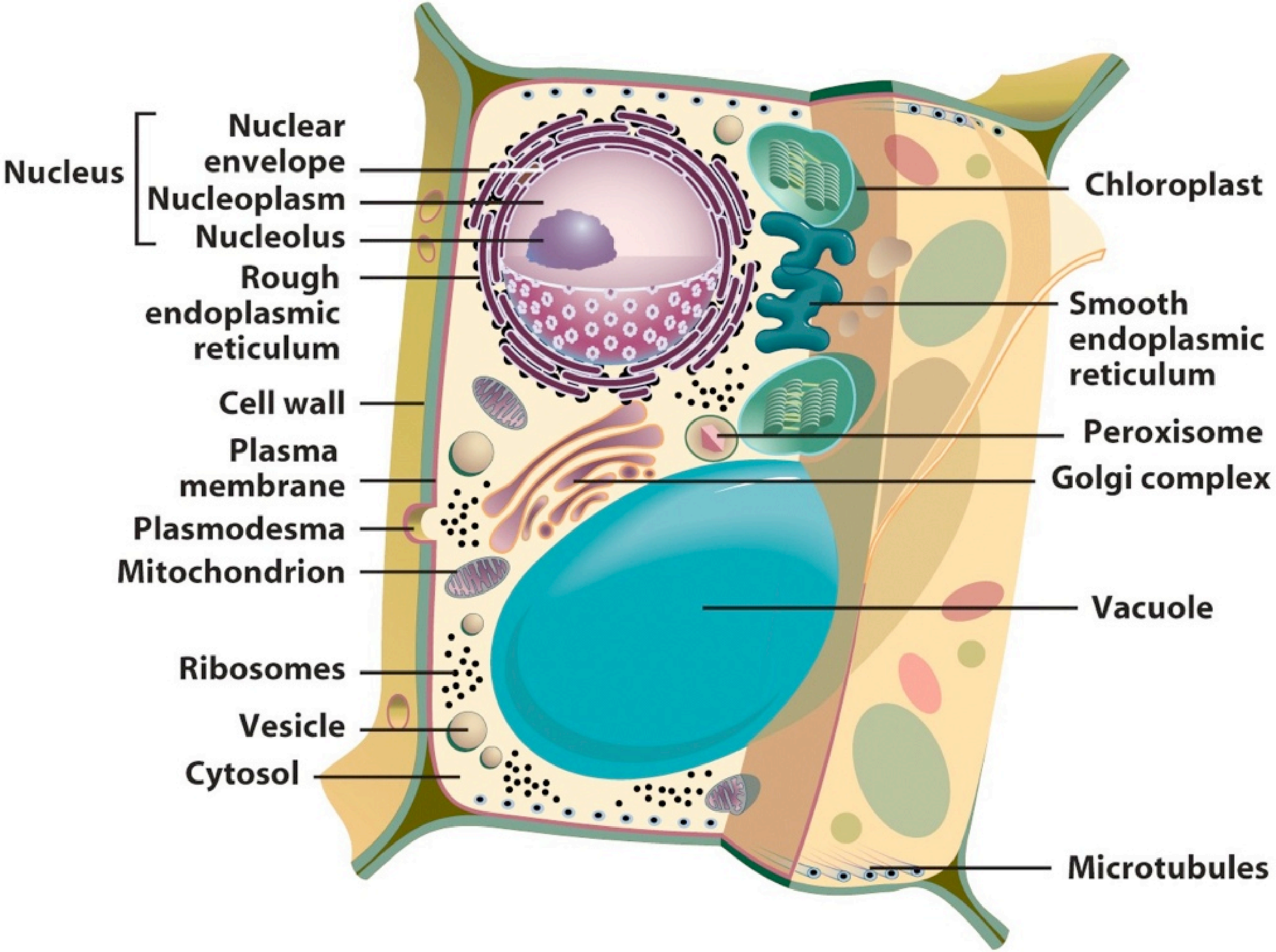
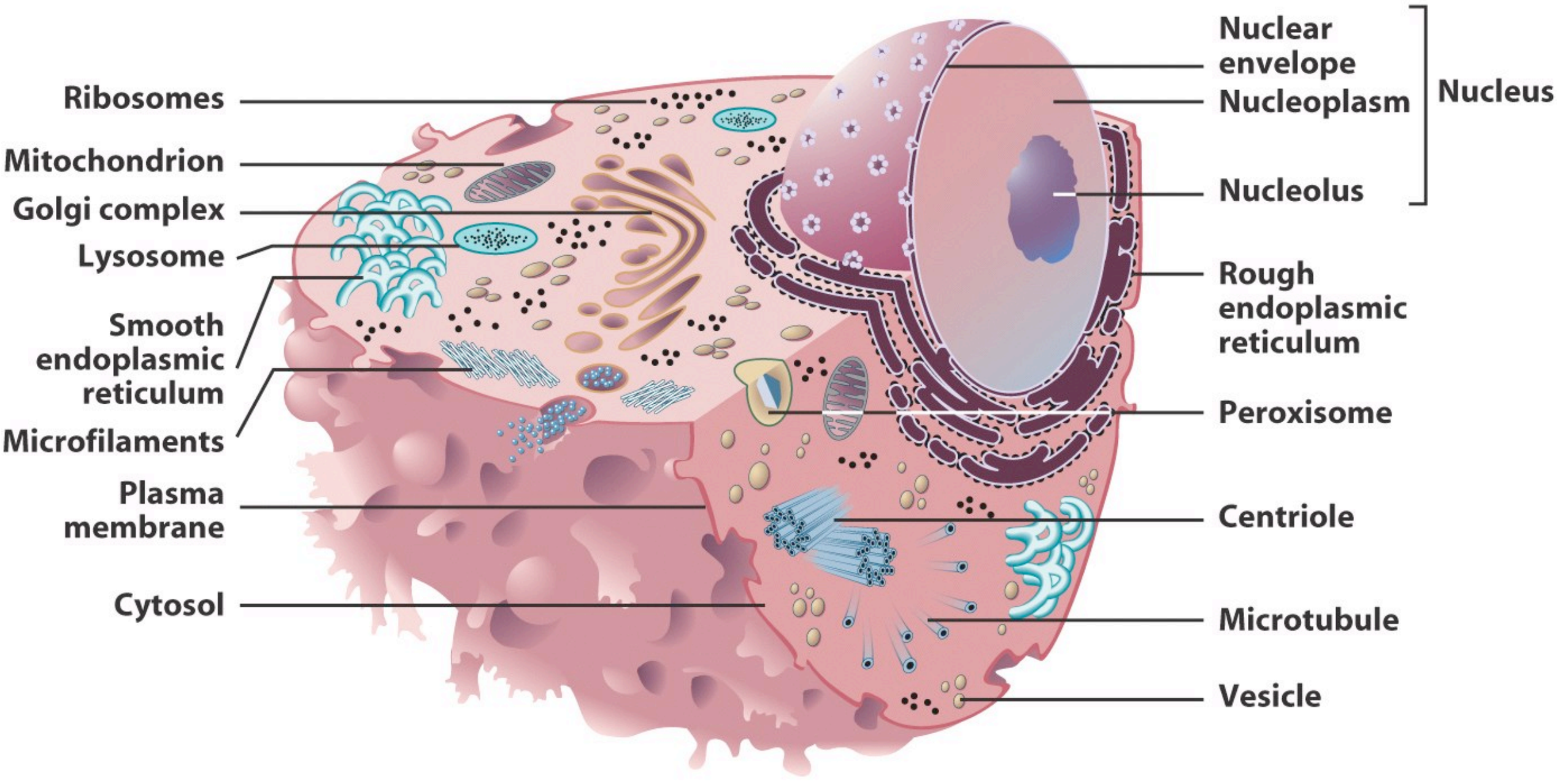


