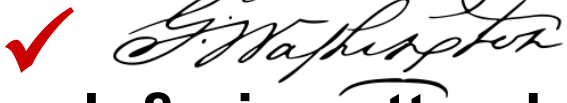
...Welcome to Human Physiology – what makes us tick!

Bl 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?

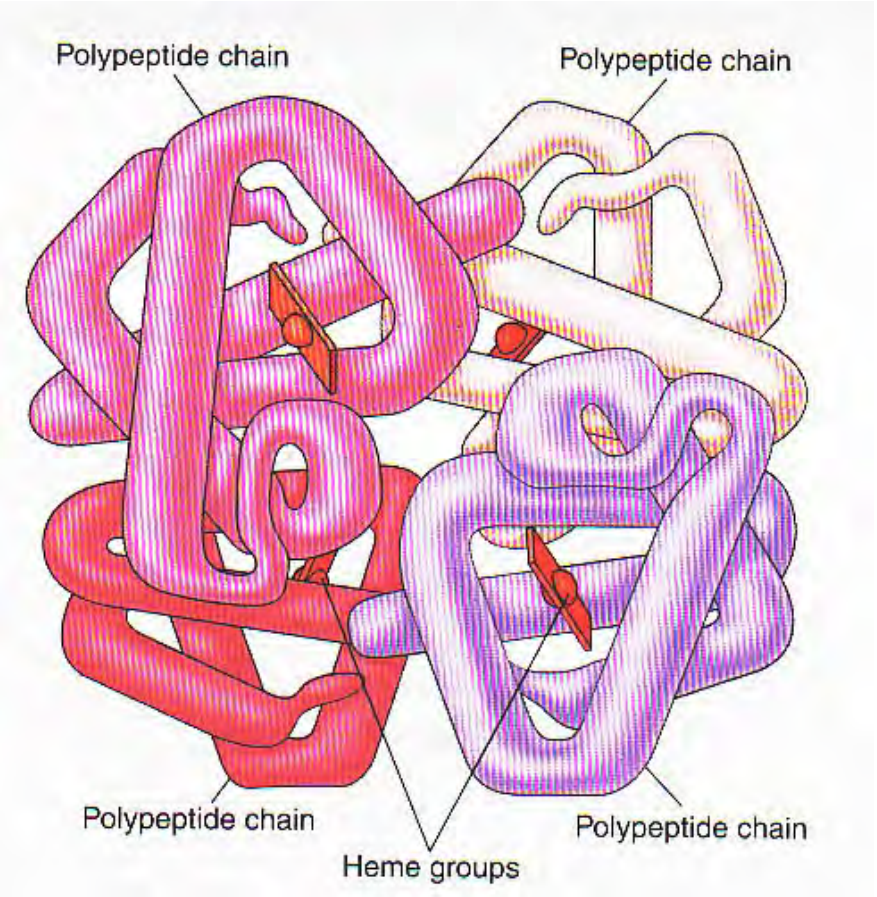
III. ***Human Physiology*** LS ch 1, DC Module 1,
   - A. What? cf: Anatomy LS p 1
   - B. Where?Body Levels of Organization LS pp1-6, DC pp1-5
   - C. How? Different Study Approaches LS p 1
   - D. Why? Security+Decision-Making Power LS p xxi, DC p v

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	***vs***	**PHYSIOLOGY**
STRUCTURE	***vs***	**FUNCTION**
WHAT?	***vs***	**HOW?**
WHERE?	***vs***	**WHY?**

vs

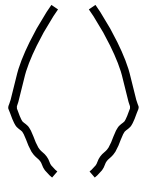
Structure* begets *function!
Structure* gives rise to *function!
***Structure* & *function* are inseparable!**



Preoperative Diagnoses: R Knee

Degenerative Joint Disease (DJD) = arthritis

Varus malalignment = bow-leg



William Sterett, MD
Ben Hogan, PAC
Vail Summit Orthopedics

Procedures:

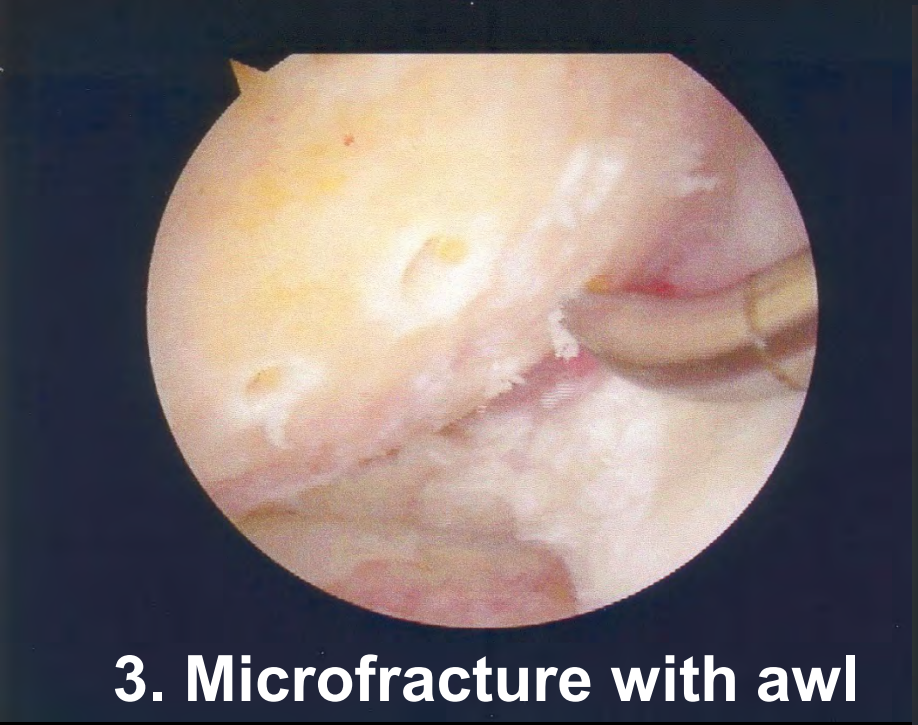
Arthroscopy & microfracture
High Tibial Osteotomy (HTO)
Packing bone graft substitute

Blocks/Medications:

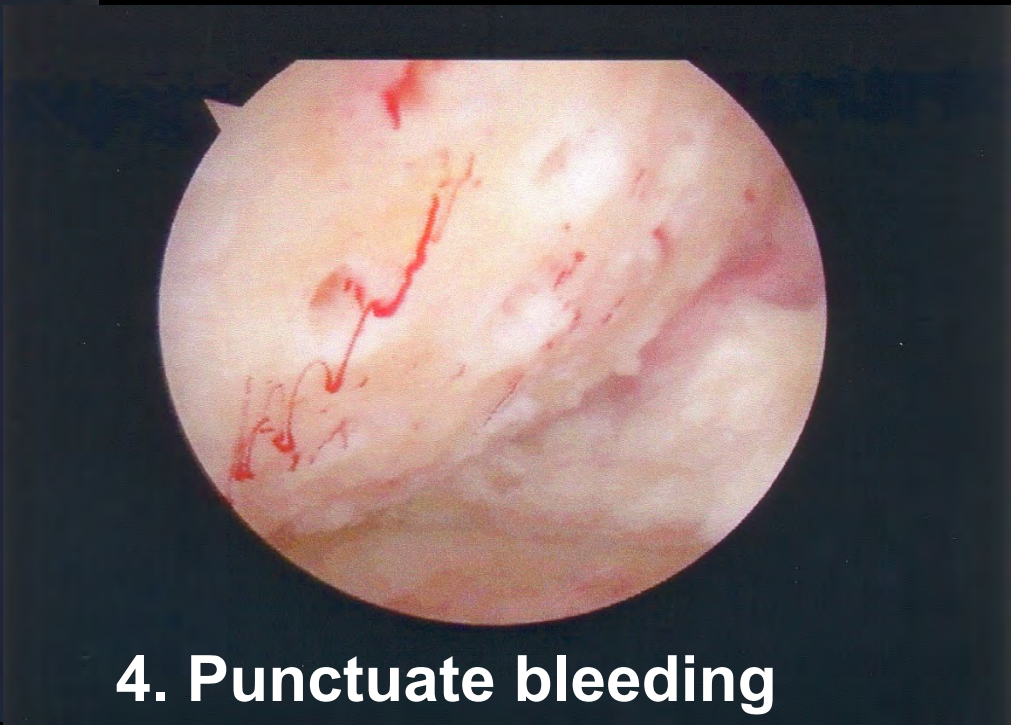
Femoral n. block
General anesthesia
IV Morphine, Oral Oxycontin + Oxycodone, Tylenol, Injectable Lovenox (enoxaparin Na)

