



...Anatomy & Physiology Lab Thurs! Fun again!

BI 121 Lecture 3

I. Announcements Q from last time? **Come to office hr!**

II. Connections Homeostatic model: BP regulation

III. Cell Anatomy, Physiology & Compartmentalization LS ch 2

A. How big? What boundaries? Why compartments? pp19-21

B. Basic survival skills ch 1 p 3

C. Organelles ≡ Intracellular specialty shops LS pp 21-34

1. Endoplasmic reticulum (ER) fig 2-1, 2-2, 2-3

2. Golgi complex fig 2-3, 2-4

3. Lysosomes fig 2-5, 2-6

4. Peroxisomes fig 2-6

5. Mitochondria fig 2-8 LS 2012 pp 20-34, tab 2-1 p 36

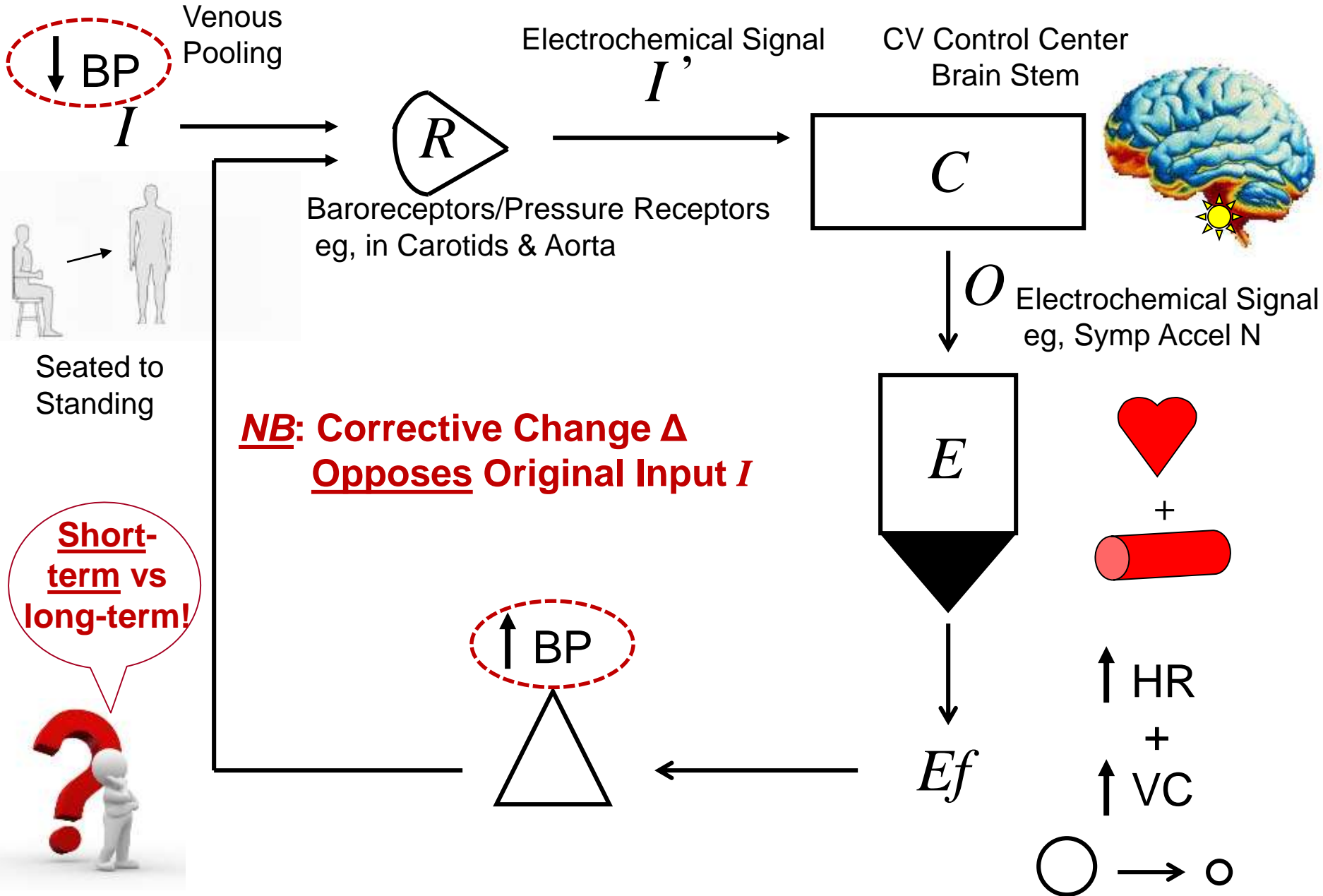
D. **Physiol News** Moms eggs execute Dad's mitochondria?

IV. Anaerobic vs Aerobic Metabolism Overview Many sources!

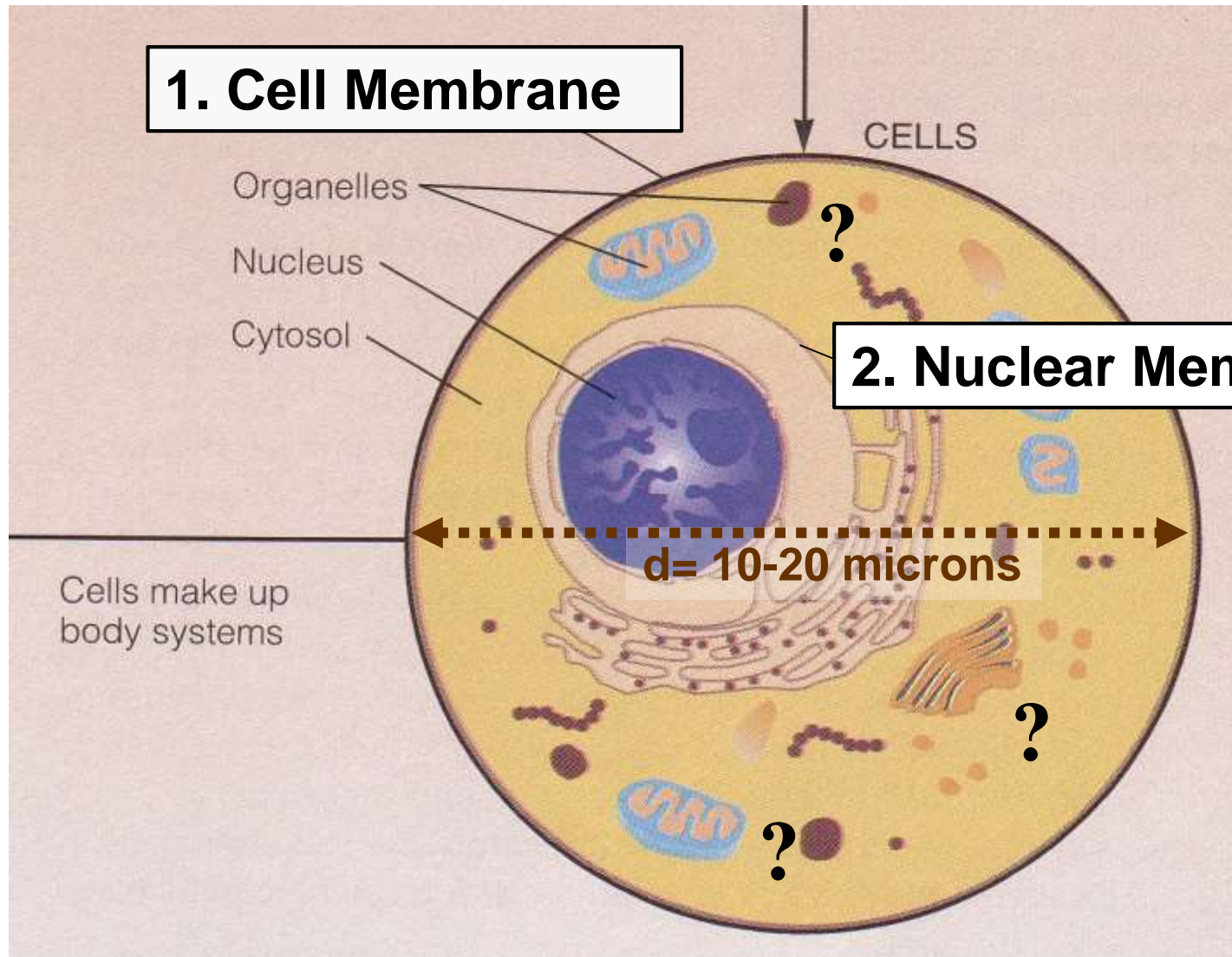
Mathews & Fox 1976...LS 2012 pp 26-33, fig 2-15 p 33