Figure 1-8b Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)

Cells.... Animal



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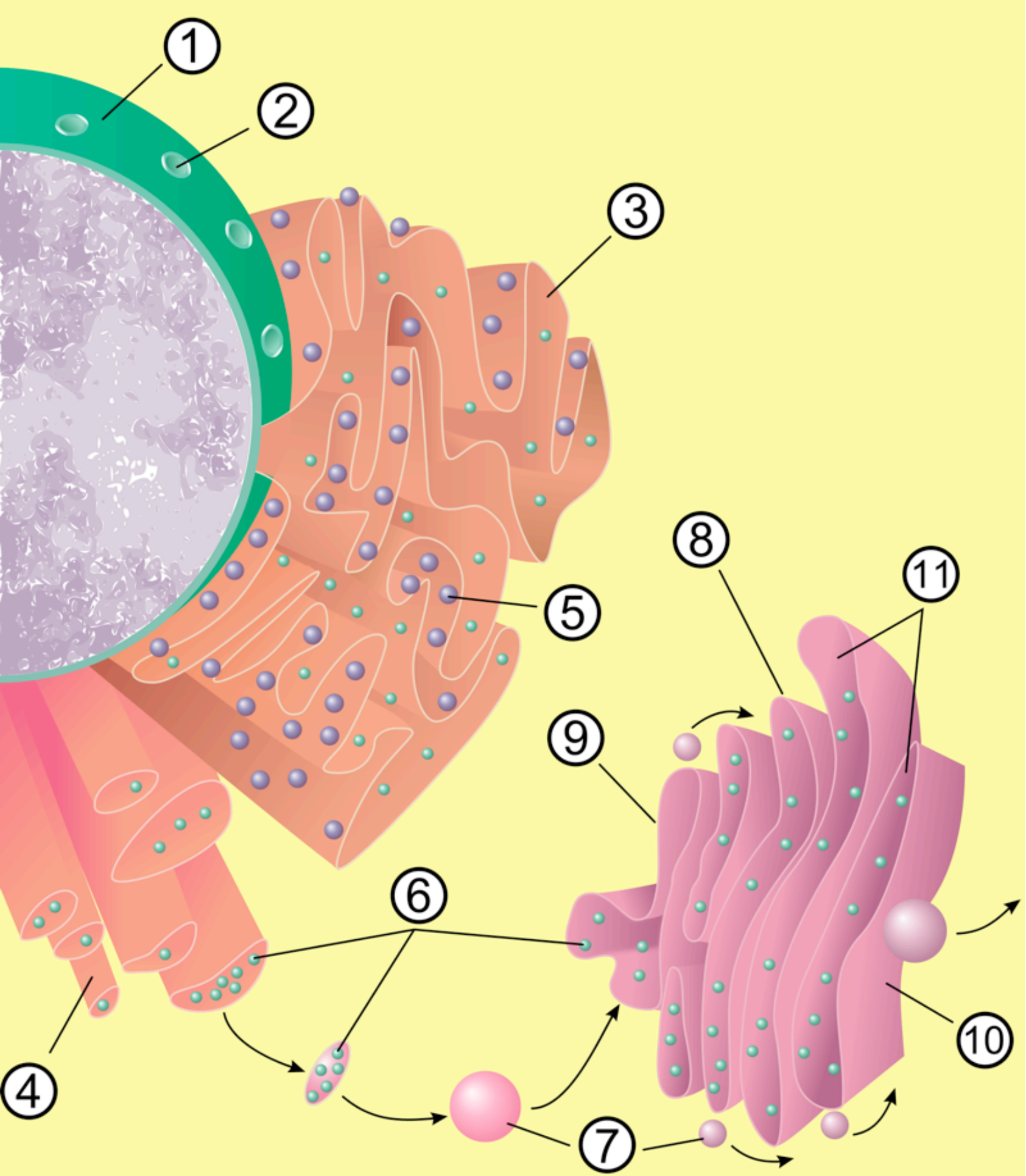


Secretory pathway diagram, including nucleus, endoplasmic reticulum and golgi apparatus.

1. Nuclear membrane
2. Nuclear pore
3. Rough endoplasmic reticulum (rER)
4. Smooth endoplasmic reticulum (sER)
5. Ribosome attached to rER
6. Macromolecules
7. Transport vesicles
8. Golgi apparatus
9. *Cis* face of Golgi apparatus
10. *Trans* face of Golgi apparatus
11. Cisternae of Golgi apparatus

Magnus Manske

http://en.wikipedia.org/wiki/File:Nucleus_ER_golgi.svg

Wikipedia contributors. "Golgi apparatus." *Wikipedia, The Free Encyclopedia*. Wikipedia, The Free Encyclopedia, 25 Oct. 2010. Web. 25 Oct. 2010.

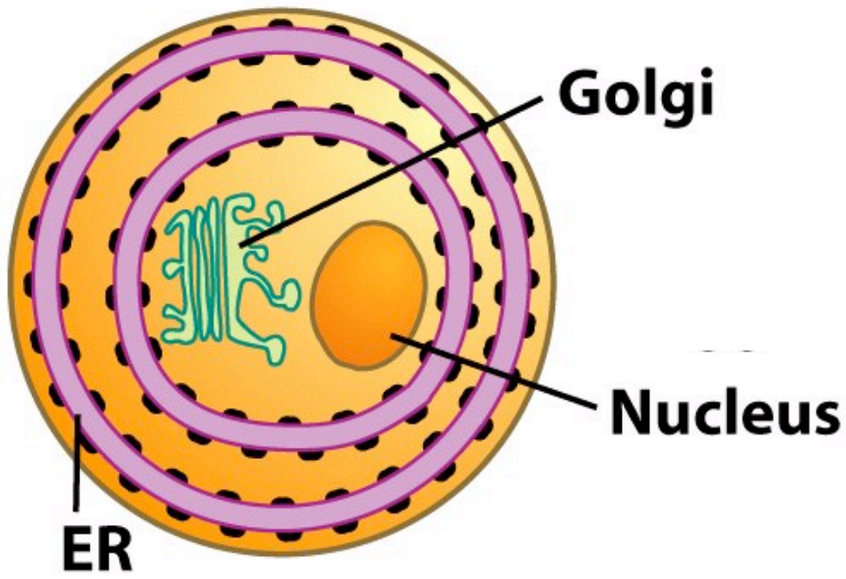
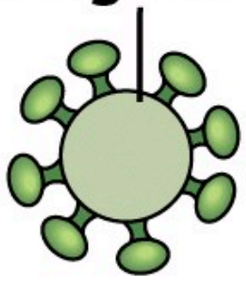


