



G. Waples

BI 121 Lecture 1

I. Announcements: Please check & sign attendance roster. Not on list? See Pat during break/>class. *Lab 1 Histology* Thursday, 10 am – 5 pm sections in 130 HUE. Much fun!!

II. Introduction: Staff, office hr, required sources, course overview, grading, expectations & success. Q?

III. Human Physiology LS ch 1, DC Module 1,

A. What? cf: Anatomy LS p 1

B. Where? Body Levels of Organization LS pp1-6, DC pp1-5

C. How? Different Study Approaches LS p 1

D. Why? Security+Decision-Making Power LS p xxi, DC p v

IV. Homeostasis LS ch 1, DC Module 1

A. What? Maintenance of ECF LS p 8

B. Where? ECF = Plasma + Interstitium LS fig 1-4 p 8

C. How? Simplified Homeostatic Model cf: LS fig 1-7 p 14
Balances LS p 9, DC pp 5-6

D. Why? Cell survival! LS fig 1-5 p 9, DC p 5

ANATOMY
STRUCTURE
WHAT?
WHERE?

VS

PHYSIOLOGY

VS

FUNCTION

VS

HOW?

VS

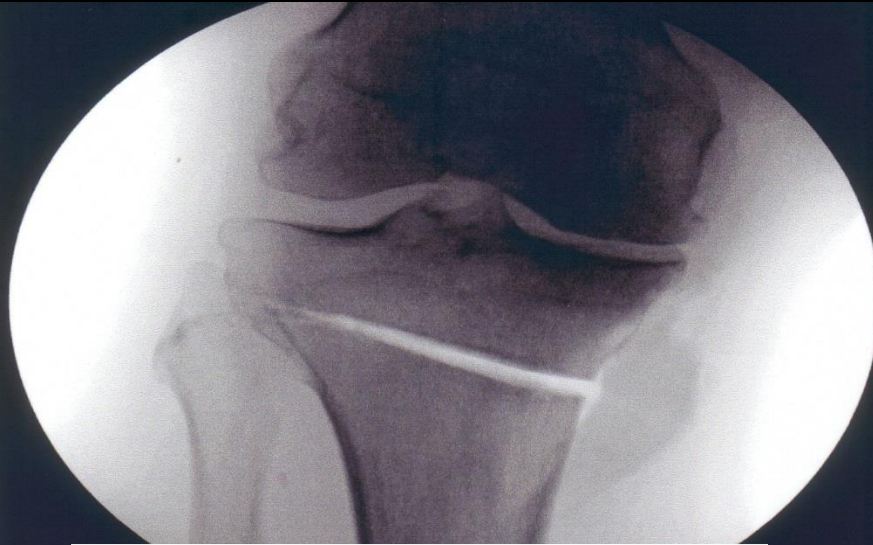
WHY?



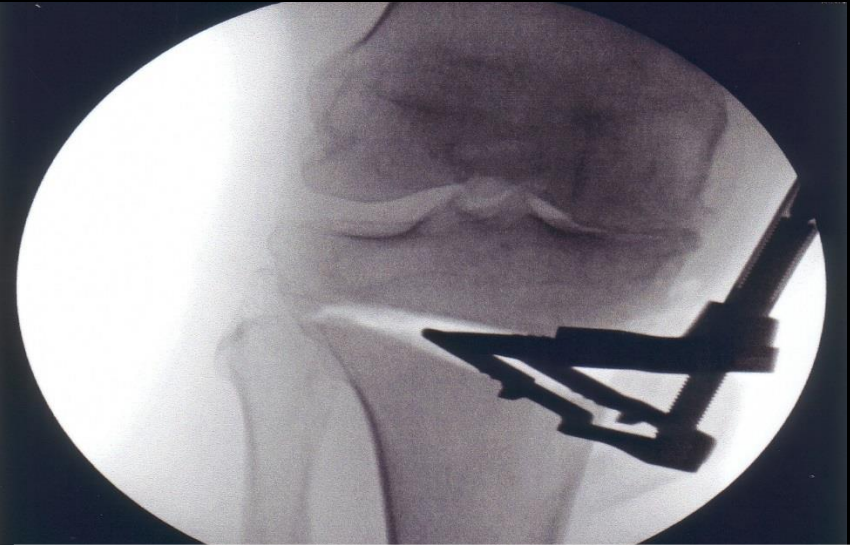
VS



High-Tibial Osteotomy (HTO) to Realign the Joint



1. Oscillating saw cut



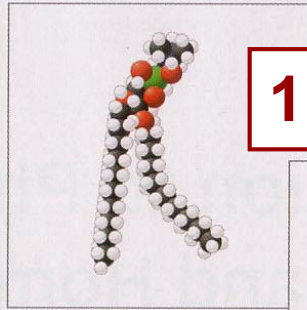
2. R plate/scaffolding insert



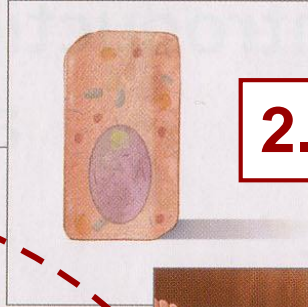
3. Align, stabilize w/screws & pack defect

Body Levels of Organization

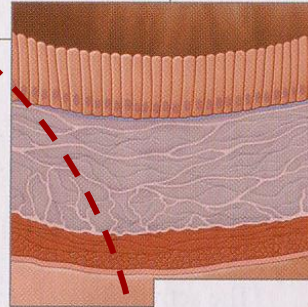
Entire Organism,
like you & me!



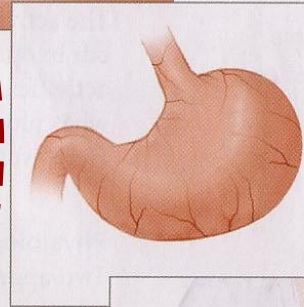
1. Molecular



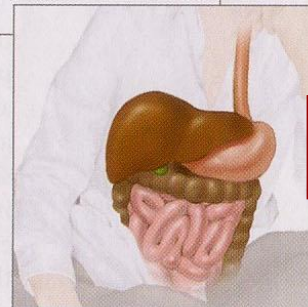
2. Cellular



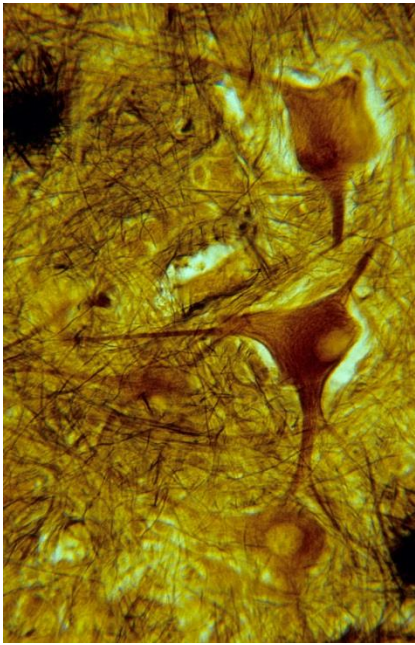
3. Tissue



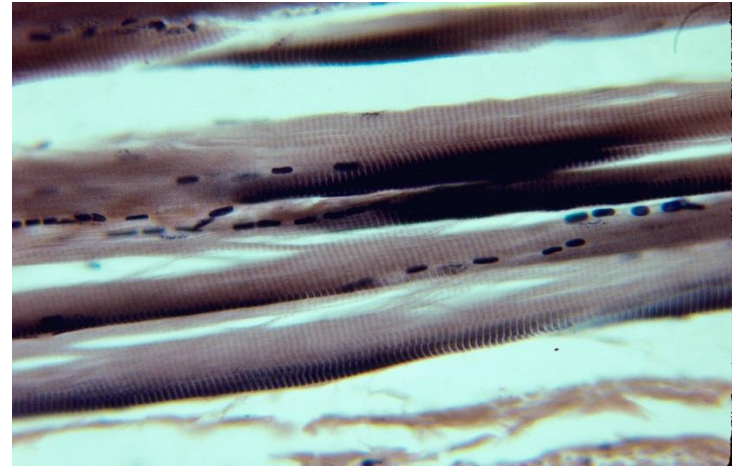
4. Organ



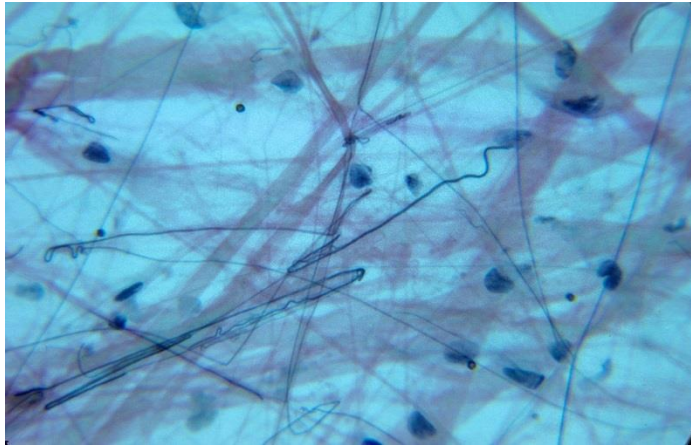
5. System



Nerve conducts



Muscle contracts

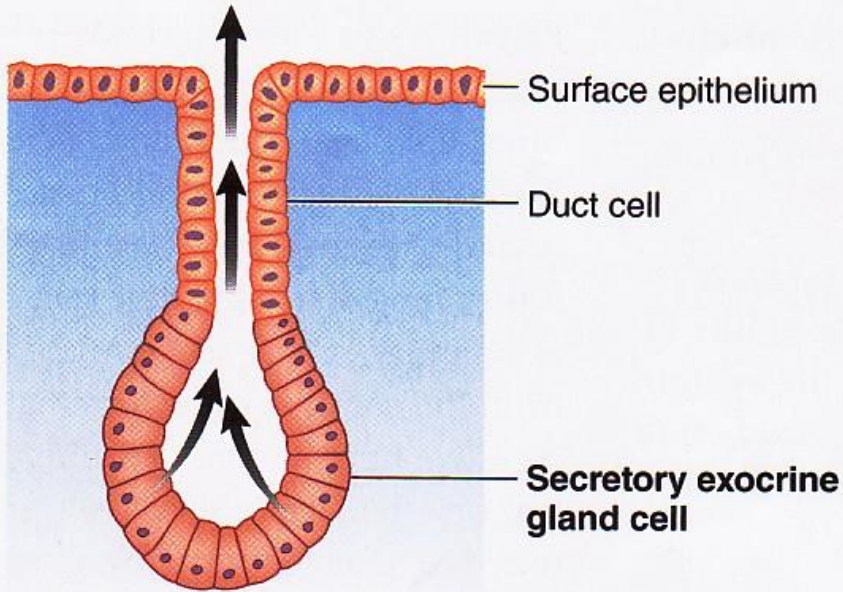


Connective connects!!

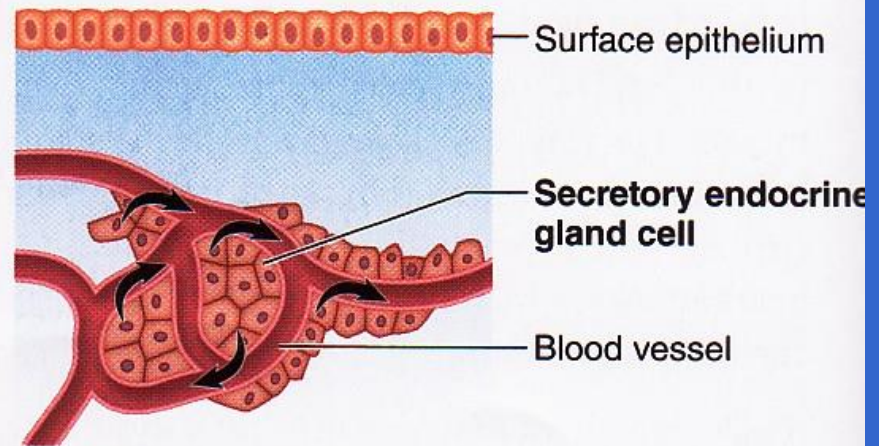


Epithelial covers

Epithelial tissue gives rise to glands: (a) exocrine & (b) endocrine



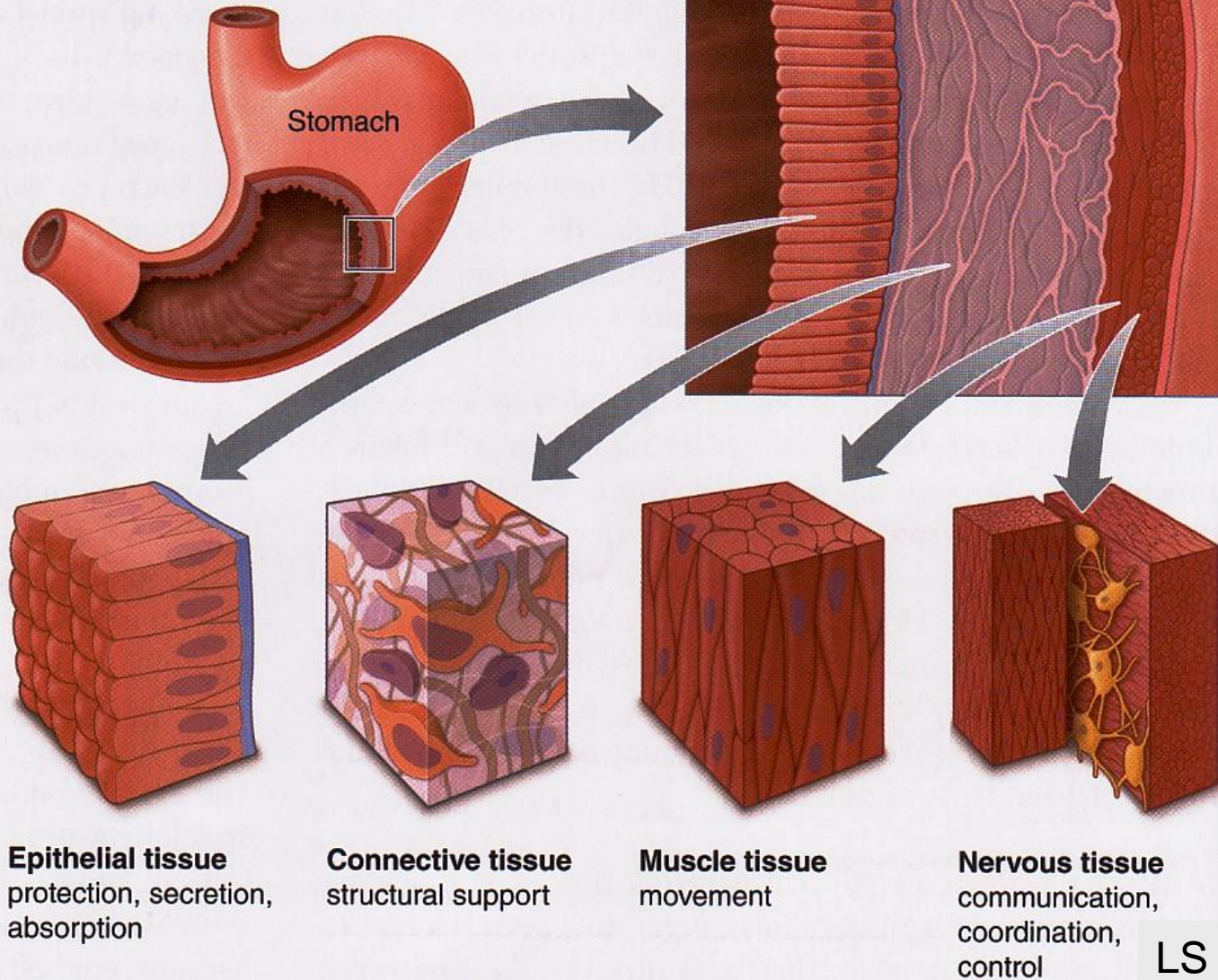
(a) Exocrine gland



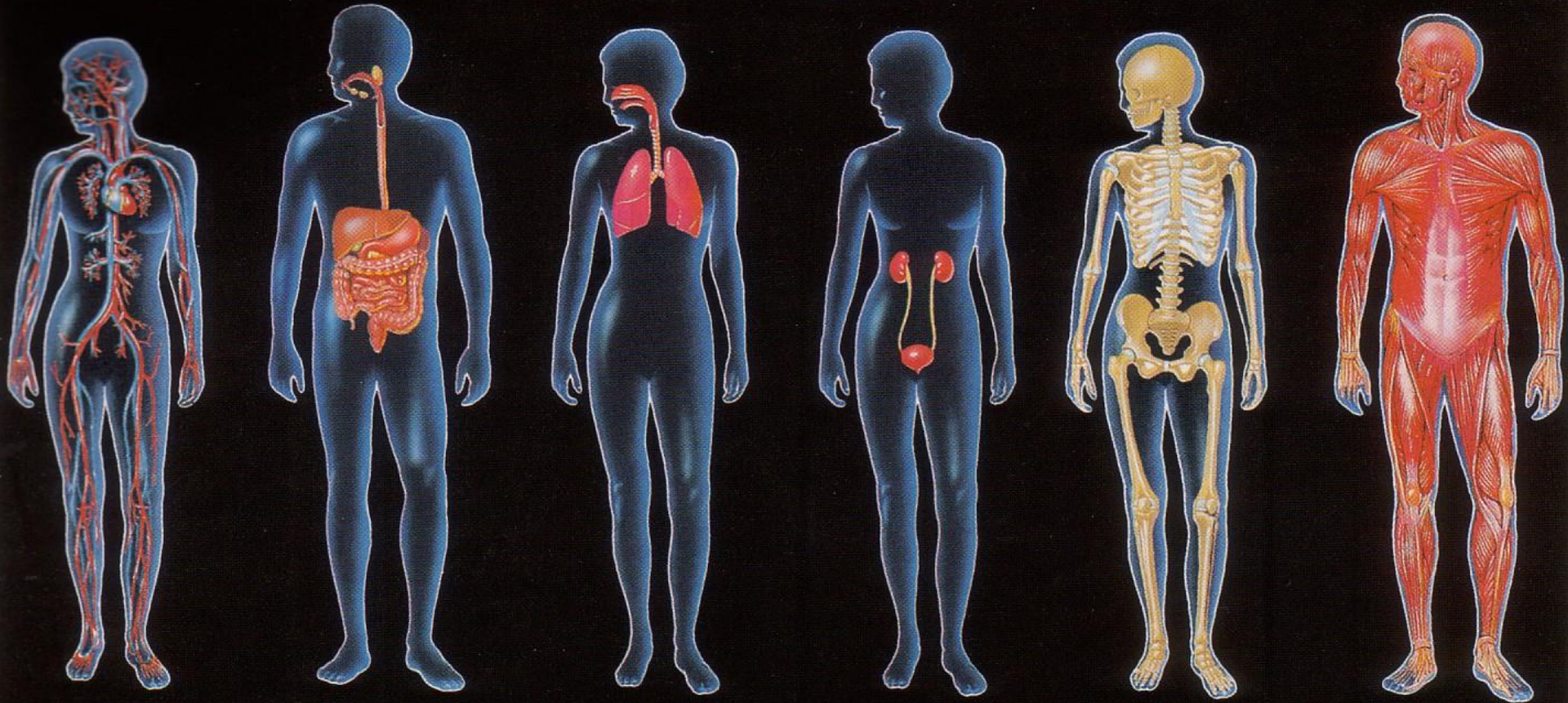
(b) Endocrine gland

Organs are made up ≥ 2 tissue types

Organ:
Body structure that integrates different tissues and carries out a specific function



Which body systems?

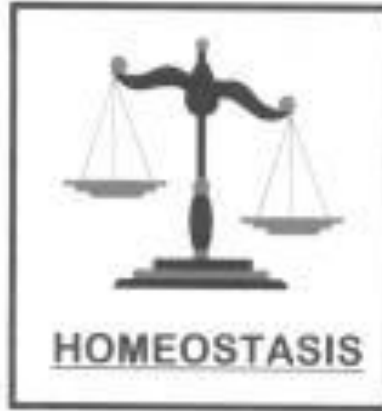


***Maintenance of a relative constancy in the
Internal environment = ECF = fluid outside of cells***

**milieu
interieur?**



Claude Bernard

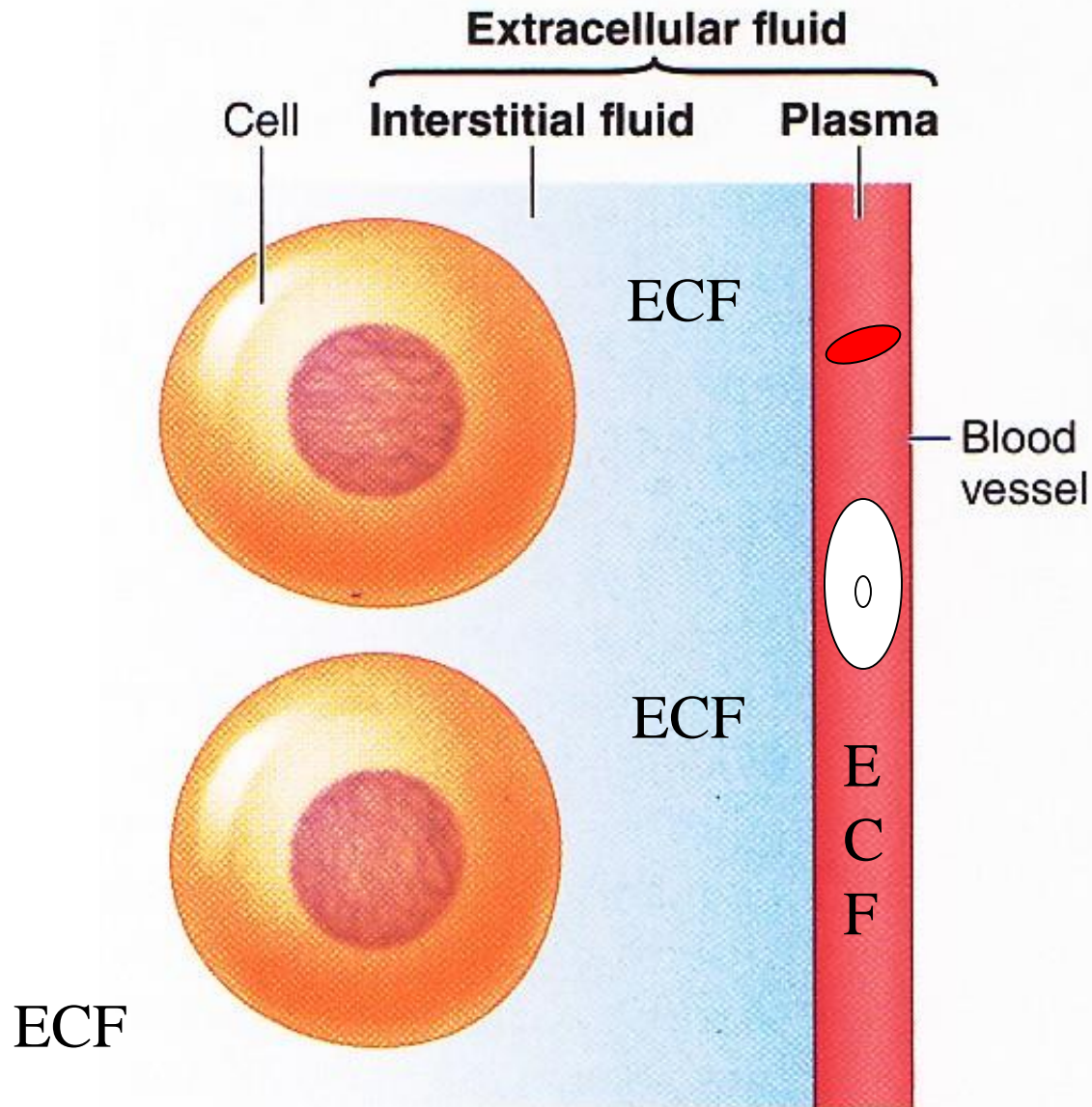


**100 trillion
cells working
intimately**



Walter B. Cannon

Where is extracellular fluid?





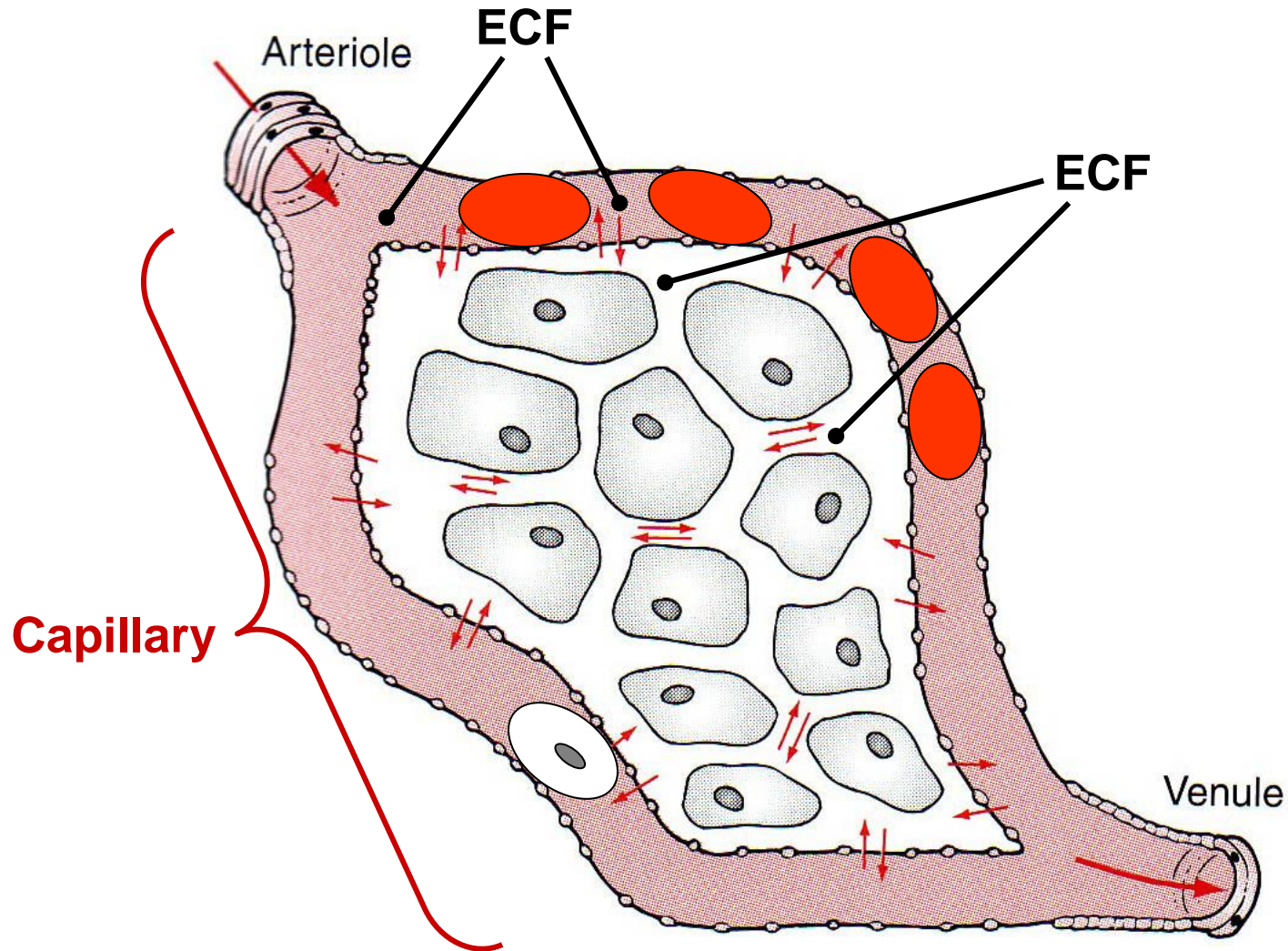
... Thanks for signing attendance roster & noting late arrival or early departure time!