A. ATP-PC Immediate, Glycolytic & Aerobic Energy Systems

Blood Pressure Homeostasis



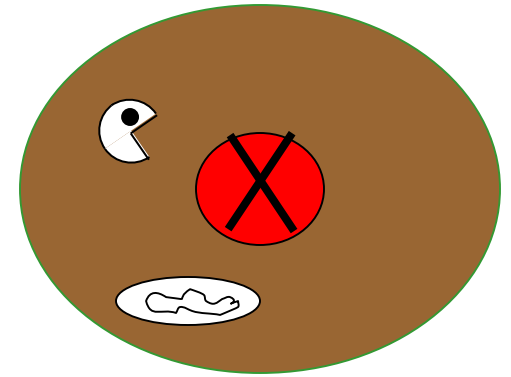
How Big? 100 Cells Lengthwise = 1 mm!!



<http://opb.pbslearningmedia.org/resource/tdc02.sci.life.cell.nucleus/nucleus-cytoplasm-membrane/>

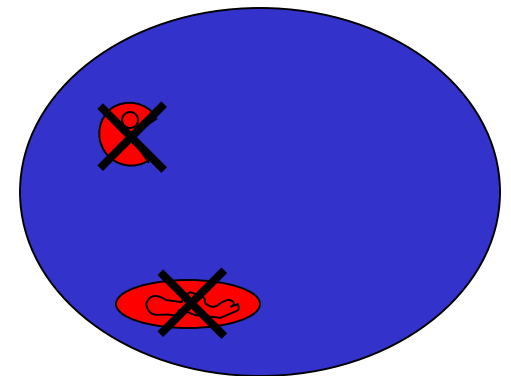
Cytoplasm = Cell - Nucleus

[Extract nucleus; includes organelles]



Cytosol = Cytoplasm - Organelles

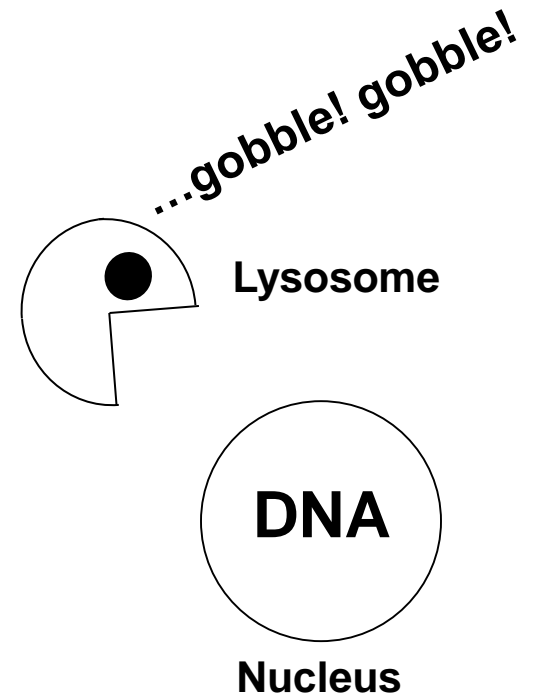
[Extract organelles; complex gel-liquid]



Why Compartments? Advantage?

**Incompatible reactions can
take place**

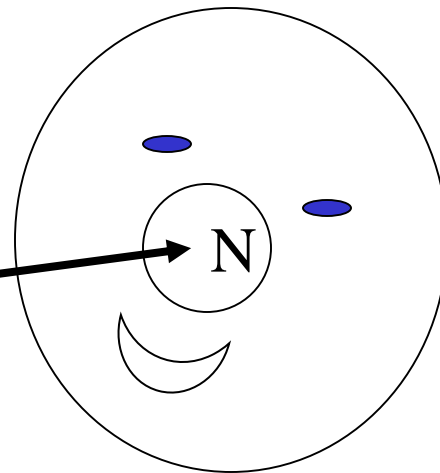
Simultaneously!!



Basic Cell Survival Skills?

- 1. Get food**
- 2. Use food**
- 3. Rid wastes**
- 4. Move**
- 5. Reproduce**

Nucleus or nose?



How to live?

1 Sample Cartoon of 100 Trillion (100×10^{12}) Cells!

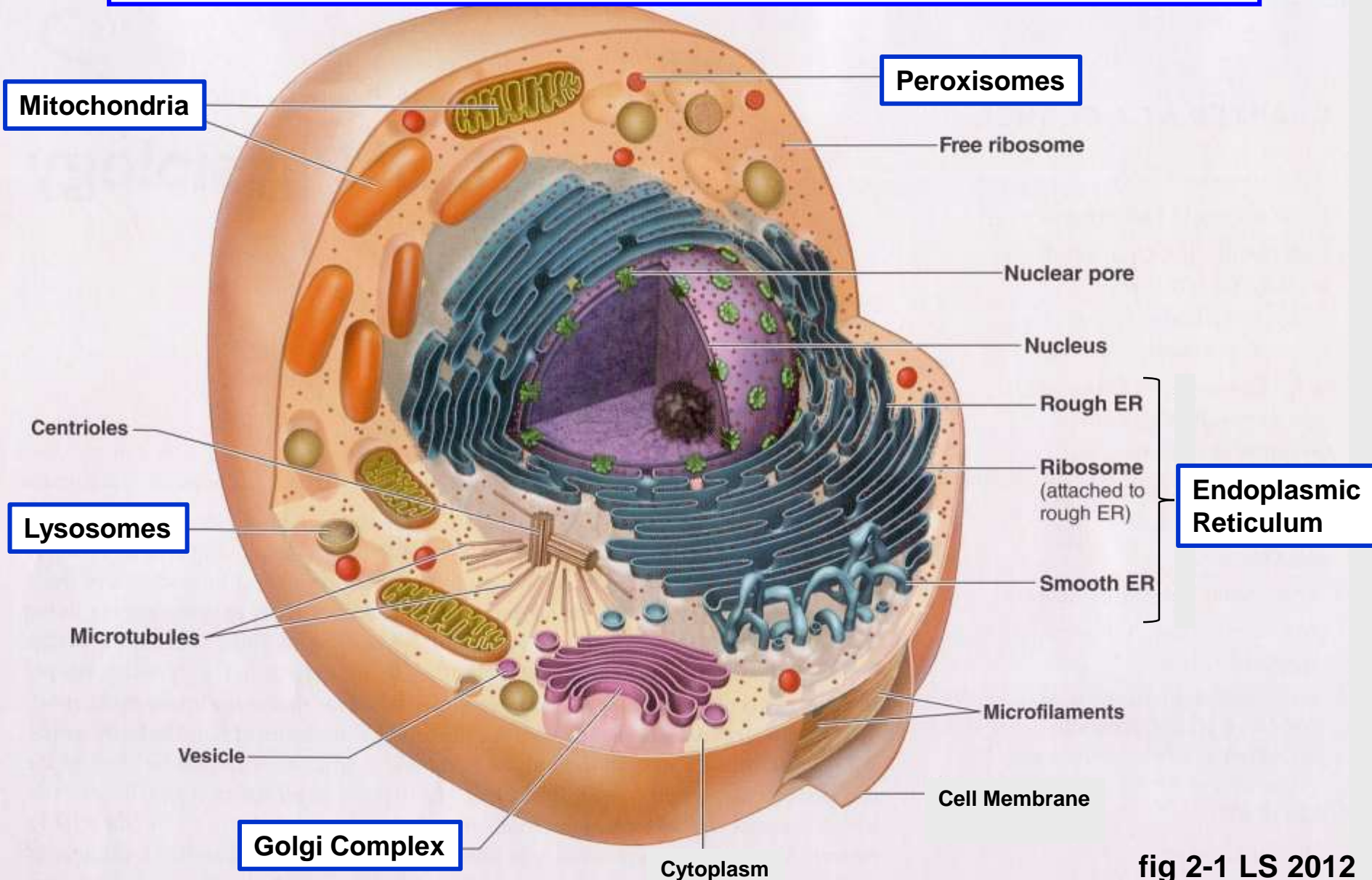
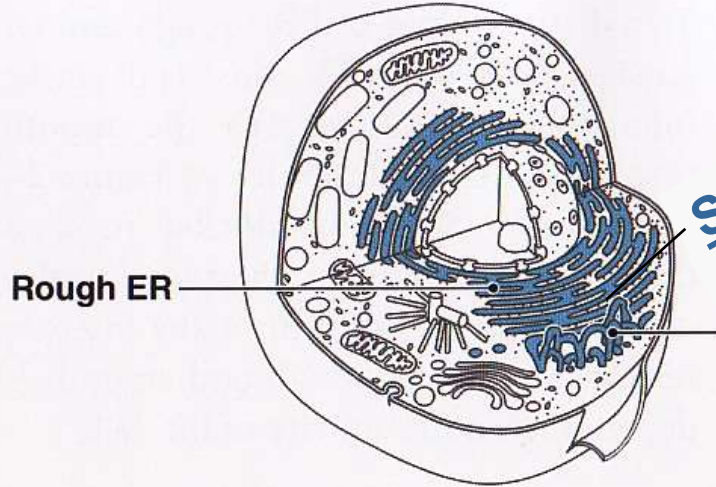