Figure 8-4c Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)

Viral genome contains temperature-sensitive *VSVG* gene fused to *GFP* gene



VSV

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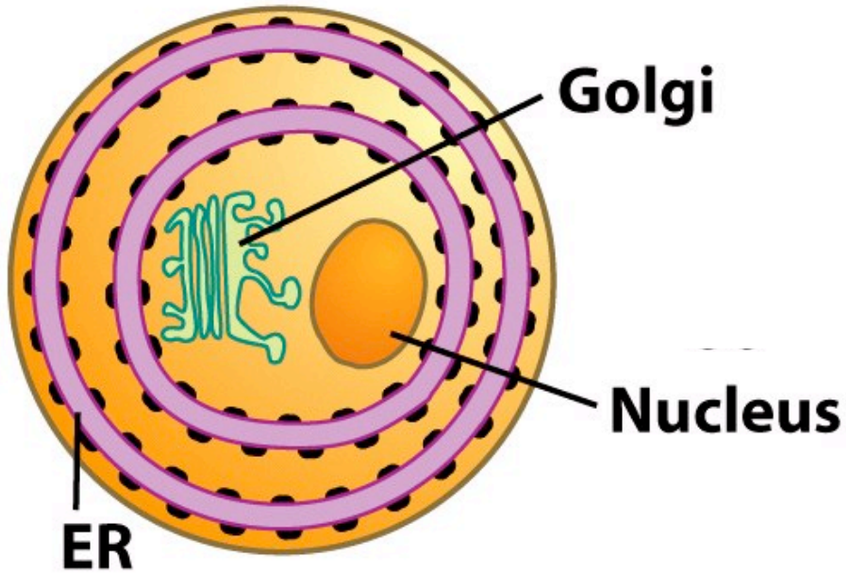

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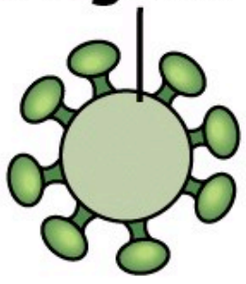

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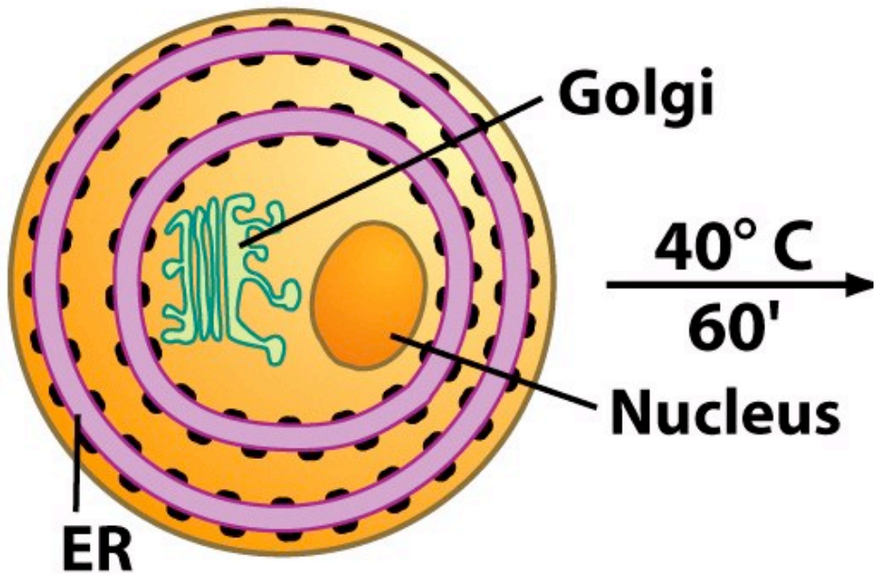

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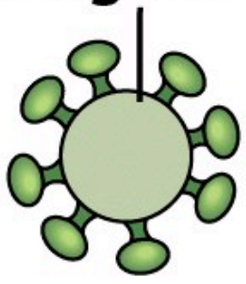