BI 121 Lecture 2

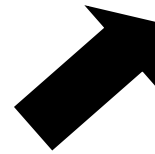
- I. **Announcements** Lab 1 Histology today!
130 HUE. Fun! Readings: DC, LS, LM? **NB**: UO Biology blog vs. Canvas <http://blogs.uoregon.edu/bi121/fall-2016/>
- II. **Homeostasis** LS ch 1, DC Module 1
 - A. **What?** Maintenance of ECF LS p 8
 - B. **Where?** ECF = Plasma + Interstitium + ? LS fig 1-4 p 8
 - C. **Homeostatic Balances?** LS p 9, DC pp 5-6
 - D. **Why?** Cell survival! LS fig 1-5 p 9, DC p 5
 - E. **Physiology in the News** H₂O? Are we like watermelons?
 - F. **How** are balances maintained? Simplified Homeostatic Model cf: LS fig 1-7 p 14; T°C + BP balance e.g. + vs. - FB
- III. **Cell Anatomy, Physiology & Compartmentalization** LS ch 2
 - A. How big? What boundaries? Why compartments? pp 19-21
 - B. Basic survival skills LS ch 1 p 3
 - C. Organelles ≡ Intracellular specialty shops
Endoplasmic Reticulum (ER), Golgi, Lysosomes,
Peroxisomes & Mitochondria, LS fig 2-1, 2-2, 2-3 pp 20-3

Where is extracellular fluid?



As long as between/outside cells, **ECF everywhere?**

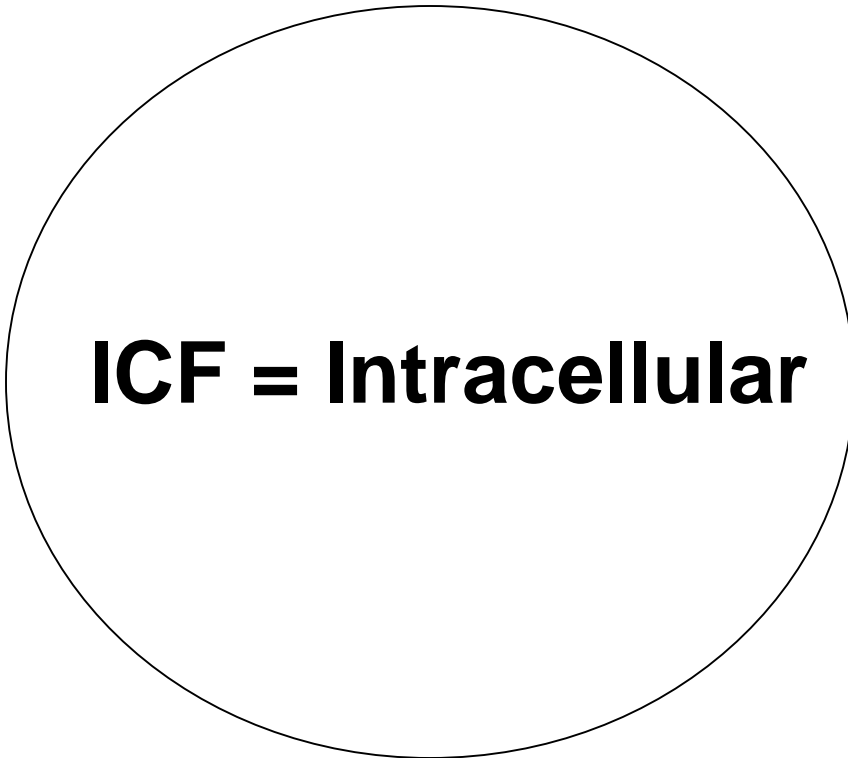
ECF = Extracellular



Plasma 
(within CV System)



Interstitium
(eg, between
muscle cells)

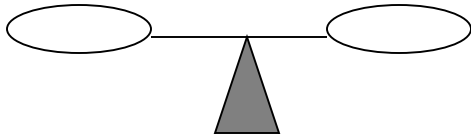


ICF = Intracellular

Metabolic

ANA-

CATA-



H₂O



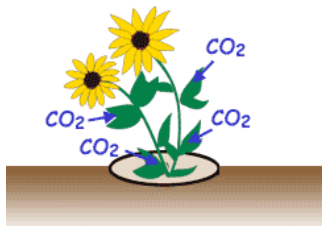
T^oC



Dr. Evonuk's 6 Balances

O₂/CO₂

Carbon Dioxide



Ion^{+/-}

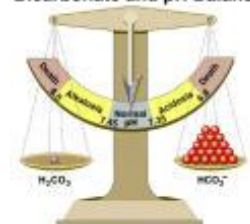


Captain Calcium



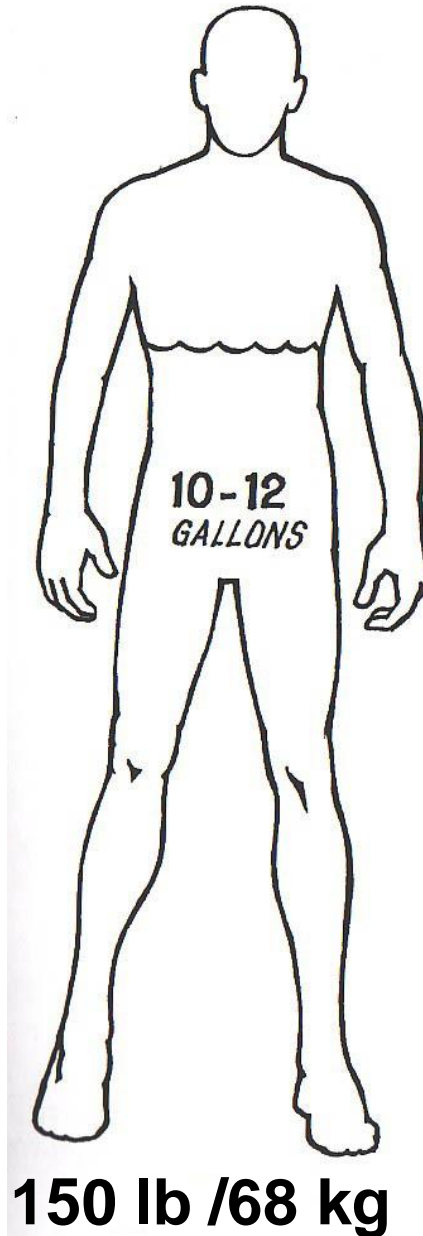
pH

Bicarbonate and pH Balance



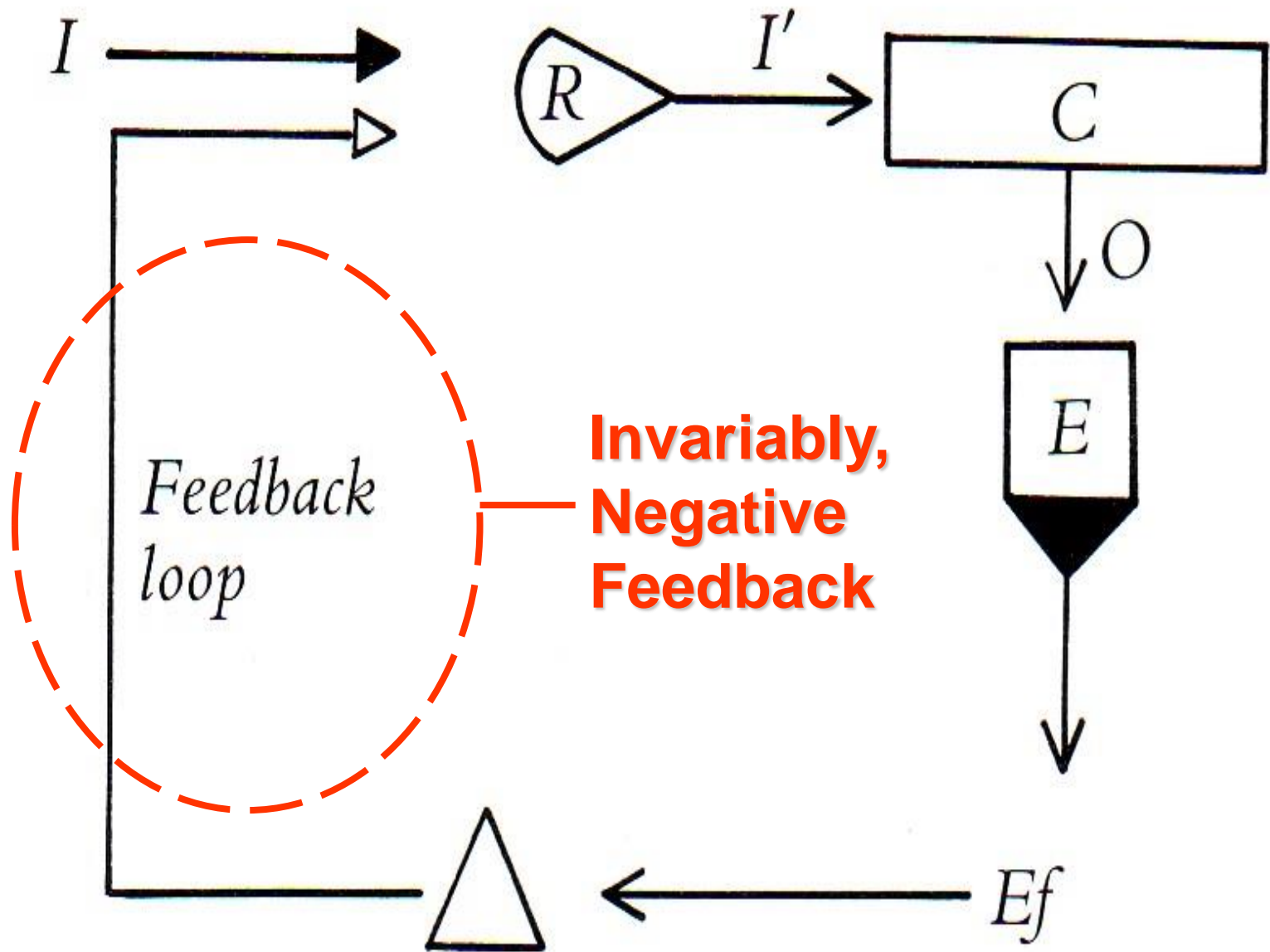
Drink about 1 L per 1000 calories energy expenditure!!

Human ~ 2/3 H₂O
~ 60 – 70 %



NB: So 2000 kcal →
drink 2000 mL
≡ 67.63 fl oz
≡ ~ 8 cups!

= ~40 – 48 kg H₂O



NB: Though most often **negative** feedback, there are exceptions:

Selected +FB eg:

LH Surge + Ovulation

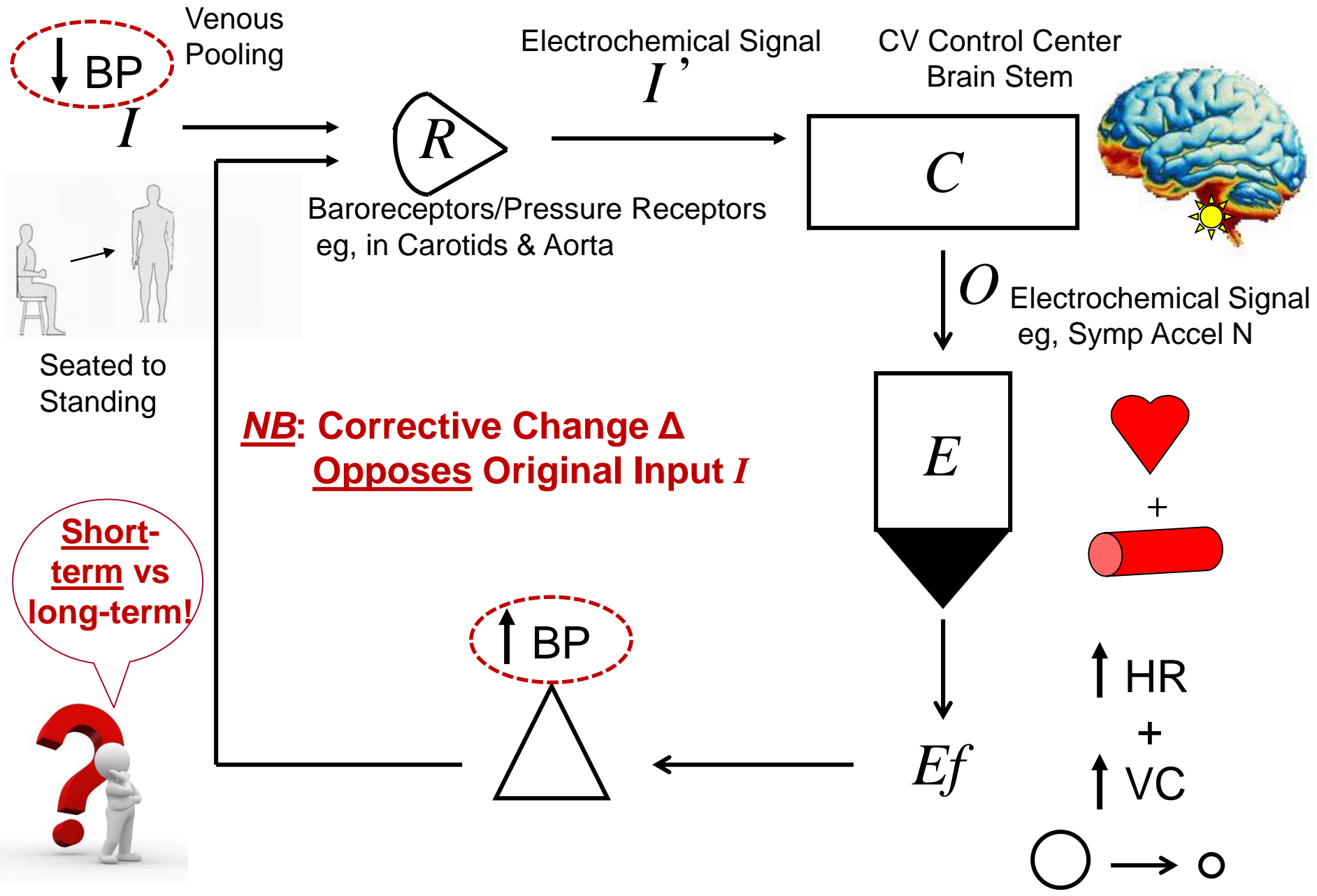
Oxytocin + Uterine Contraction

Blood Clotting Cascade

cAMP Cascade

Na⁺ influx during AP

Blood Pressure Homeostasis



BI 121 Lecture 3



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

I. Announcements Registered? AEC Notes? **Come to office hr!**

II. Connections Videos + Q about Homeostatic Model for BP

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 \equiv Intracellular specialty shops w/membranes

1. Endoplasmic Reticulum (ER) 2. Golgi 3. Lysosomes

4. Peroxisomes & 5. Mitochondria. LS 2012 pp 20-34

fig 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8 pp 20-7 tab 2-1 p 36

D. What about vaults? LS 2006, p 32

E. **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

V. Introduction to Genetics LS 2012 ch 2 p 20-1 + Appendix C

A. What's a gene? Where? p A-18, fig C-2, C-3

B. Why are genes important? p A-18

C. What's DNA & what does it look like? pp A-18 thru A-20

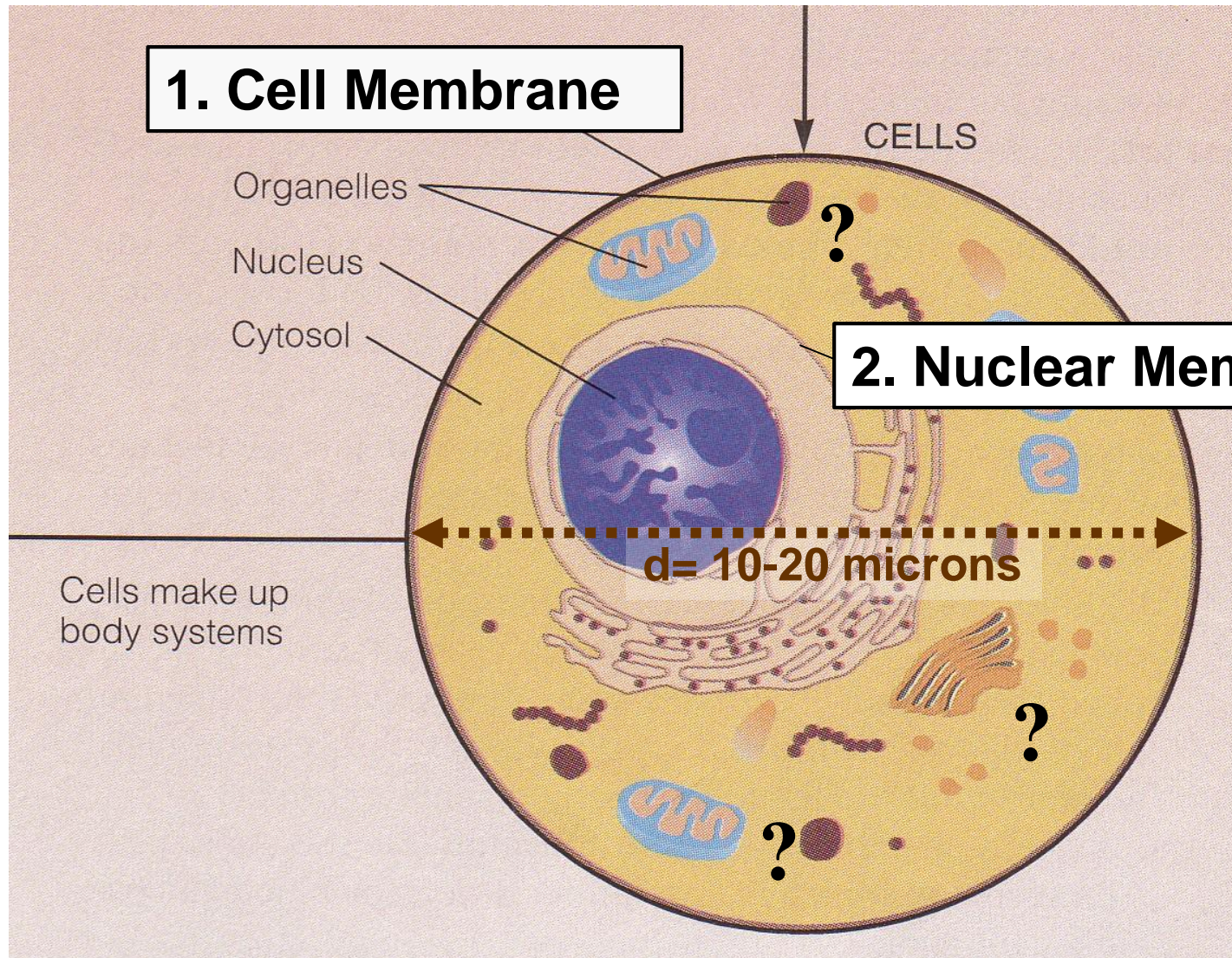
D. How does information flow in the cell? fig C-6

E. How does DNA differ from RNA? pp A-20 thru A-22

F. Genetic code? pp A-22, A-23

G. How are proteins made? fig C-7, C-9

How Big? 100 Cells Lengthwise = 1 mm!!

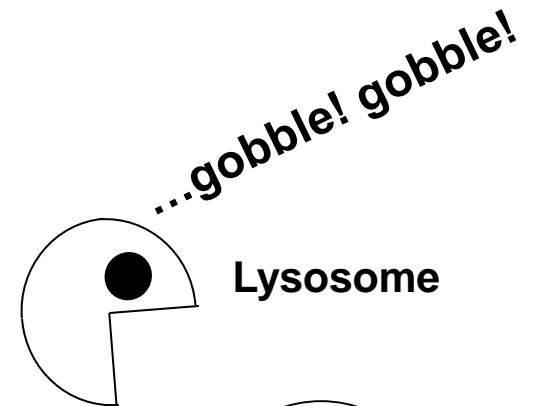


<http://opb.pbslearningmedia.org/resource/tdc02.sci.life.cell.nucleus/nucleus-cytoplasm-membrane/>

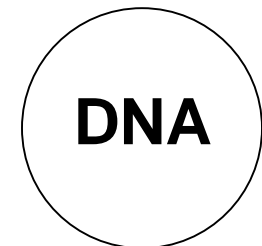
Why Compartments? Advantage?

**Incompatible reactions can
take place**

Simultaneously!!



Lysosome



Nucleus

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

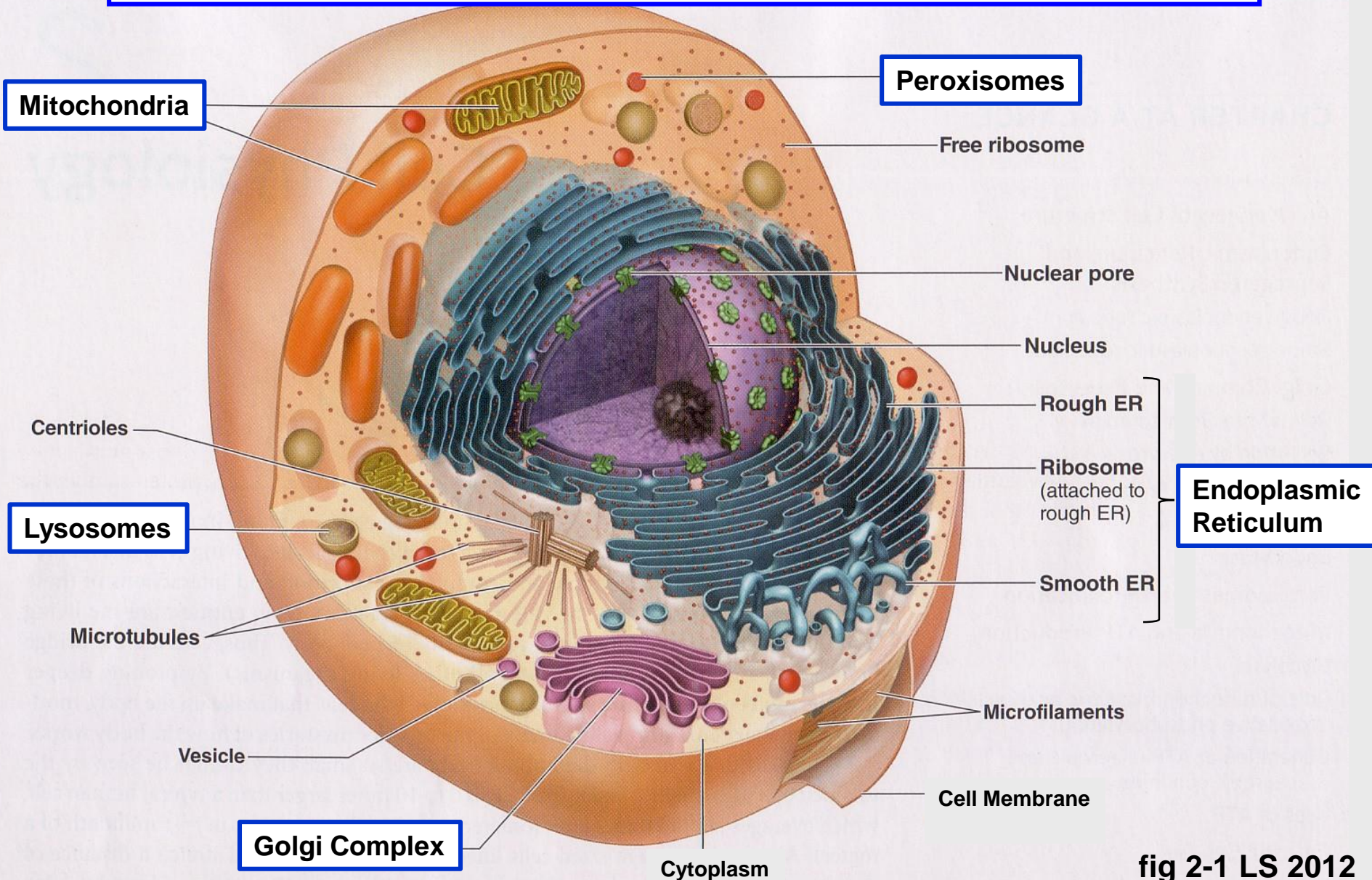
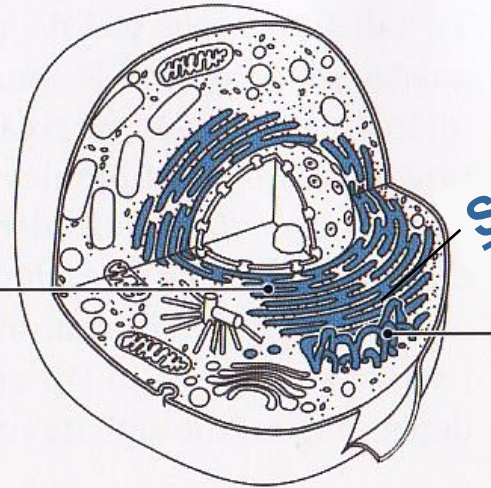