fig 2-1 LS 2012

<http://opb.pbslearningmedia.org/resource/tdc02.sci.life.cell.organelles/organelles-in-the-cytoplasm/>

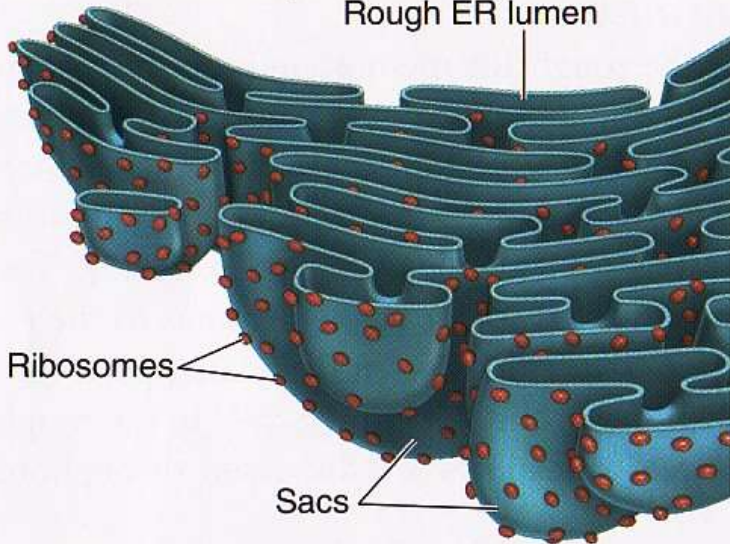
Rough & Smooth Endoplasmic Reticulum (ER): Protein & Lipid Synthesizing Factories

Smooth ER:
1. packages new proteins in transport vesicles
2. stores calcium in muscles