1. Arthroscopy clean-up

2. Debridement complete



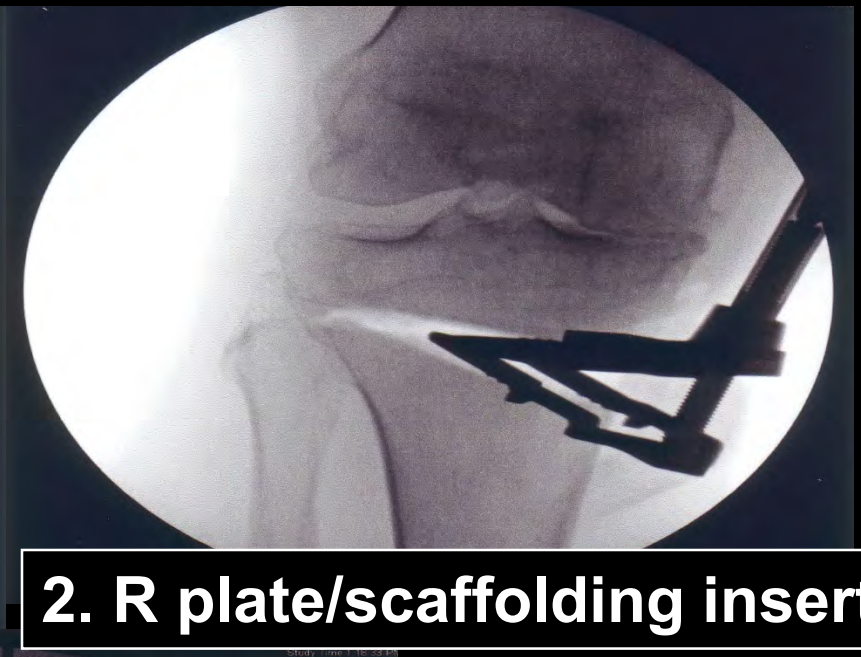
3. Microfracture with awl



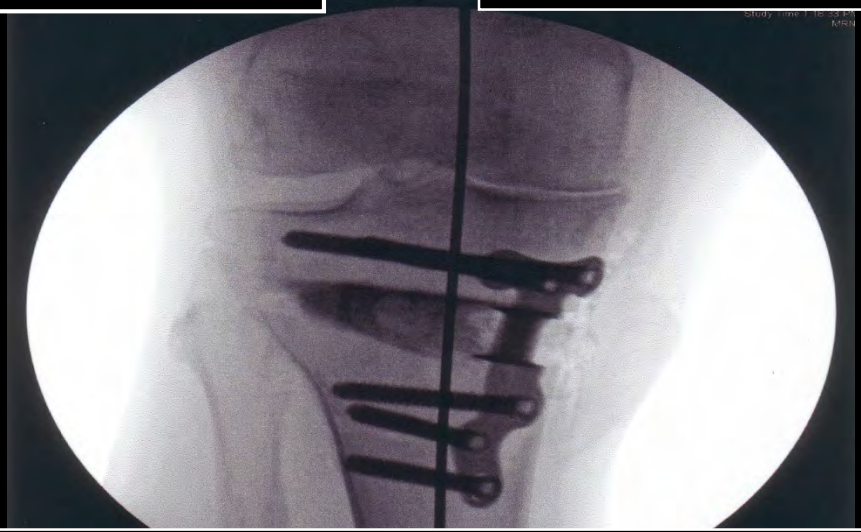
4. Punctuate bleeding

High-Tibial Osteotomy (HTO) to Realign the Joint

1. Oscillating saw cut

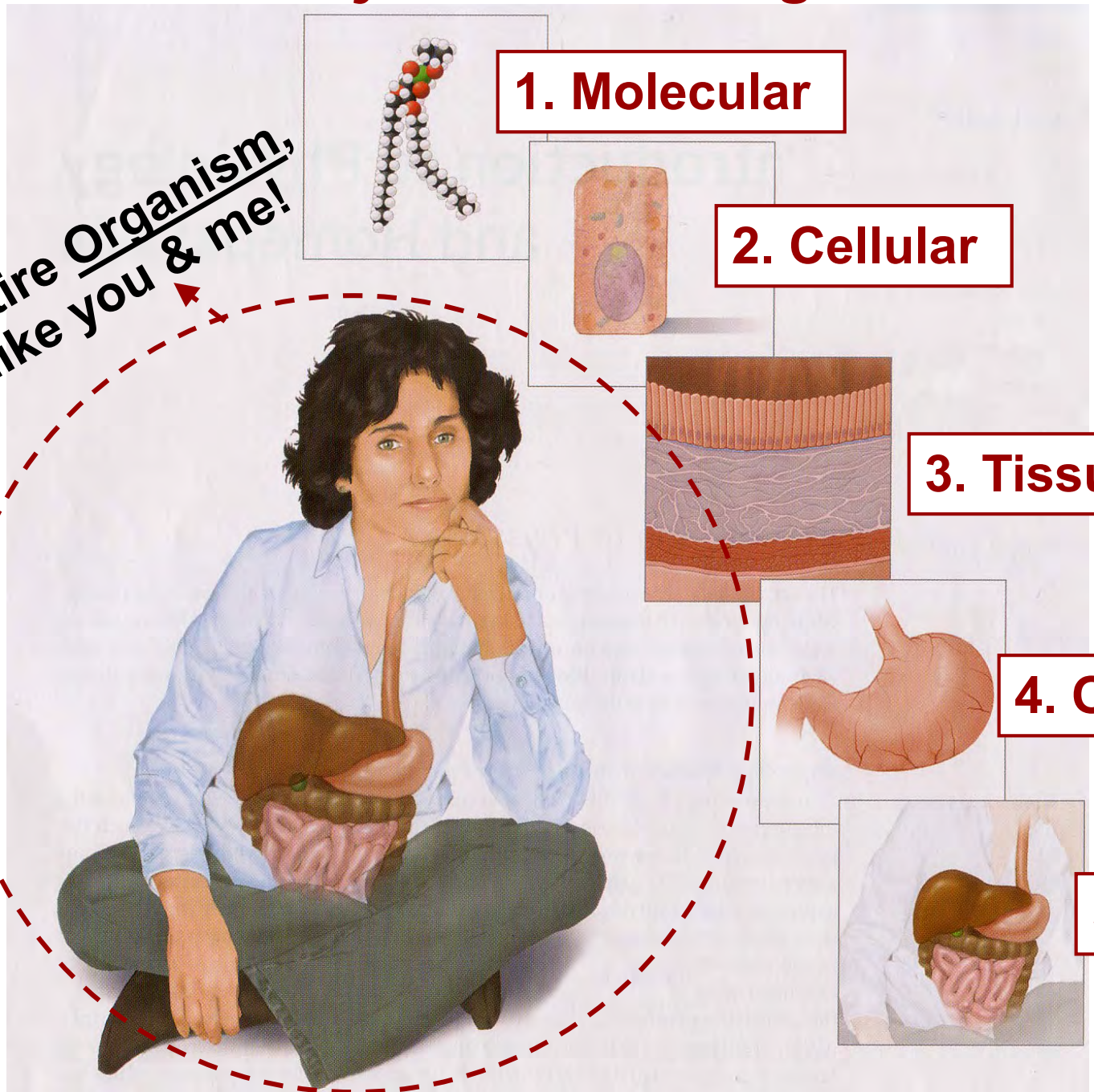


2. R plate/scaffolding insert

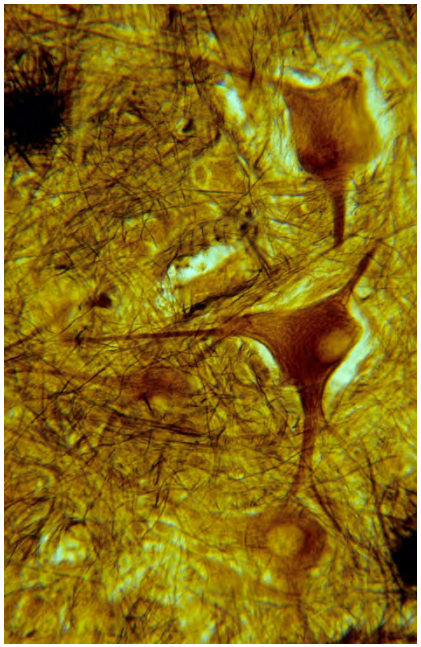


3. Align, stabilize w/screws & pack defect

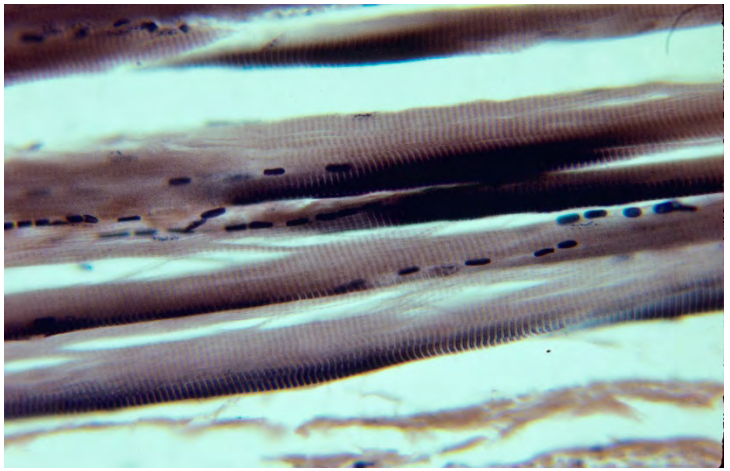
Body Levels of Organization



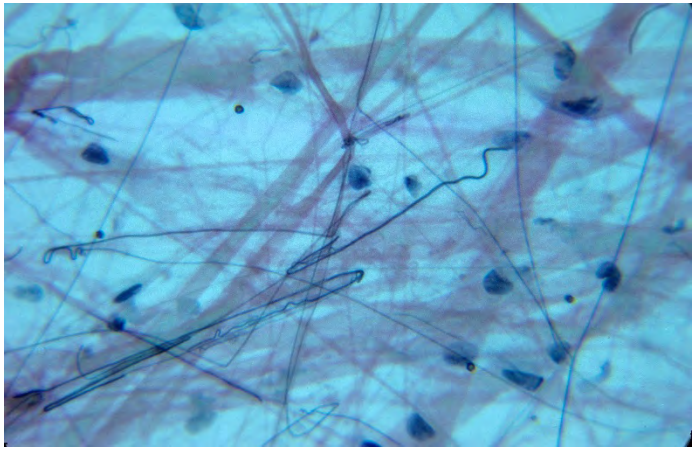
LS fig 1-1 p 2



Nerve conducts



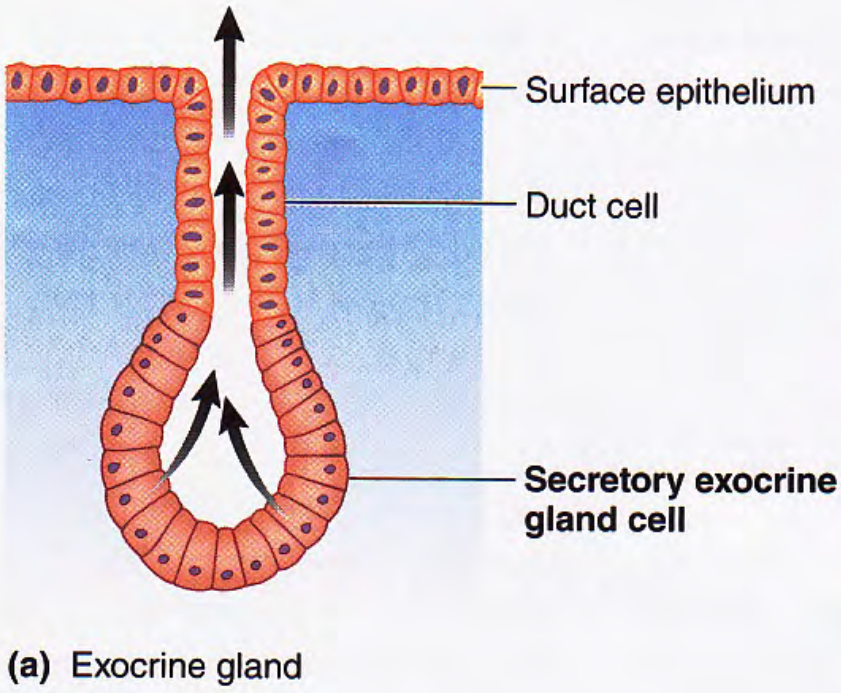
Muscle contracts

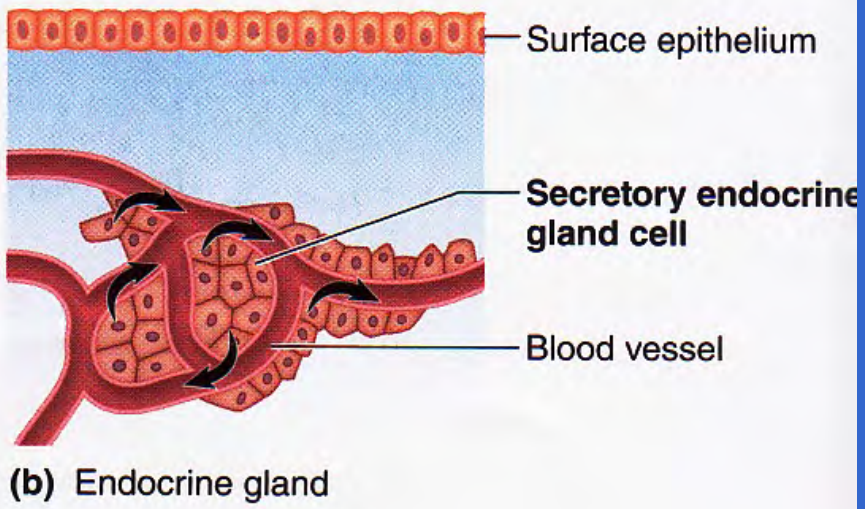


Connective connects!!

Epithelial covers

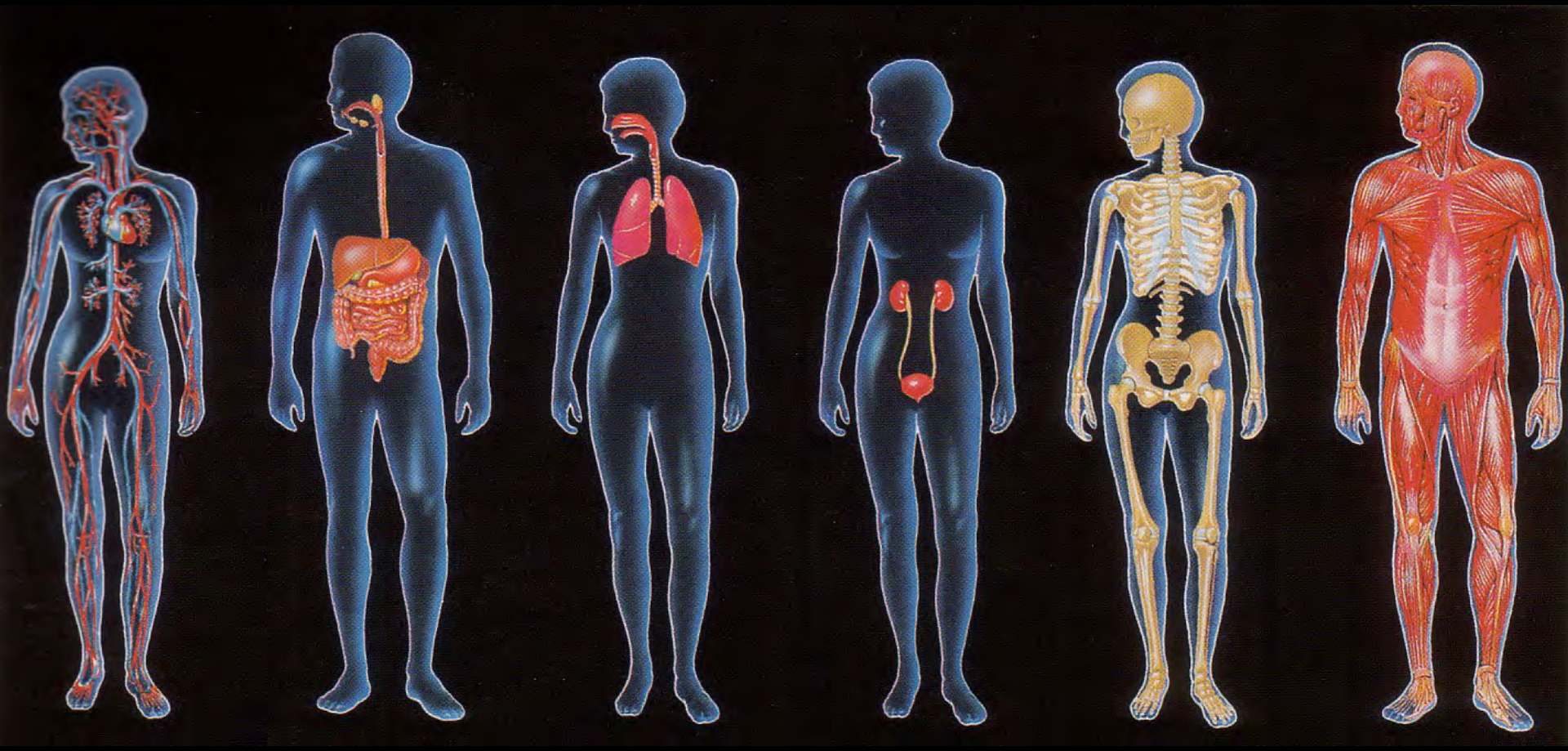
Epithelial tissue gives rise to glands: (a) exocrine & (b) endocrine





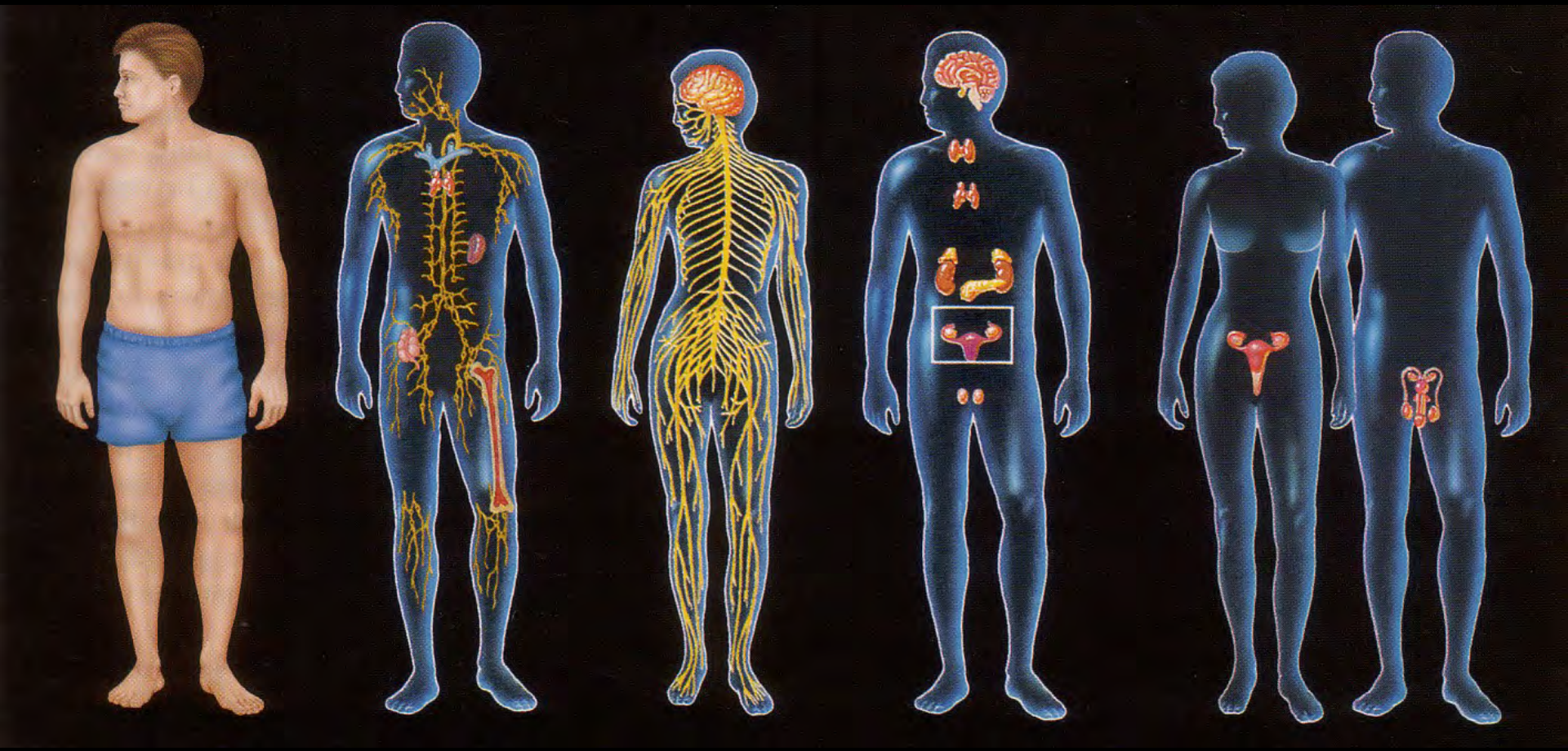
LS fig 1-3 p 4

Which body systems?



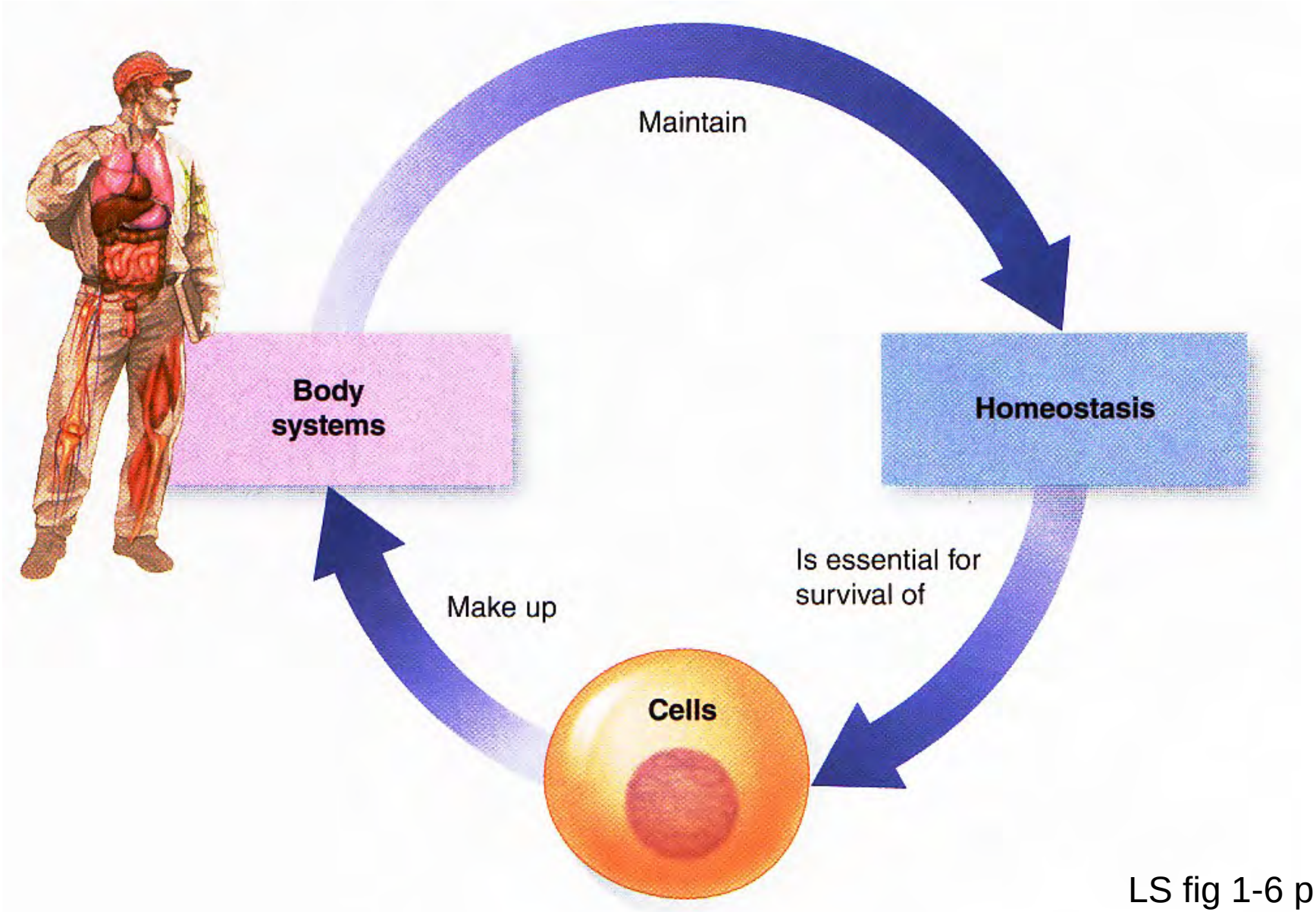
LS fig 1-4 p 6

Which body systems?



LS fig 1-4 p 6

Homeostasis is essential for cell survival!



LS fig 1-6 p 7

BI 121 Lecture 2

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

I. ***Announcements*** Lab 1 Histology today! 130 HUE. Fun! Readings: DC, LS, LM? ***NB***: UO Biology blog *vs.* Blackboard or Canvas *http://blogs.uoregon.edu/bi121/fall-2015/*

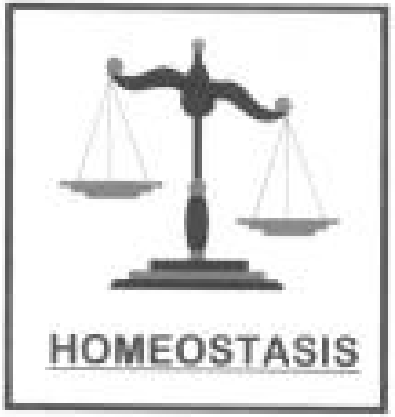
II. ***Homeostasis*** LS ch 1, DC Module 1
- A. ***What?*** Maintenance of ECF LS p 8
- B. ***Where?*** ECF = Plasma + Interstitium + ? LS fig 1-4 p 8
- C. ***Homeostatic Balances?*** LS p 9, DC pp 5-6
- D. ***Why?*** Cell survival! LS fig 1-5 p 9, DC p 5
- E. ***Physiology in the News*** H_2O? Are we like watermelons?
- F. ***How*** are balances maintained? Simplified Homeostatic Model *cf:* LS fig 1-7 p 14; T^oC + 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

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

milieu interieur?