fig 2-1 LS 2012

<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

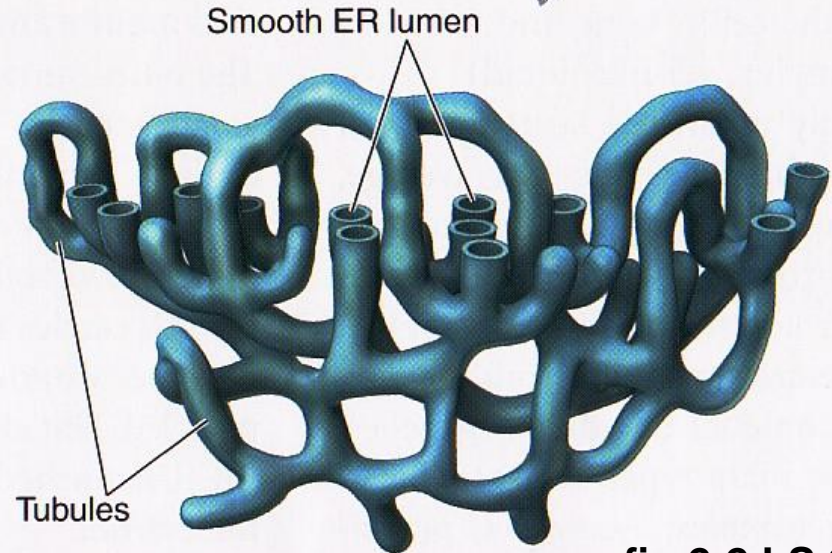
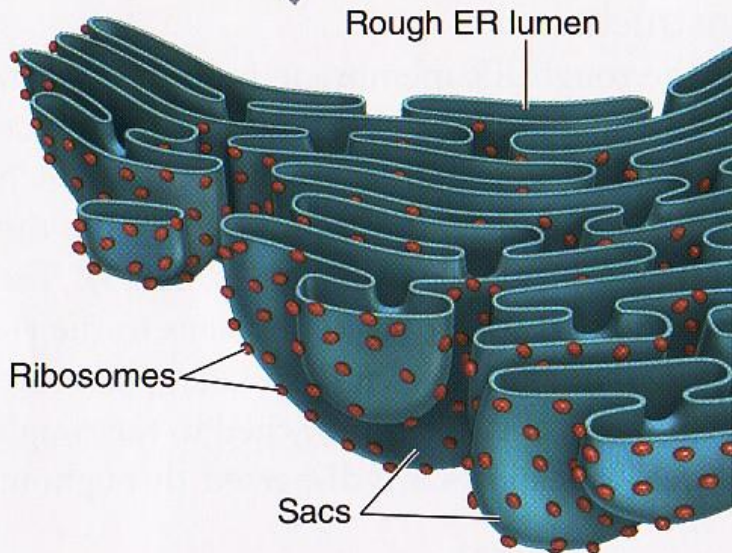


fig 2-2 LS 2012

Secretion of Proteins Produced by ER

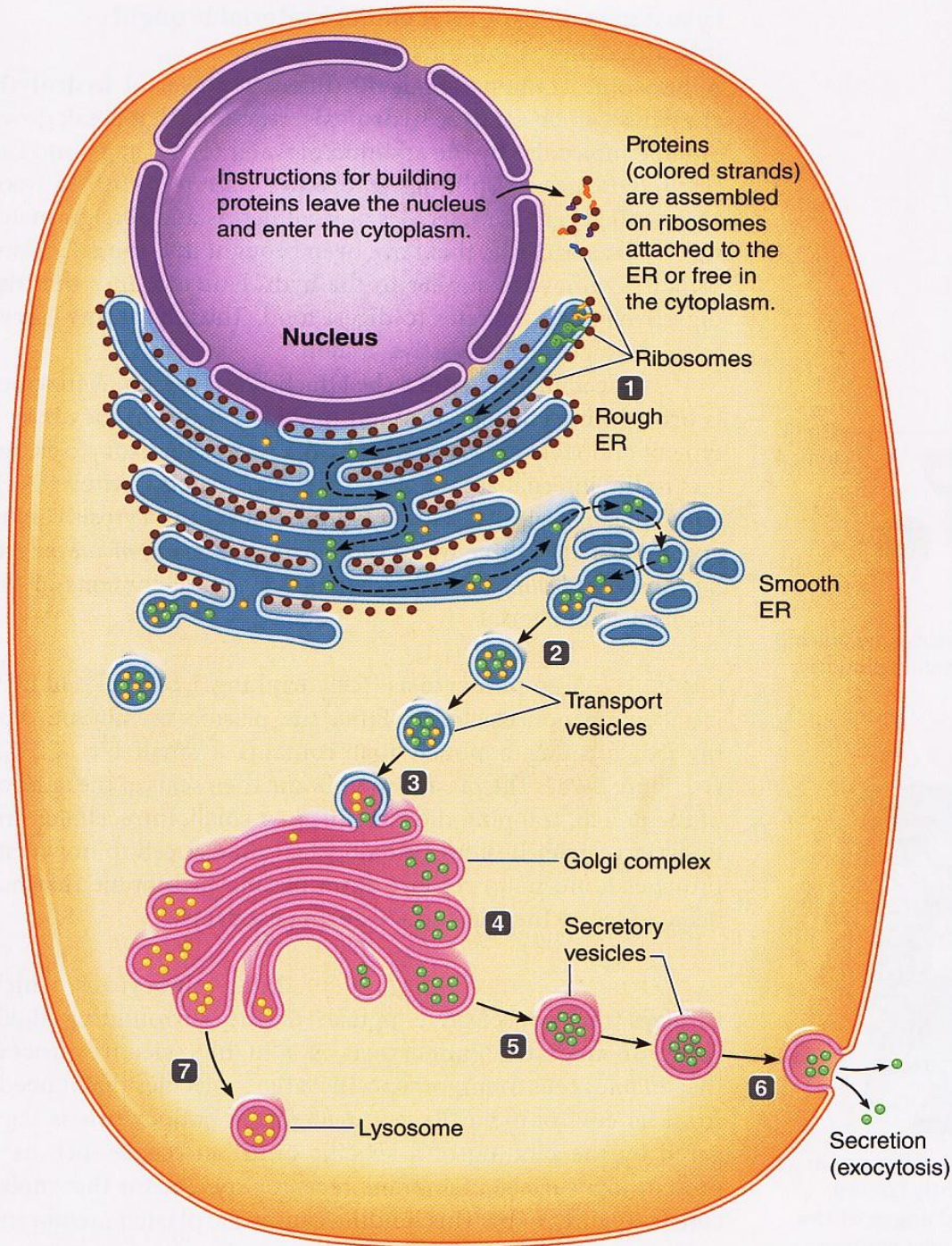
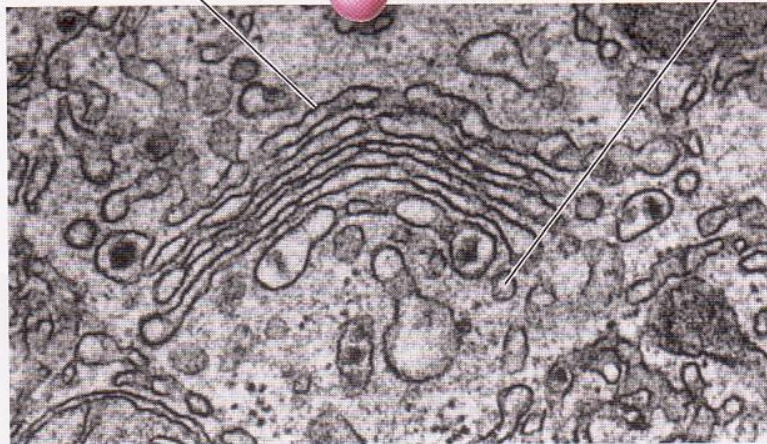
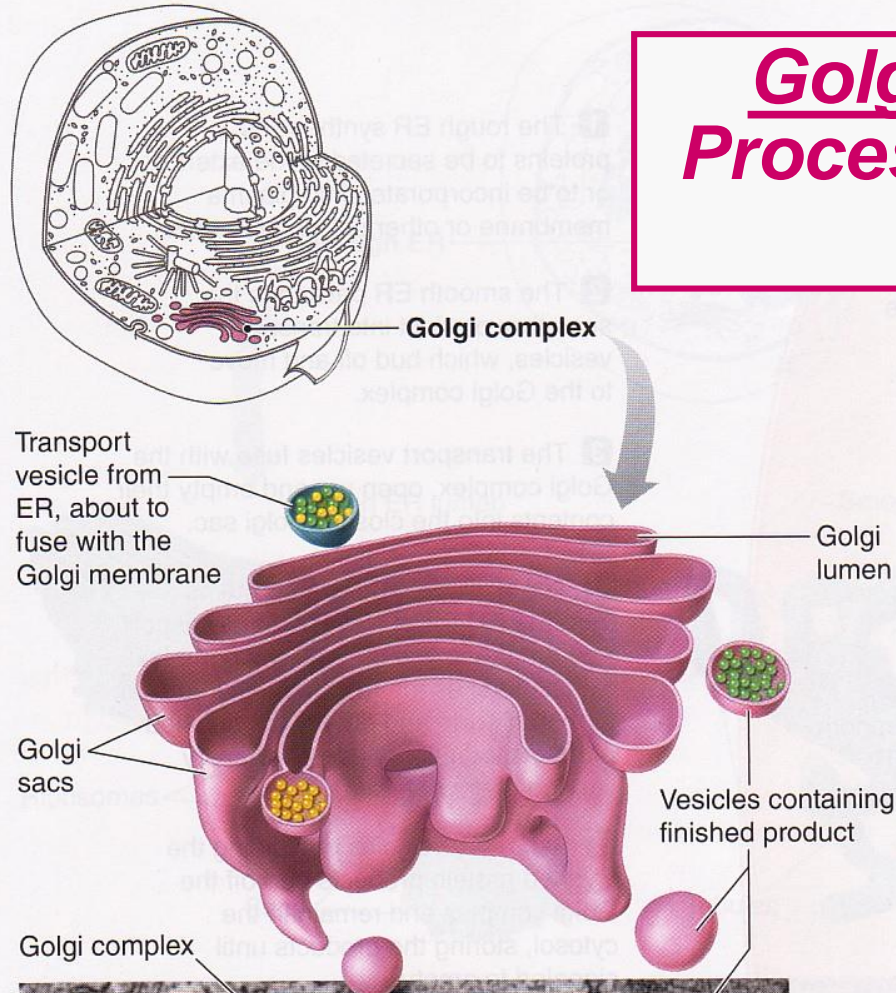


fig 2-3 LS 2012

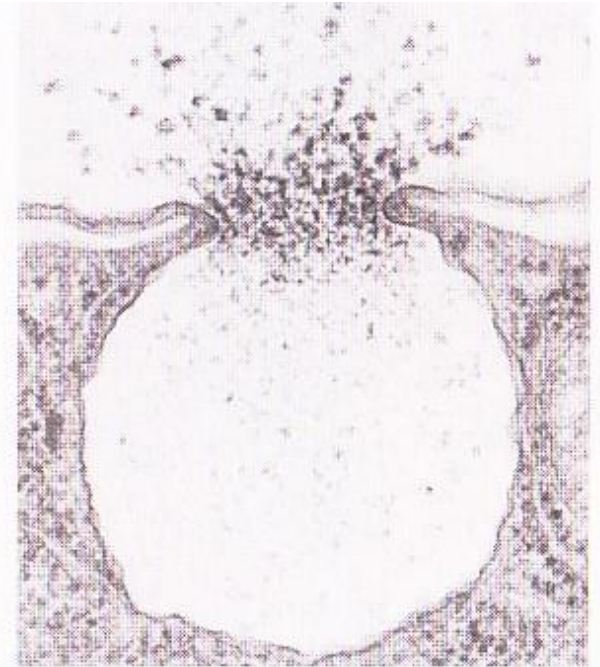
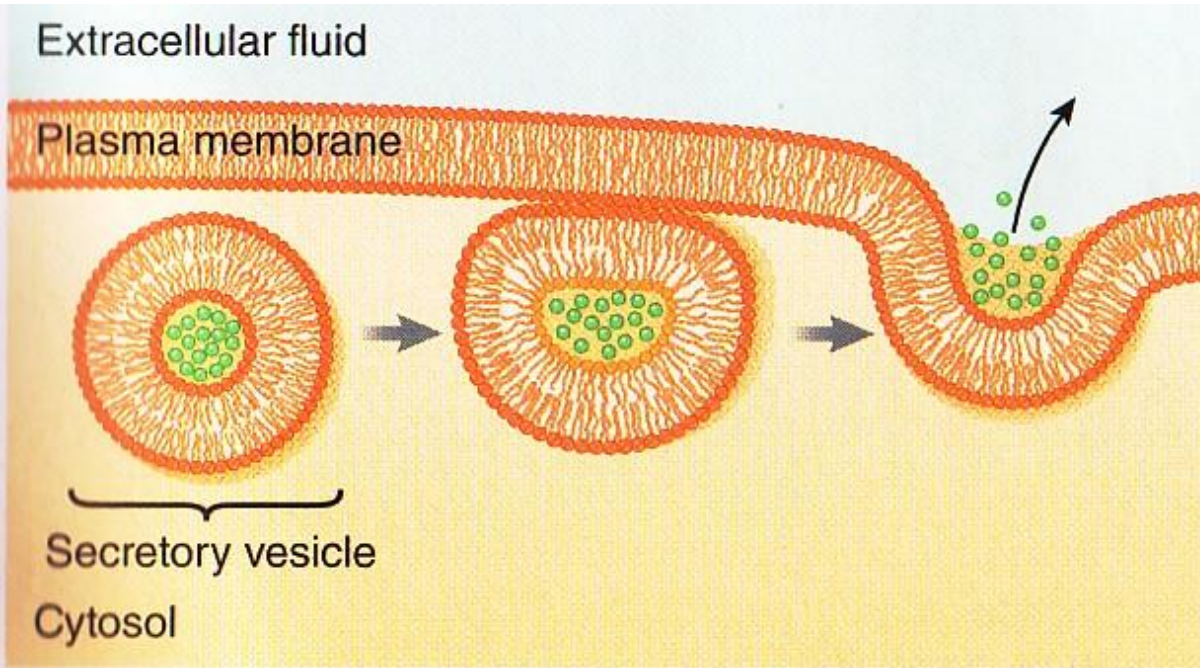
Golgi Complex: Final Processing, Packaging & Distribution



Dr. Don Fawcett & R. Bollender/Visuals Unlimited

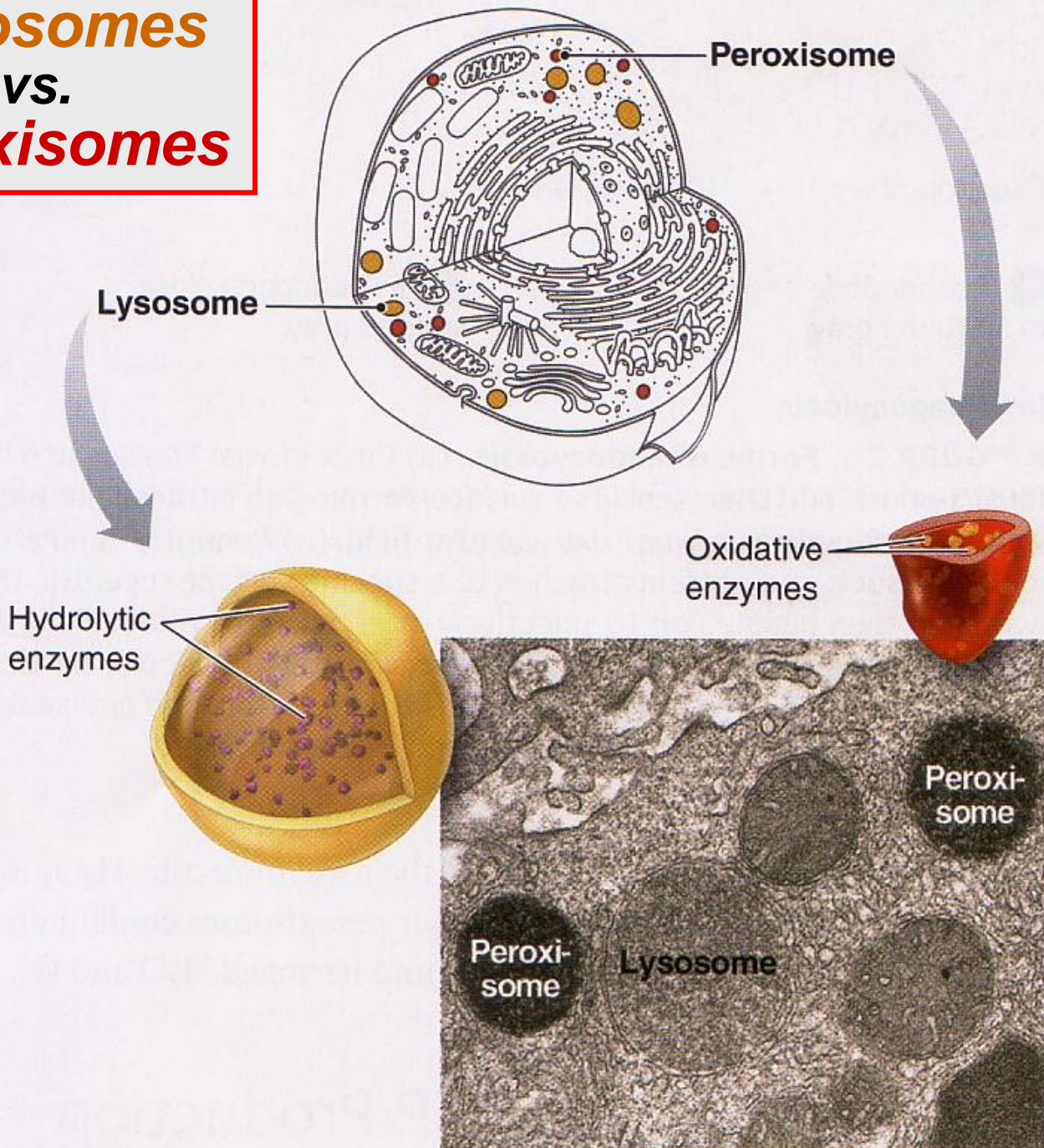
fig 2-4 LS 2012

Exocytosis: Primary Means of Secretion



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

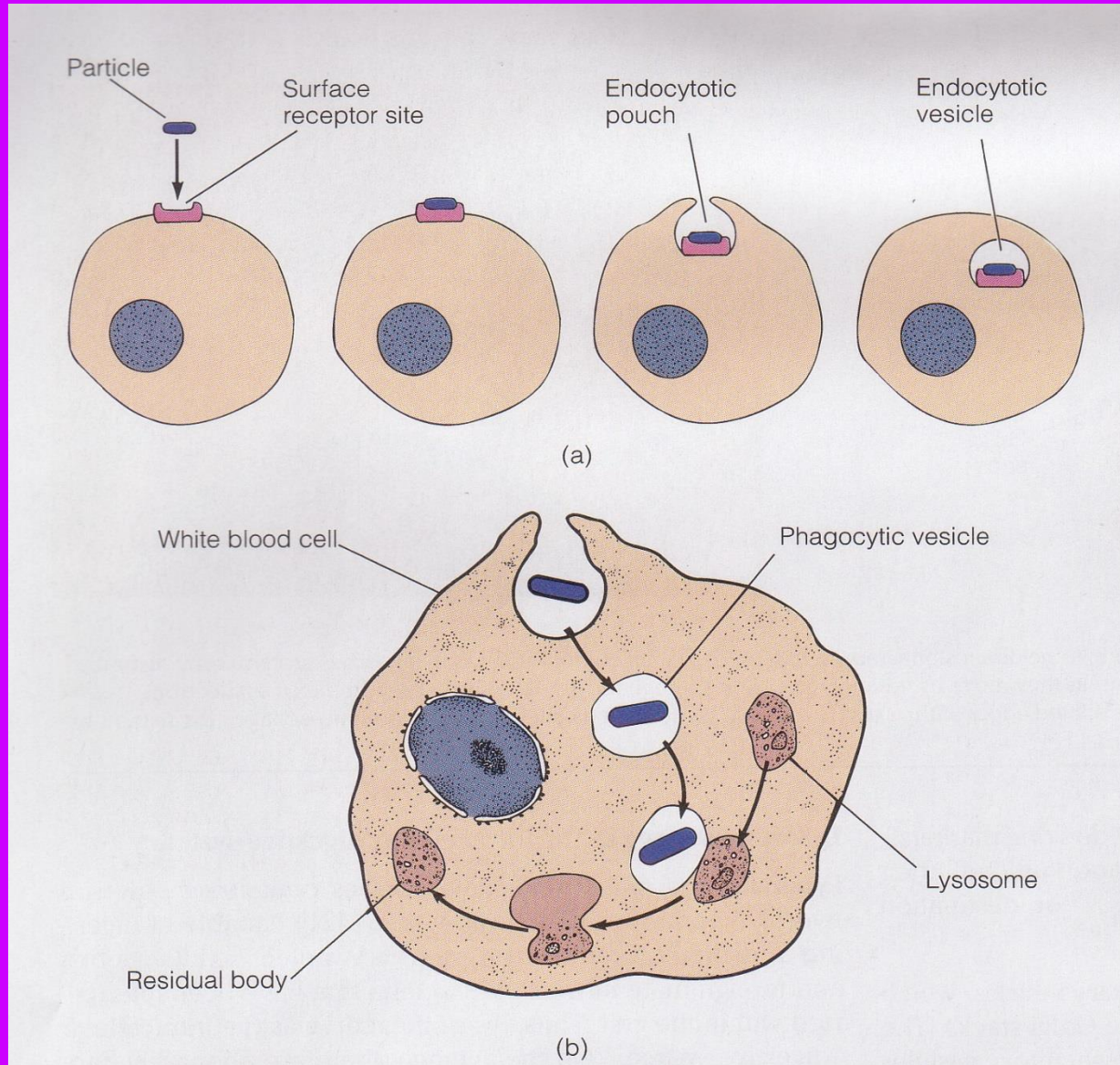
Lysosomes **vs.** **Peroxisomes**



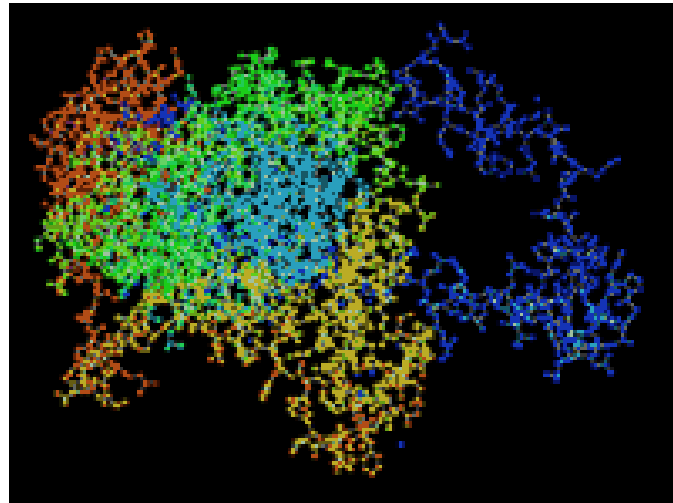
© Don W. Fawcett/Photo Researchers, Inc.

fig 2-6 LS 2012

Phagocytosis: Cell Eating!



Catalase Enzyme Reaction in Peroxisomes Neutralize Toxin at Production Site!



Mitochondria: Energy Organelles

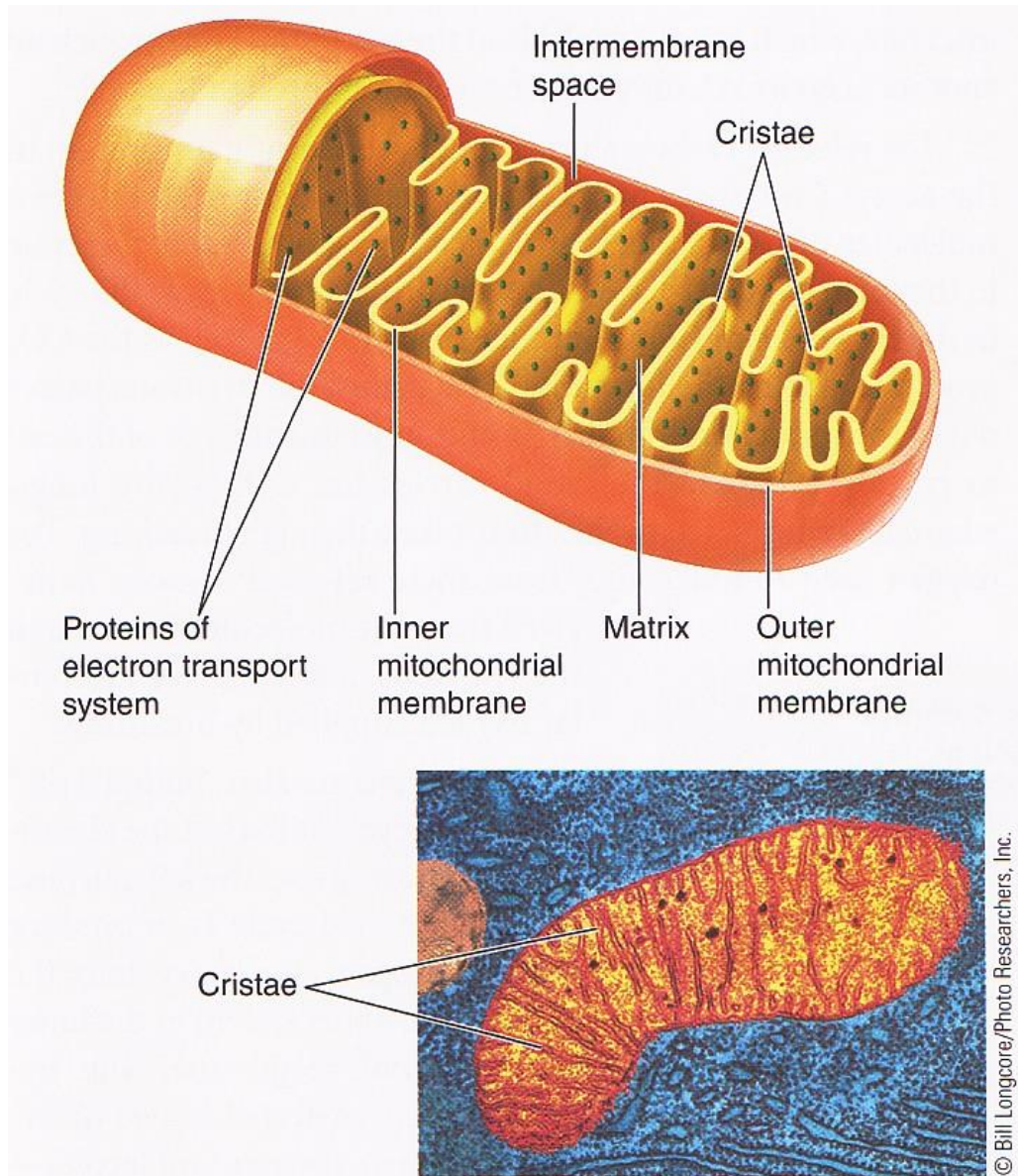
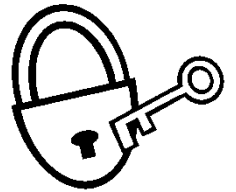


fig 2-8 LS 2012

BI 121 Lecture 4



Structure-function = fun!



I. Announcements Anatomy & Physiology Lab today!

Be sure to complete p 3-7 dietary record in LM < lab next wk!
Help with estimating serving sizes for Nutrition Lab 3. Q?