Rough ER

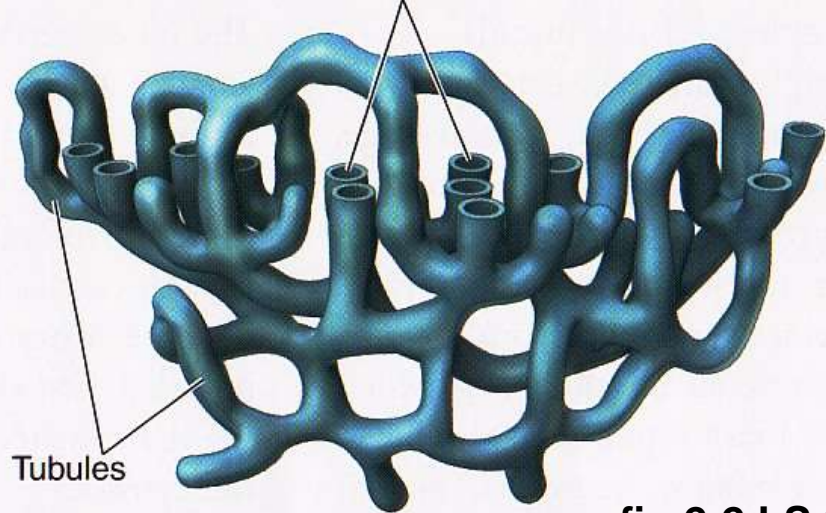
Rough ER lumen



Ribosomes

Sacs

Smooth ER lumen



Tubules

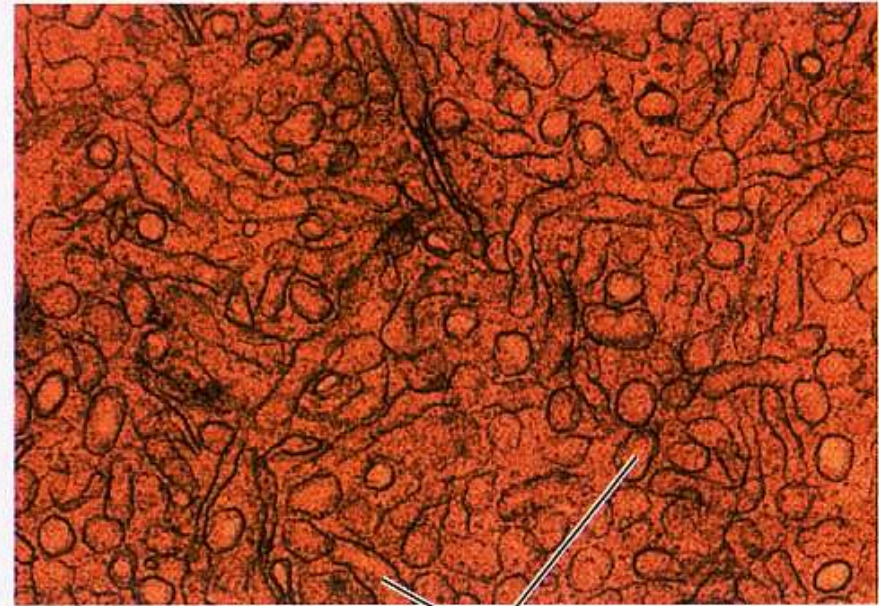
fig 2-2 LS 2012

Electron Micrographs of Rough vs. Smooth ER



Rough ER lumen

Ribosomes



Smooth ER lumen

Secretion of Proteins Produced by ER

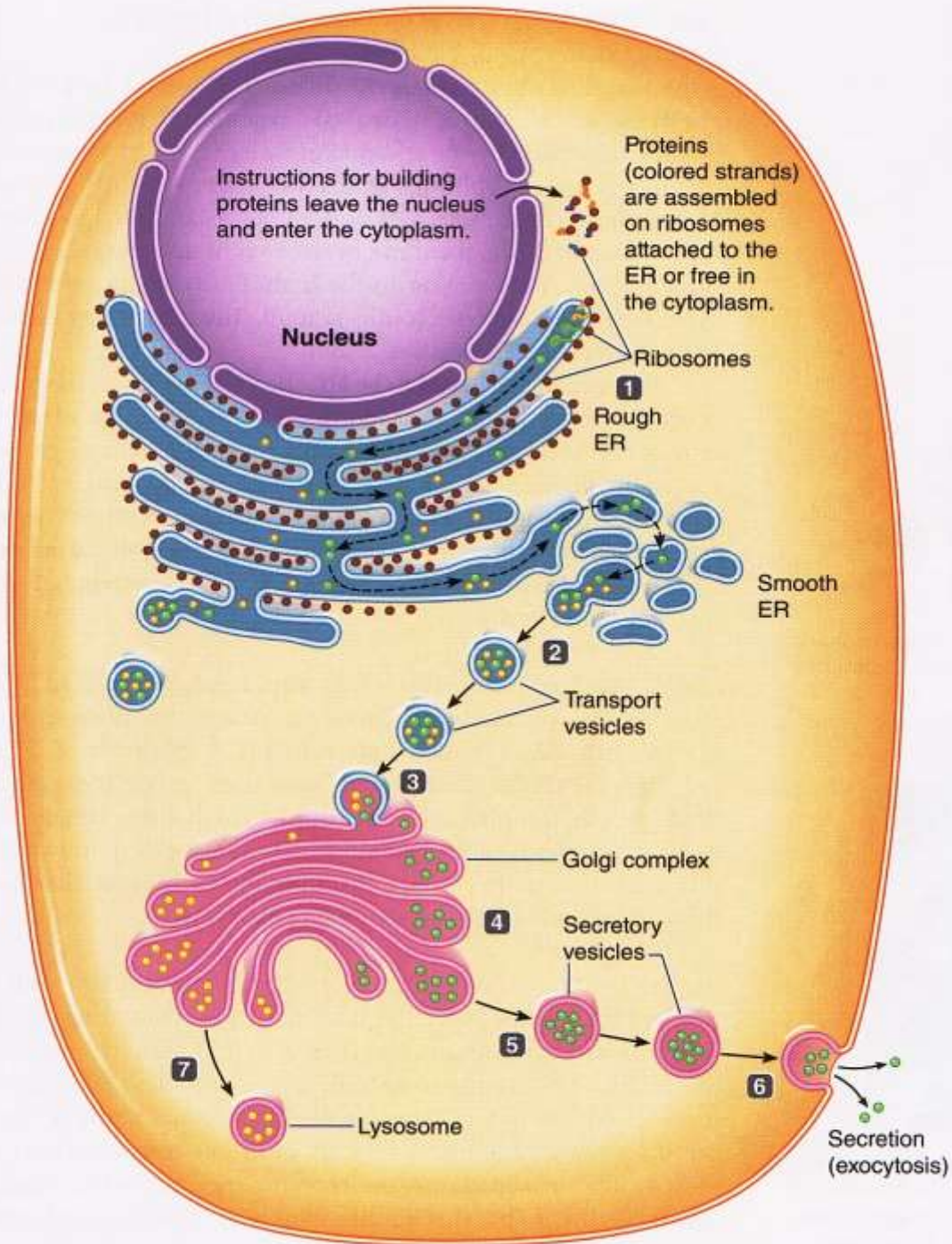
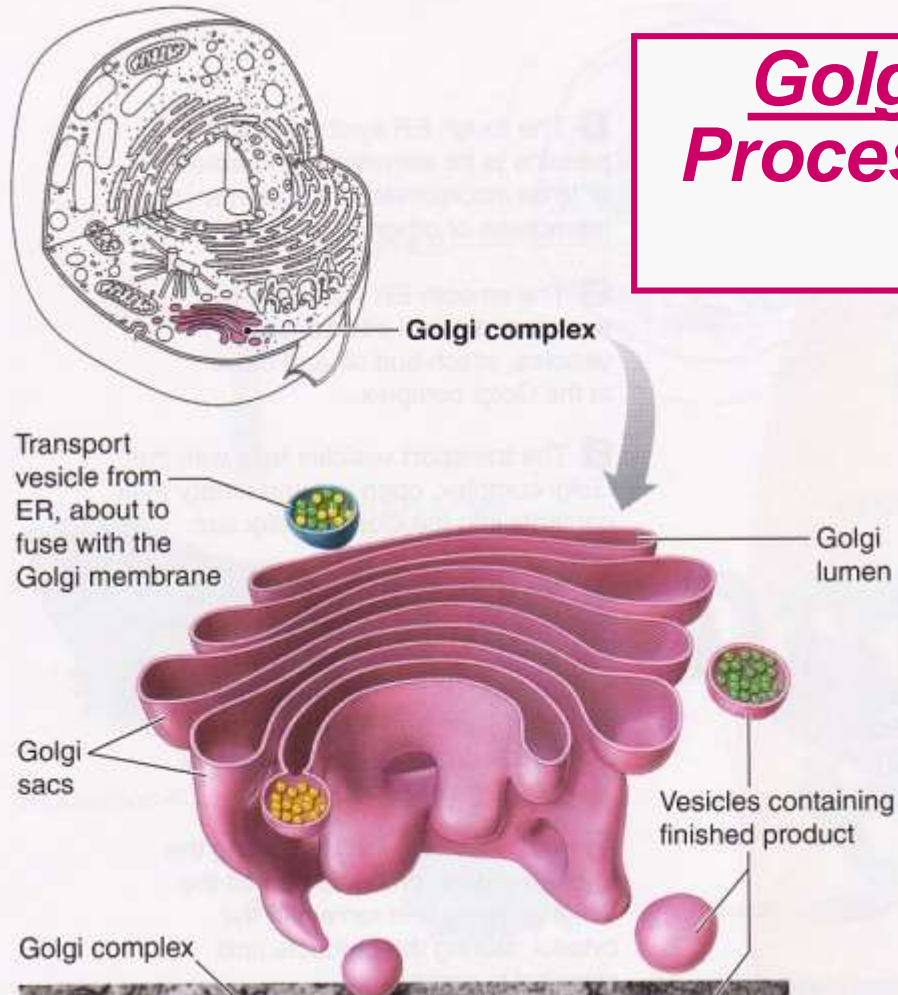


fig 2-3 LS 2012

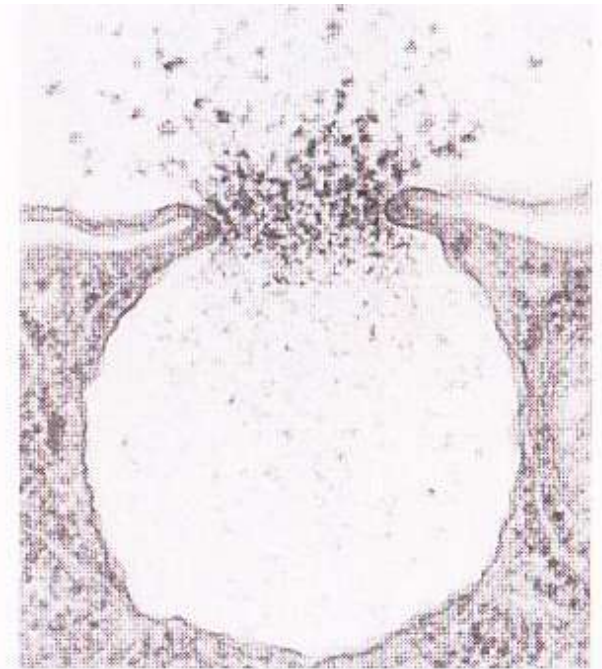
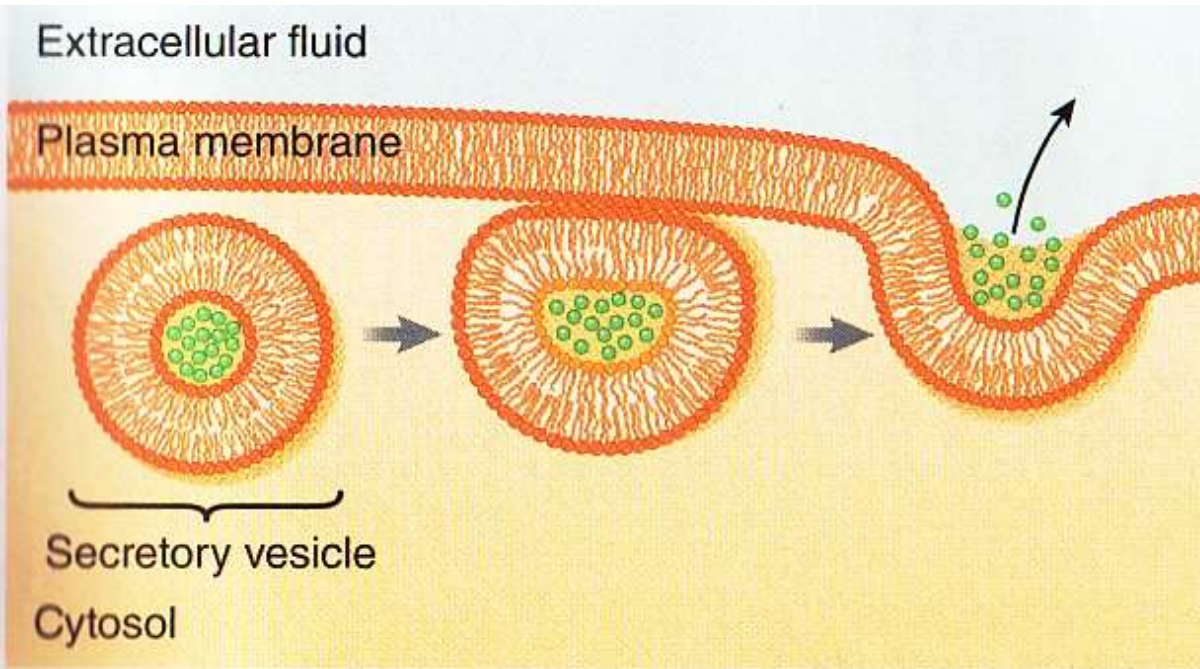
Golgi Complex: Final Processing, Packaging & Distribution