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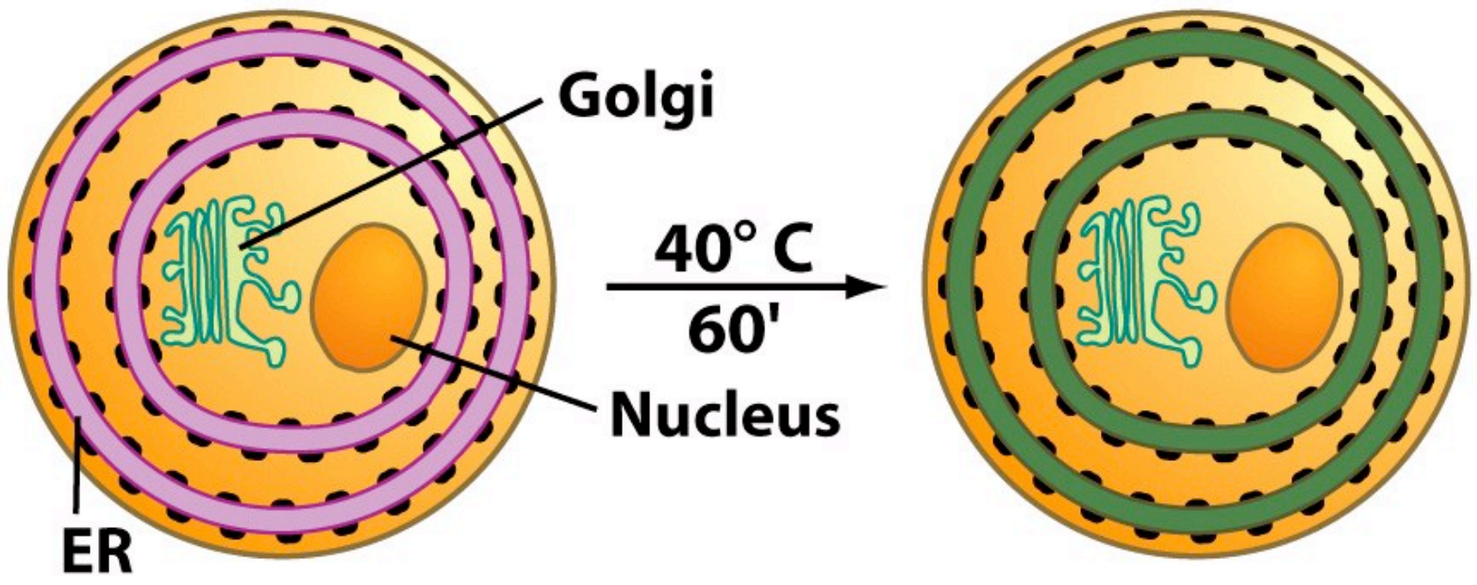

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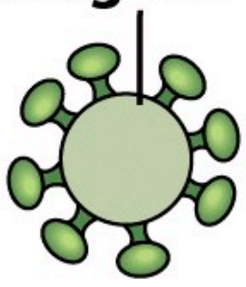

VSV

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Figure 8-4c Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)