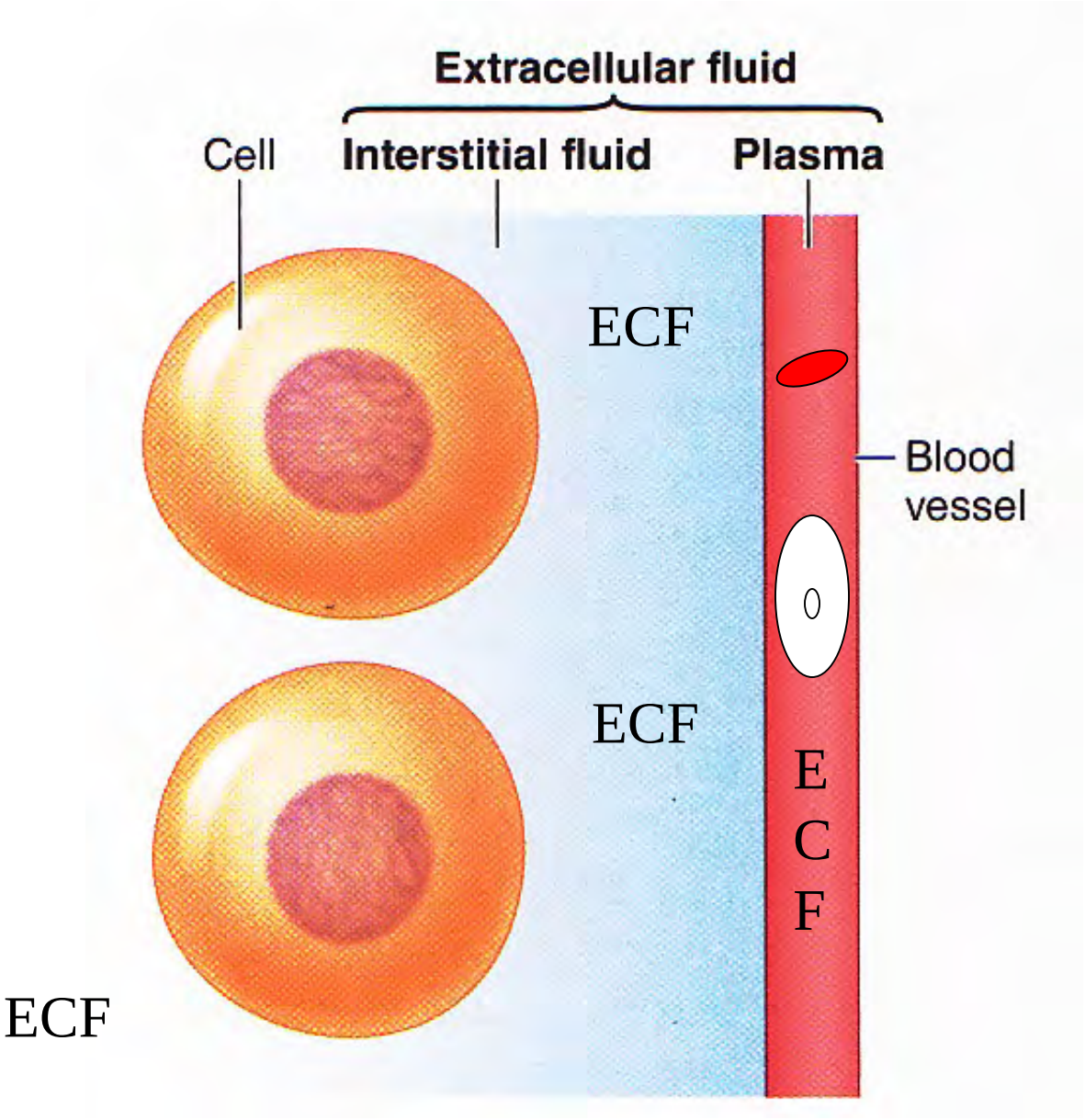
Claude Bernard



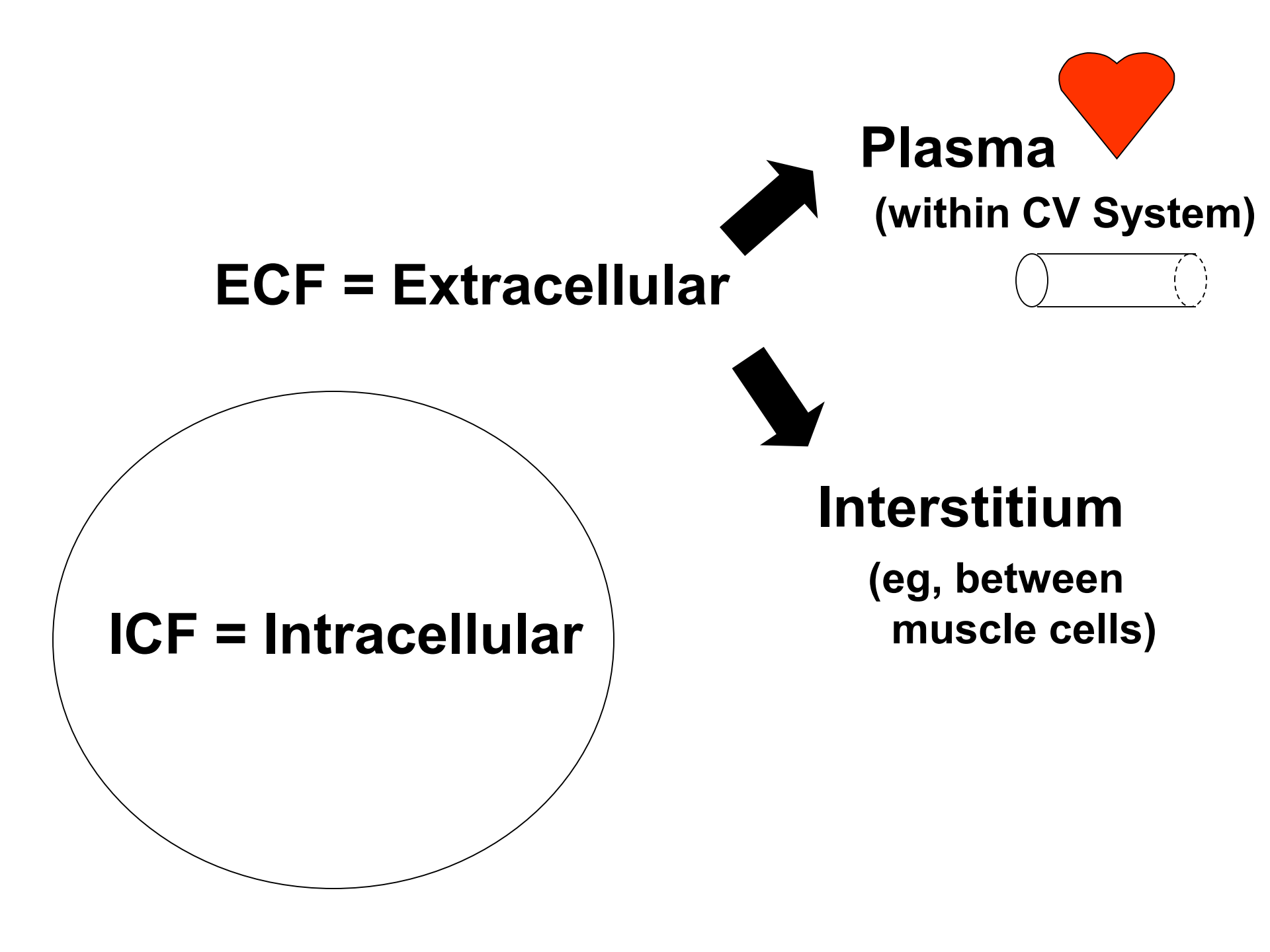
100 trillion cells working intimately

Walter B. Cannon

Where is extracellular fluid?

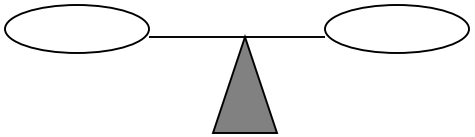


LS fig 1-5 p 7


Plasma
(within CV System)
ECF = Extracellular
Interstitium
(eg, between
muscle cells)
ICF = Intracellular

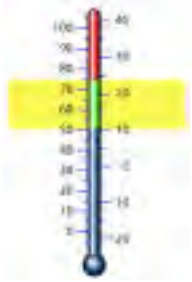
Metabolic

ANA- CATA-



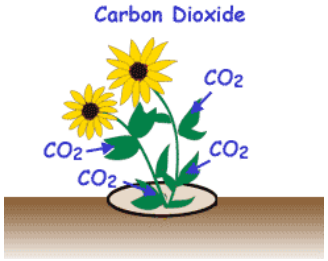
H_2O

T°C



Dr. Evonuk's 6 Balances

O_2/CO_2



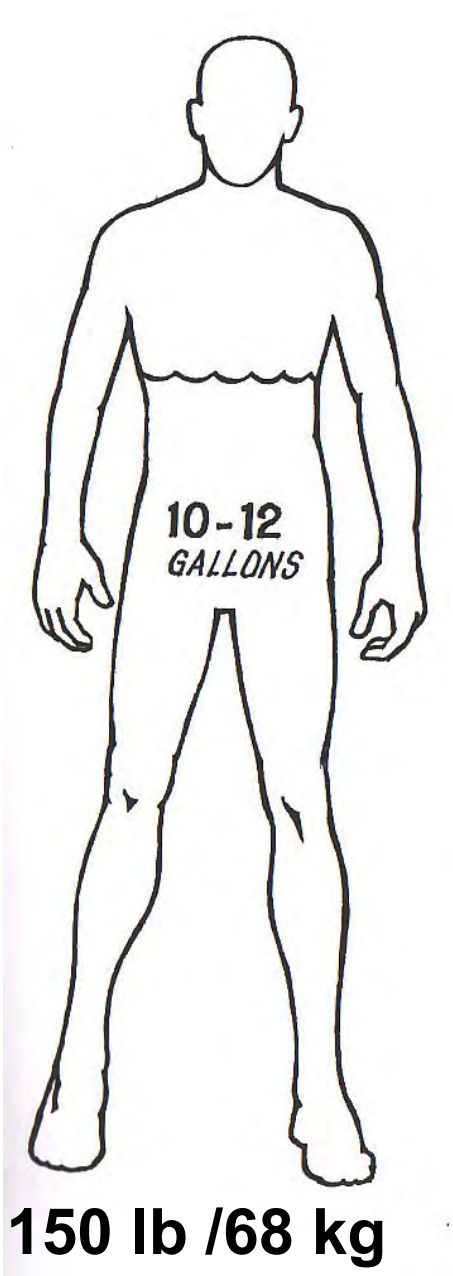
$Ion^{+/-}$

pH

Drink about 1 L per 1000 calories energy expenditure!!

Human ~ 2/3 H_2O

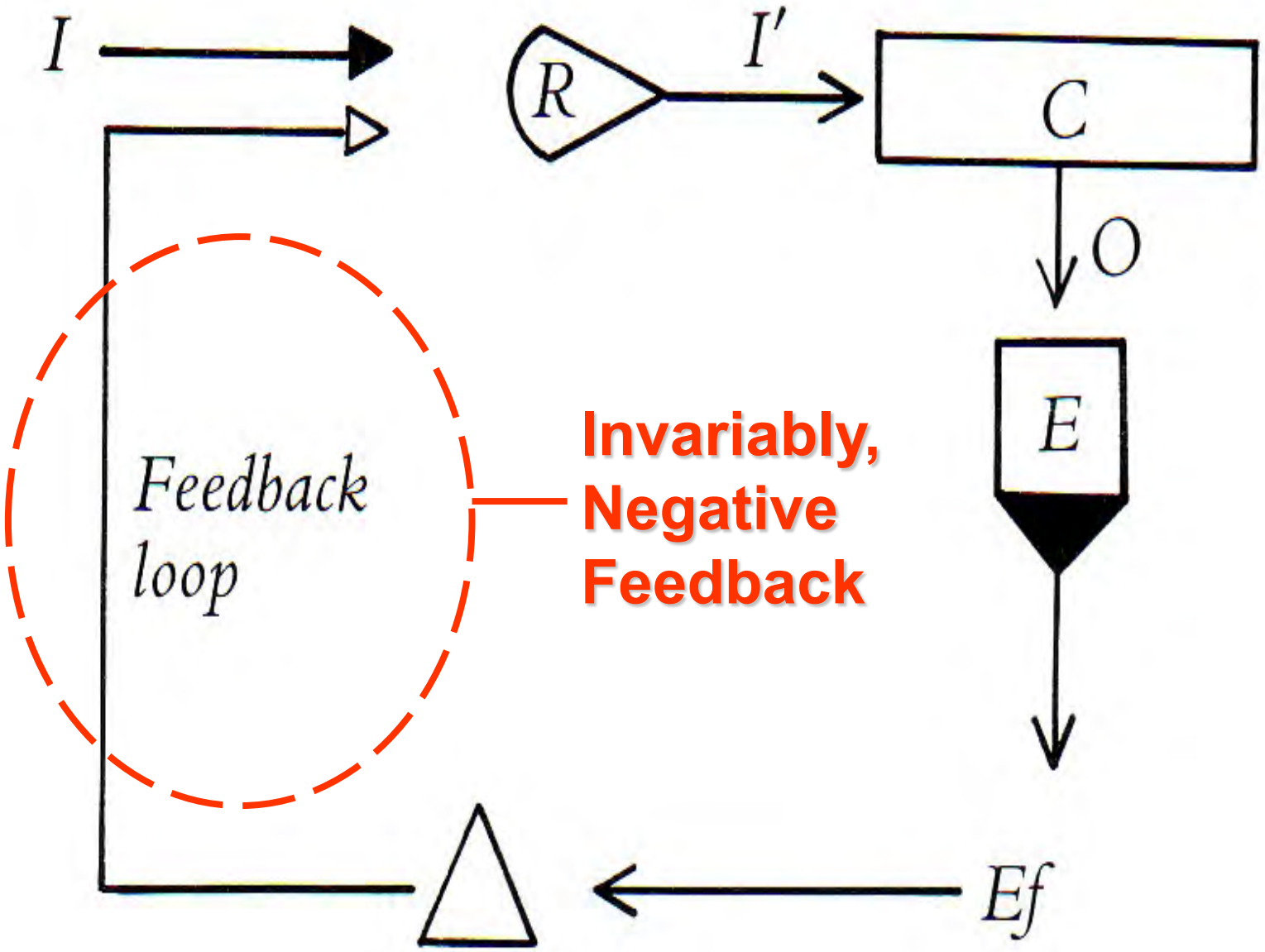
~ 60 – 70 %



150 lb /68 kg

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

= ~40 – 48 kg H_2O

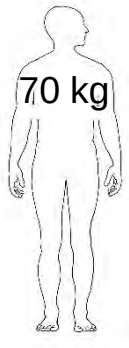

I
R
I′
C
O
E
Feedback loop
Invariably, Negative Feedback
Ef

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

70% H_2O = 49L



eg

ICF = 35L

+

ECF = 14L

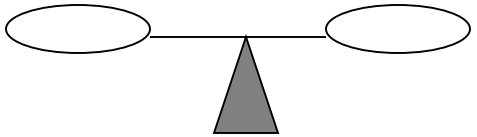
[Interstitium = 11L
Plasma = 3L]

H_2O

INPUT

Dietary Drink	1200 mL
Dietary Eat	400 mL
Oxidation	400 mL
Total =	2000 mL ✓

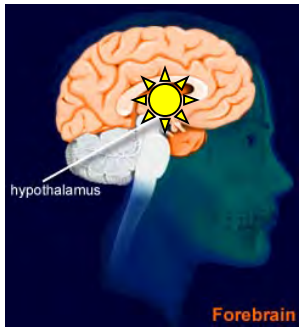
BALANCE!



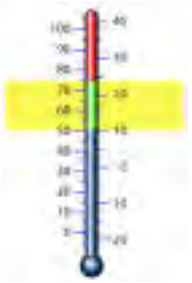
OUTPUT

Urine	1000 mL
Sweat + Insensible	900 mL
Feces	100 mL
Total =	2000 mL ✓

Controller = Hypothalamus with Set Point



ToC



ToC

Lethal

42oC

Protein Denaturation

True Diurnal Variation

110oF

Set Point

37oC

98.6oF

35oC

Mild Hypothermia

Profound Hypothermia

33oC

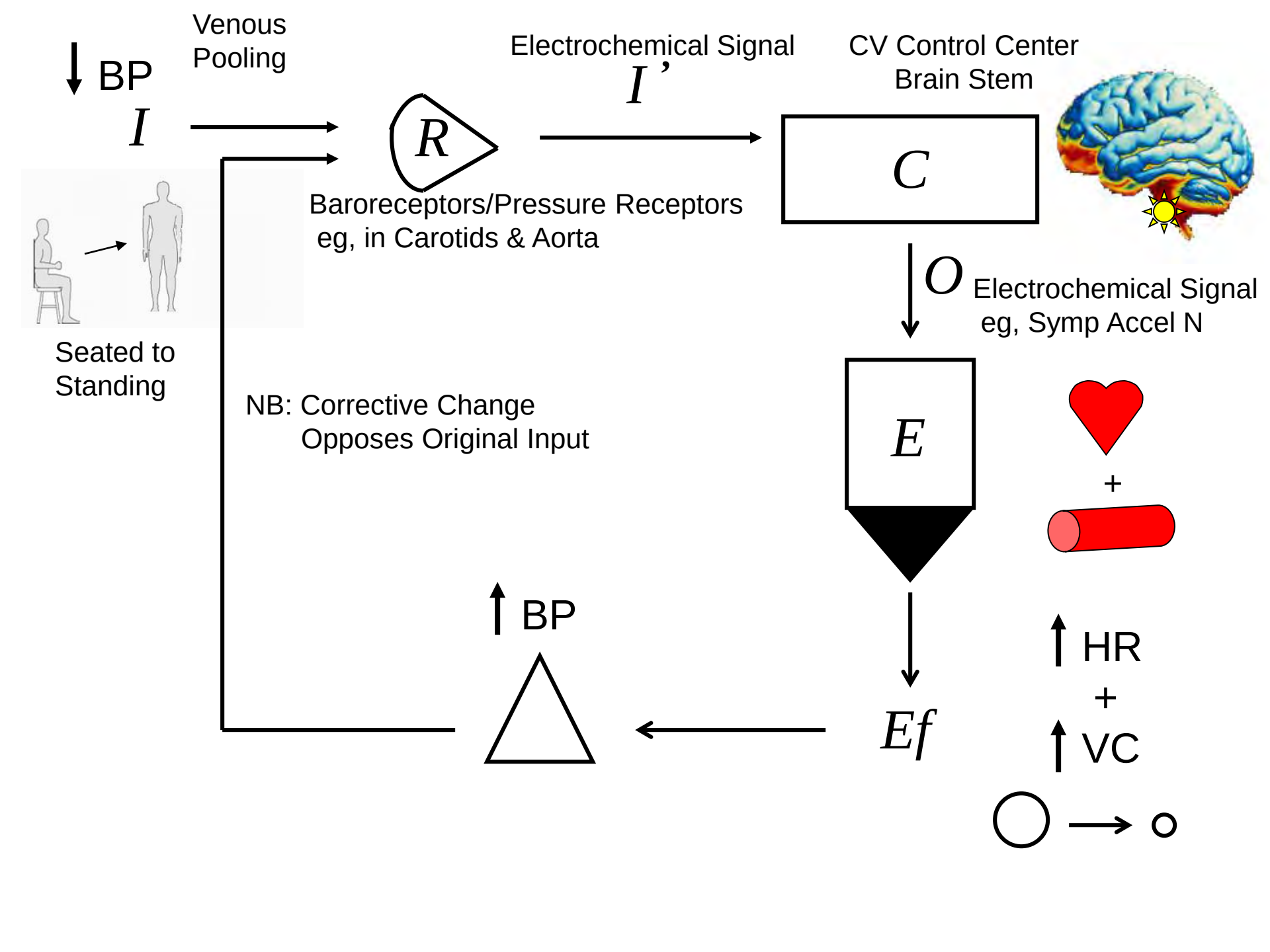
< 30oC

Lethal

29oC

0600 1400 0600 1400

Time of Day


BP
I
Venous
Pooling
R
Baroreceptors/Pressure Receptors
eg, in Carotids & Aorta
Electrochemical Signal
I'
CV Control Center
Brain Stem
C
O
Electrochemical Signal
eg, Symp Accel N
Seated to
Standing
NB: Corrective Change
Opposes Original Input
E
+
BP
Ef
HR
+
VC

BI 121 Lecture 3

Anatomy & Physiology Lab Thurs! Fun again...