Dr. Don Fawcett & R. Bollender/Visuals Unlimited

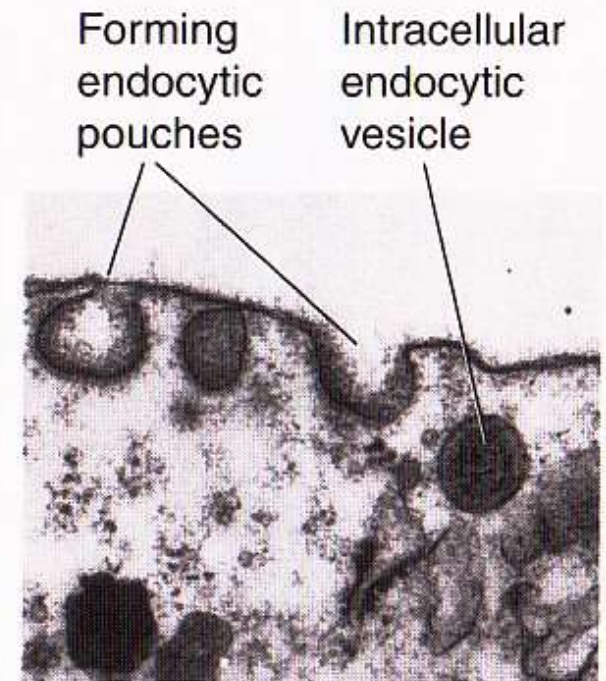
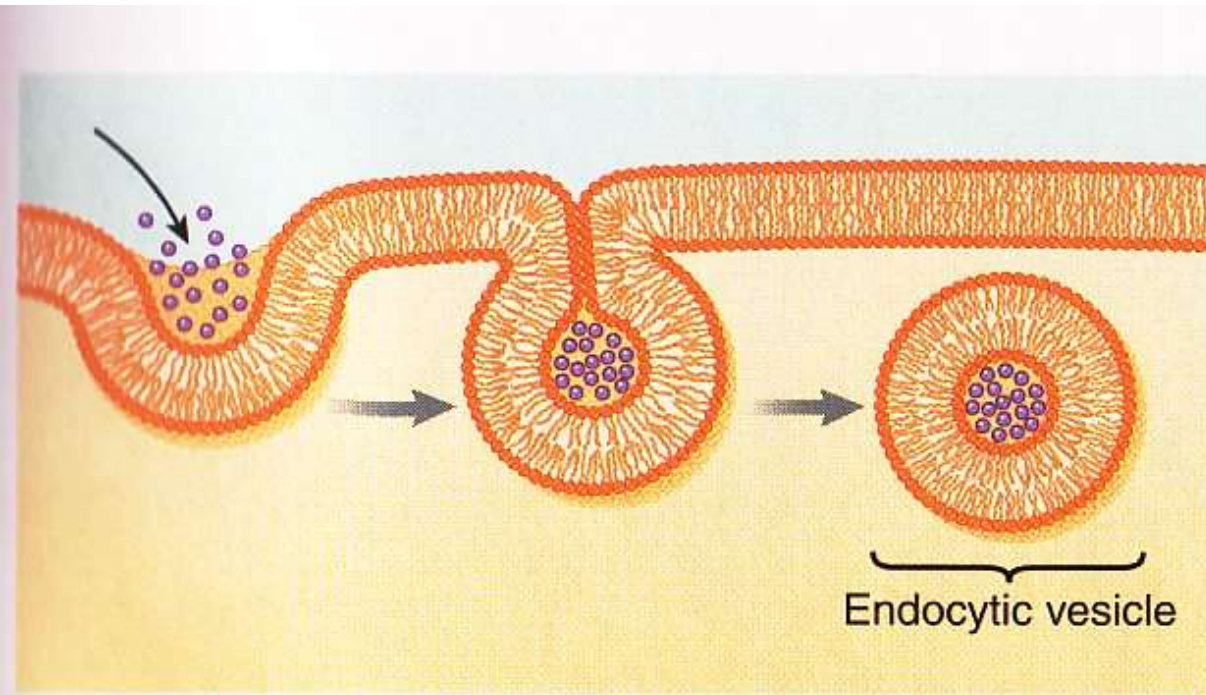
fig 2-4 LS 2012

Exocytosis: Primary Means of Secretion



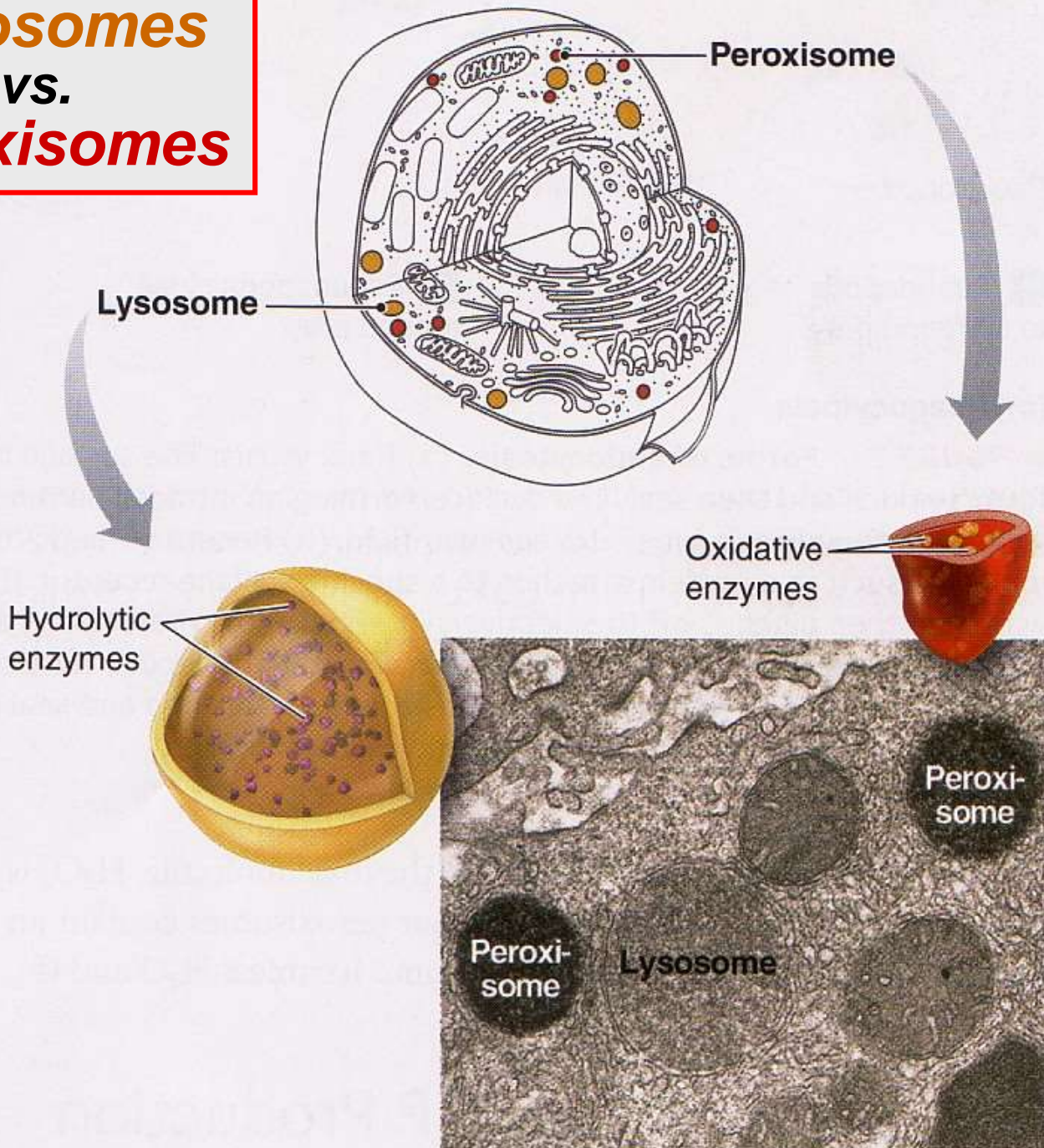
(a) Dr. Birgit Satir, Albert Einstein College of Medicine

Endocytosis: Primary Means of Ingestion



(b) © Don W. Fawcett/Photo Researchers, Inc.