II. Cell Organelle Connections Little organs or specialty shops!

III. Physiology News ♀ vs ♂ Mitochondria; Vaults? *Sci News*

IV. Anaerobic vs Aerobic Metabolism Connections

LS ch 2 pp 26-33

A. Take-home points + key differences fig 2-15 + vpl

B. Few details: Glycolysis, CAC, ETC fig 2-9, 2-10, 2-11, 2-12

V. Introduction to Genetics LS pp 20-1 + Appendix C

A. What's a gene? Where? p A-18, fig C-2, C-3

B. Why are genes important? p A-18

C. What's DNA & what does it look like? pp A-18 thru A-20

D. How does information flow in the cell? fig C-6

E. How does DNA differ from RNA? pp A-20 thru A-22

F. Genetic code? pp A-22, A-23

G. How are proteins made? Class skit! fig C-7, C-9

4 oz → 3 oz



Deck of Cards



or

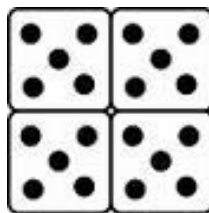


≡ 1 c

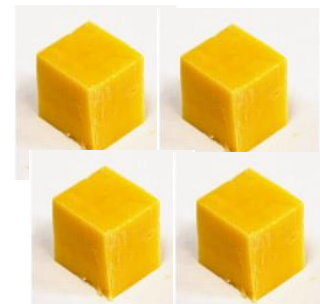
raw → cooked



≡ 1/3 c



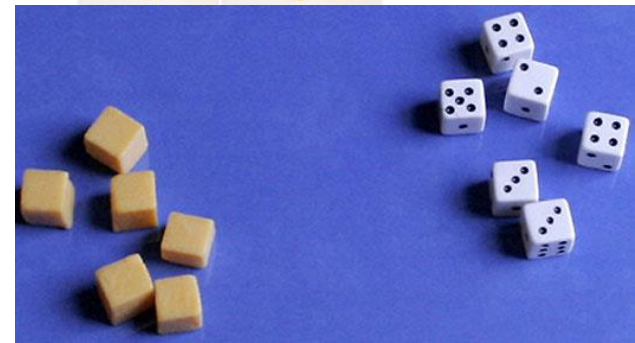
≡ 1 oz



≡ 1/4 c



≡ 1.5 oz





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

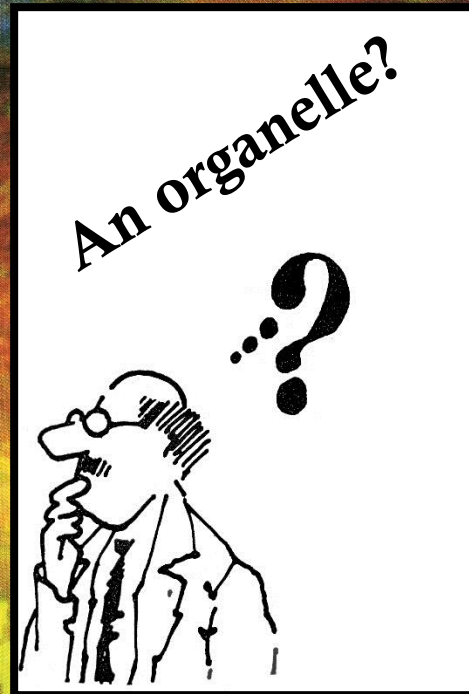
SOURCE: Sutovsky P, Moreno RD, Ramalho-Santos J, Dominko T, Simerly C, Schatten G. *Nature* 1999;402(6760), 371-2.

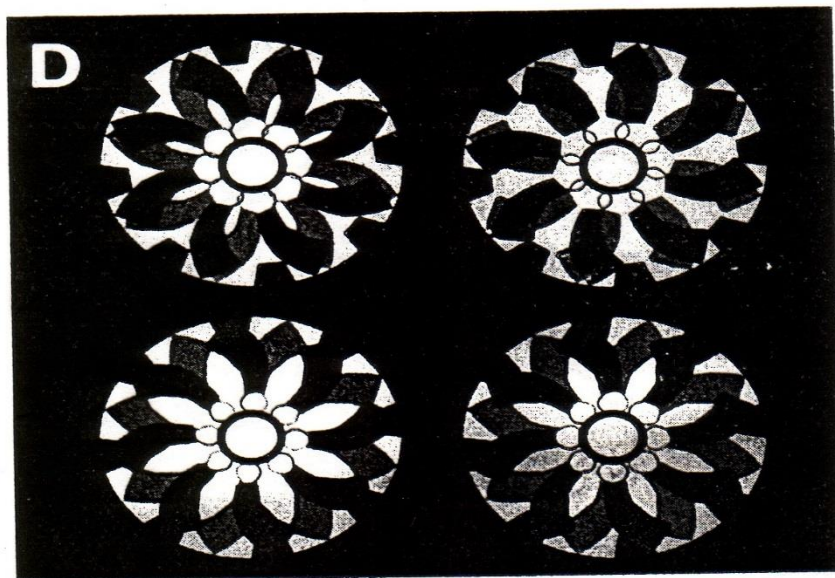
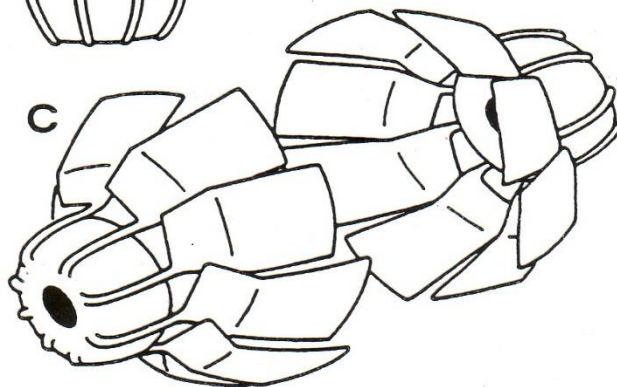
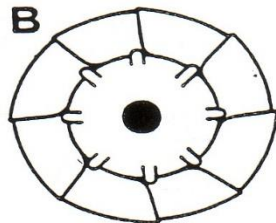
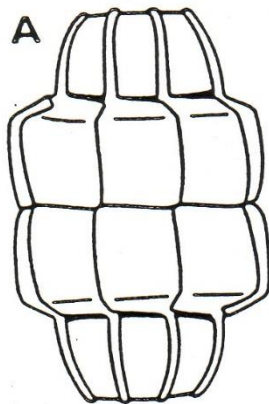
The Weekly Newsmagazine of Science

SCIENCE NEWS

July 27, 1996
Vol. 150, No. 4
Pages 49-64

Vaults Hold Cell Mystery





AEROBIC

w/O₂

=

MITOCHONDRION

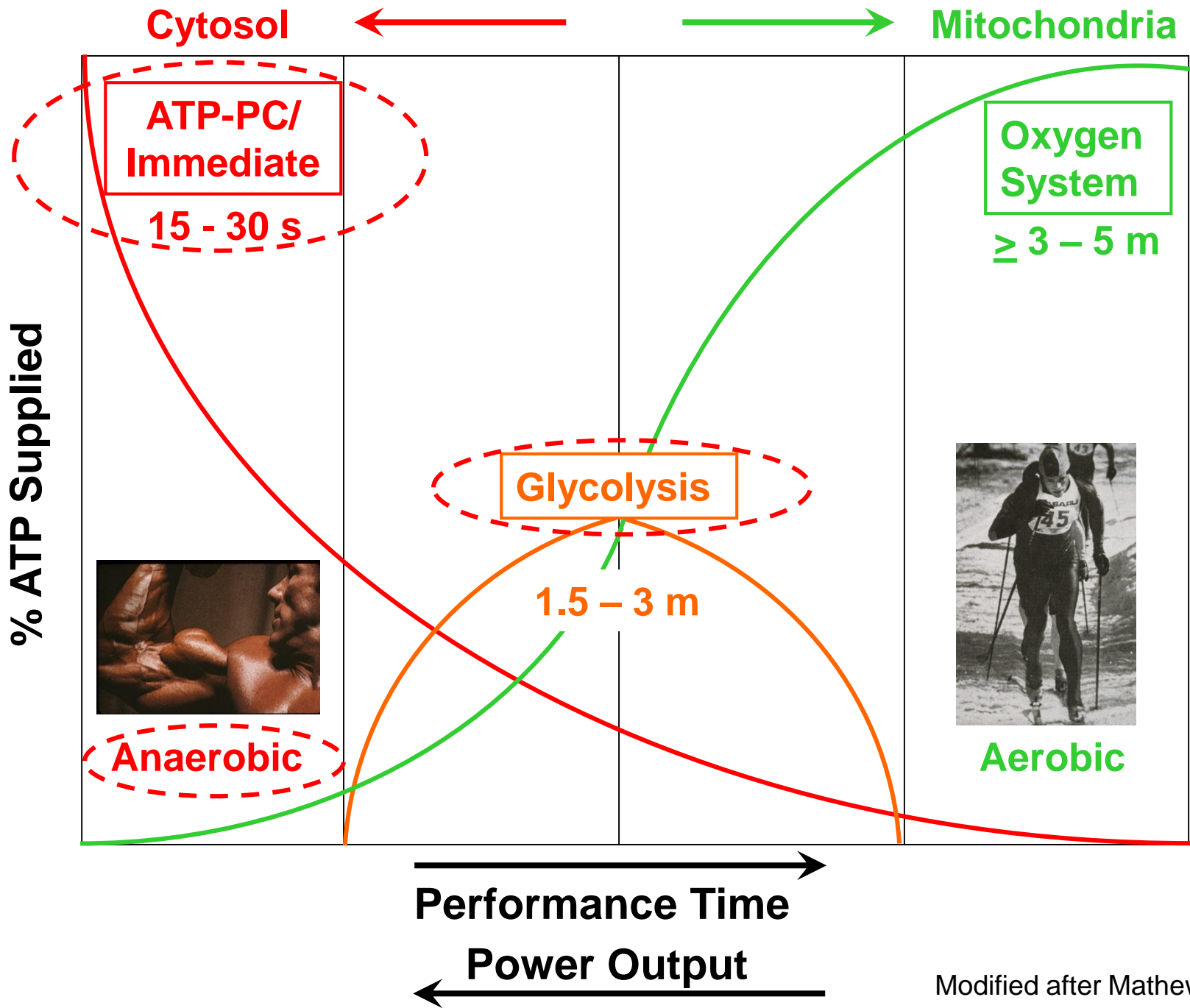
ANAEROBIC

without O₂

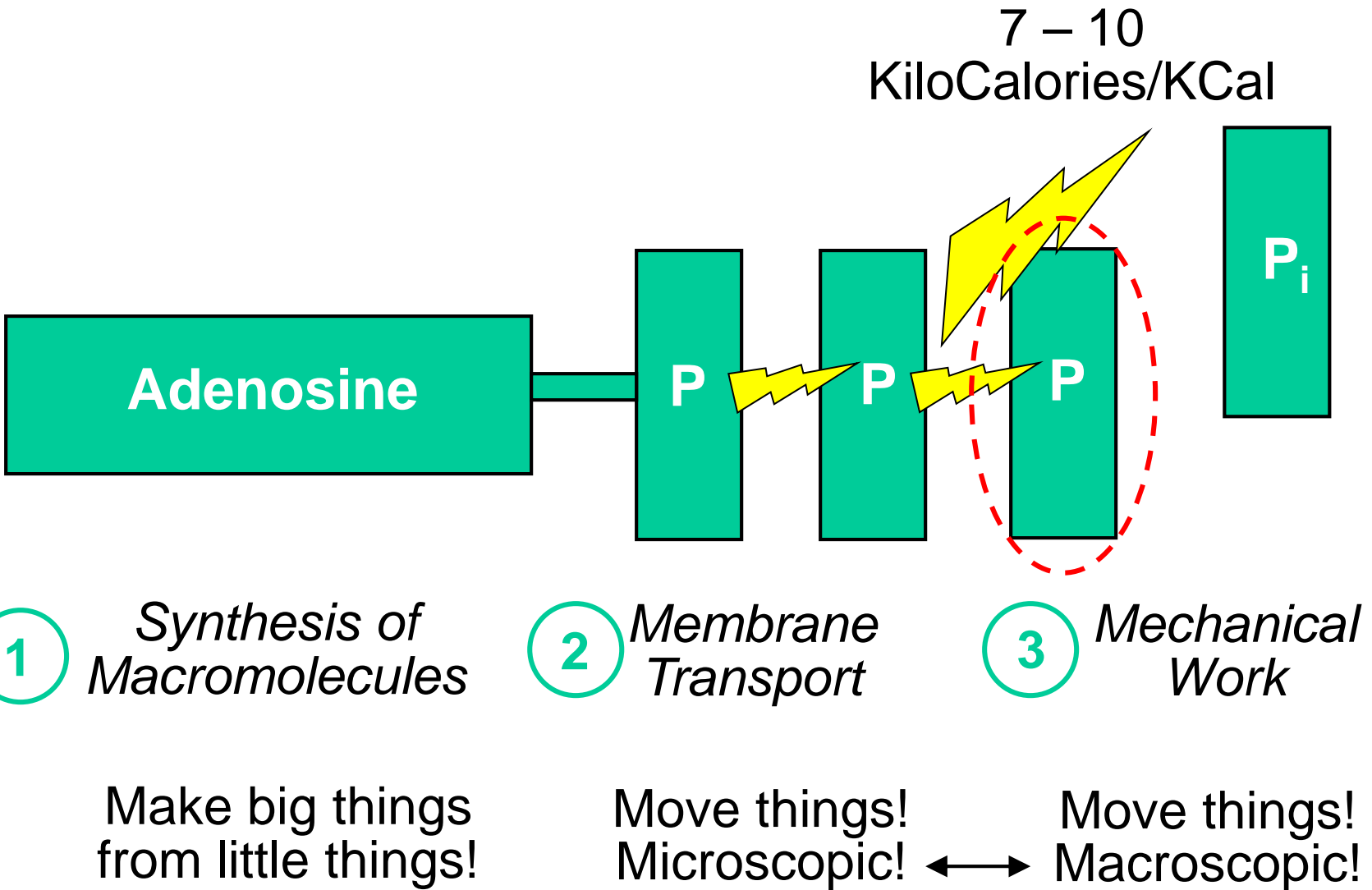
= CYTOSOL



1. Immediate/ATP-PC
2. Glycolysis

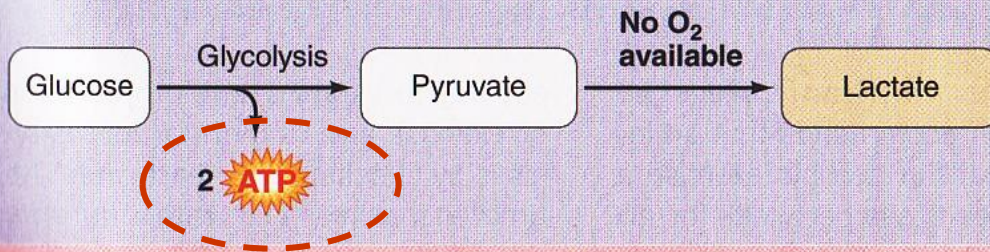


Cleave One High Energy Phosphate Bond To Do Work!!



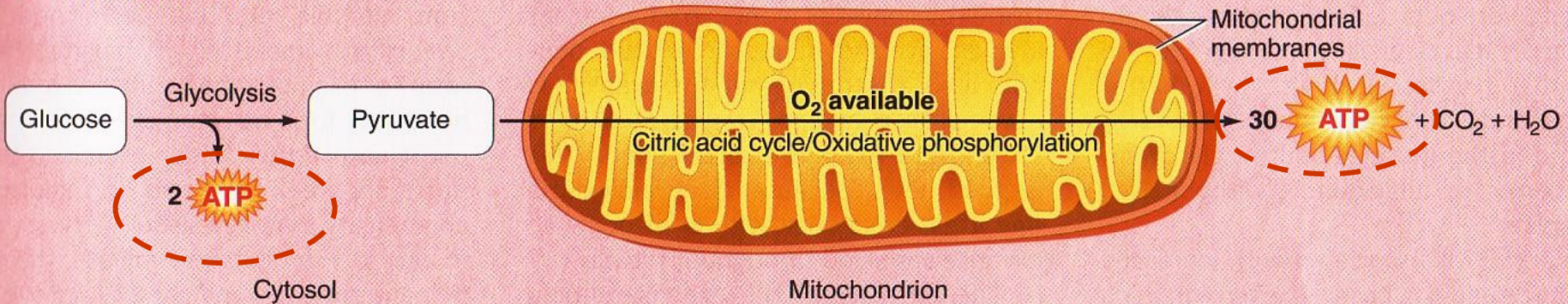
Anaerobic vs. Aerobic Metabolism

Anaerobic conditions



Anaerobic Glycolysis
"sugar dissolving"
without O₂. Net of 2 ATP
per molecule of glucose

Aerobic conditions

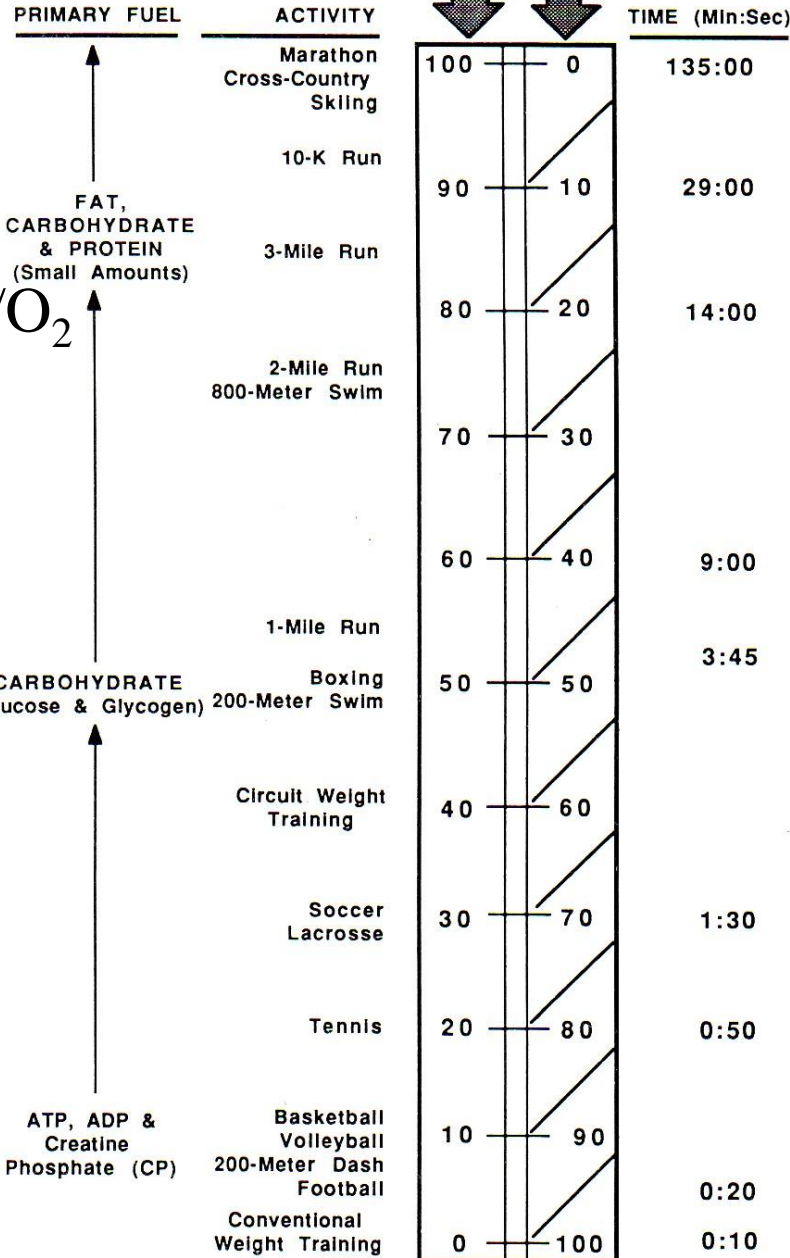


Aerobic Metabolism
+mitochondrial processing of
glucose with O₂. Net of 32 ATP
per molecule of glucose



AEROBIC

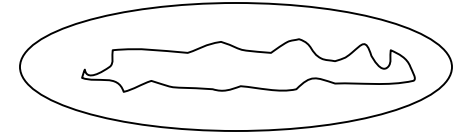
w/O₂



FAT,
CARBOHYDRATE
& PROTEIN
(Small Amounts)

CARBOHYDRATE
(Glucose & Glycogen)

ATP, ADP &
Creatine
Phosphate (CP)



MITOCHONDRIA

CYTOSOL

Glycolysis



Immediate/ATP-PC



ANAEROBIC

Stages of Cellular Metabolism/Respiration

**Anaerobic
Glycolysis
Cytosol**

**Aerobic
Metabolism
Mitochondria**

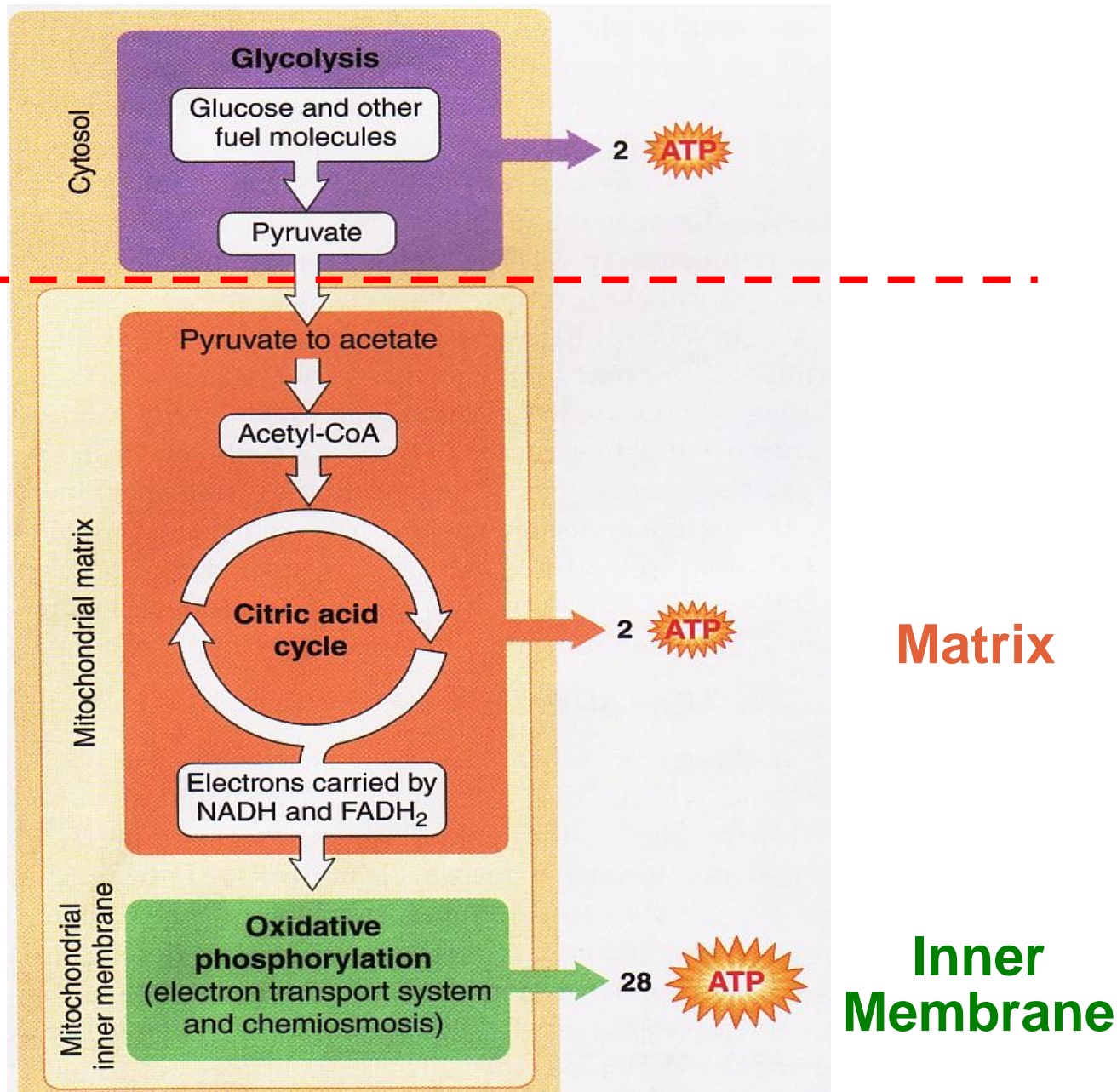


fig 2-9 LS 2012

Cashing in electrons at the Electron Transport Chain (ETC) produces an abundance of ATP energy molecules!

Cytosol

Outer mitochondrial membrane

MitoSciences®

Rod Capaldi
U of O Biology



Inner ...