I. *Announcements* UWGS Mentor? Registration? Q? Office hr?

II. *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 ≡ Membranous, cytoplasmic specialty shops!
  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?

III. *Anaerobic vs Aerobic Metabolism Overview* Many sources!
Mathews & Fox 1976...LS 2012 pp 26-33, fig 2-15 p 33

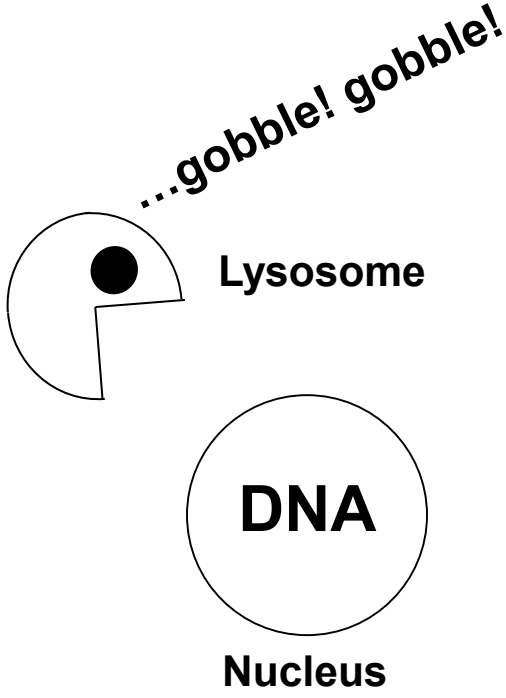
IV. *Introduction to Genetics* LS 2012 ch 2 p 20-1 + Appendix C

- 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

Why Compartments? Advantage?

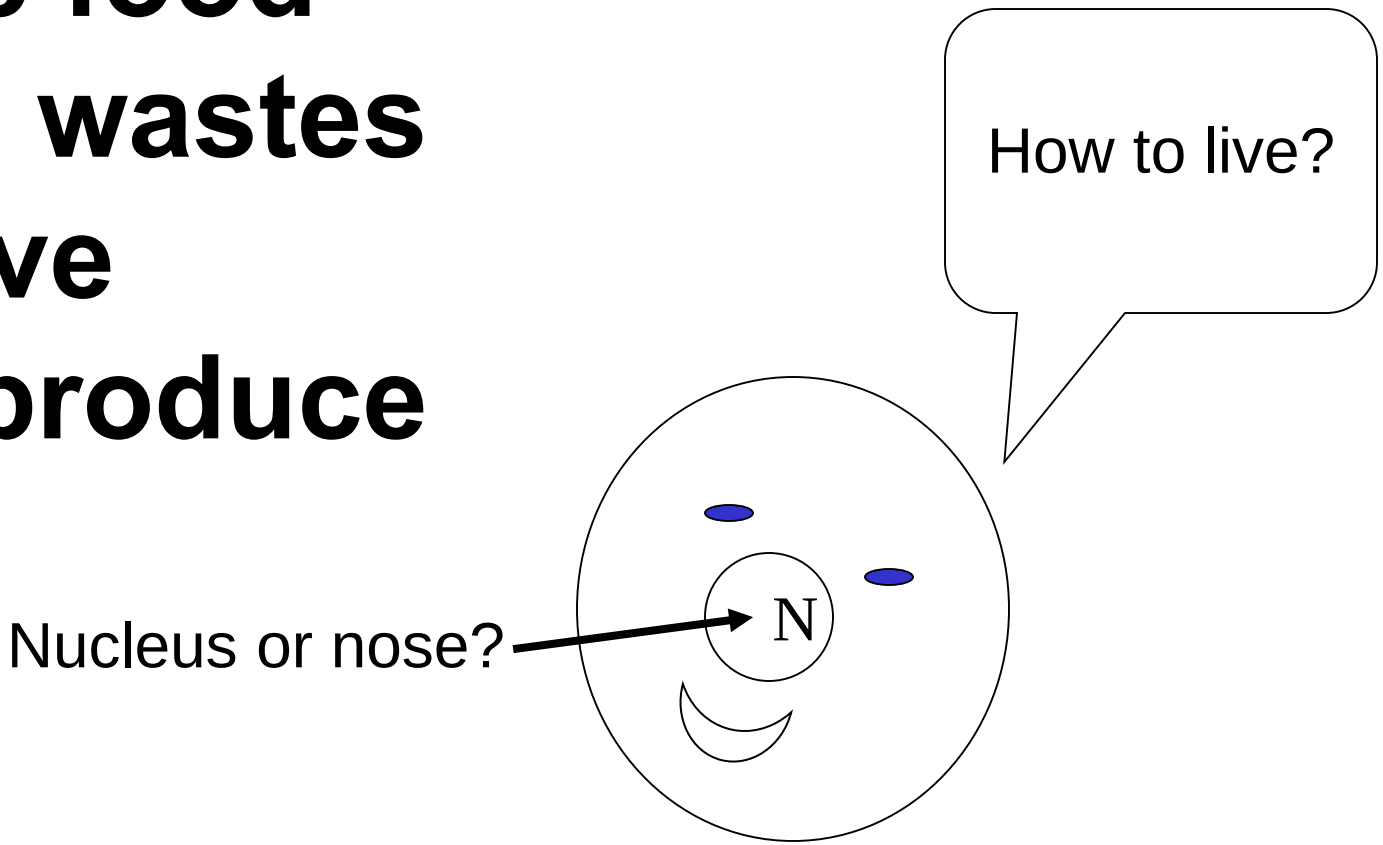
<u>*Incompatible*</u> reactions can take place

<u>*Simultaneously*</u>!!



Basic Cell Survival Skills?

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



1 e.g. Cell of 100 Trillion!