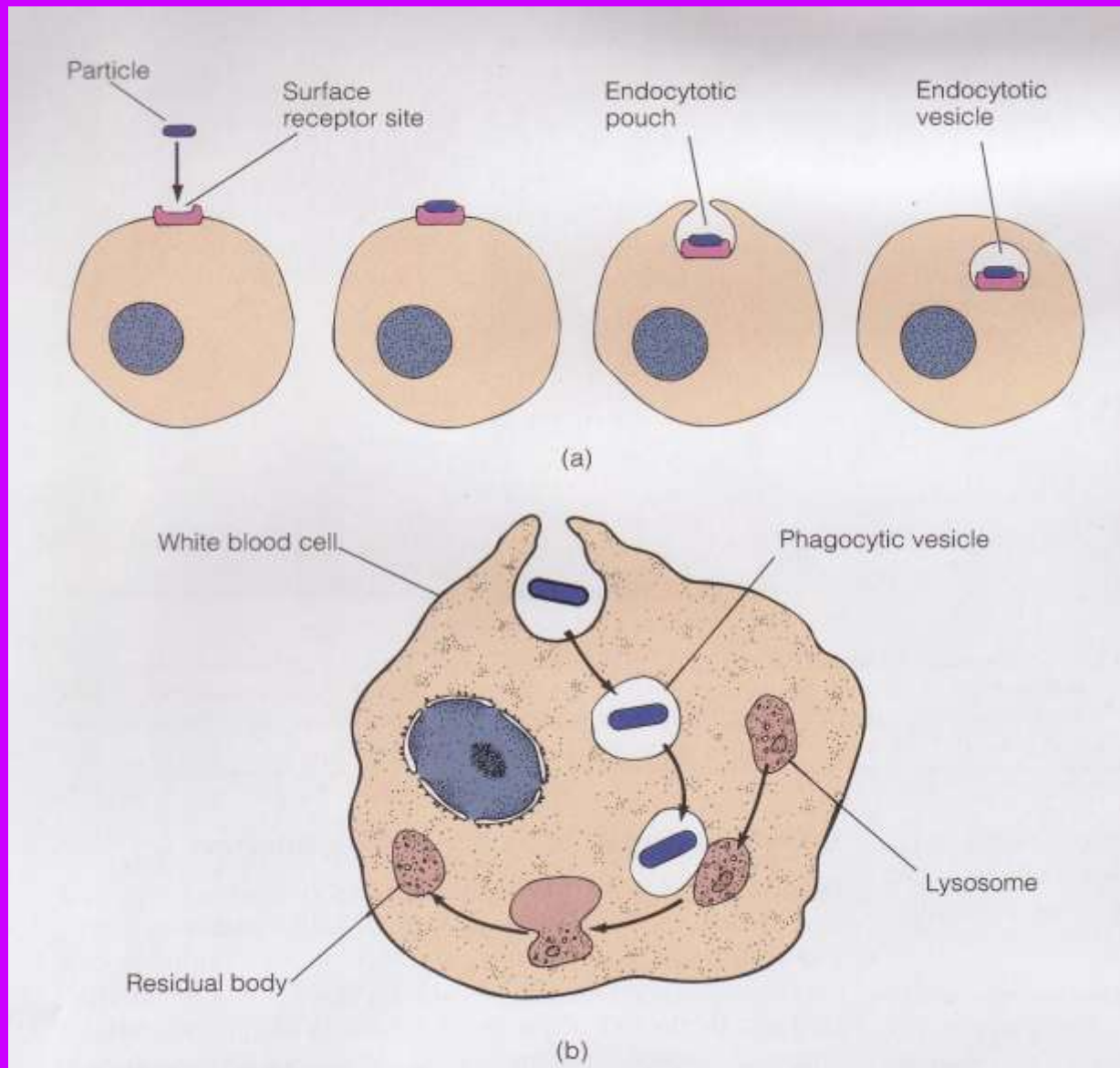
Lysosomes vs. Peroxisomes



© Don W. Fawcett/Photo Researchers, Inc.

fig 2-6 LS 2012

Phagocytosis: Cell Eating!