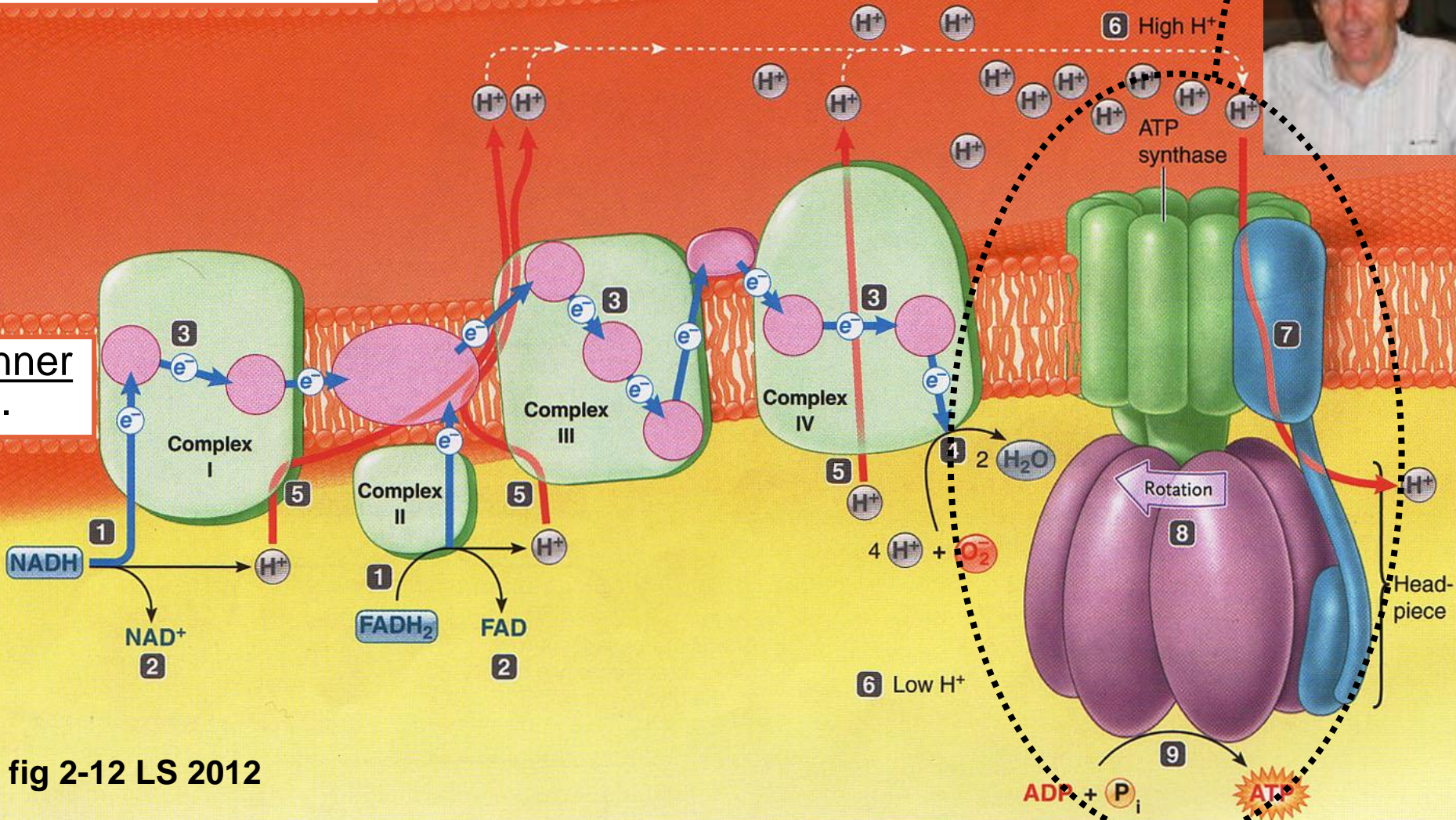


fig 2-12 LS 2012

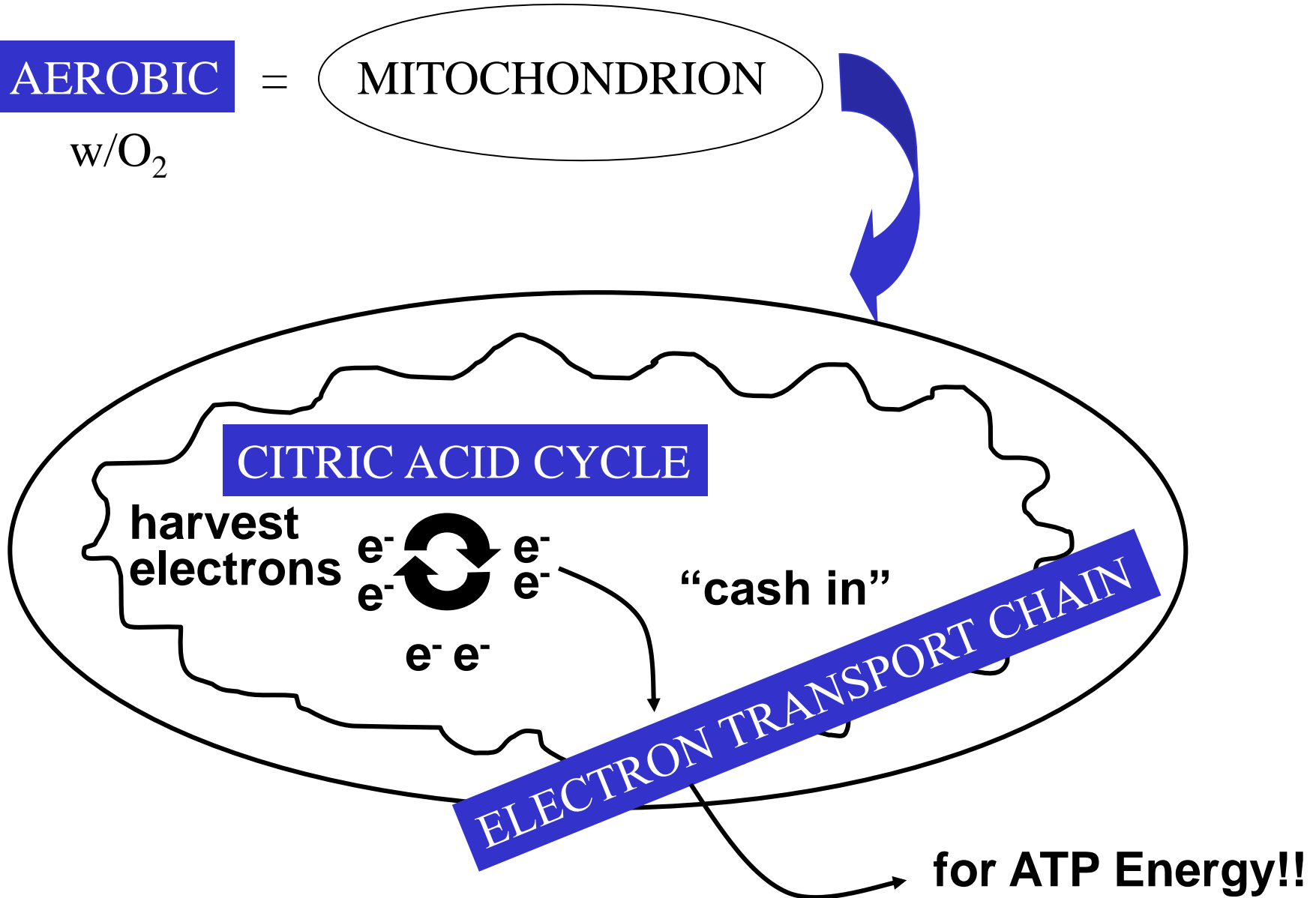
Goals of Aerobic Metabolism

AEROBIC

=

MITOCHONDRION

w/O₂





I. Announcements Nutrition Analyses this Thursday!
Please record diet on p 3-7 LM & begin analysis using
<https://www.supertracker.usda.gov/> Bring flash drive? Q?

II. Metabolism Connections Mitochondrial metabolism +

III. Introduction to Genetics LS 2012 ch 2 p 20-1 + Appendix C

A. How does DNA differ from RNA? pp A-20 thru A-22

B. Genetic code? pp A-22, A-23

C. How & where are proteins made? fig C-7, C-9

D. Class skit: Making proteins @ ribosomes!

IV. Nutrition PrimerSizer & Whitney (S&W) Sci Lib

A. Essential Nutrients: H₂O, 1^o Carbohydrates, 2^o Fats, 3^o Proteins, Vitamins, Minerals; Macro- vs Micro-?

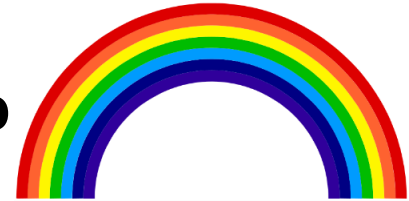
B. Dietary Guidelines: USDA, AICR, Eat Like the **Rainbow!**

C. Diet or exercise? Diet composition & endurance? Fasting?
Zuti & Golding 1976; Sacks **AHA NPAM Council** 2009;
AMDR? Adjusted Macronutrient Distribution Range!

D. *Beware of Nutrition Quackery* S. Kleiner & Monaco 1990!

V. Nutrition in the News Gain weight by drinking calories?

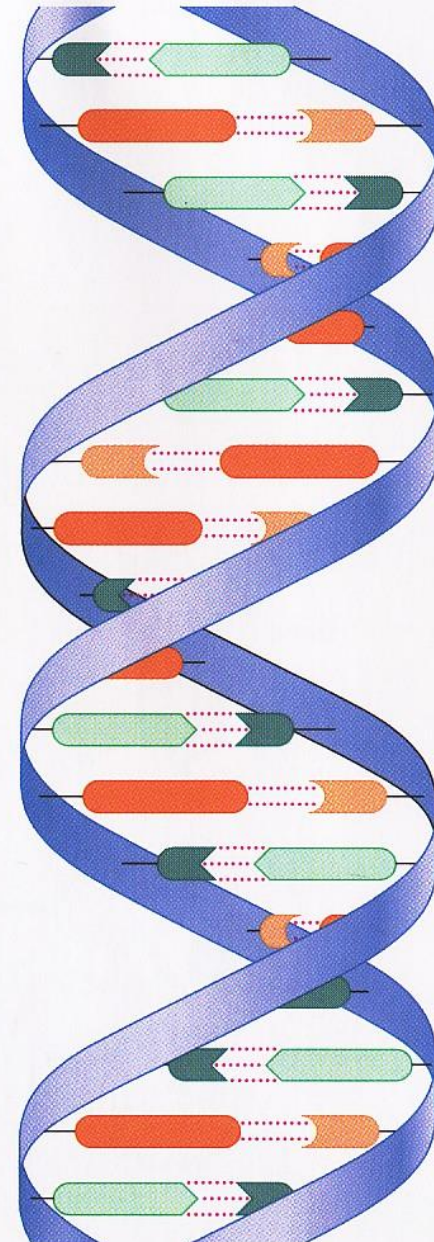
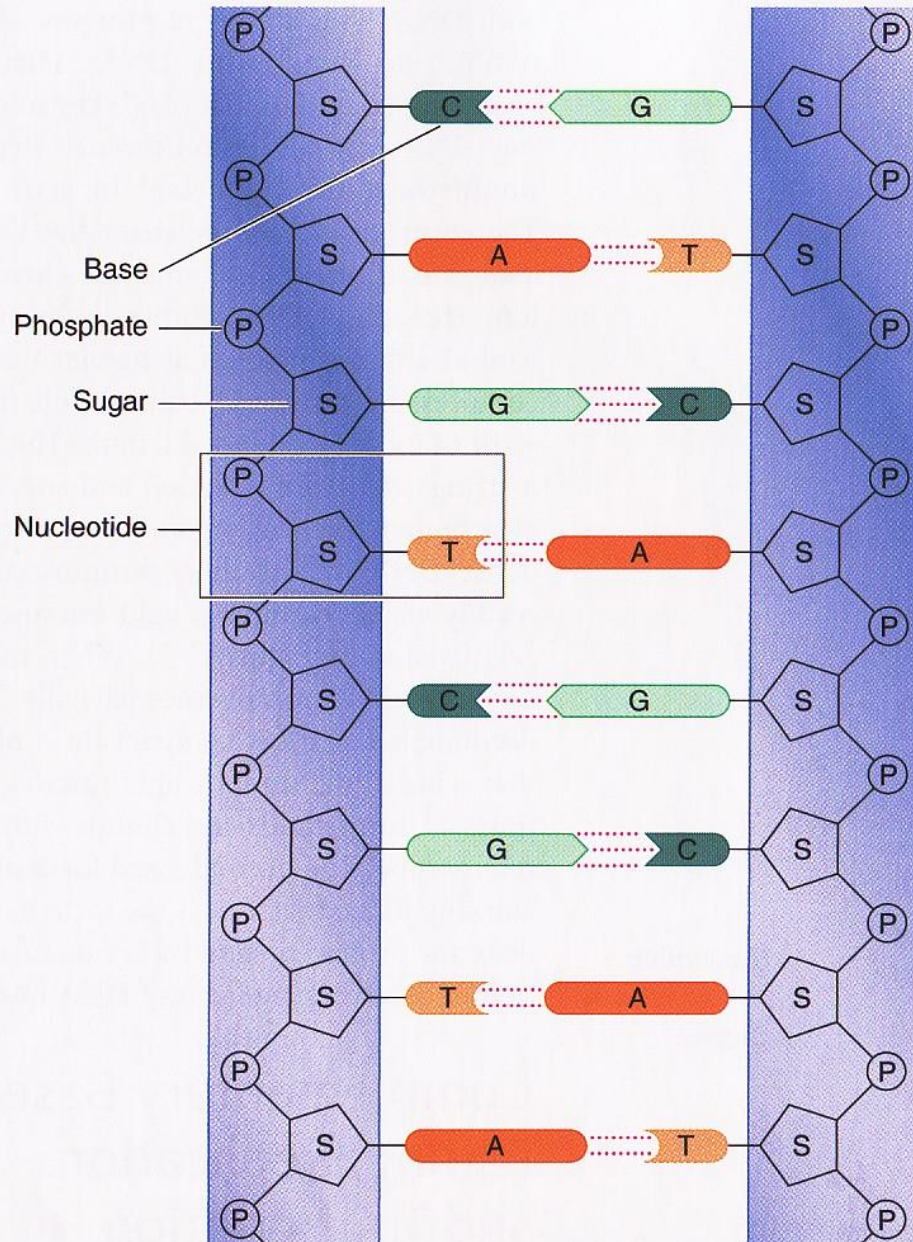
VI. Introduction to Digestion Steps + hydrolysis



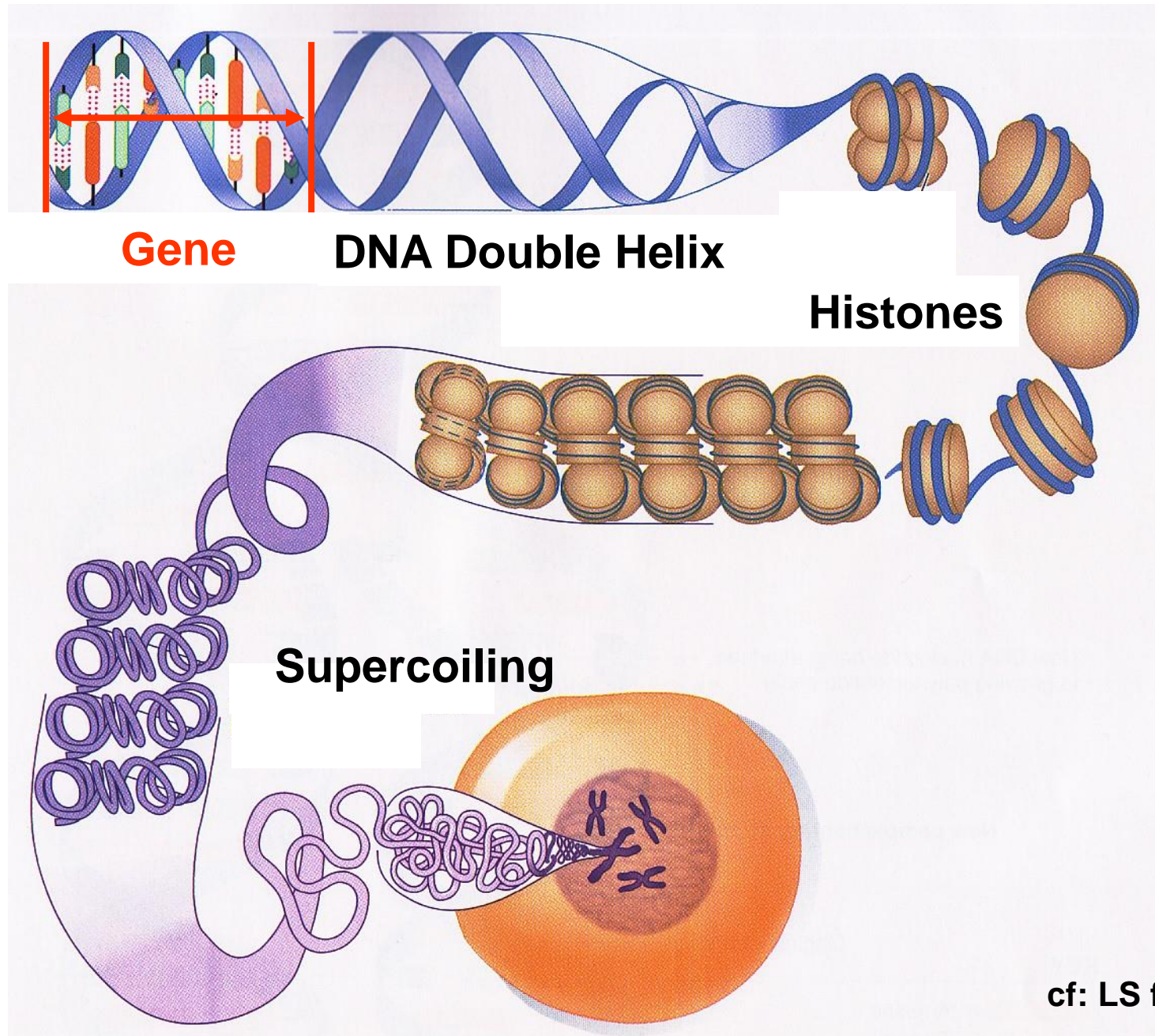
What are DNA's major functions? Heredity + Day-to-Day Cell Function



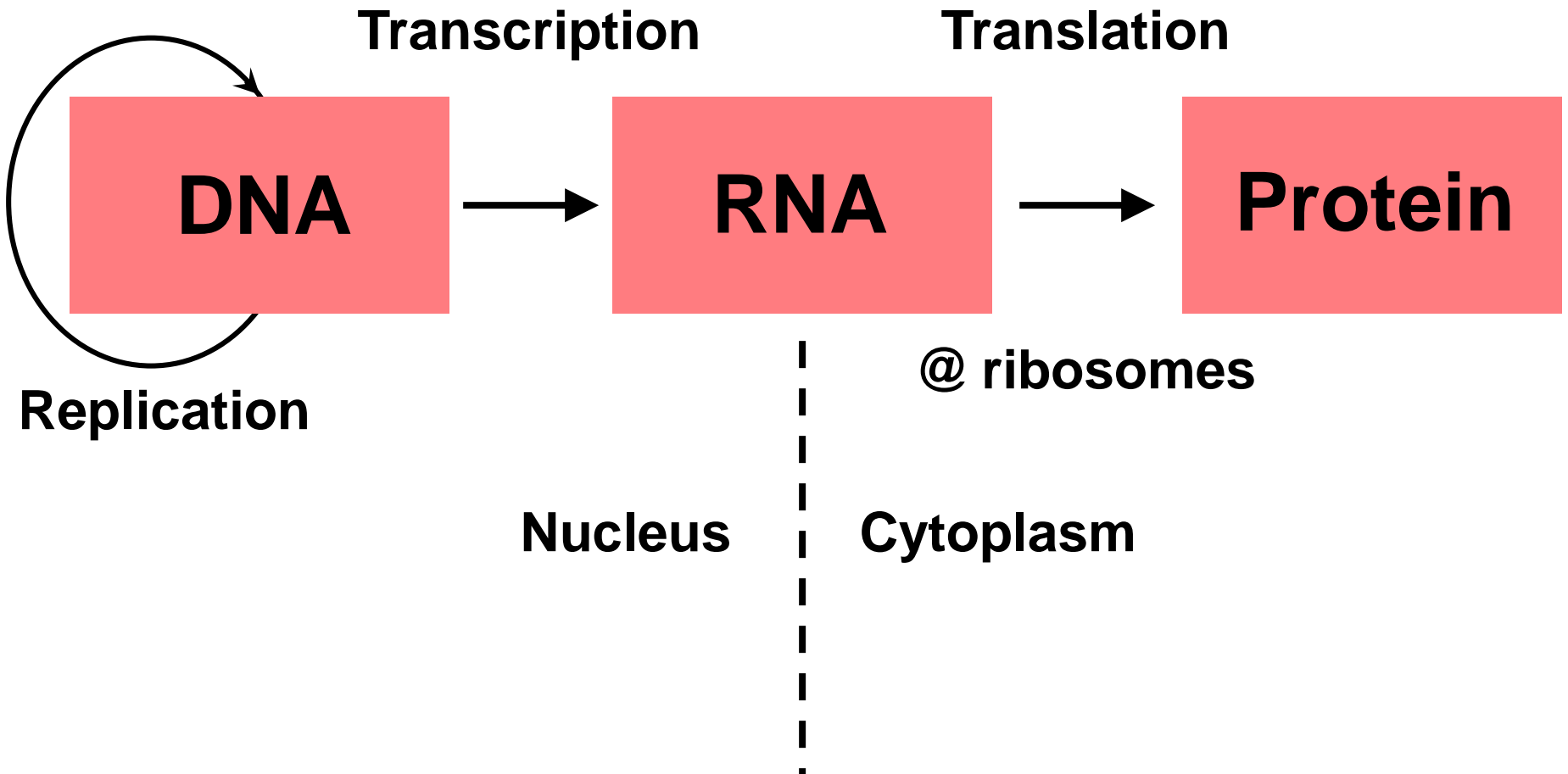
What does DNA look like? Double-helix!!



Gene = *Stretch of DNA that codes for a protein*



What does DNA do, day-to-day?



DNA vs RNA?

1. Double-stranded

2. Deoxyribose
(without oxygen)

3. A, T, C, G
Thymine

4. Self-replicative
(can copy itself)

5. Nucleus
(+mitochondria)

1. Single-stranded

2. Ribose
(with oxygen)

3. A, U, C, G
Uracil

4. Needs DNA as
template

5. 1^o Cytoplasm
(but Nucleus origin)

6. mRNA, rRNA, tRNA

*Triplets of bases code for amino acids,
the building blocks of proteins*

DNA

mRNA

tRNA

code word

codon

anti-codon

TAT

AUA

UAU

ACG

UGC

ACG

TTT

AAA

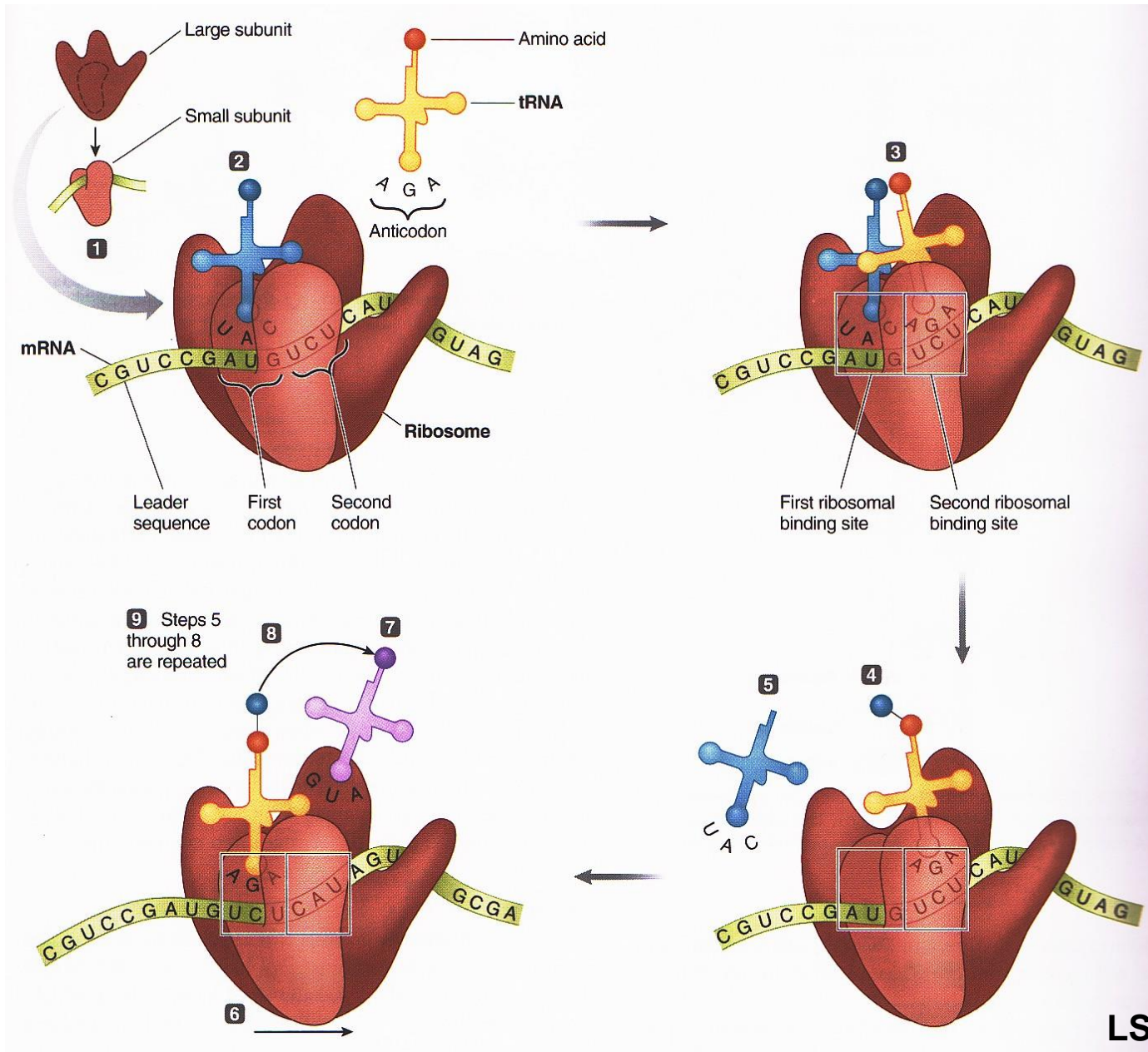
UUU

TAC

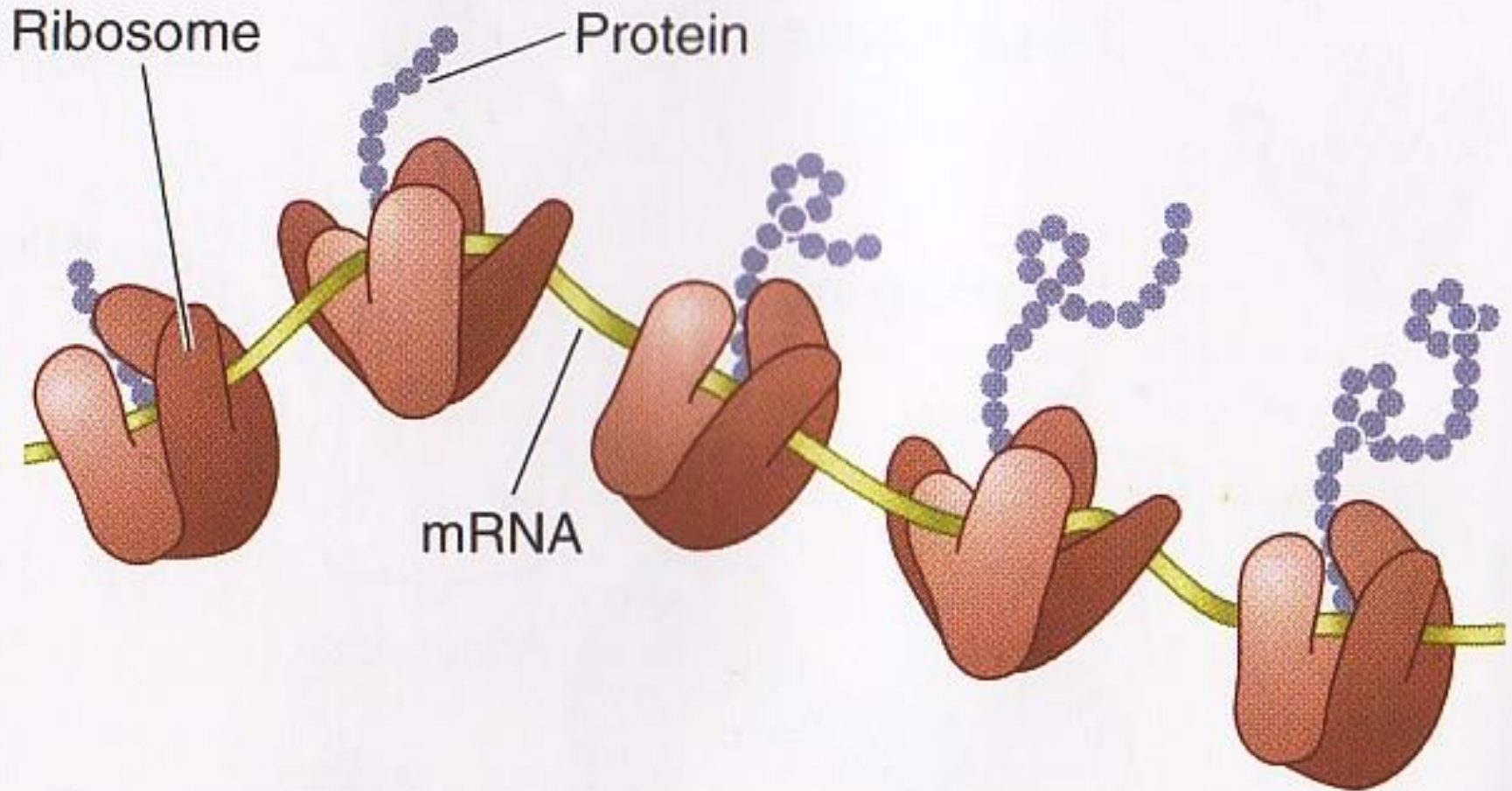
AUG

UAC

Translation? Ribosomes Make Proteins



A Polyribosome. Which Way is Synthesis?