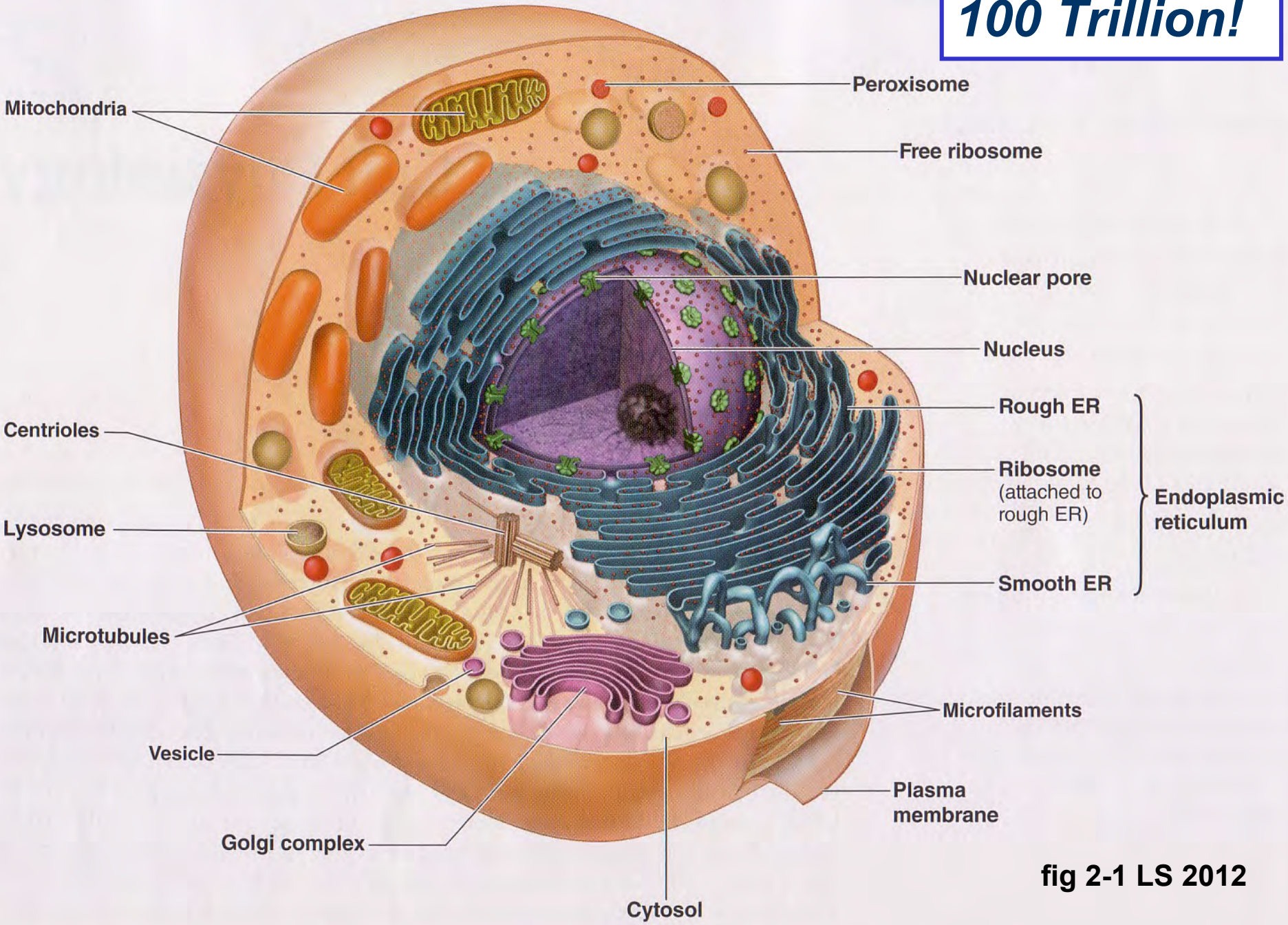


fig 2-1 LS 2012

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

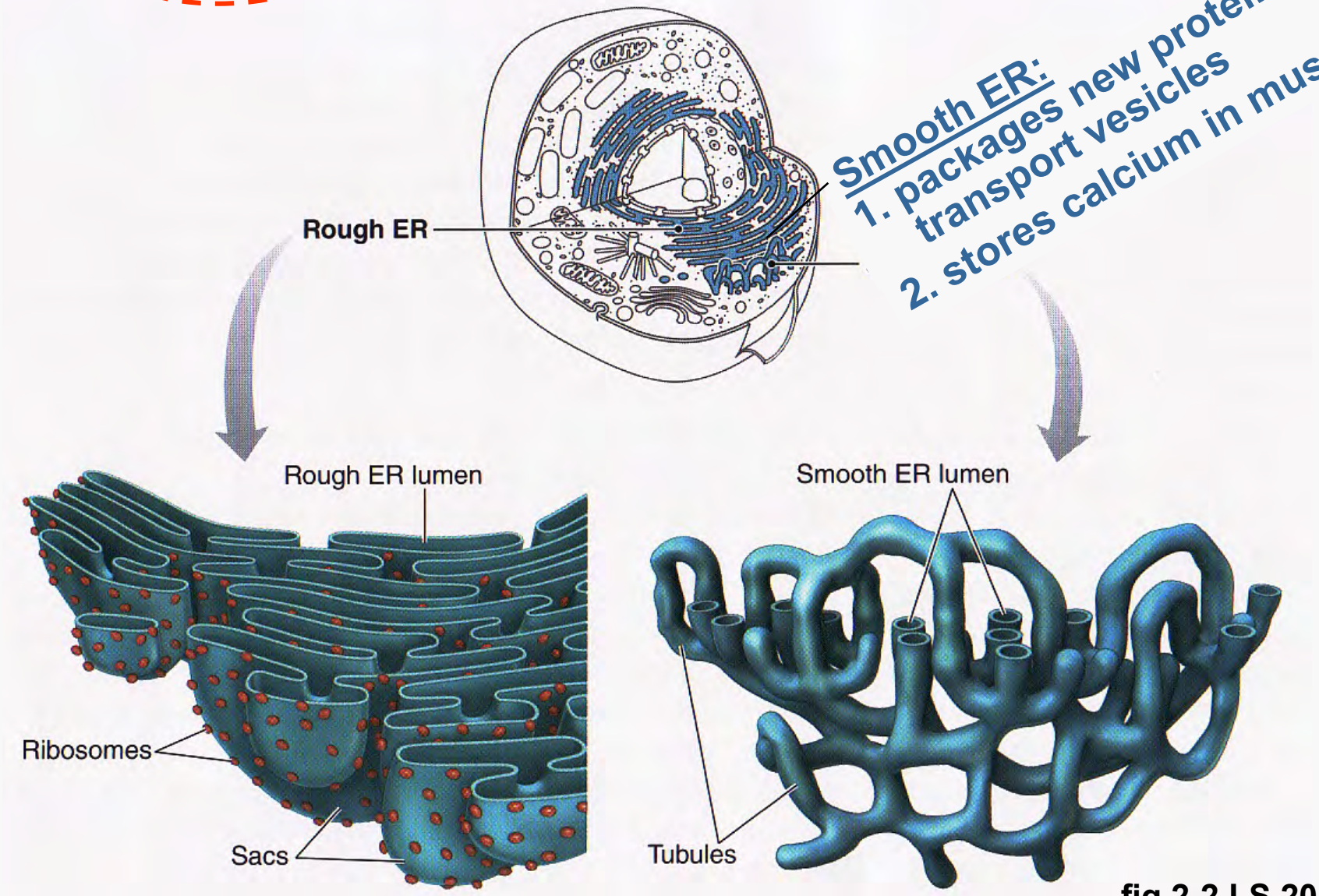


fig 2-2 LS 2012

Secretion of Proteins Produced by ER

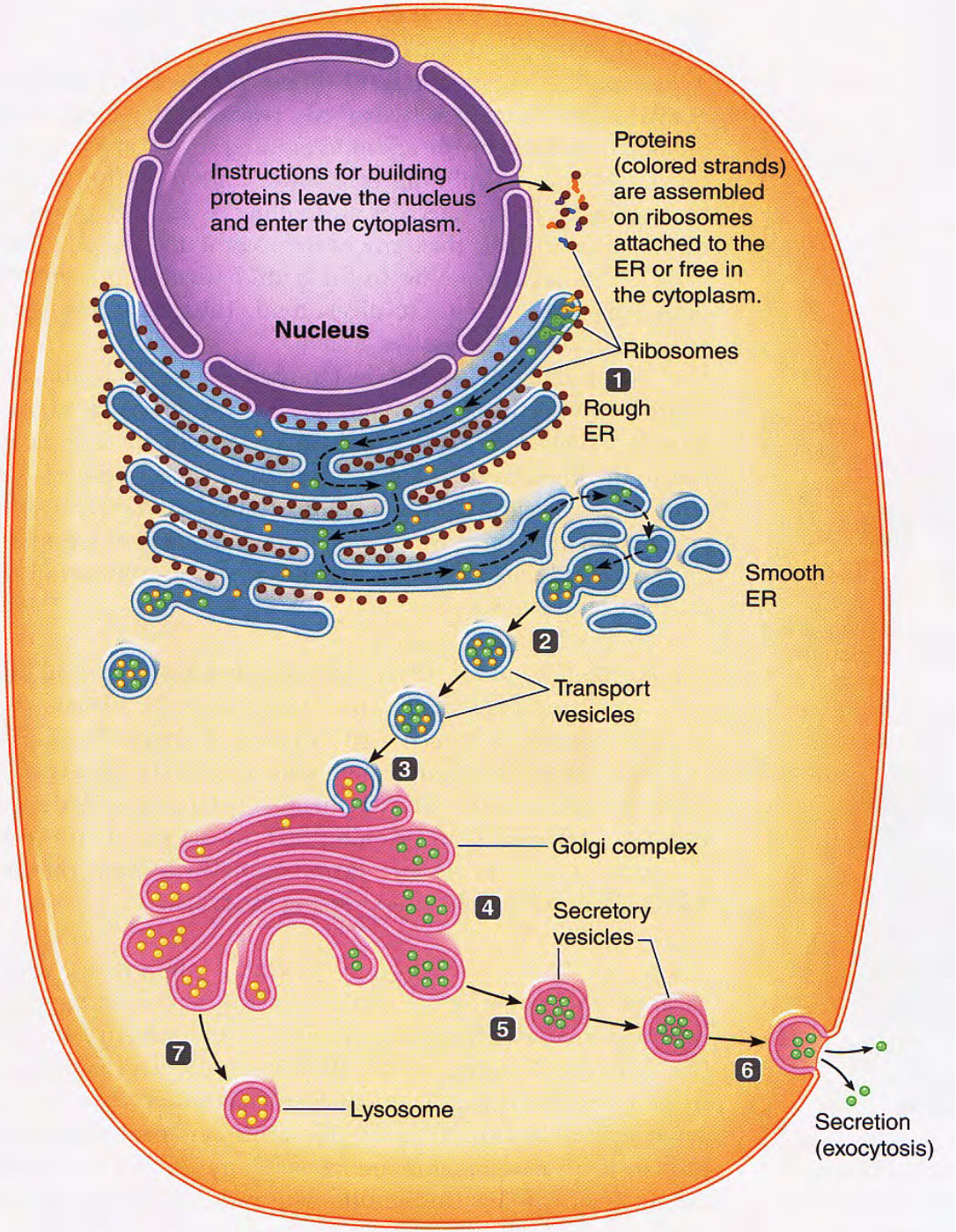


fig 2-3 LS 2012

Golgi Complex: Final Processing, Packaging & Distribution

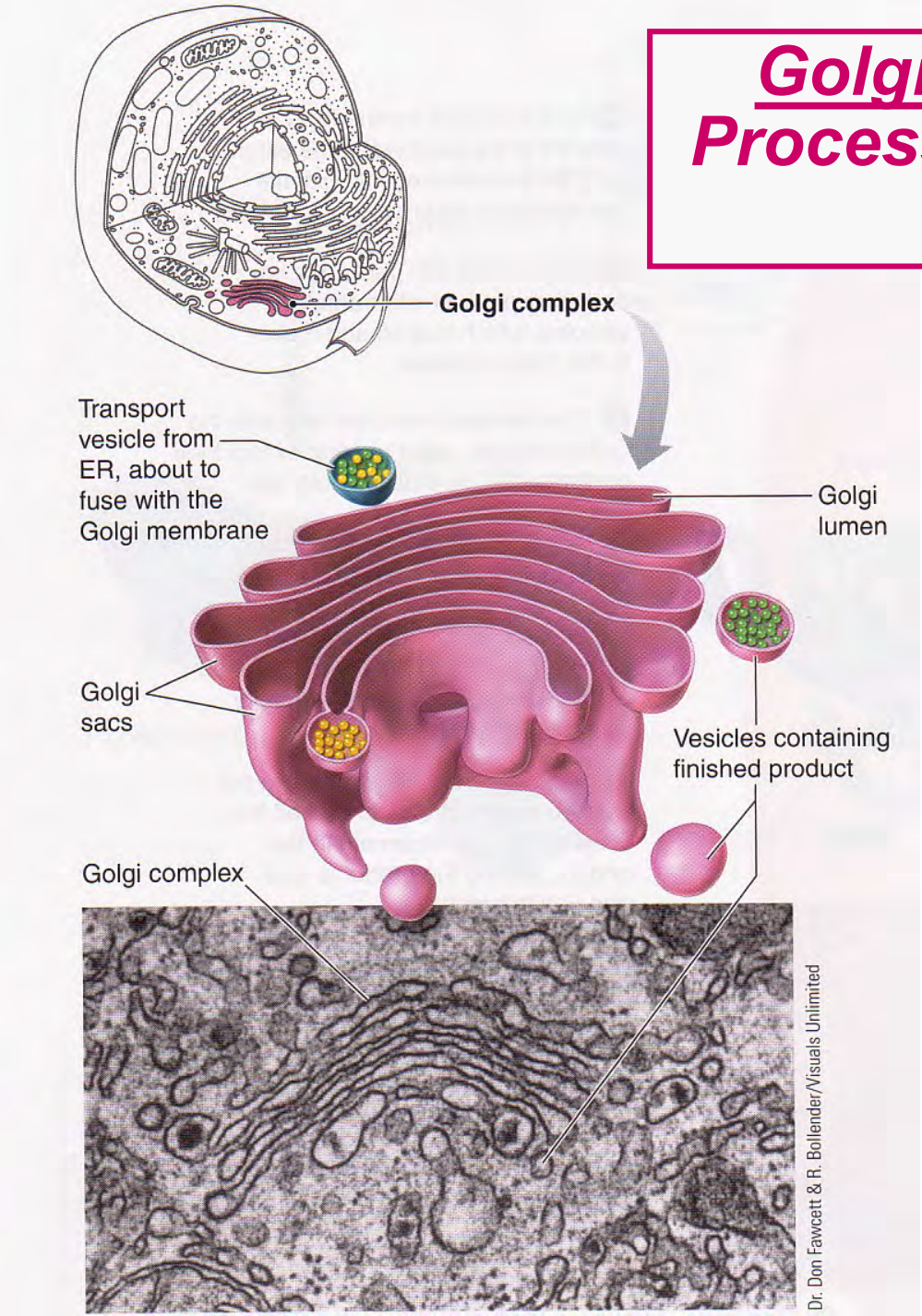


fig 2-4 LS 2012

Exocytosis: Primary Means of Secretion

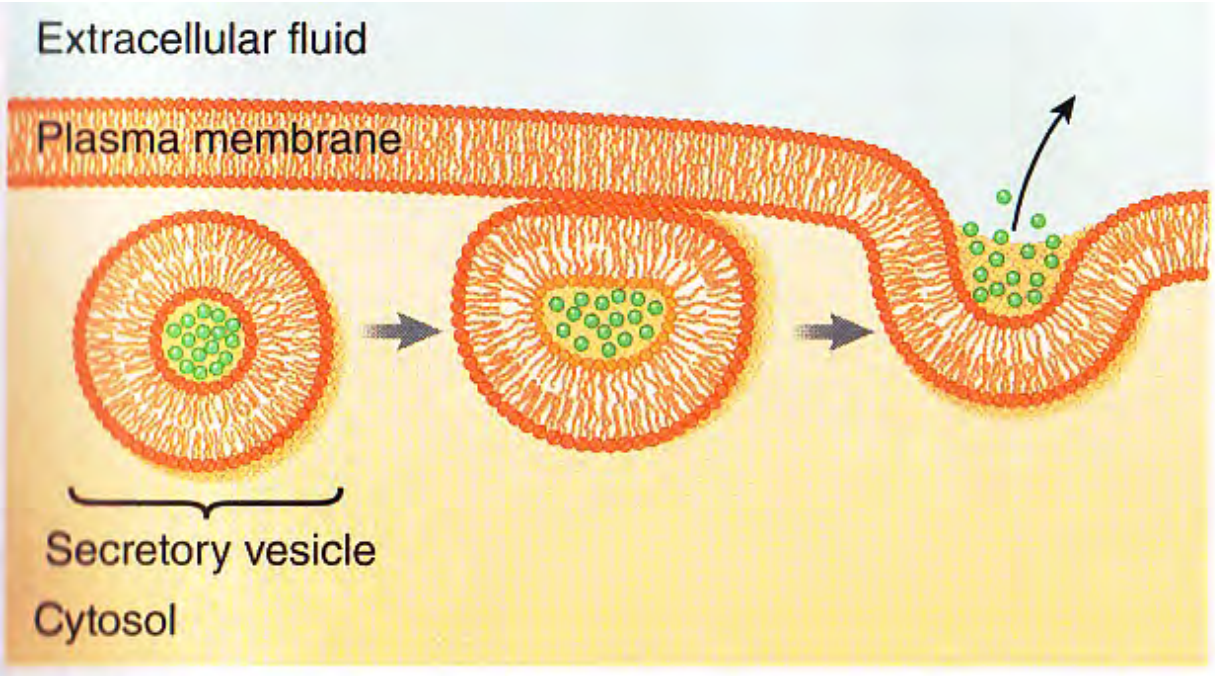
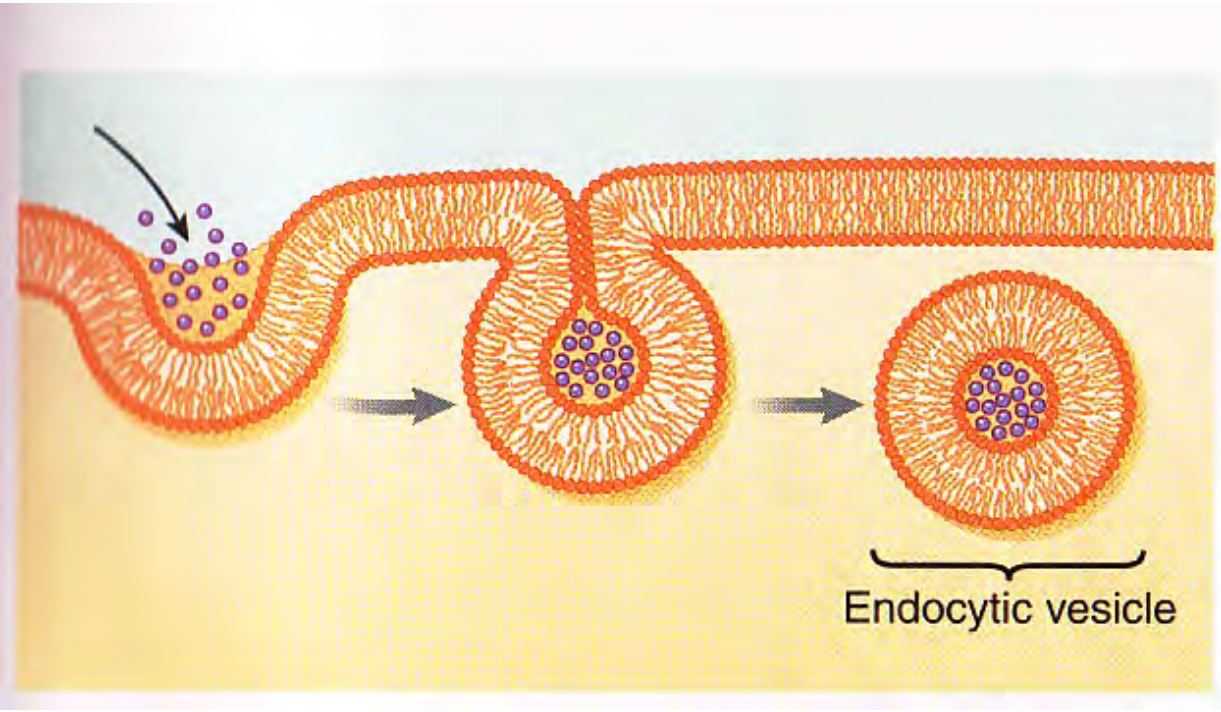


fig 2-5a LS 2012

Endocytosis: Primary Means of Ingestion



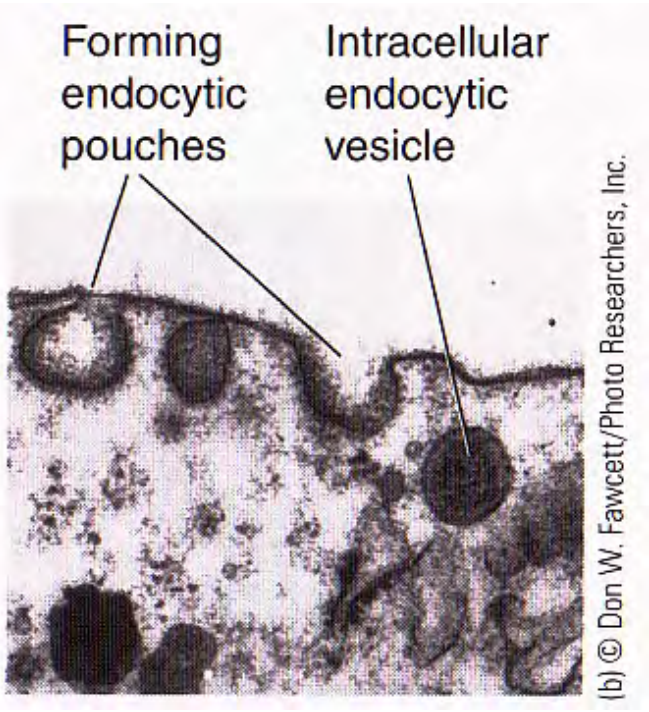


fig 2-5b LS 2012

Lysosomes *vs.* *Peroxisomes*

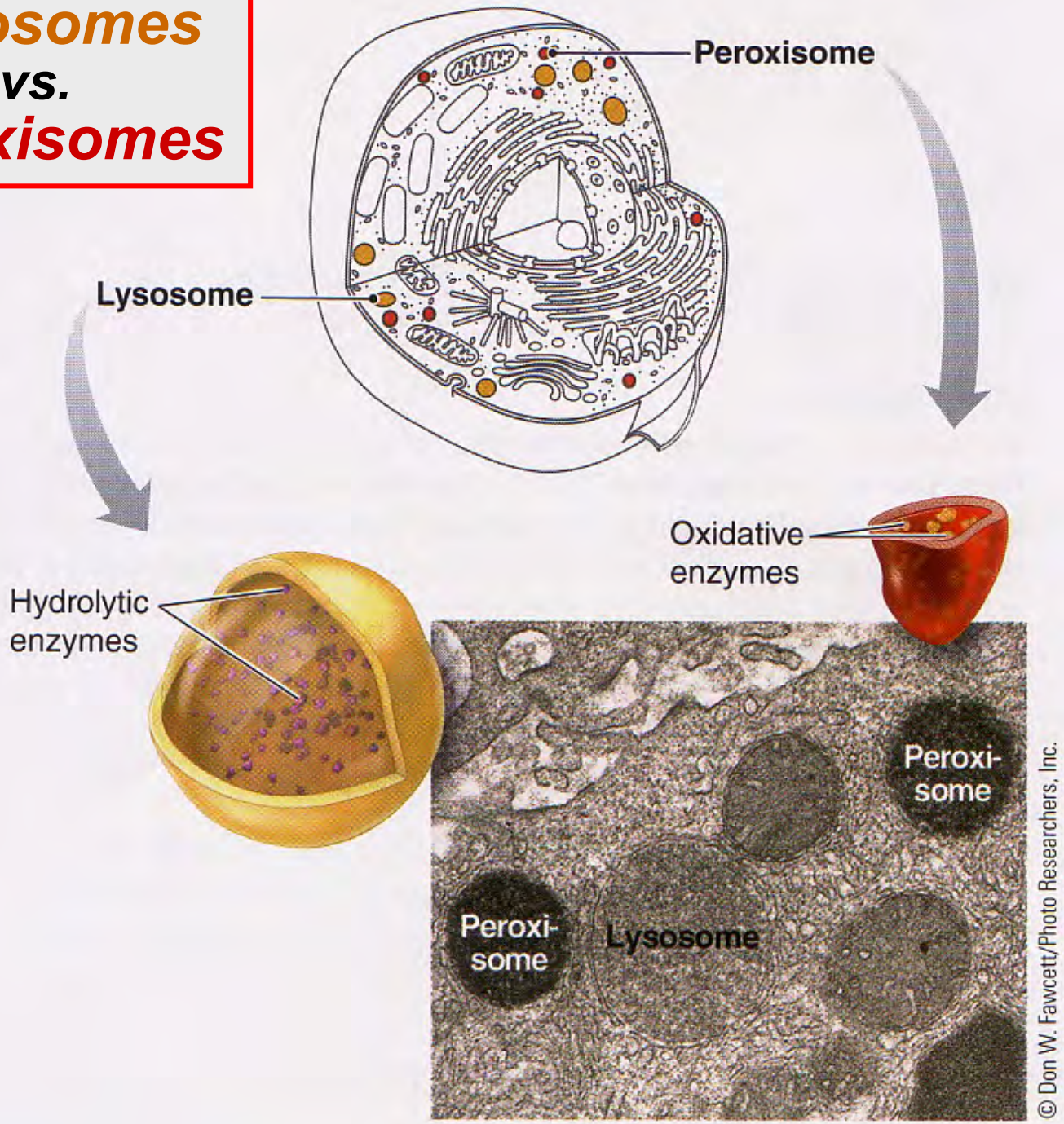


fig 2-6 LS 2012

Phagocytosis: Cell Eating!

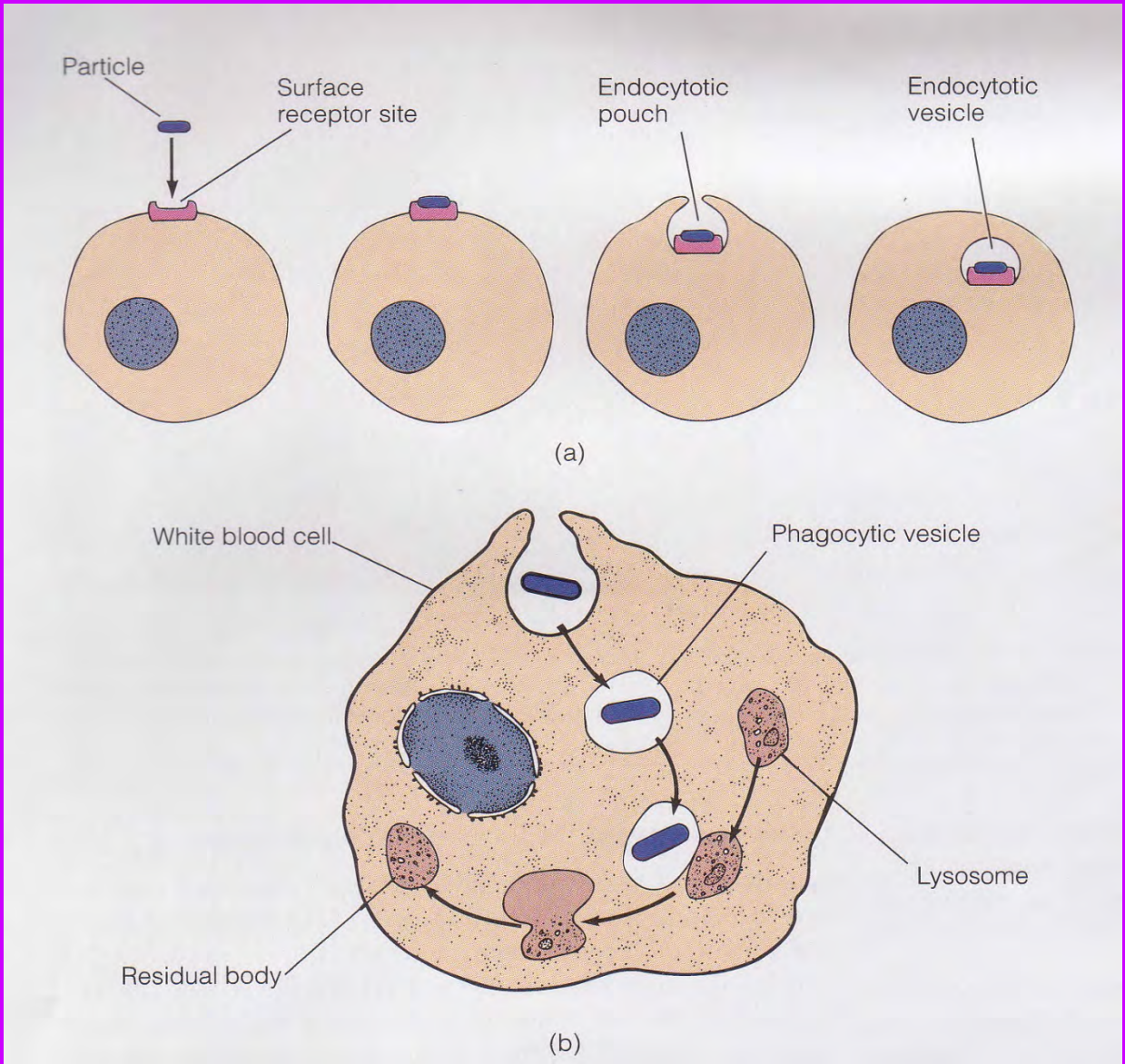
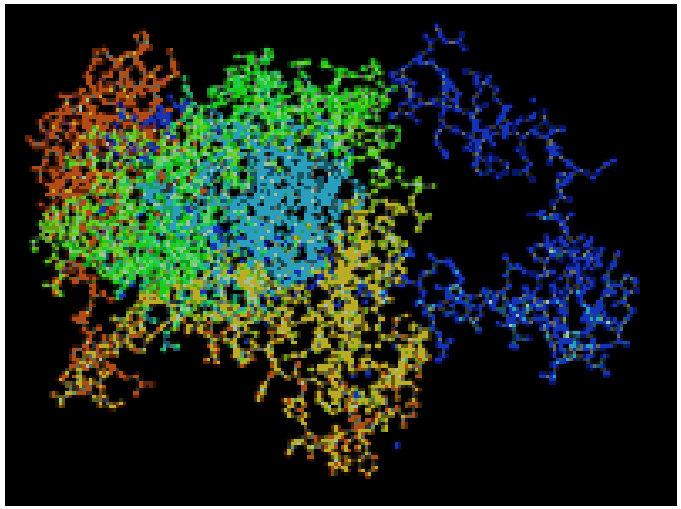


fig 2-7 LS 2006

Catalase Enzyme Reaction in Peroxisomes Neutralize Toxin at Production Site!