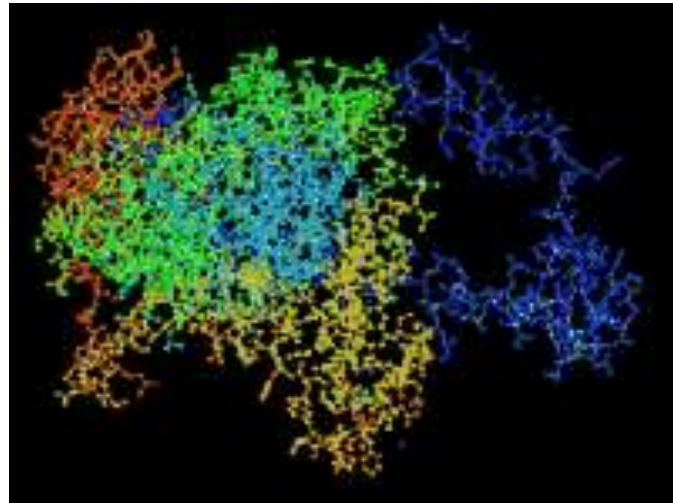


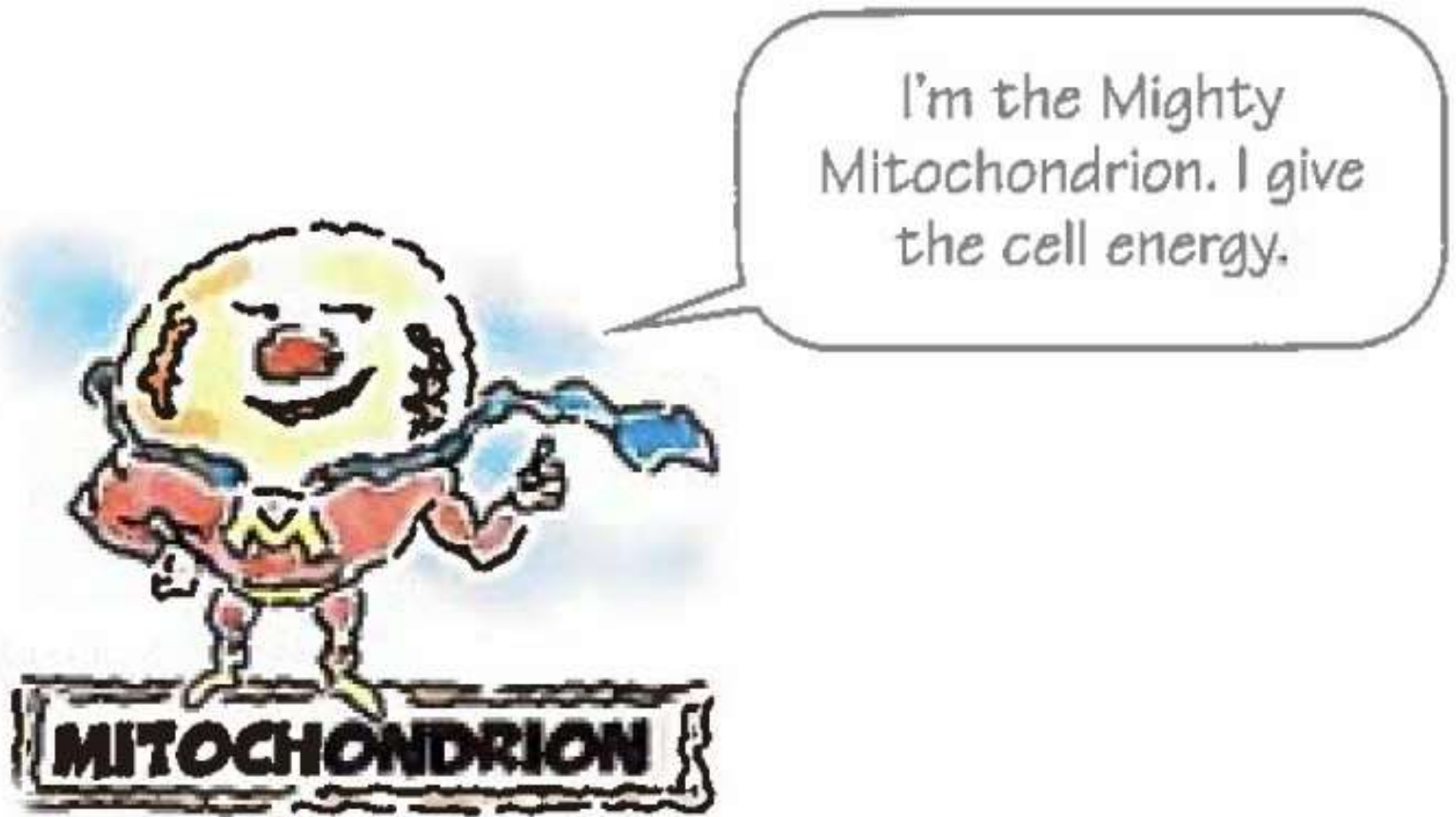


Film: Neutrophil engulfing bacterium

<http://devreotes.johnshopkins.edu/videos>

Catalase Enzyme Reaction in Peroxisomes Neutralize Toxin at Production Site!





SOURCE: Bot Roda, Illustrator. *Anatomy & Physiology made Incredibly Visual!*
Wolters Kluwer Health, Lippincott Williams & Wilkins, 2009.

Mitochondria: Energy Organelles

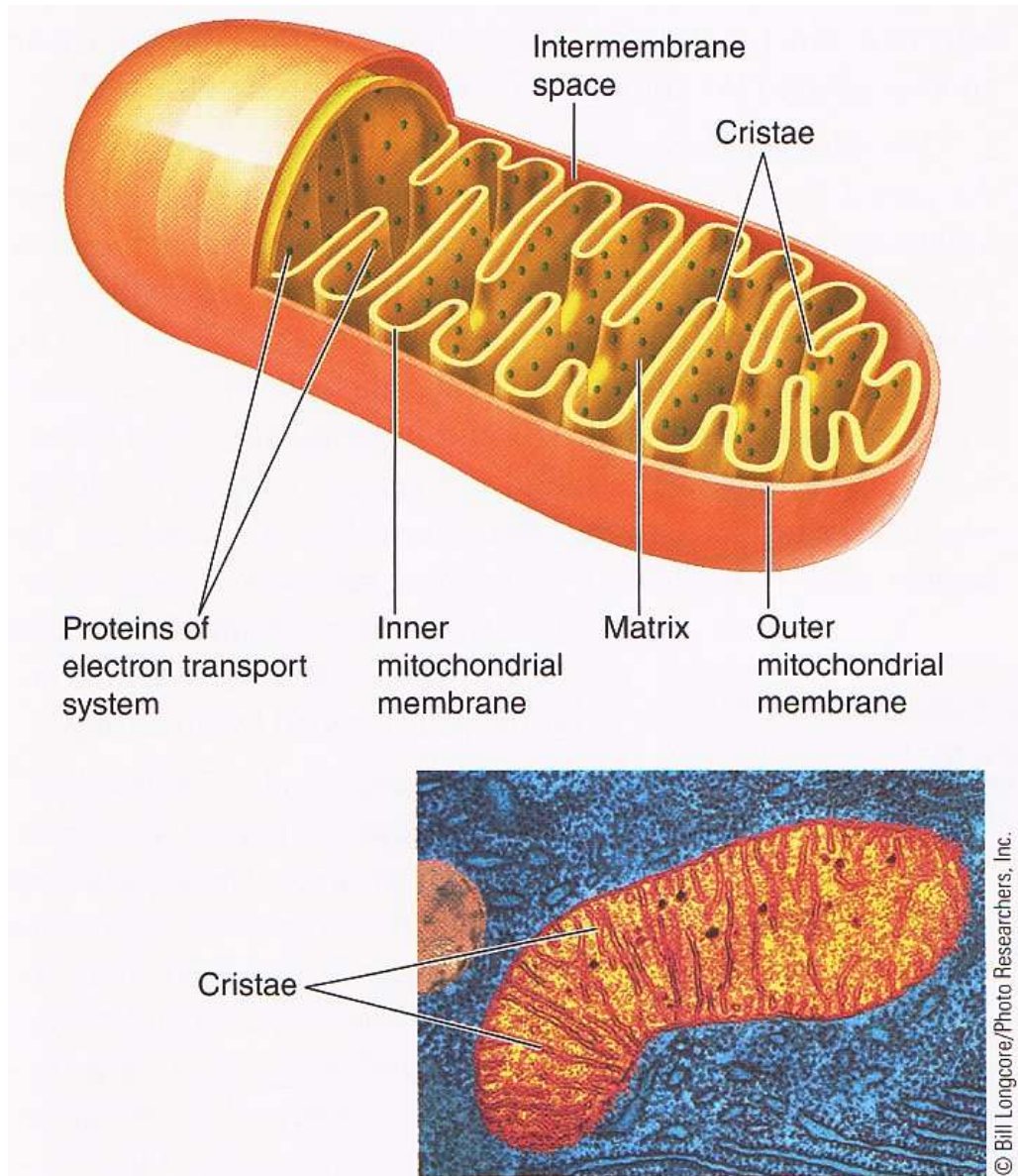
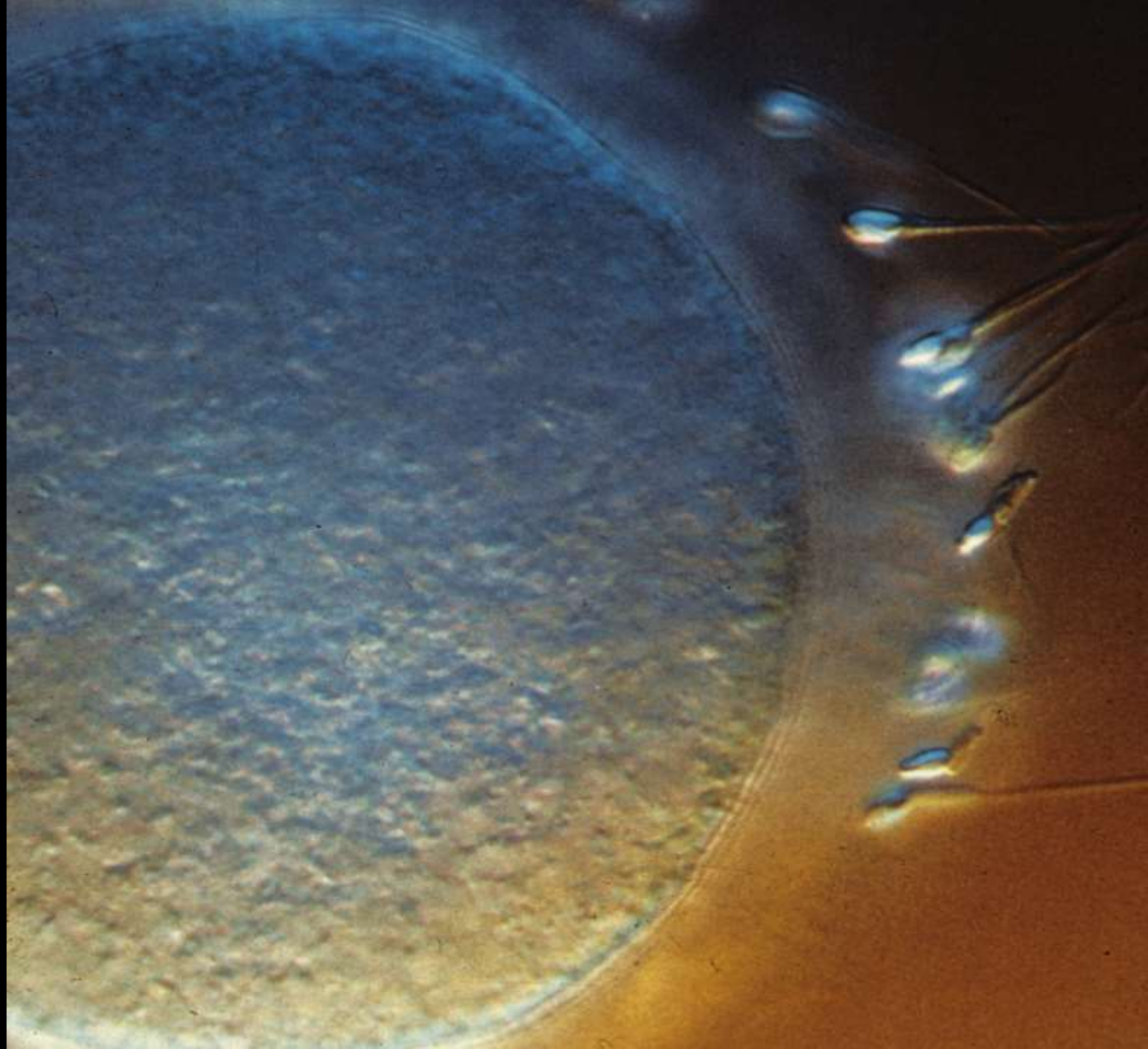