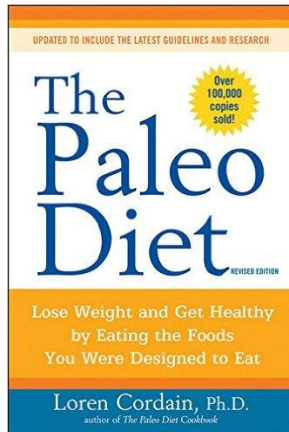
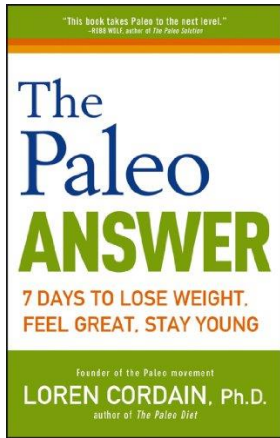
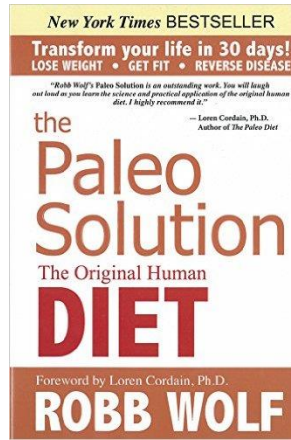




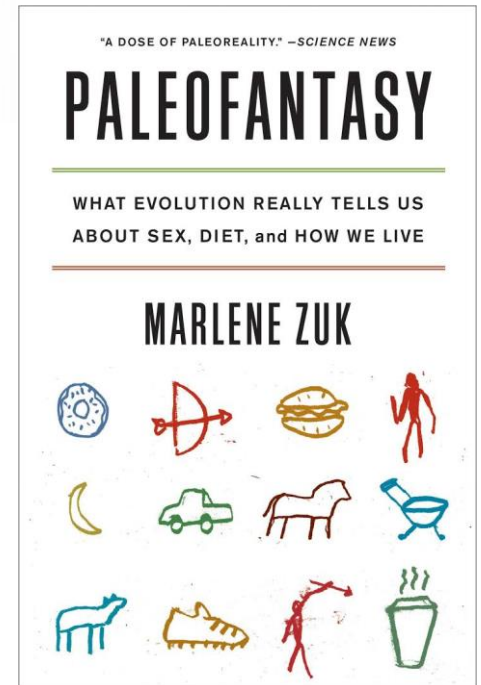
BI 121 Lecture 6

- I. Announcements** Data + Flashdrive for today's lab! Q?
If you want notebook to study for Exam I on Oct 25th, turn in prior lecture next Tuesday, Oct 18th. Sample Exam Q.
- II. Nutritional Physiology in the News** Pondering Paleo Nutrition
Action Health Letter, Marlene Zuk, U Minnesota + Shake the salt habit! *UC Berkeley Newsletter*. → Drink Your Calories? *PEBB Identifying Nutrition Quackery*, Kleiner & Monaco
- III. Nutrition Connections** DC Mod 2, Sizer & Whitney (S&W) Sci Lib
 - A. Diet & endurance? What's the best path to losing weight?
 - B. Low-carbohydrate dieting? What about fasting?
 - C. Balanced approach, Dr. Sacks [AHA NPAM Council](#)
- IV. Gastrointestinal Physiology** DC Module 3 pp 17-23, LS ch 15+
 - A. GI = Donut? GI secretions: What? Where? Why? LS p 438
 - B. How is the gut controlled?
 - C. Organ-by-organ review A&P LS tab 15-1 pp 440-1 +...
 - D. Zymogen? = Inactive precursor LS fig 15-9 p 452...
 - E. Accessory organs? Pancreas, Liver, Recycling! pp 457-63
 - F. Small intestine? Ulcers? LS fig 15-20,15-22 pp 467-8
<http://www.cdc.gov/ulcer> *Beyond the Basics* LS p 456
 - G. Large intestine? LS fig 15-24 pp 472-4

Pondering Paleo?



**Evolutionary Biologist
Behavioral Ecologist
U Minnesota**



<http://www.nutritionaction.com/daily/how-to-diet/pondering-paleo/>

More Reasons to Shake the Salt Habit



- ① ↓ blood vessel vasodilation w/in 30 min by ingesting 1500 mg Na+!
- ② ↑ Ca²⁺ excretion ↑ bone loss, risk of osteoporosis & fractures.
- ③ May directly impair kidney function & ↑ risk of kidney stones.
- ④ GI cancer risk, inflammation?

I'm outta here!!



Macronutrients & Micronutrients Essential for Life

Macronutrients

H₂O/Water

➔ 1^o Carbohydrates

➔ 2^o Fats/Triglycerides/Lipids

➔ 3^o Proteins

Micronutrients

Vitamins (A, D, E, K; C + B)

Minerals (K⁺, Na⁺, Ca²⁺, Mg²⁺,
Fe²⁺, Zn²⁺,...)

Sample Food Sources

Water, other drinks, fruits
& vegetables

Grains, vegetables, fruits,
dairy products

Meats, full-fat dairy
products, oils

Meats, legumes, dairy
vegetables

NB: Need only minute quantities!

Vegetables, vegetable oils,
fruits, citrus, grains, dairy

Fruits, vegetables, grains,
nuts, dairy, meats,
processed foods

➔ **Energy nutrients = yield ATP**



MyPlate launched June 2, 2011

2. Focus on fruits.
Whole fruit preferable to juice, but any fruit counts!
Fill $\frac{1}{2}$ your plate with fruits & vegetables!



3. Make at least $\frac{1}{2}$ of your grains whole grains!

5. Get your calcium-rich foods. Buy skim or 1% milk. Go easy on cheese!

1. Vary your veggies.
Fill $\frac{1}{2}$ your plate with fruits & vegetables!

4. Go lean with protein. Keep protein to $< \frac{1}{4}$ plate! Nuts, beans, peas, seeds, poultry, lean meat, seafood,...

Diet & Health Guidelines for Cancer Prevention

- 1. Choose a diet rich in variety of plant-based foods.**
- 2. Eat plenty of vegetables & fruits.**
- 3. Maintain a healthy weight & be physically active.**
- 4. Drink alcohol only in moderation, if at all.**
- 5. Select foods low in fat & salt.**
- 6. Prepare & store food safely.**

And always, remember...

Do not smoke or use tobacco in any form.



American Institute for Cancer Research (AICR)

5 times per wk? \equiv 106,600 calories/yr \equiv \pm 30.5 lb fat/yr



Starbucks
Cinnamon
Dolce Latte,
whipped cream
Venti (20 oz.)

410 calories

Jogging | **50 min.**



**Better
choices!**

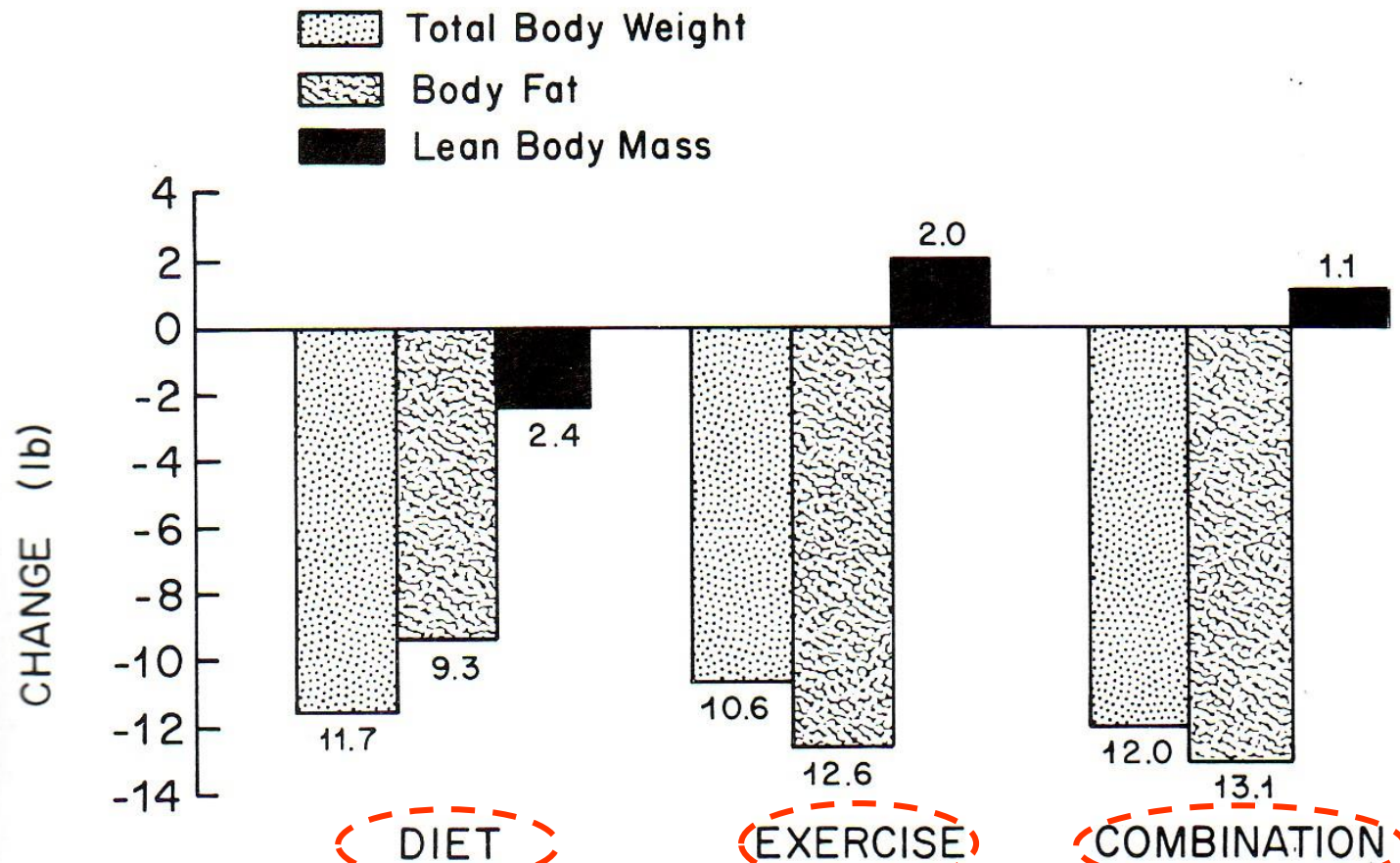


Figure 4-9. Changes in body weight, body fat, and lean body weight for diet, exercise, and combination groups. (From Zuti W. B., and Golding, L. A.: Comparing diet and exercise as weight reduction tools. *Phys. Sportsmed.* 4:49-53, 1976.)

NB: Each group 500 kcal deficit/day, 16 weeks



Exercise is better than dieting in lowering body fat & preserving muscles!



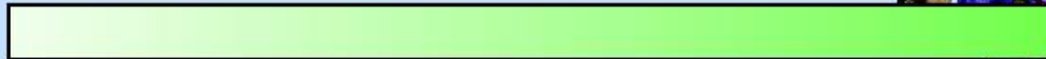
Dietary Composition & Physical Endurance

eg, Atkins!

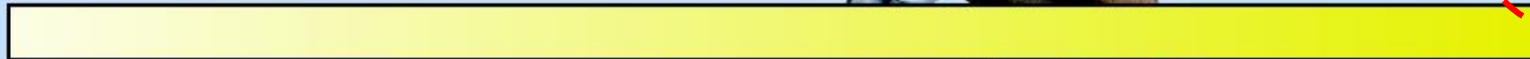
High-fat diet



Normal mixed diet



High-carbohydrate diet



~ 1/3 endurance!

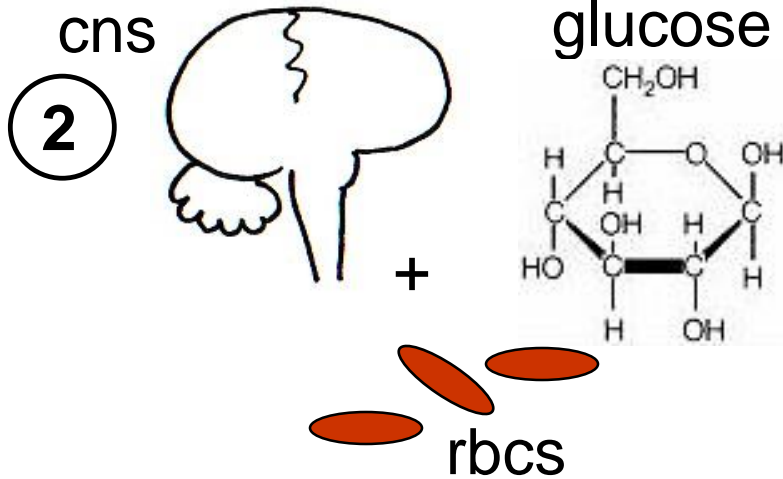
Maximum endurance time:

57 min

114 min

167 min





Negative Effects of Low Carbohydrate

1



- ① ↑ fatigue/exhaustion central & peripheral!
- ② ↓ glucose – brain+spinal cord, rbcs thrive upon.
- ③ ↓ variety which reduces intake of phytochemicals, vitamins, minerals & fiber.
- ④ ↑ risk of respiratory infections.

4



+ gall stones,
↓ thermoregulation...

**To Help Lower Body Wt & %Fat
EXERCISE!! +*Minimize* These!!**



FAT 9 Kcal/g

ETOH 7 Kcal/g

CARB 4 Kcal/g

PRO 4 Kcal/g

**NB: *Minimize* not *Eliminate!*
Moderation not *Abstinence!!***

60-day Fast???

Lost 60 lb!! Wow!!

Yet

26 lb Water

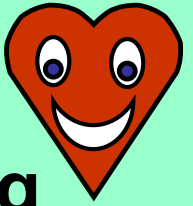
20 lb Lean Body Mass

14 lb Fat

Fat < 1/4 total wt loss!

> 3/4

Dr. Sacks' Conclusions:



We conclude that healthful diets with varying emphases on carbohydrate, fat & protein levels can all achieve clinically meaningful weight loss & maintenance of weight loss over a 2-yr period. The results give people who need to lose weight the flexibility to choose a diet that they can stick with, as long as it's heart healthy. Such diets can also be tailored for individuals based on their personal & cultural preferences & in this regard may have the best chance for long-term success.



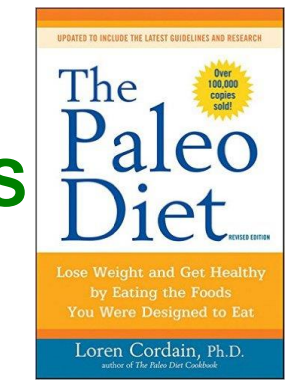
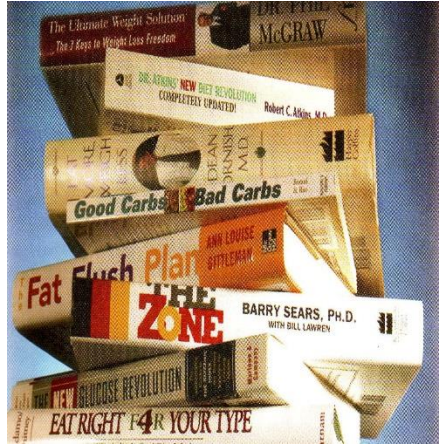
...Put Lab Notebook in box based on your lab time. Thanks!!



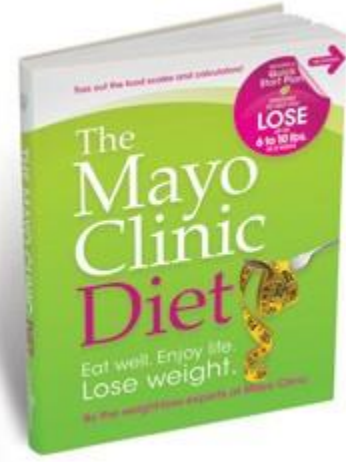
BI 121 Lecture 7

- I. Announcements** Exam I one week from today, Oct 25th! Summary & Review, Sunday Oct 23rd, 6-7:30 pm, here! Q?
- II. Nutrition Final Comments & Discussion** Recommended diets? Nutrition Quackery? Kleiner & Monaco. Diet & disease?
- III. Gastrointestinal Physiology** DC Module 3 pp 17-23, LS ch 15+
 - A. GI = Donut? GI secretions: What? Where? Why? LS p 438
 - B. How is the gut controlled?
 - C. Organ-by-organ review A&P LS tab 15-1 pp 440-1 +...
 - D. Zymogen? = Inactive precursor LS fig 15-9 p 452...
 - E. Accessory organs? Pancreas, Liver, Recycling! pp 457-63
 - F. Small intestine? Ulcers? LS fig 15-20, 15-22 pp 467-8
<http://www.cdc.gov/ulcer> Beyond the Basics LS p 456
 - G. Large intestine? LS fig 15-24 pp 472-4
- IV. Cardiovascular System** DC Mod 4, LS ch 9, Torstar, G&H+...
 - A. Circulatory vs. Cardiovascular (CV)? CV vs. Lymphatic
CV Pulmonary & Systemic circuits DC pp23-31+LS p229+
DC fig 4-1 p 24, LS fig 9-2b p 231
 - B. Arteries, capillaries, veins, varicosities? G&H, Torstar, DC
 - C. ♥ layers, box, chambers, valves, inlets, outlets
LS fig 9-4 p 233, fig 9-2a p 231; DC pp 23-6
 - D. Normal vs. abnormal blood flow thru ♥ & CVS LS, Fox+...

NOT PEER-REVIEWED = TRADE BOOKS



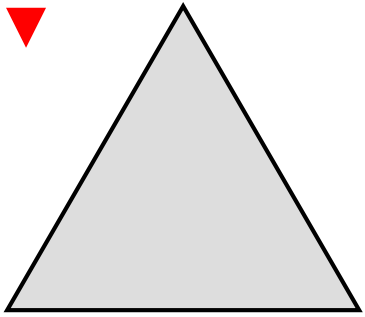
PEER-REVIEWED = TEXTS → RESEARCH



AHA + DASH + MAYO CLINIC



LOWER CARBOHYDRATE



LOWER FAT



**ELIMINATE CALORIES or FOOD GROUPS
ENCOURAGE FASTING**

**ADEQUACY
BALANCE
CONSISTENCY & MODERATION**

Kleiner's & Monaco's Top 10 Hit List for Nutrition Quackery

1. Treatment based on unproven theory calling for non-toxic, painless therapy.
2. Author's/purveyor's credentials aren't recognized in scientific community.
3. No reports in scientific, peer-reviewed literature but rather mass media used for marketing.
4. Purveyors claim medical establishment is against them & play on public's paranoia about phantom greed of medical establishment.
5. Treatments, potions, drugs manufactured according to secret formula.
6. Excessive claims promising miraculous cures, disease prevention or life extension.
7. Emotional images rather than facts used to support claims.
8. Treatments require special nutritional support including health food products, vitamins and/or minerals.
9. Clients are cautioned about discussing program to avoid negative.
10. Programs based on drugs or treatments not labeled for such use.

Nutrition Action

OCTOBER 2011 \$2.50

HEALTH LETTER®
 CENTER FOR SCIENCE IN THE PUBLIC INTEREST

Eat Real, America!

"With the right food choices, physical activity, and not smoking, we could prevent about 80 percent of heart disease, about 90 percent of diabetes, and 70 percent of stroke," says Walter Willett, chair of the nutrition department at the Harvard School of Public Health in Boston. "Those are the three pillars. They really do make a difference."

The right food choices are simple: Eat less red meat, sweets, refined grains, and salt, and drink fewer sugary beverages. Replace unhealthy foods with vegetables, fruit, beans, and whole grains, and with smaller amounts of fish, poultry, and low-fat dairy. Those foods aren't just good for our health. They can also help protect the Earth.

Here's why—and how—to eat real.

Continued on page 3.

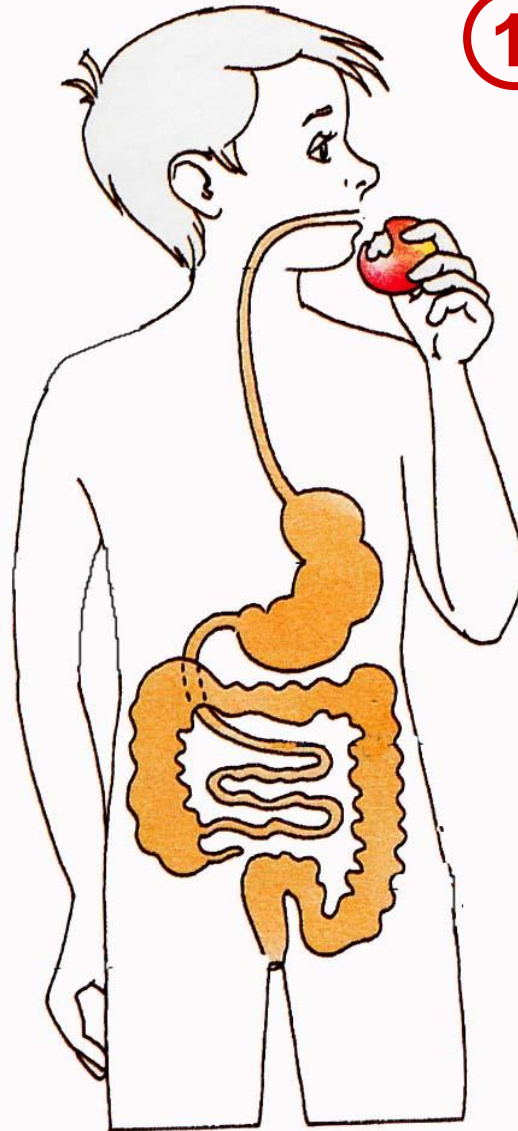
With the right food choices, physical activity, and not smoking, we could prevent about ~90% of diabetes, 80% of heart disease & 70% of stroke!

Photo: © Marissa/Bettmann/Photo


FOOD DAY
OCTOBER 24, 2011
JOIN US AT FOODDAY.ORG

40
CSPI • 1971-2011

Digestion Steps



① Ingestion

② Mechanical Digestion

③ Chemical Digestion

④ Peristalsis

⑤ Absorption

⑥ Storage

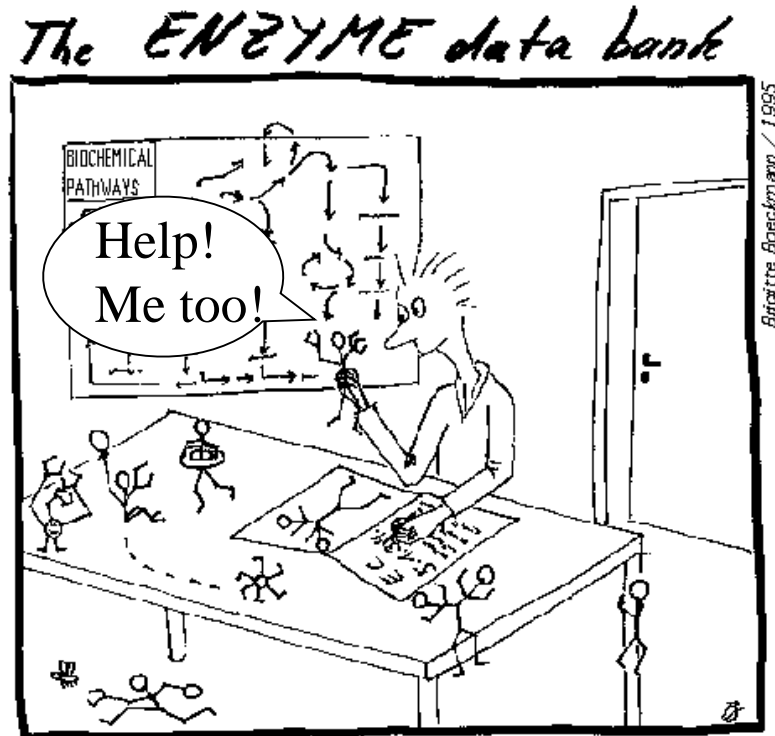
⑦ Defecation

Hydrolysis of Energy Nutrients

Hi gang!!
You need me
for digestion!!



+



H₂O

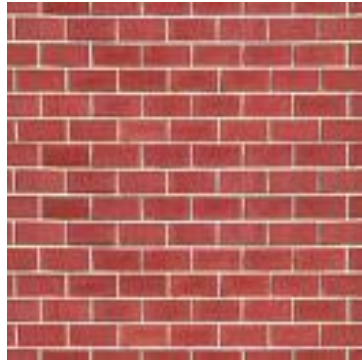
+

Enzyme

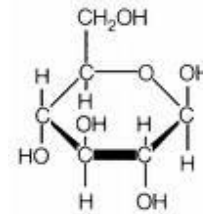
Polymer to Monomer (Many to One)



...Central-linking theme!!