Mitochondria: Energy Organelles

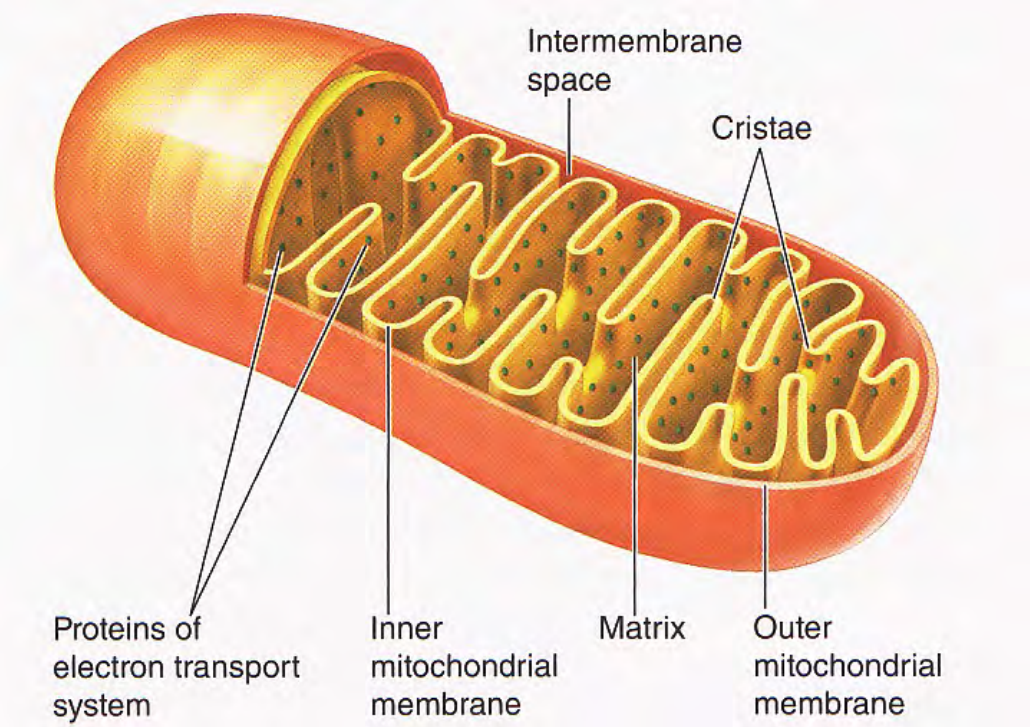
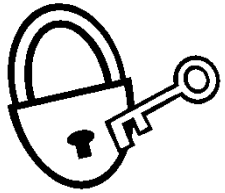


fig 2-8 LS 2012

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. ***Medical Moment*** Structure-Function in Clinical Practice

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. ***Cytoskeleton*** LS 2012 fig 2-17, 2-18 + LS 2006 fig 2-20

VI. ***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

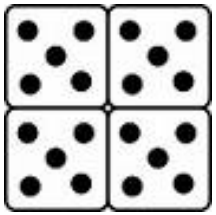
or

≡ 1 c

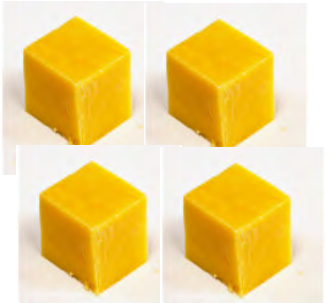
≡

raw → cooked

≡ 1/3 c

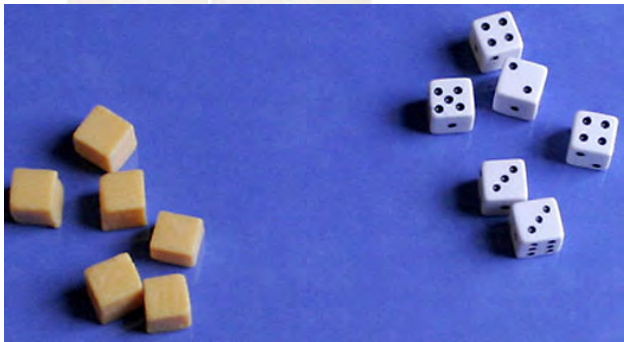


≡ 1 oz

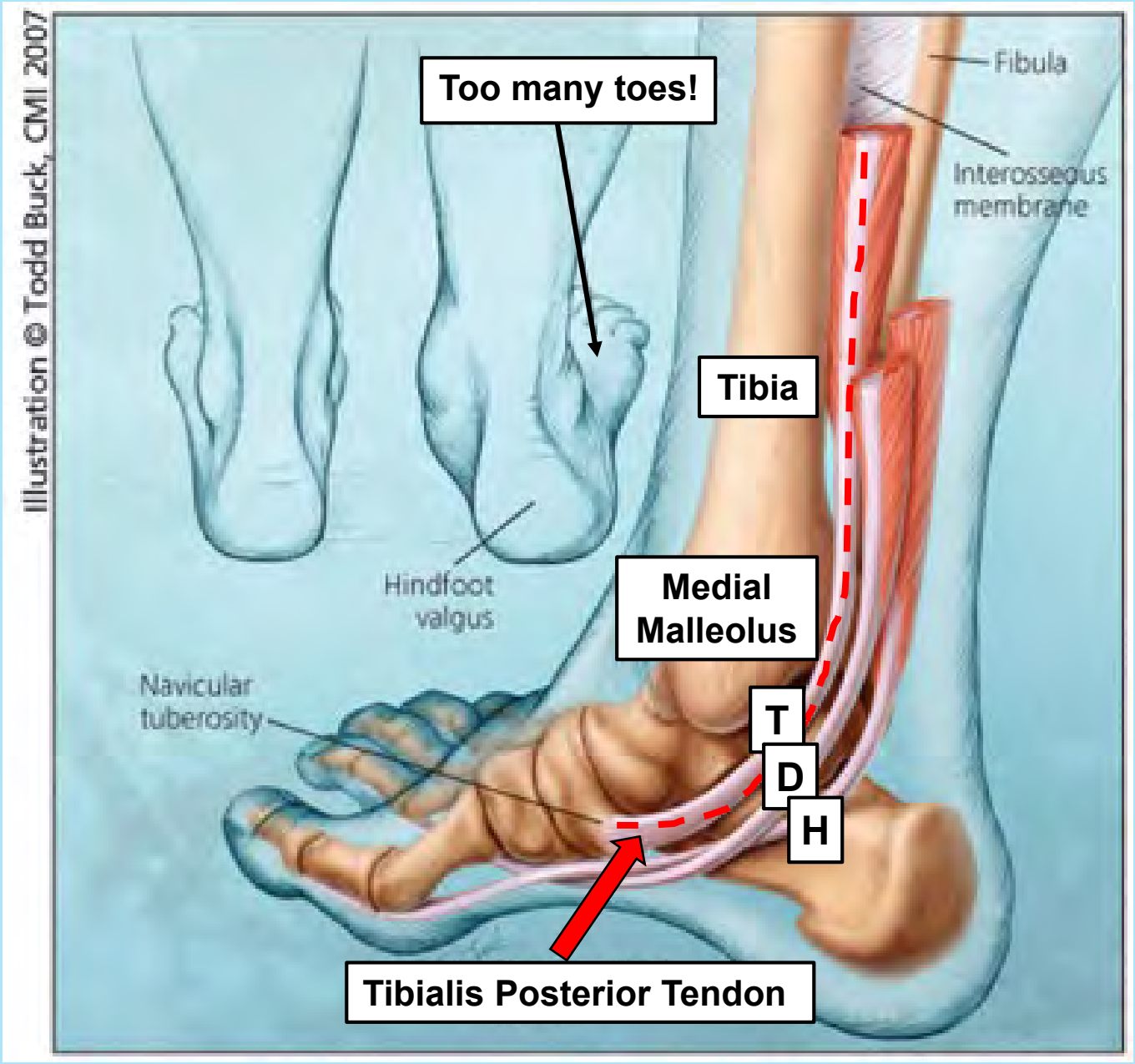


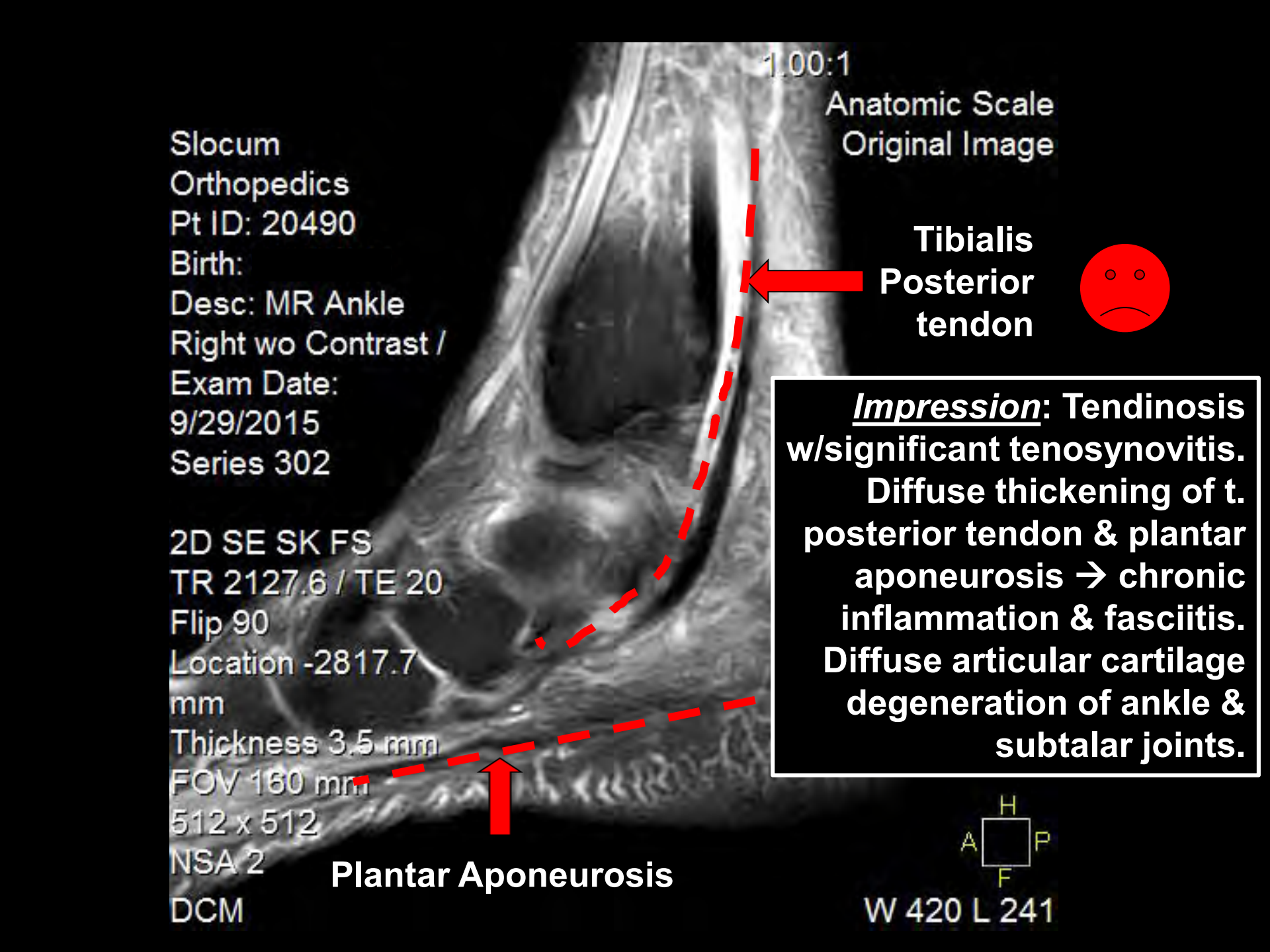
≡ ¼ c

≡ 1.5 oz



R Ankle Too Many Toes Posterior View, Medial View




1.00:1
Anatomic Scale
Original Image
Slocum
Orthopedics
Pt ID: 20490
Birth:
Desc: MR Ankle
Right wo Contrast /
Exam Date:
9/29/2015
Series 302
2D SE SK FS
TR 2127.6 / TE 20
Flip 90
Location -2817.7
mm
Thickness 3.5 mm
FOV 160 mm
512 x 512
NSA 2
DCM
Tibialis
Posterior
tendon
Impression: Tendinosis w/significant tenosynovitis. Diffuse thickening of t. posterior tendon & plantar aponeurosis → chronic inflammation & fasciitis. Diffuse articular cartilage degeneration of ankle & subtalar joints.
Plantar Aponeurosis
H
A
P
F
W 420 L 241

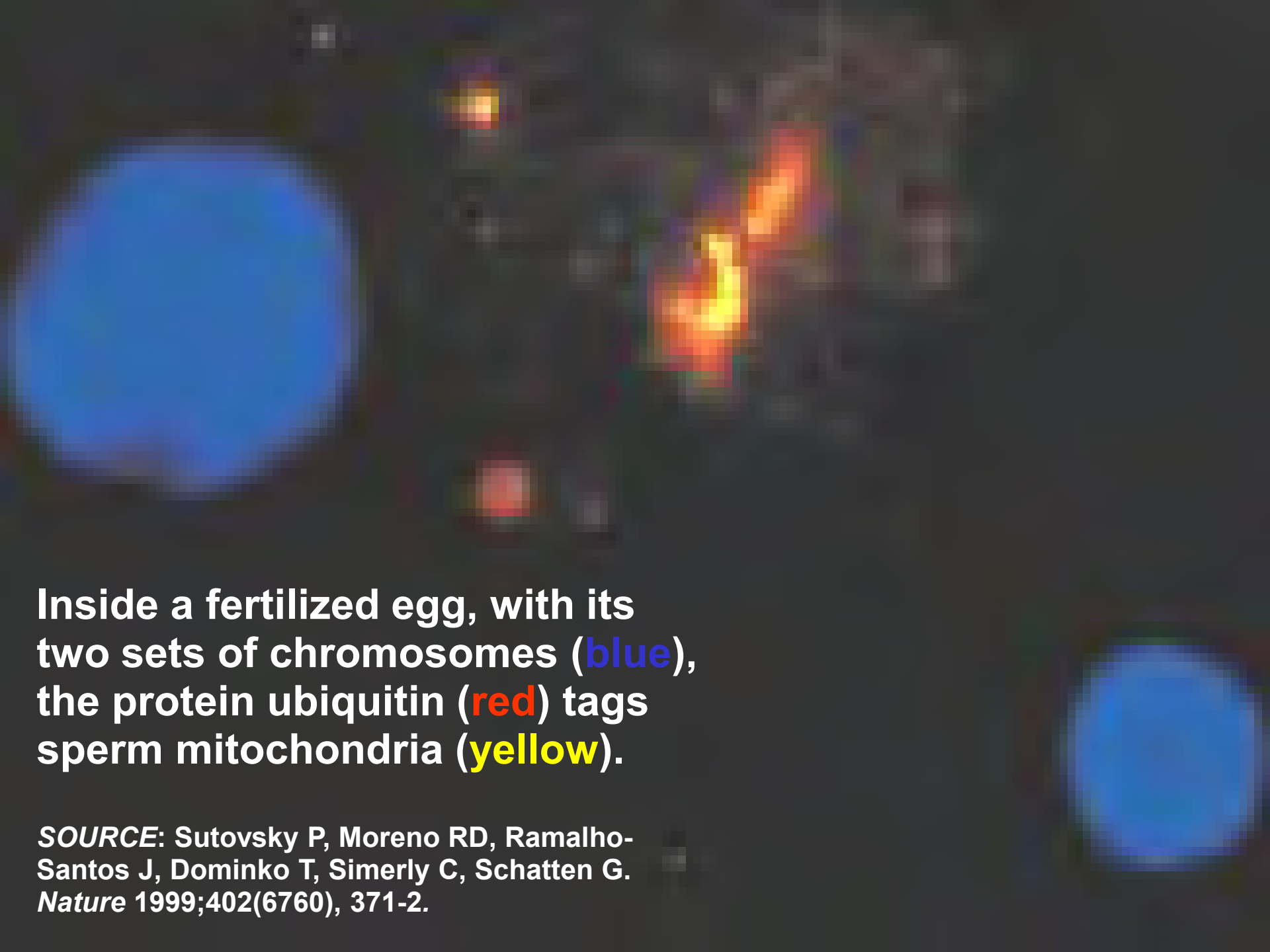
Mom's eggs execute Dad's mitochondria

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.

***SOURCE*: John Travis, *Science News* 2000;157(1), 5.**



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.

What's in the Vault?