Exocytosis and endocytosis

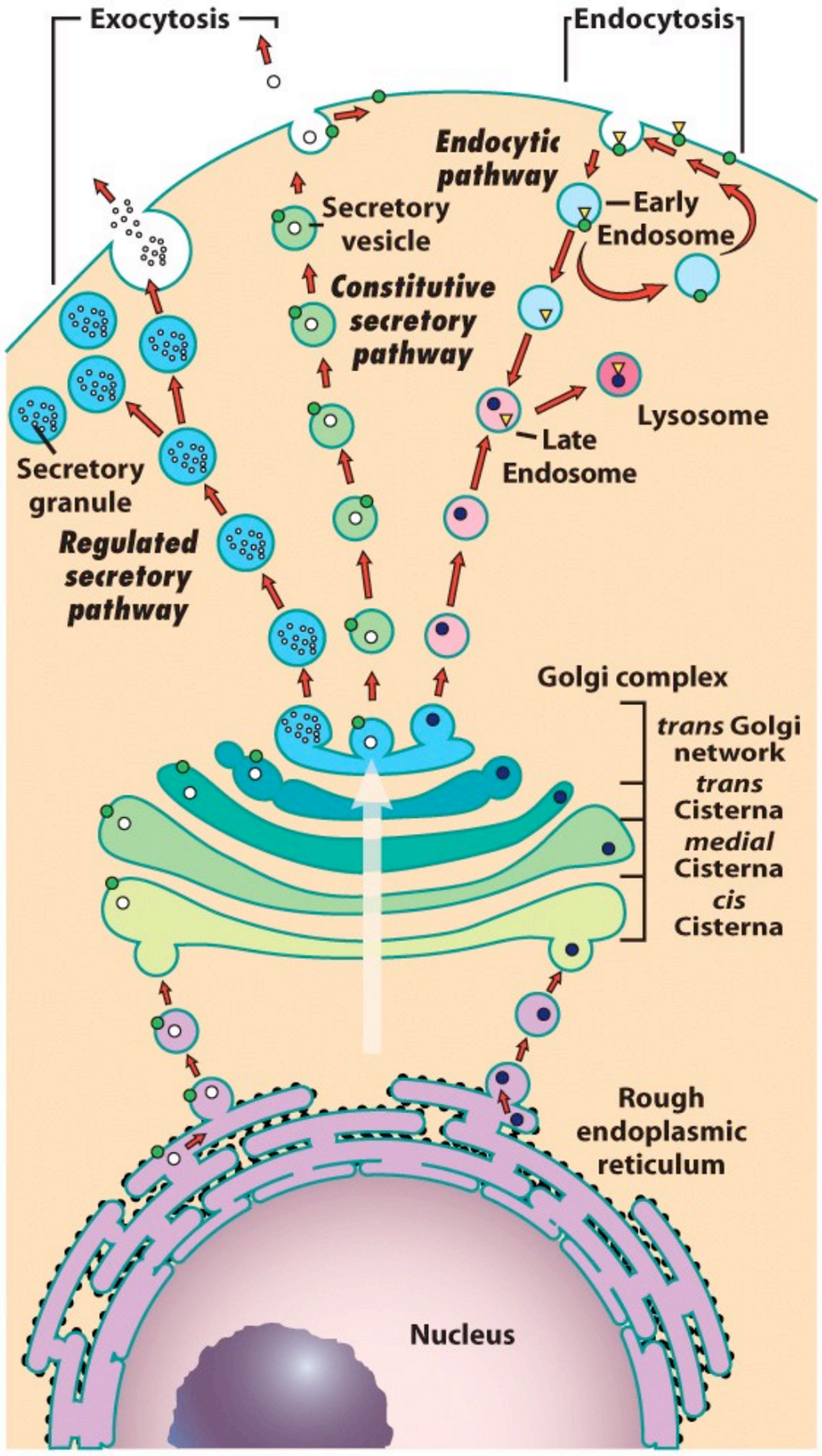


Figure 8-2b Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)

Figure 8.2 An overview of the biosynthetic/secretory and endocytic pathways that unite endomembranes into a dynamic, interconnected network.