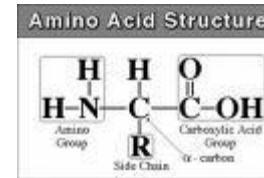


Carbohydrate

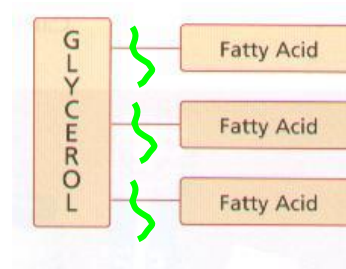
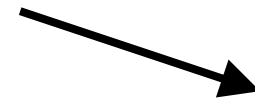


Glucose

Protein
+
Fat

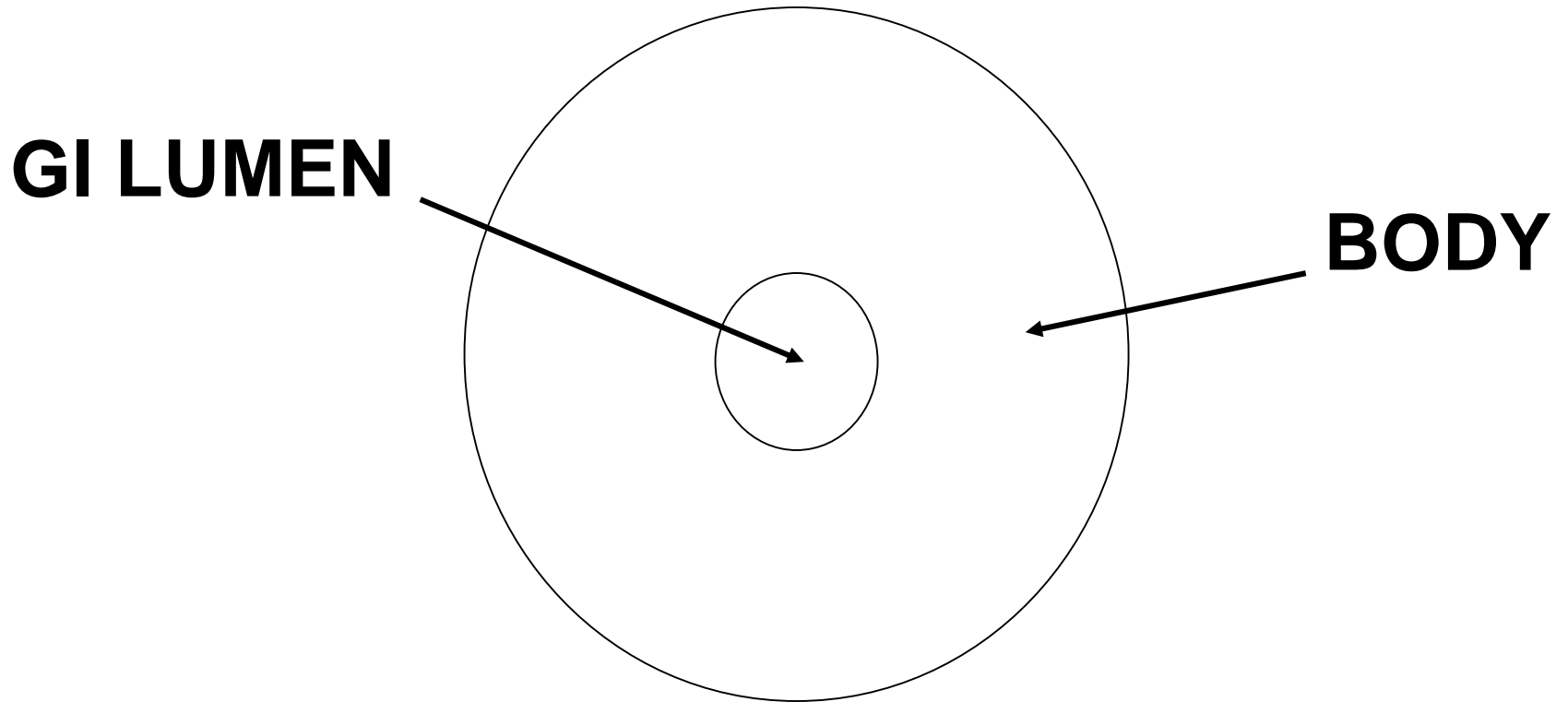


Amino Acids



Fatty Acids
+
Glycerol

GI-DONUT ANALOGY



Gut Secretions

Secretion

Release Site

1. Mucus

into GI Lumen

2. Enzymes

into GI Lumen

3. H₂O, acids, bases+

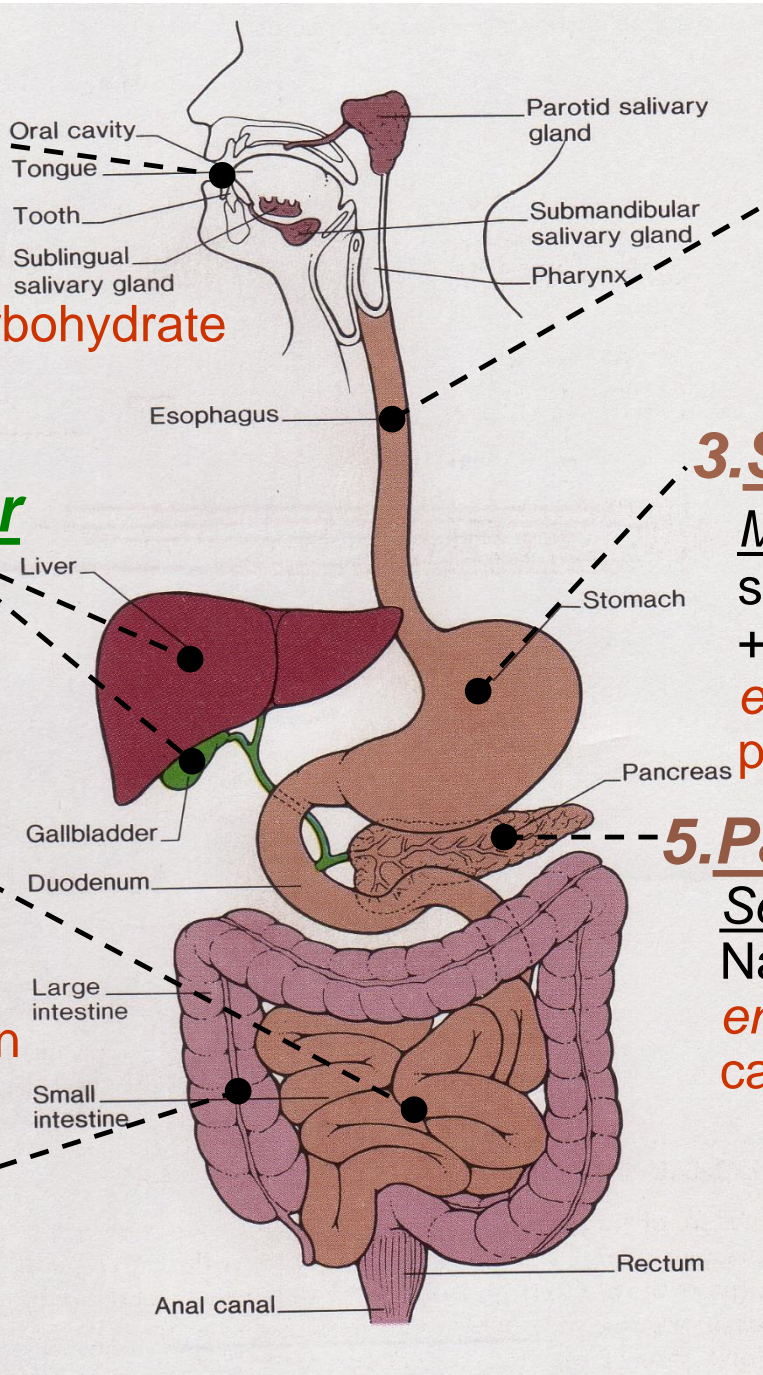
into GI Lumen

4. Hormones

into Blood

1. Mouth

Ingestion entry way
salivary gland secretion
mucus + enzymes
enzymatic digestion: carbohydrate
mastication = chewing
deglutition = swallowing



2. Esophagus

Rapid transit
peristalsis
secretion mucus

3. Stomach

Mixing peristalsis
secretion mucus + HCl
+ enzymes
enzymatic digestion:
protein + butter fat!

5. Pancreas

Secretion mucus +
 NaHCO_3 + enzymes
enzymatic digestion:
carbohydrate, fat, protein

4. Liver-Gall Bladder

Emulsification =
detergent action of bile
+ secretion

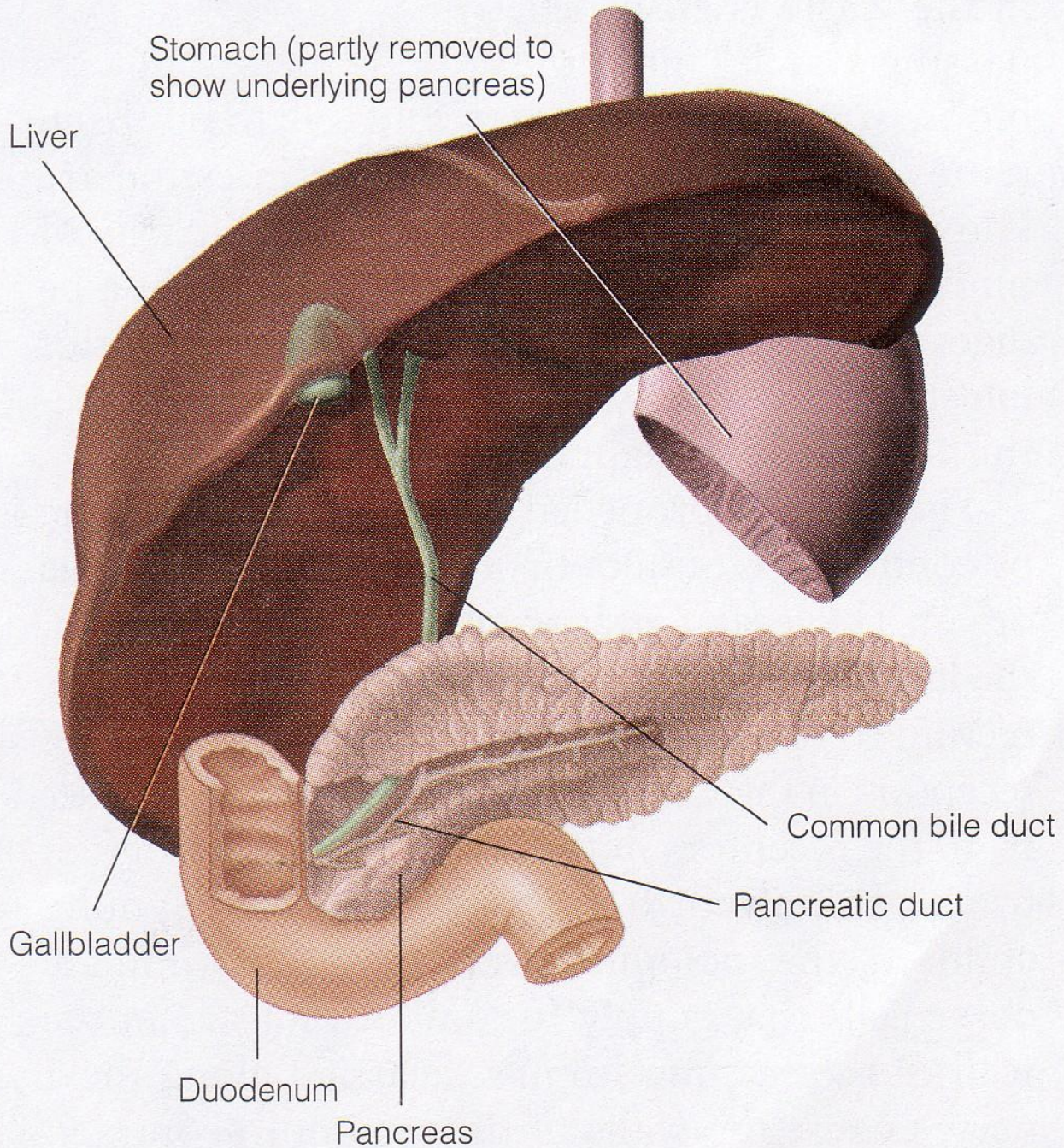
6. Small Intestine

Absorption
Secretion mucus
+ enzymes
enzymatic digestion:
carbohydrate, fat, protein
Peristalsis

7. Large Intestine

Dehydration
secretion + absorption
storage + peristalsis

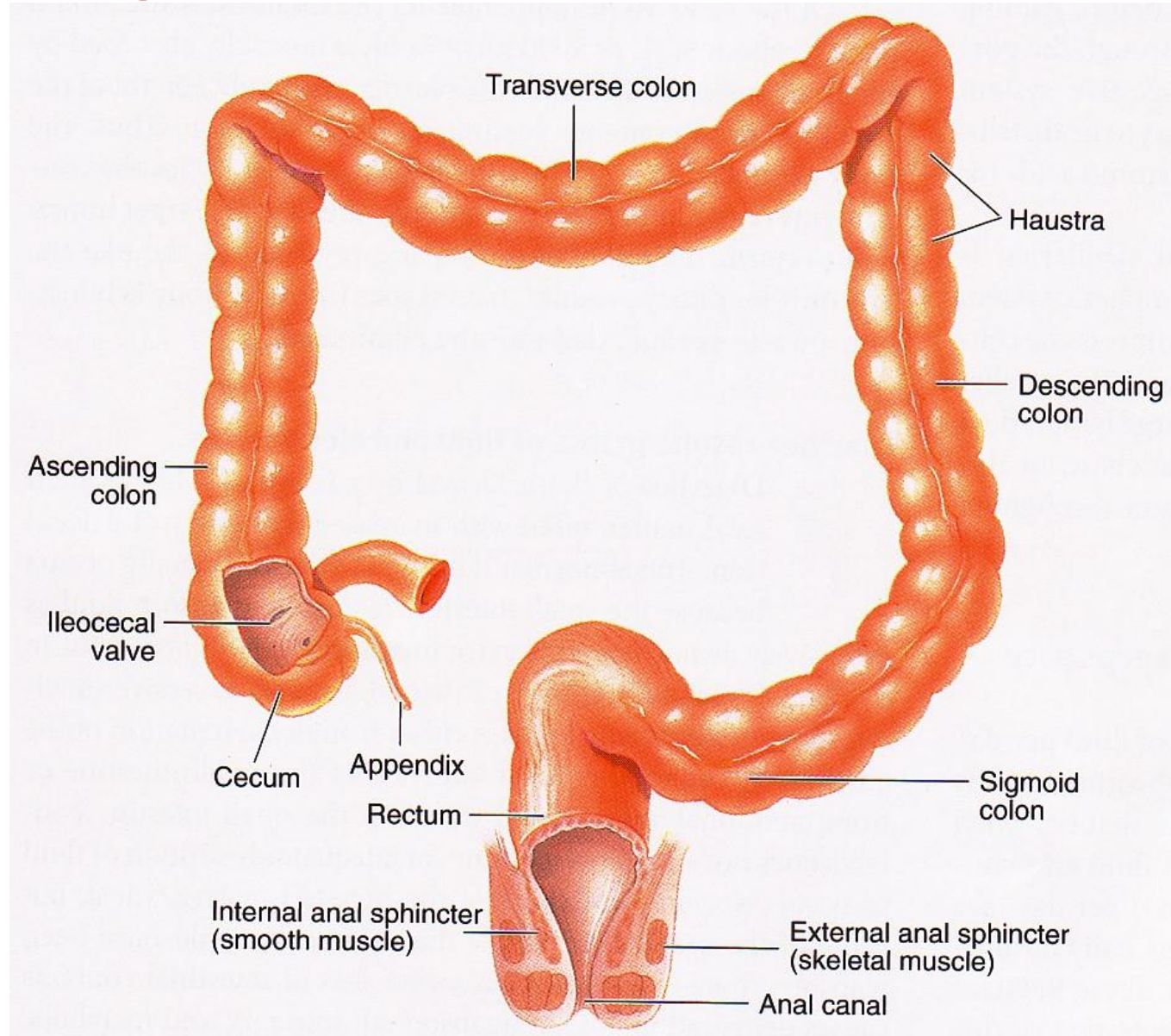
What are other
accessory organs
of digestion, that is,
off-shoots of the
primary tube?



What is the major
function of the
small intestine?

Absorption!!

Large Intestine Structure & Function



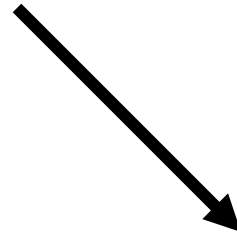
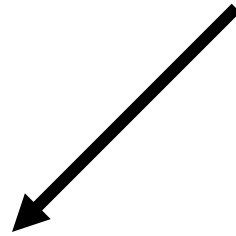


BI 121 Lecture 8

- I. Announcements** **Exam I next session; 10 am & 2 pm lab sections go directly to 5 KLA & 202 CAS. All others here (100 WIL)! Review: Sunday, 6 pm here!** Lab notebooks. Q?
- II. Cardiovascular Connections** LS 2012 ch 9, Torstar Books+...
- III. CV Physiology in News** AHA + NHLBI websites. Nic? ACSM, AHA, DHHS Healthy people exercise guidelines!
- IV. CV Pathophysiology & Risk Reduction** LS ch 9, 10 +...
 - A. AMI, CVA, CVD, PVD, TIA, HTN? + surgical treatments
 - B. Atherosclerosis? LS fig 9-27, 9-25, 9-26 pp 266-8
 - C. How to minimize risk of CVDs? Treatment triad:
Exercise, Diet, Drugs+Surgery
 - D. Food choices
make a difference?
What's HAPOC?



Cardiac Cycle

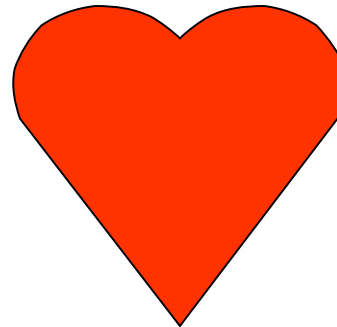
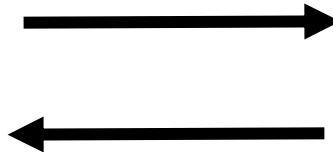
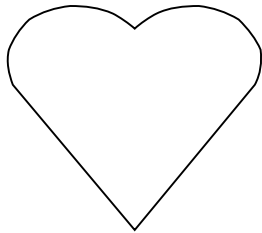


Systole

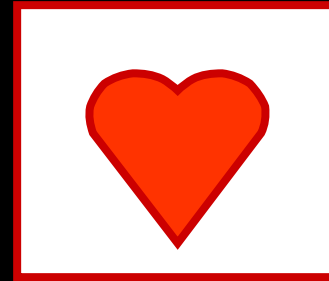
Contract
& Empty

Diastole

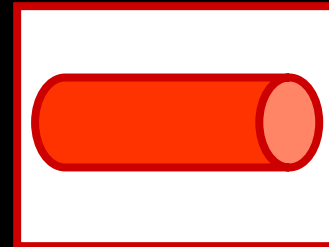
Relax
& Fill



Cardiovascular (CV) = Heart + Vessels + Blood!



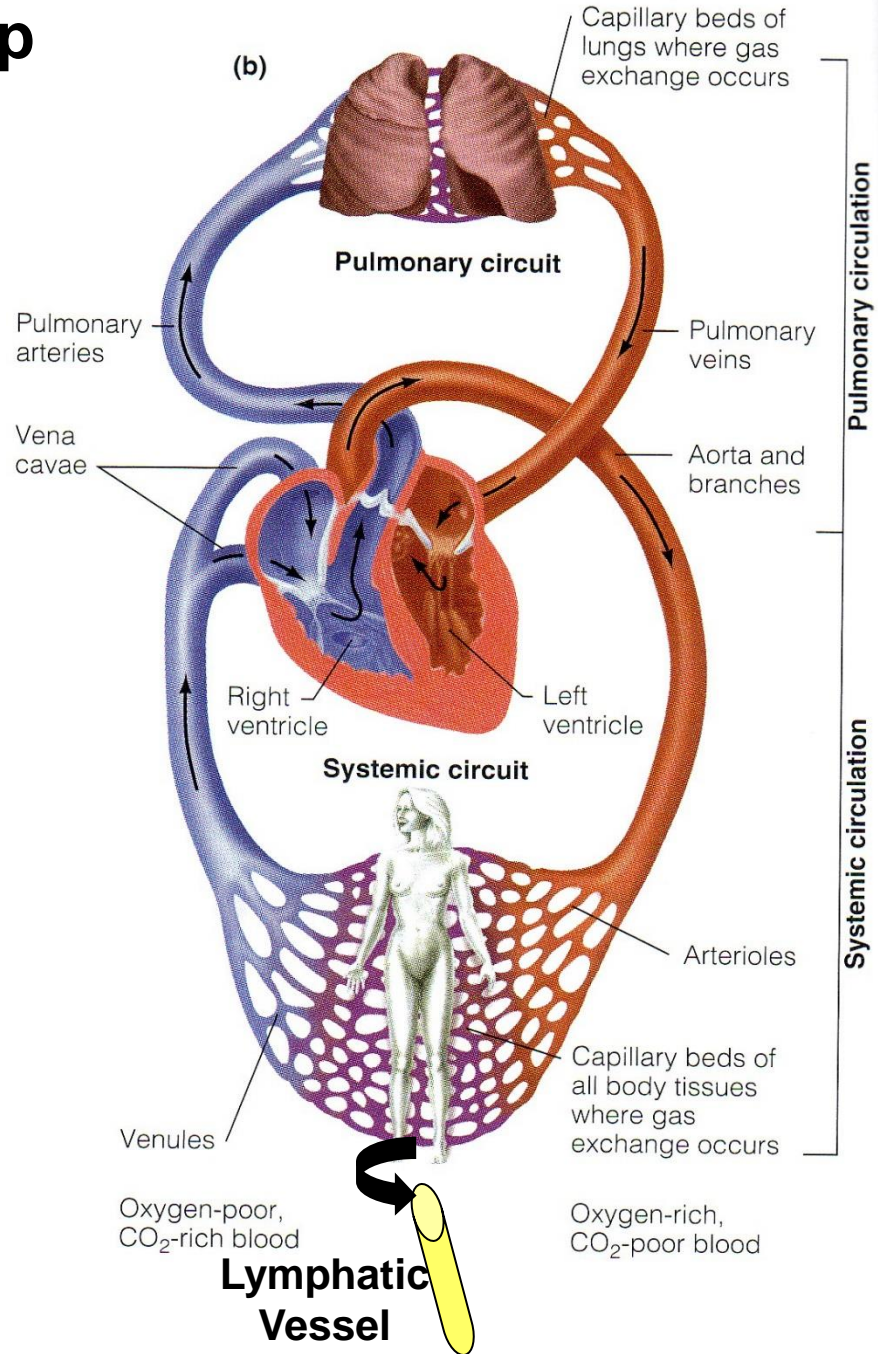
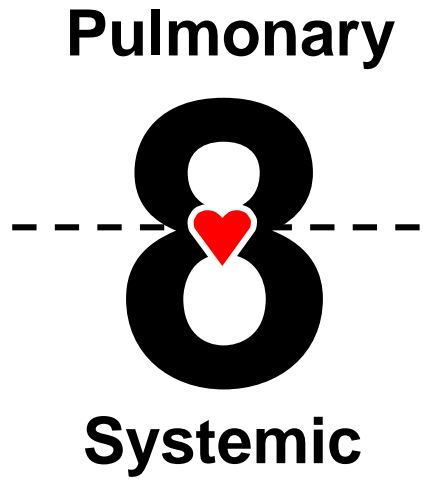
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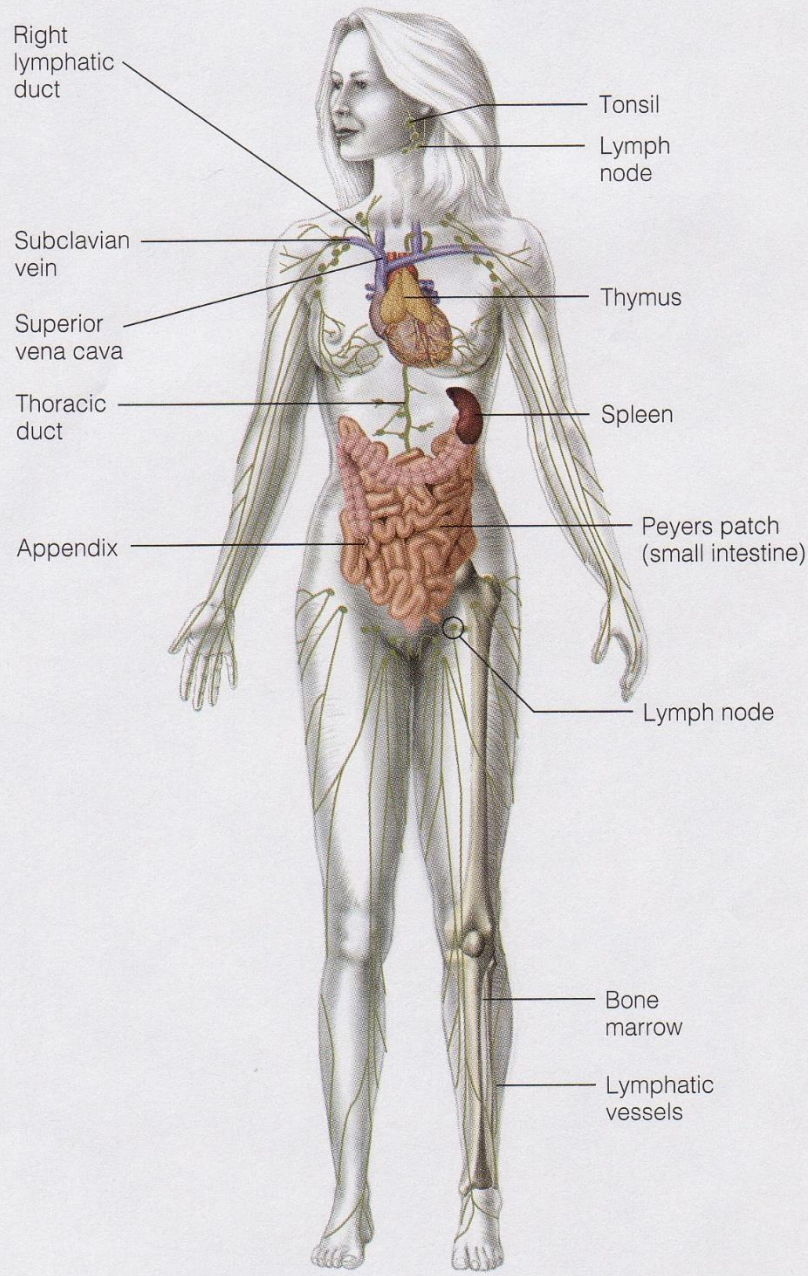


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NB: Figure-8 loop



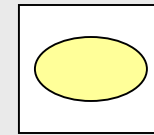


Lymphatic System

1. Lymph Nodes

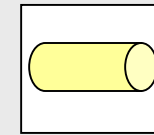
2. Vessels

3. Lymph

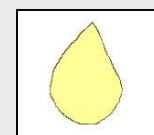


No pump!