An ignored cell component may often account for why chemotherapy fails

By JOHN TRAVIS

Can you imagine exploring the anatomy of the human body and missing the heart, the organ that sends life-giving blood coursing through the body? Of course not. Or not noticing the brain, the custodian of memories and creator of thoughts? Don't be ridiculous.

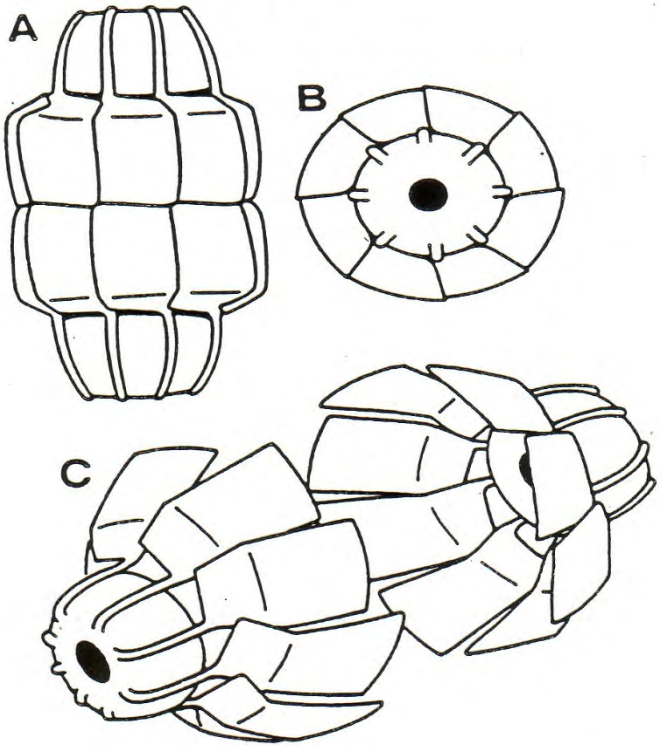
Yet cell biologists may soon have to acknowledge an equally unimaginable oversight in their field. For decades, their powerful microscopes have failed to spot a basic cell component of animals and perhaps any organism with a nucleus. Known as vaults, the barrel-shaped particles are three times the size of ribosomes, the eas-

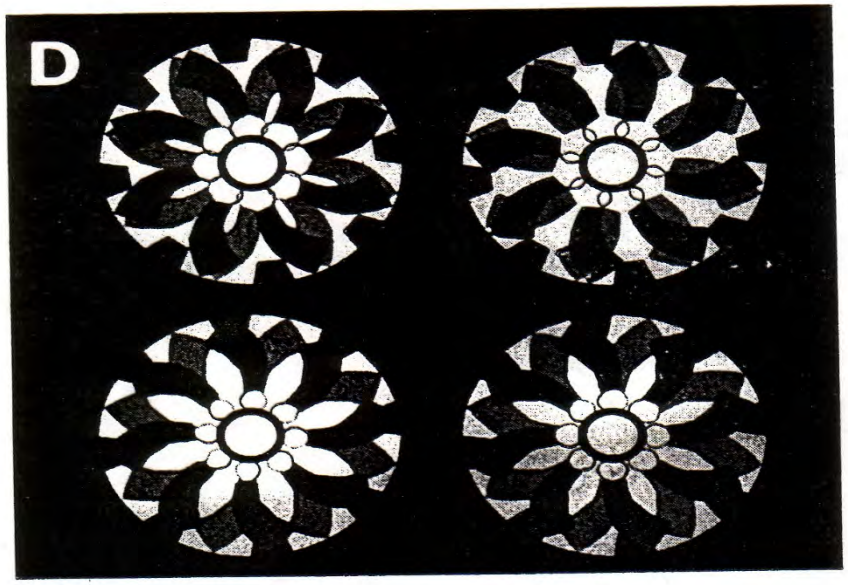
through a microscope. But if it were contaminated with objects that shrug off the stain, that sea would be dotted with white islands. Rome likens the strategy to finding an invisible person by looking for an unexplained shadow in the beam of a spotlight.

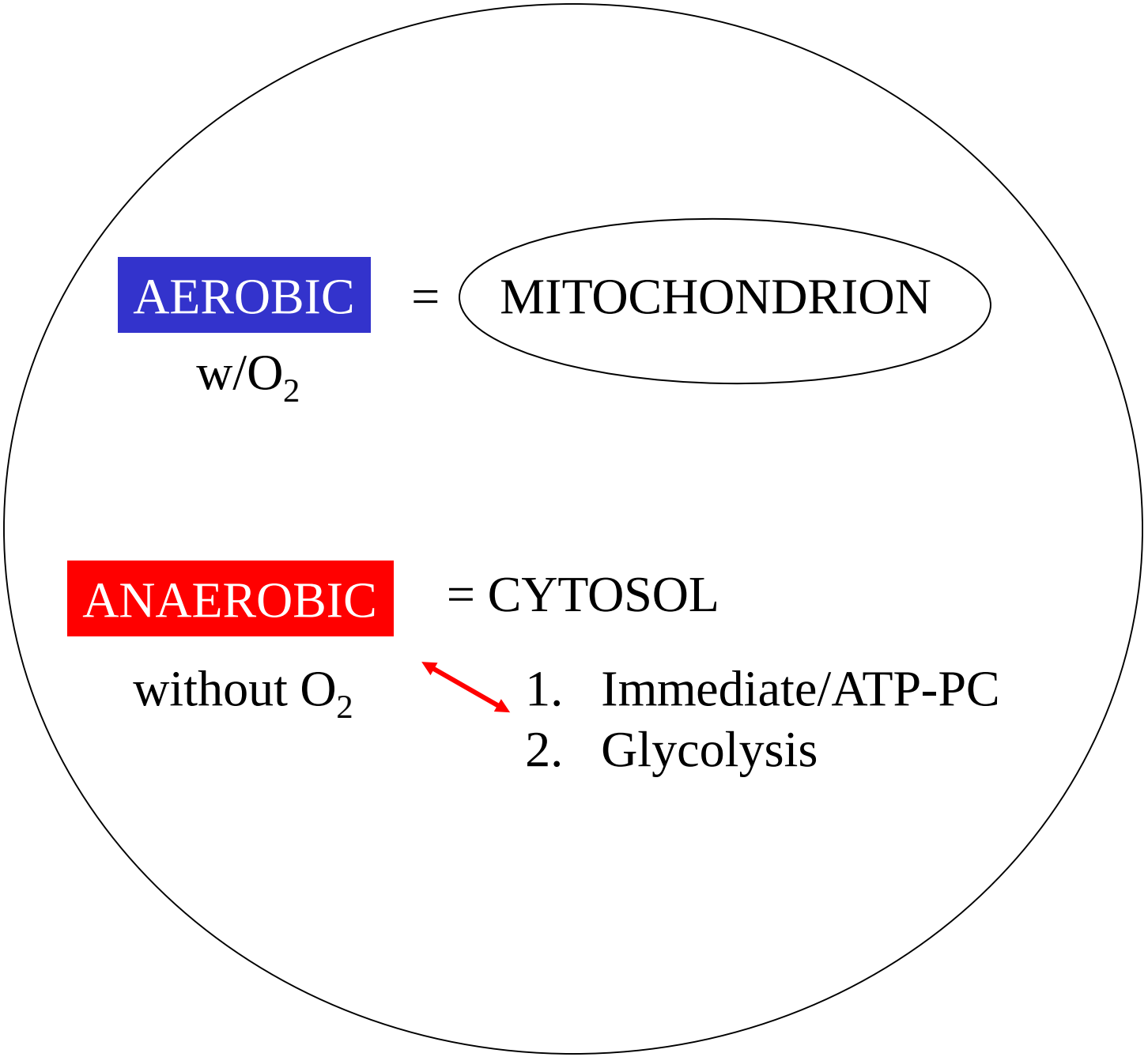
To Kedersha's surprise, unstained ovoid objects appeared among her coated vesicles. Since some of the stain settled into furrows on top of the unexpected shapes, the negative staining revealed fine details of the exterior of these mysterious interlopers, including arches that reminded Rome and Kedersha of the sail-

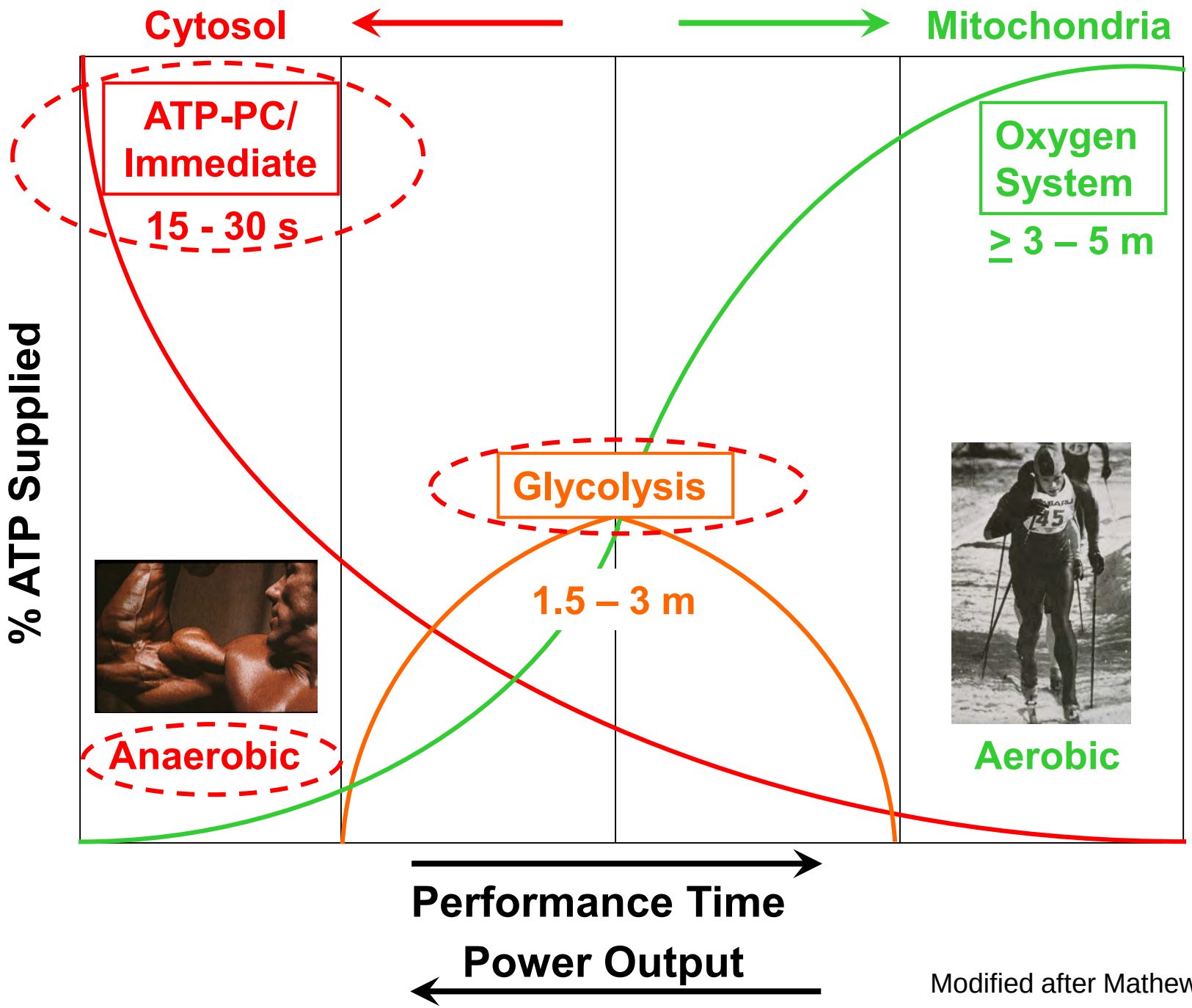
us something by this incredible structure. And the one thing we might surmise from the structure [of vaults] is that they might contain something," says Rome.

That shape also hints that vaults may pick up their unknown cargo at the nuclear membrane, the barrier that separates the cell's cytoplasm from its nucleus. The nucleus is a fluid-filled sac containing DNA and the machinery required to translate the instructions encoded by that DNA into molecules called messenger RNA. These mRNA strands, as well as other molecules,


A
B
C


D

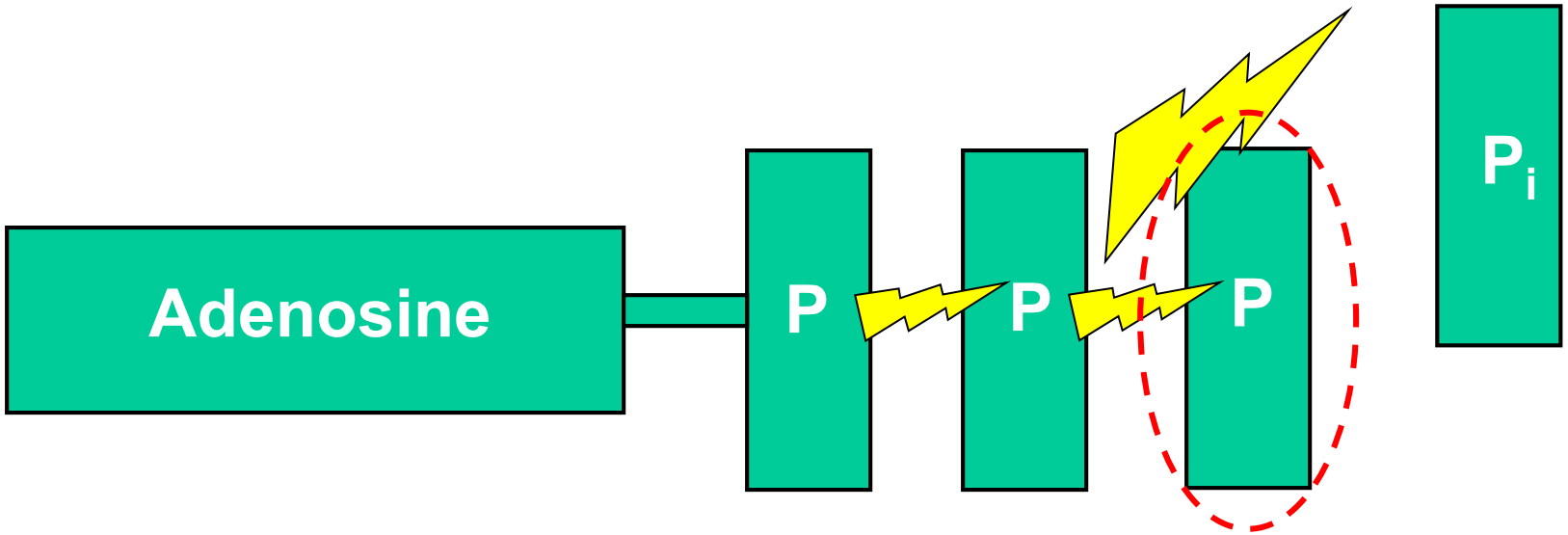

AEROBIC
=
MITOCHONDRION
w/O2
ANAEROBIC
= CYTOSOL
without O2
1. Immediate/ATP-PC
2. Glycolysis



Modified after Mathews & Fox

Cleave One High Energy Phosphate Bond To Do Work!!

7 – 10
KiloCalories/KCal

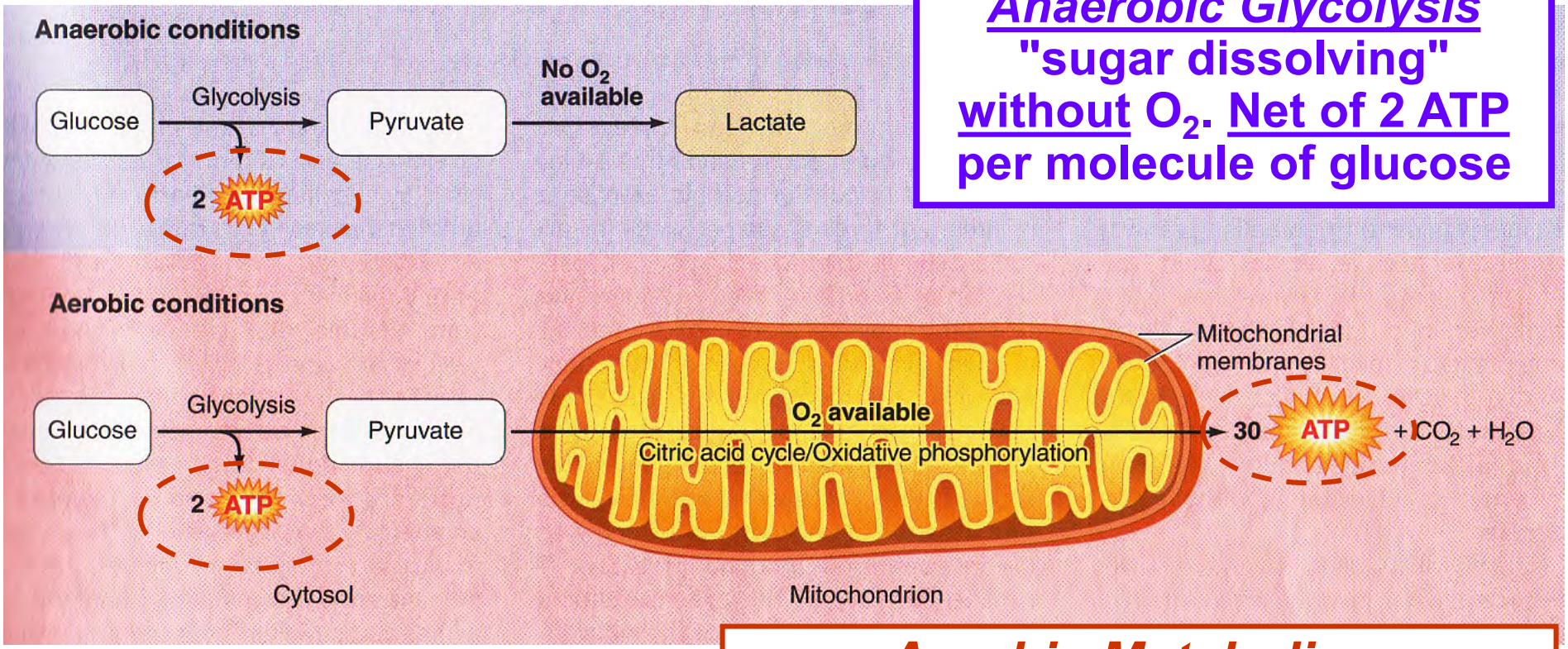


1. *Synthesis of Macromolecules*
2. *Membrane Transport*
3. *Mechanical Work*

Make big things from little things!