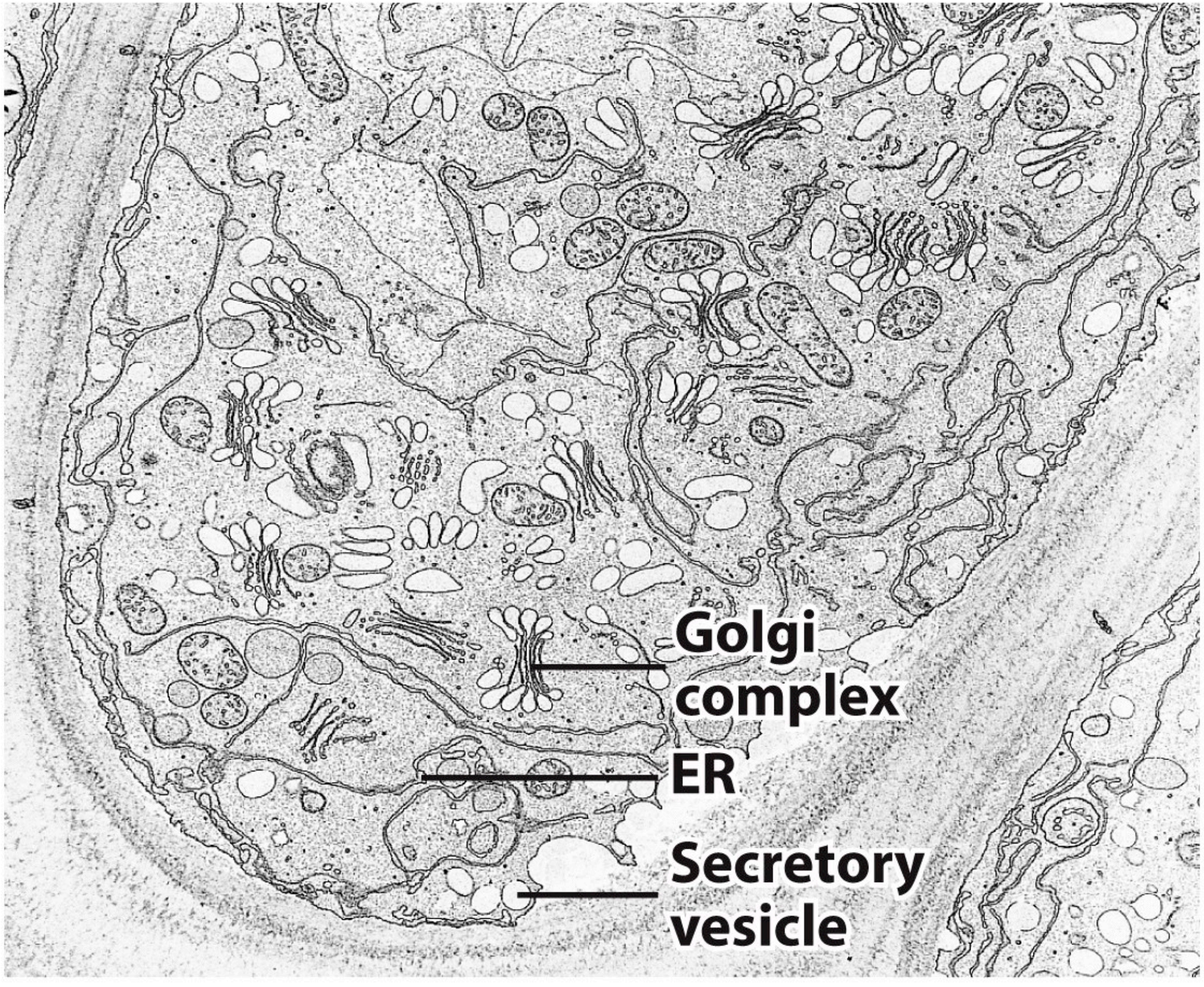


Figure 8-1 Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)