+



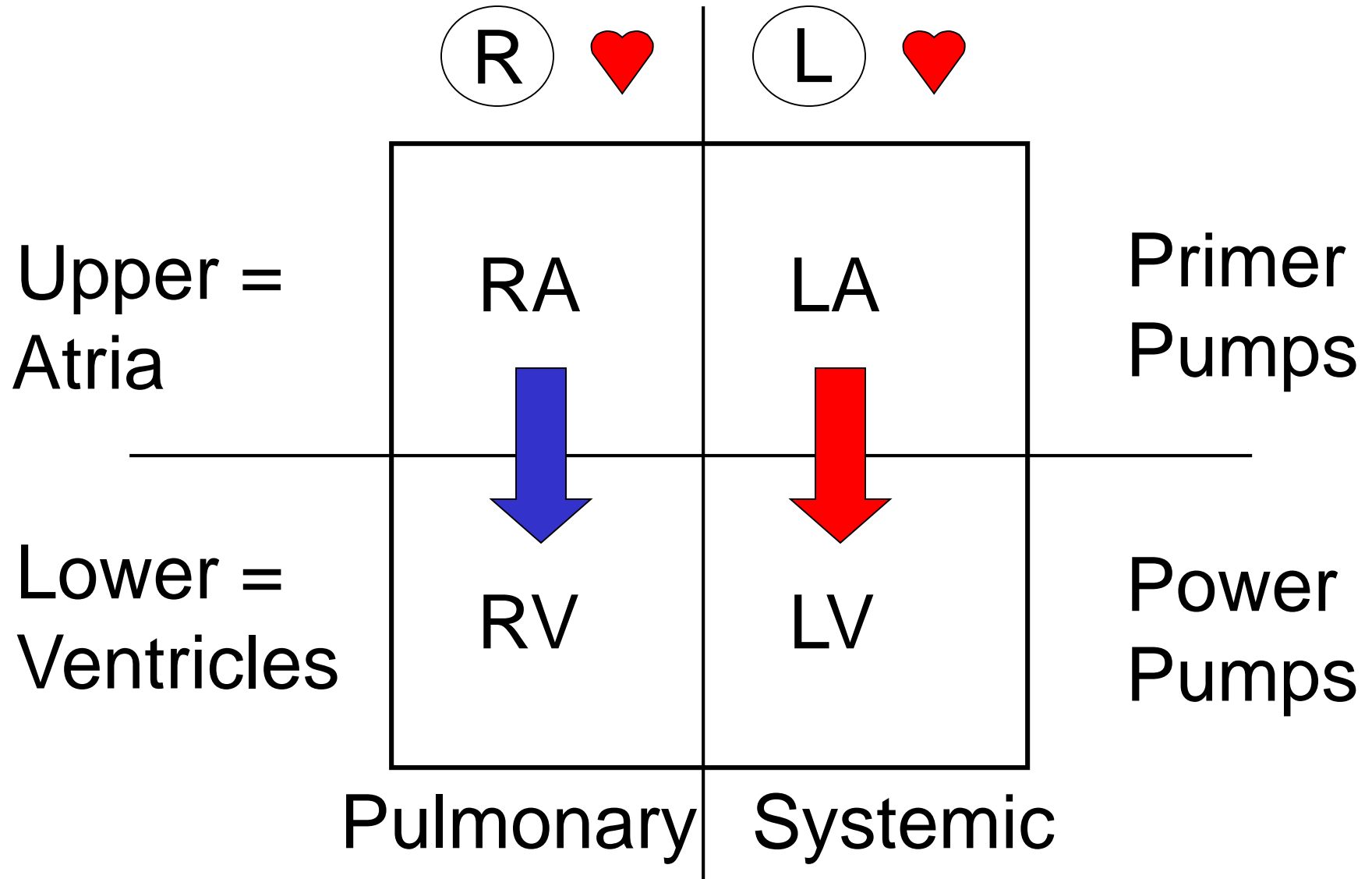
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Lymphatic System Blockage in Elephantiasis from Mosquito-borne Parasitic Filaria Worm



Human  = 4-chambered box?
2 separate pumps?



Human ♥ = 4 unique valves?
2 valve sets?

Semilunar = Half-moon shaped

More
rigid

1. Pulmonic/Pulmonary
2. Aortic



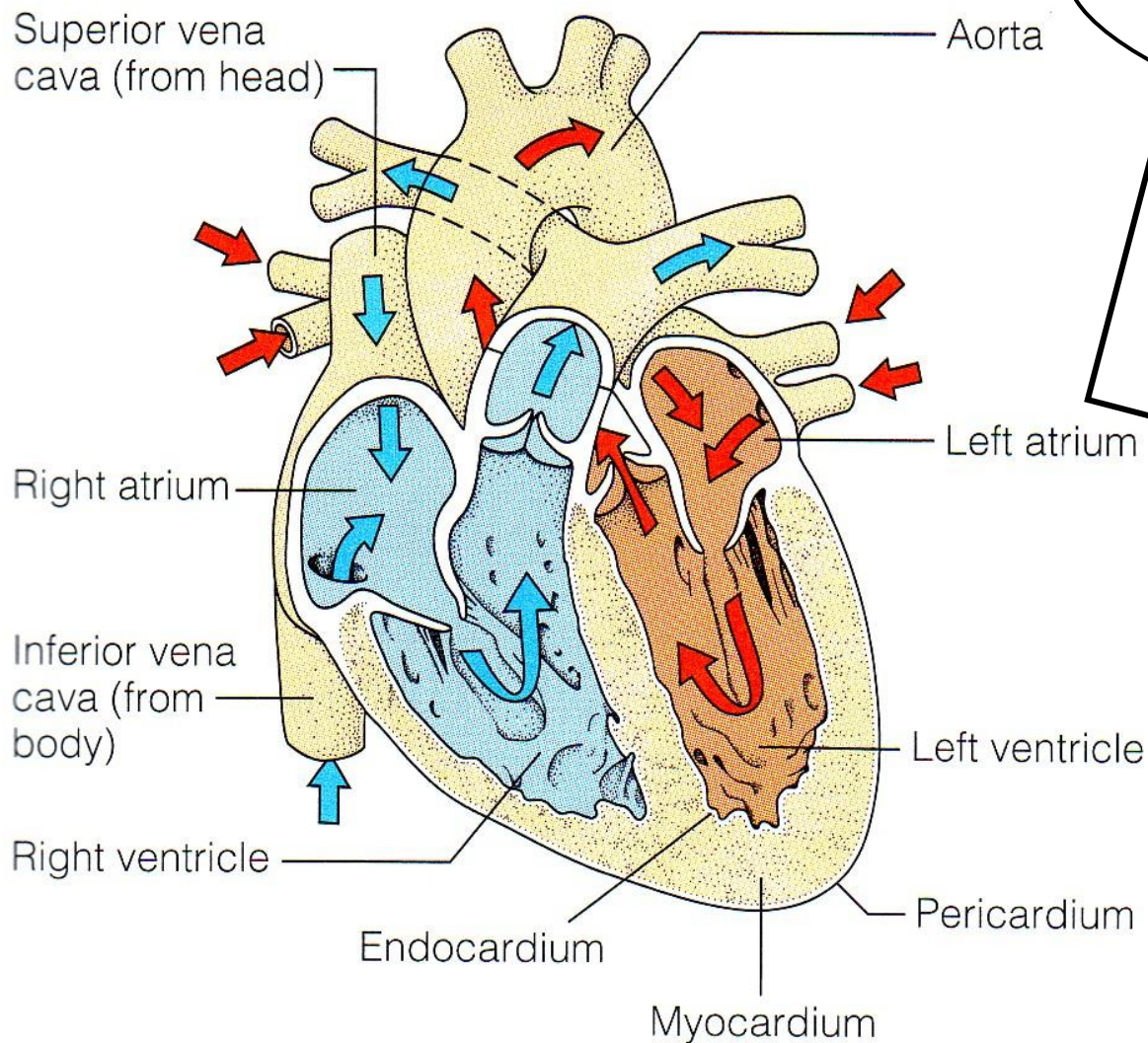
AV = Atrioventricular

More
flimsy

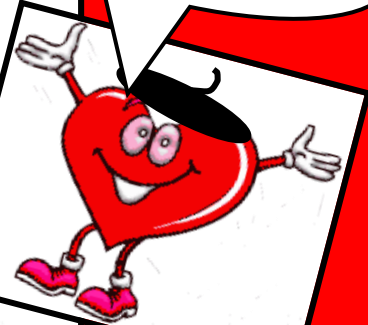
3. (R) AV = Tricuspid
4. (L) AV = Mitral/Bicuspid



Veins → Atria → Ventricles → Arteries



VAVA!

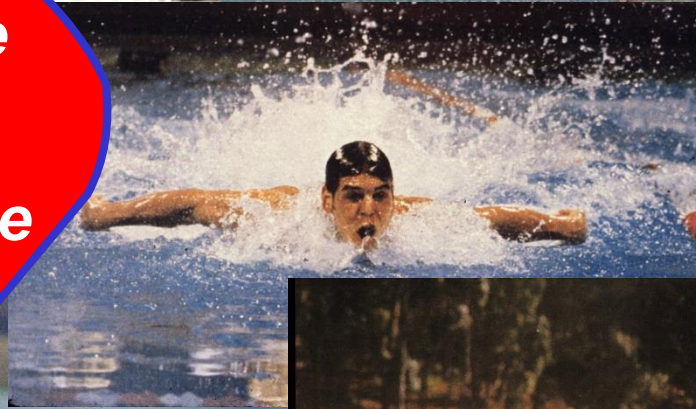


<http://www.nhlbi.nih.gov/health/health-topics/topics/hhw/contraction.html>

How much aerobic?



Continuous exercise
≥ 50% muscle mass
≥ Conversational pace
20-60 min/session
3-5 days/wk



<http://www.acsm.org/about-acsm/media-room/news-releases/2011/08/01/acsm-issues-new-recommendations-on-quantity-and-quality-of-exercise>



AMERICAN COLLEGE
of **SPORTS MEDICINE**

Guidelines: Healthy Adults < 65 yr



**Do moderately intense aerobic exercise
30 min/d, 5 d/wk**

OR

**Do vigorously intense aerobic exercise
20 min/d, 3 d/wk**

AND

**Do 8-10 strength-training exercises
8-12 repetitions/each exercise, 2 d/wk**

CVDs

AMI

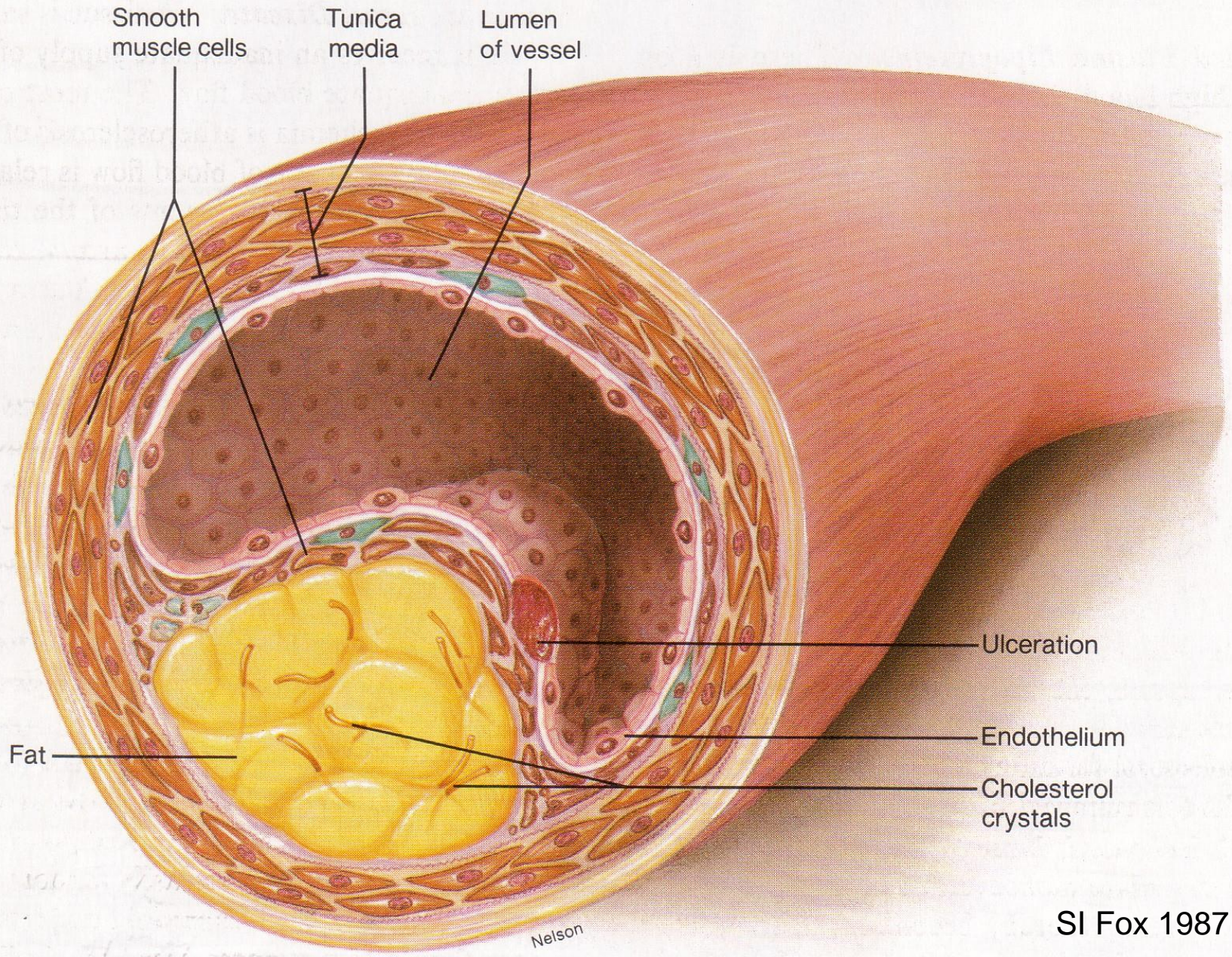
CVA



TIA

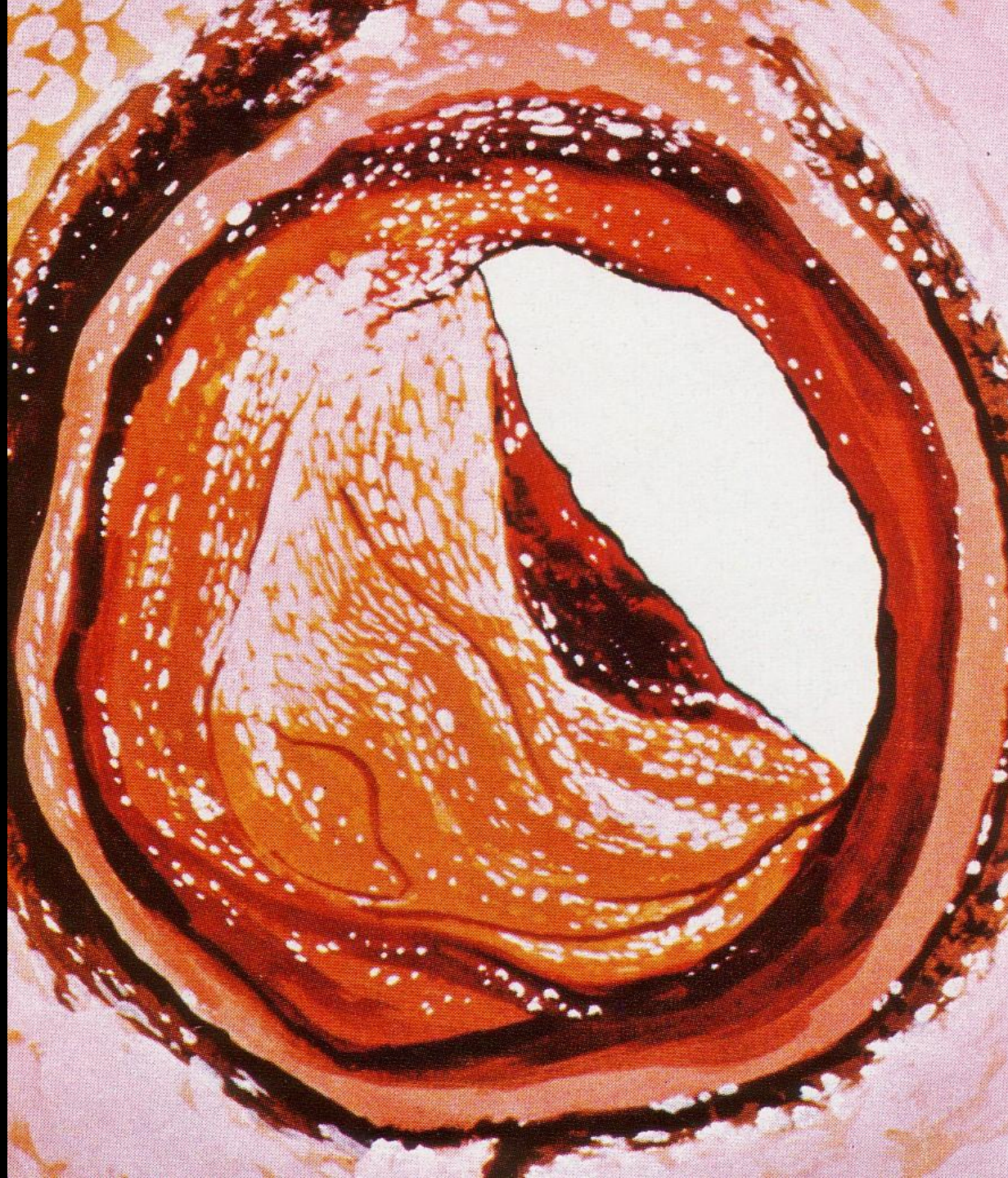
HTN

PVD

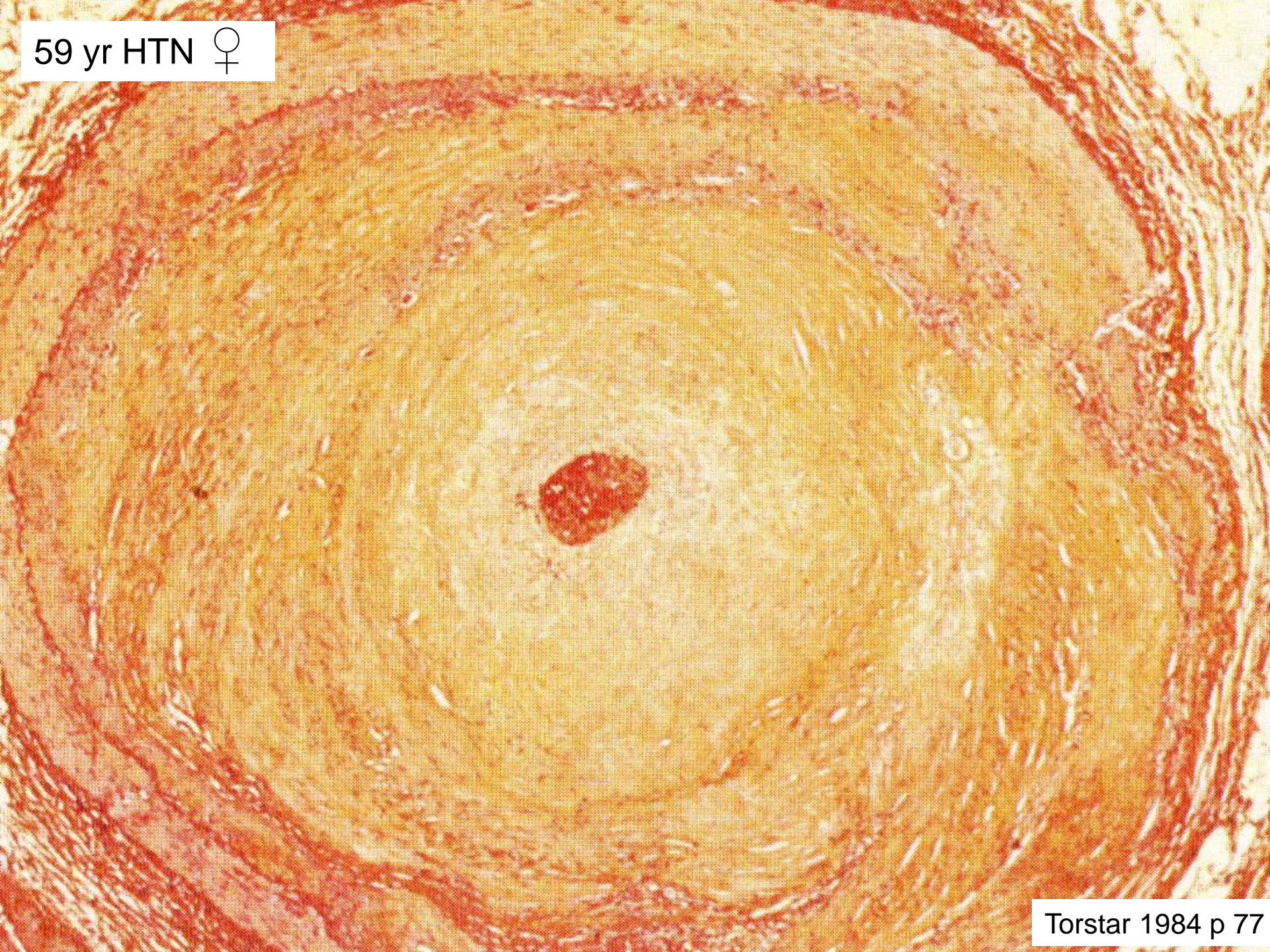


100 yr ♀





59 yr HTN ♀

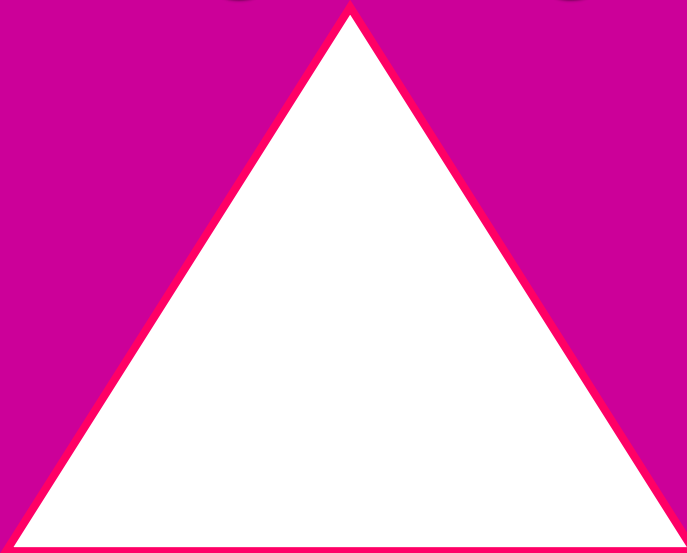


Treatment Triad

NB: Last blasted resort!!

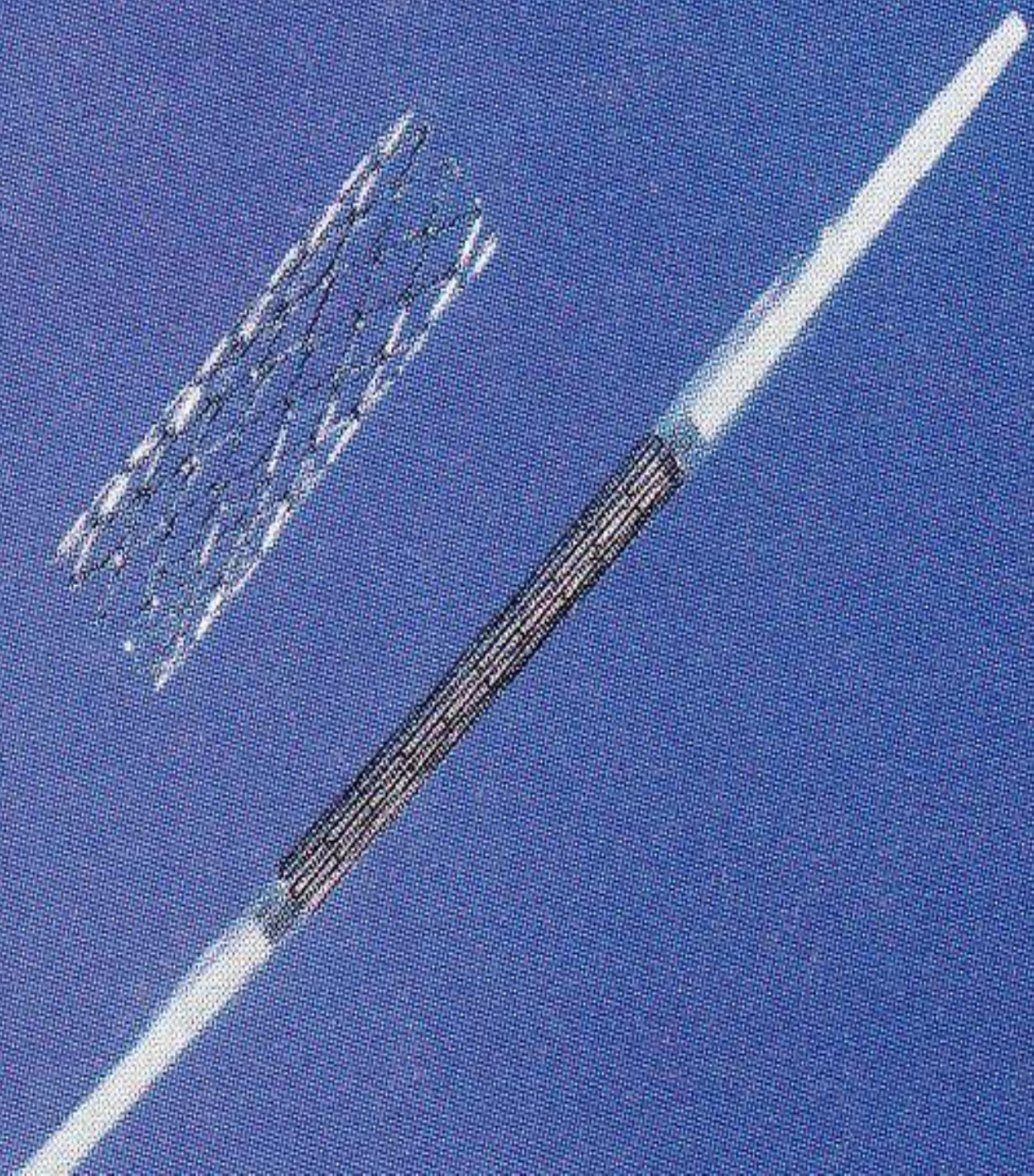


Drugs/Surgery



Exercise

*Dietary
Modification*



CABG

Coronary

Artery

By-pass

Graft