fig 2-8 LS 2012





Mom's eggs execute Dad's mitochondria

In "Hamlet," Rosencrantz and Guildenstern deliver a letter to the rulers of England that carries the ill-fated duo's own death sentence. Perhaps Shakespeare knew a bit about reproductive biology.

Scientists have now found that during a sperm's creation, its mitochondria—energy-producing units that power all cells—acquire molecular tags that mark them for destruction once the sperm fertilizes an egg. This death sentence, a protein called ubiquitin, may explain why mammals inherit the DNA within mitochondria only from their mothers, a bio-

species mitochondrial inheritance. Sperm mitochondria sometimes avoid destruction when two different species of mice mate, and Schatten's team has shown this also holds true in cattle. It's hard to understand how an egg distinguishes between paternal mitochondria of closely related species, says Schon.

When paternal mitochondria escape destruction in normal mating, the resulting embryo may suffer. Schatten notes that a colleague has found sperm mitochondria in some defective embryos from infertility clinics.



Inside a fertilized egg, with its two sets of chromosomes (**blue**), the protein ubiquitin (**red**) tags sperm mitochondria (**yellow**).

SOURCE: Sutovsky P, Moreno RD, Ramalho-Santos J, Dominko T, Simerly C, Schatten G. *Nature* 1999;402(6760), 371-2.

A watercolor illustration on a white background. On the left, there are vertical stripes in shades of yellow, light blue, and teal. A black-outlined vertical rectangle with diagonal hatching is positioned over the stripes. The main text, 'I NEEDED A BREAK', is written in large, bold, pink letters with a white outline and a soft pink shadow. To the right of the text is a decorative swirl of overlapping, scalloped shapes in shades of pink and red. Below the main text, there is a decorative flourish of three curved lines. To the left of the flourish is a small cluster of three simple flowers with dots for centers. At the bottom right, the text 'but i'd rather have a breakthrough.' is written in a simple, black, lowercase font.

I NEEDED
A BREAK

but i'd rather have
a breakthrough.

AEROBIC

w/O₂

=

MITOCHONDRION

ANAEROBIC

without O₂

= CYTOSOL

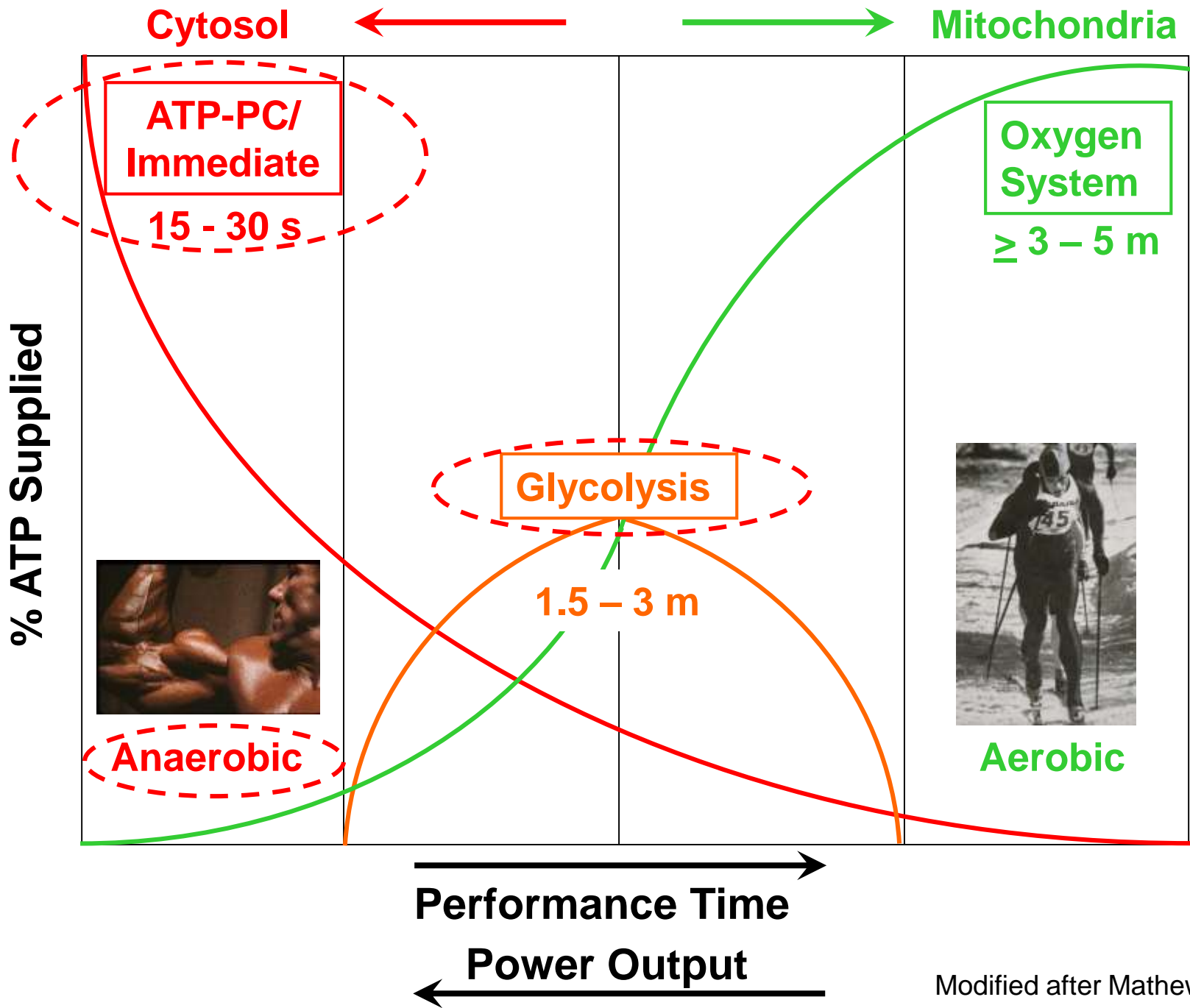


1. Immediate/ATP-PC
2. Glycolysis



<https://jissn.biomedcentral.com/articles/10.1186/s12970-017-0173-z>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3407788/>



**ATP = Adenosine Tri Phosphate
The Common Energy Currency
or the Cash Cells Understand!!**