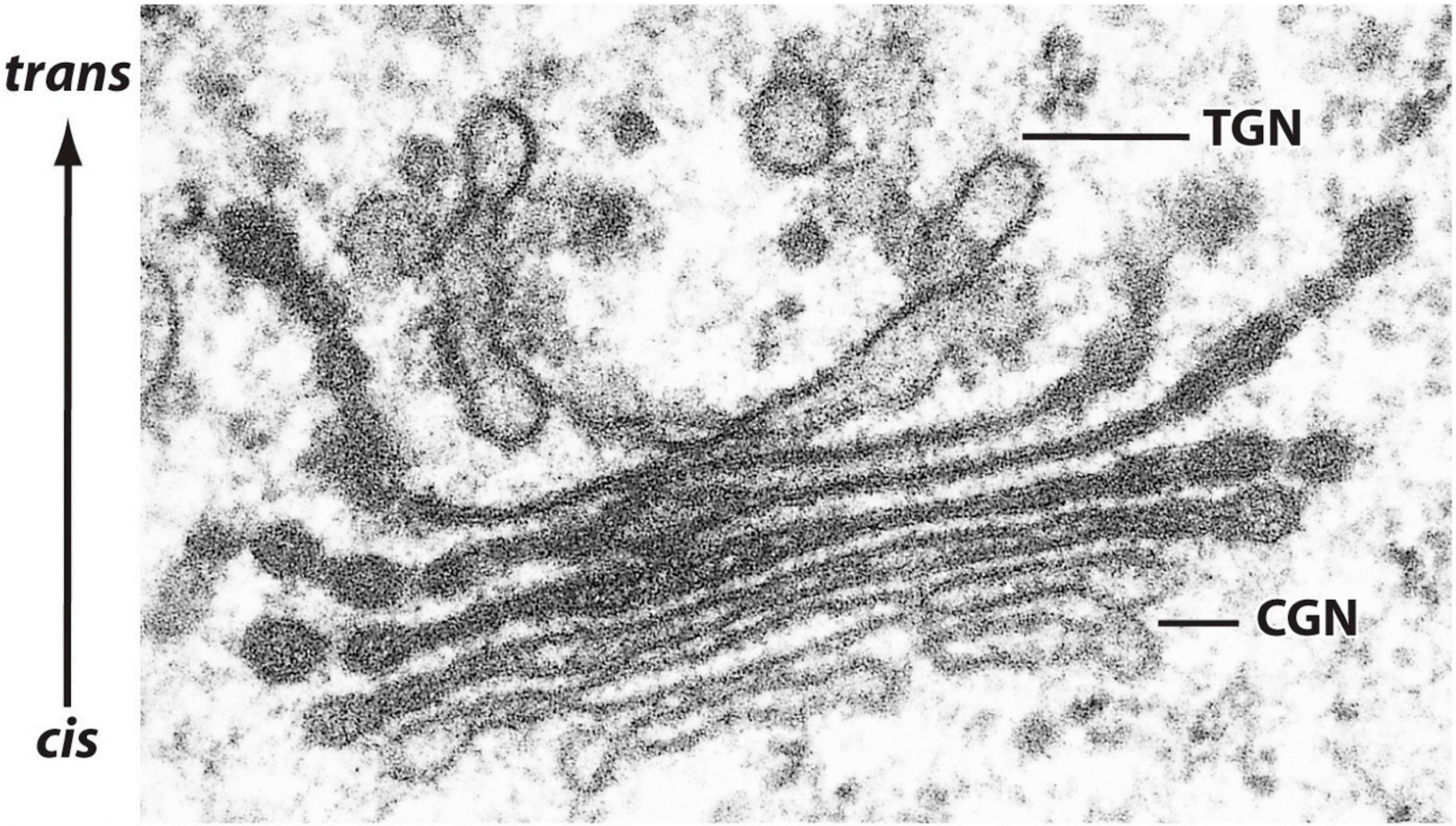
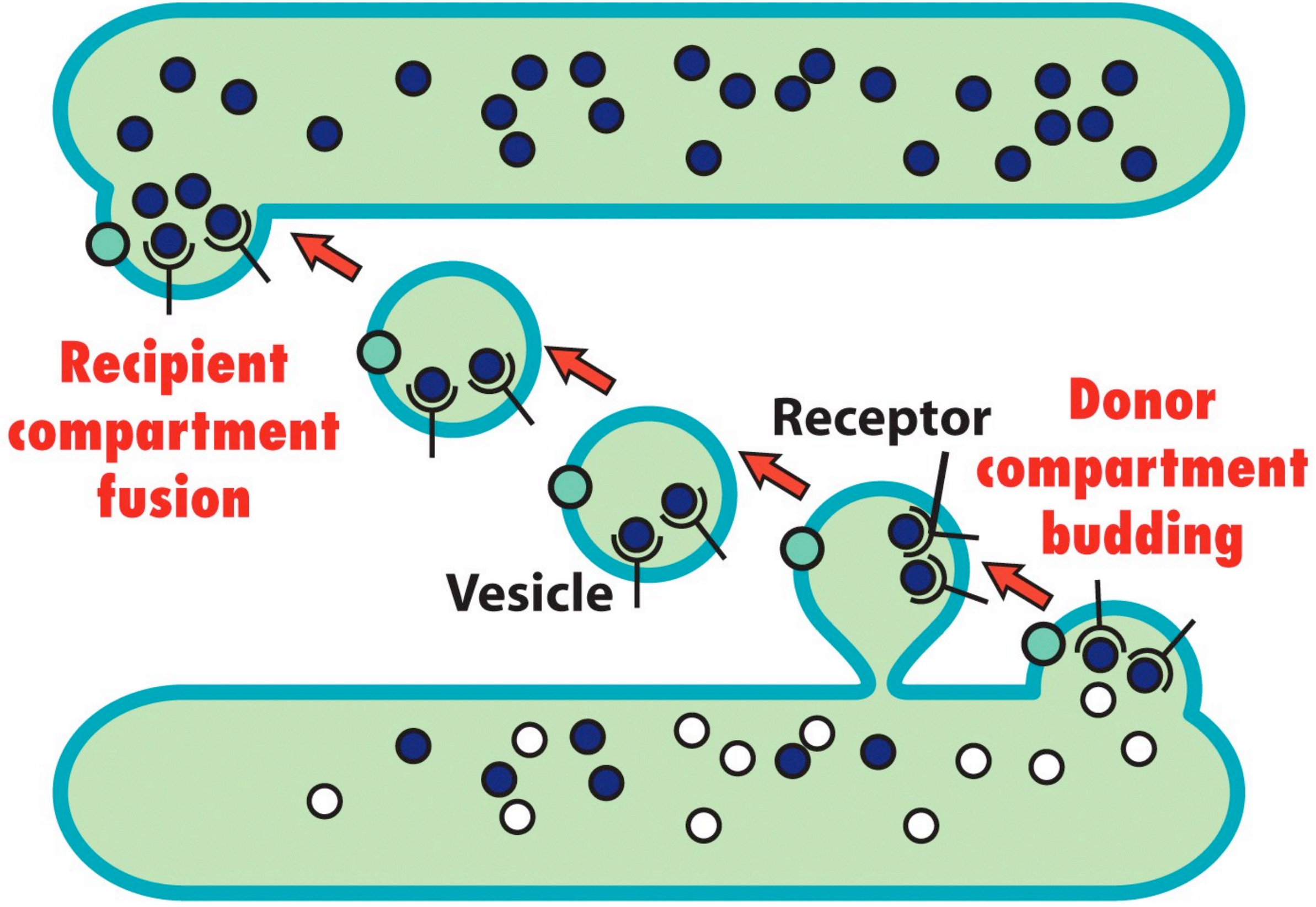


Figure 8-20b Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)

Figure 8-20a Cell and Molecular Biology, 5/e (© 2008 John Wiley & Sons)



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Next lecture...

Next lecture...

The endomembrane system

Vesicular transport

Membrane Biochemistry

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Intermission....