Move things! Microscopic! ⟷ Move things! Macroscopic!

Anaerobic vs. Aerobic Metabolism

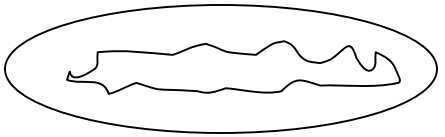


Anaerobic Glycolysis
"sugar dissolving" without O_2. Net of 2 ATP per molecule of glucose

Aerobic Metabolism
+mitochondrial processing of glucose with O_2. Net of 32 ATP per molecule of glucose

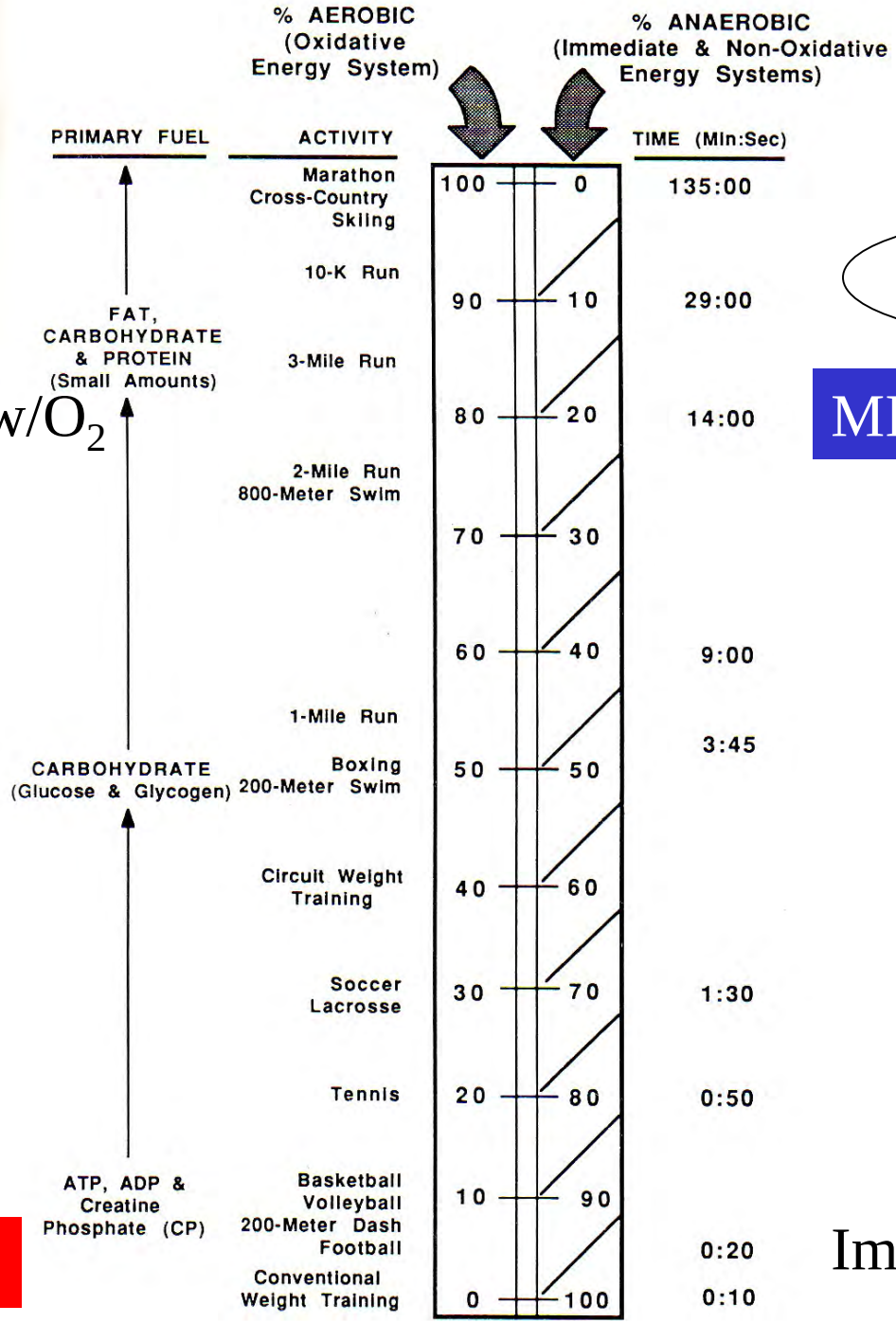
fig 2-15 LS 2012

AEROBIC w/O_2



MITOCHONDRIA

ANAEROBIC



CYTOSOL

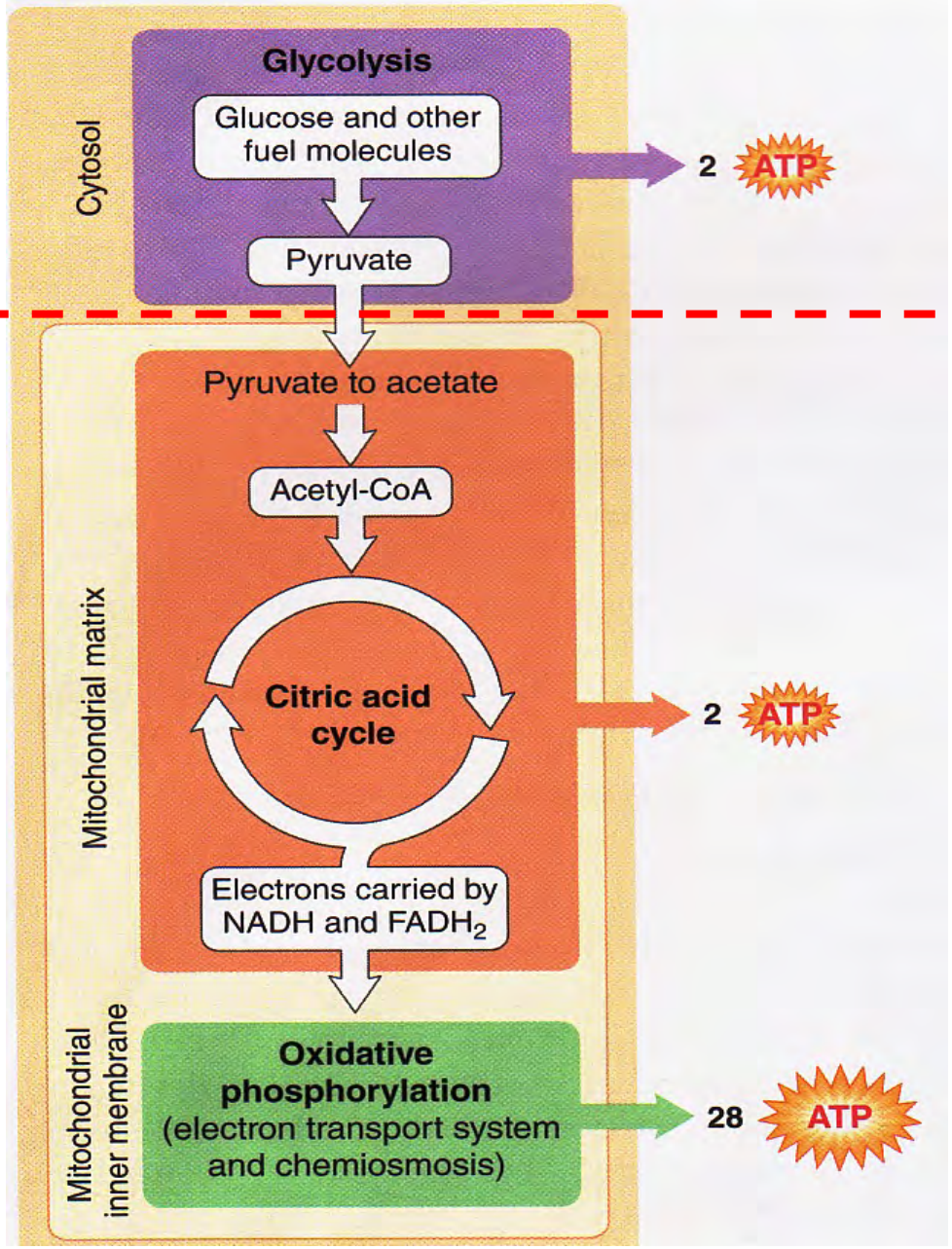
Glycolysis

Immediate/ATP-PC

Stages of Cellular Metabolism/Respiration

Anaerobic
Glycolysis
Cytosol

Aerobic
Metabolism
Mitochondria

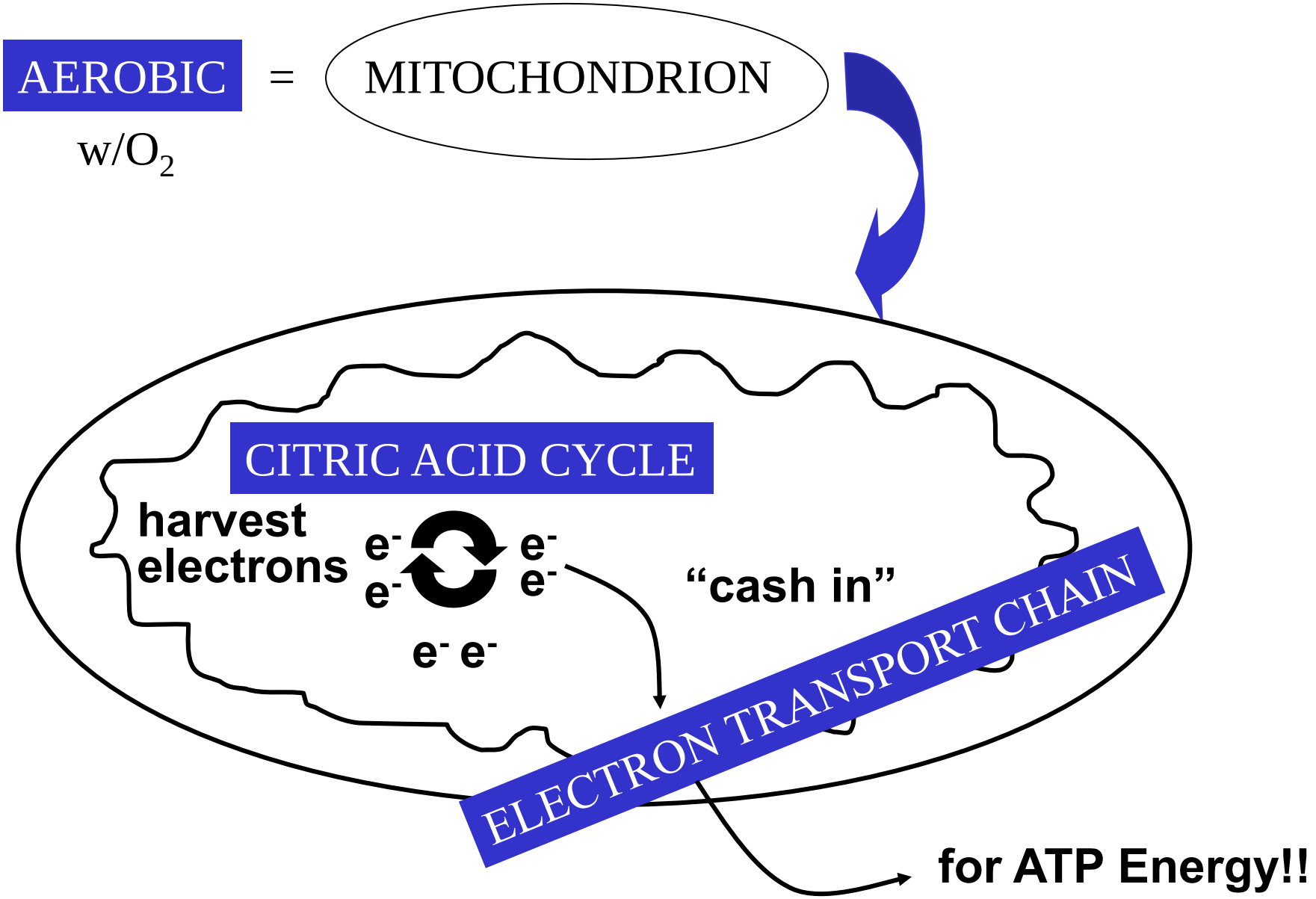


Matrix

Inner Membrane

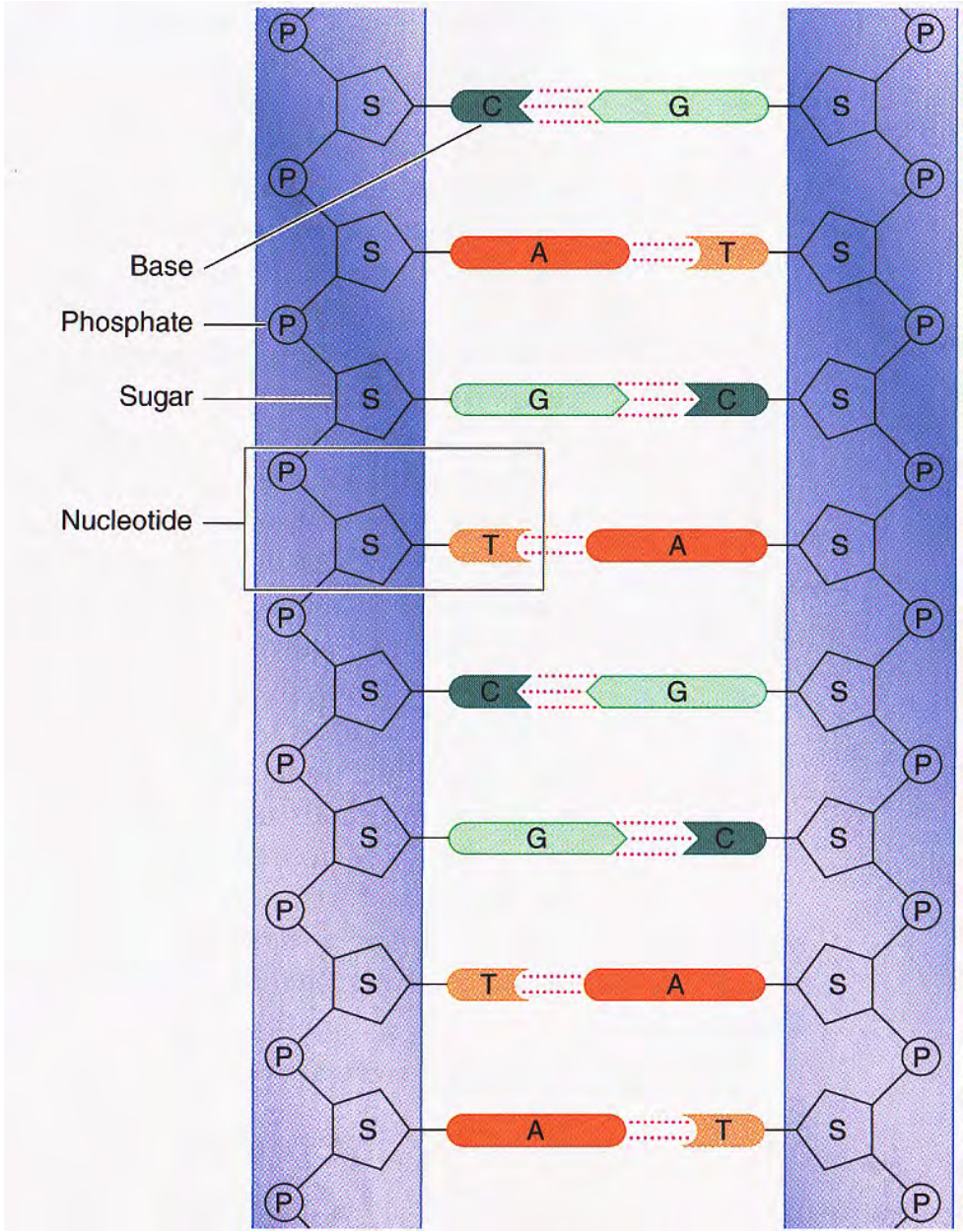
fig 2-9 LS 2012

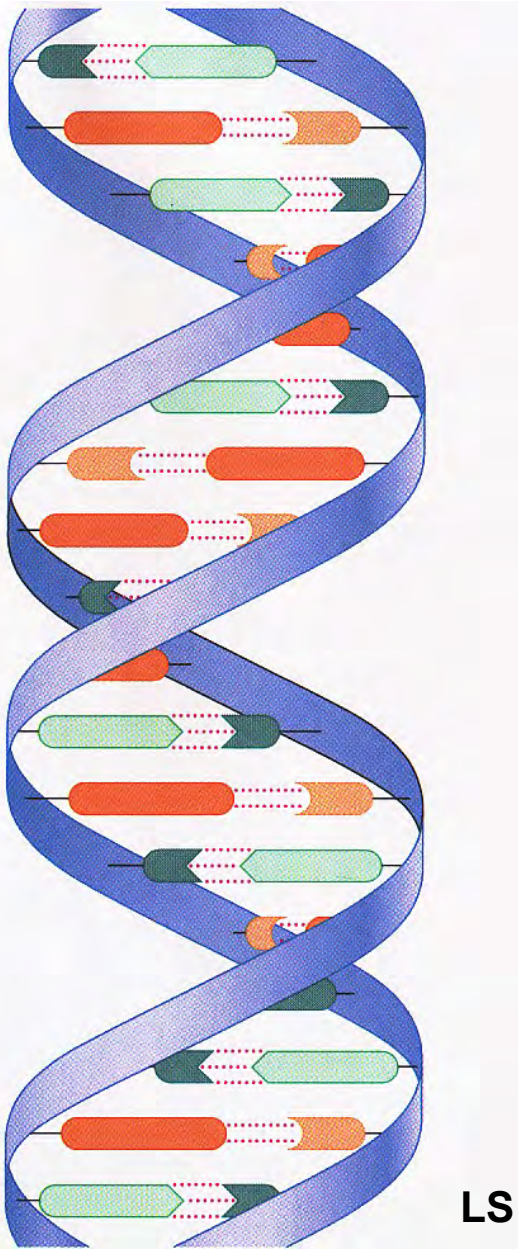
Goals of Aerobic Metabolism



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

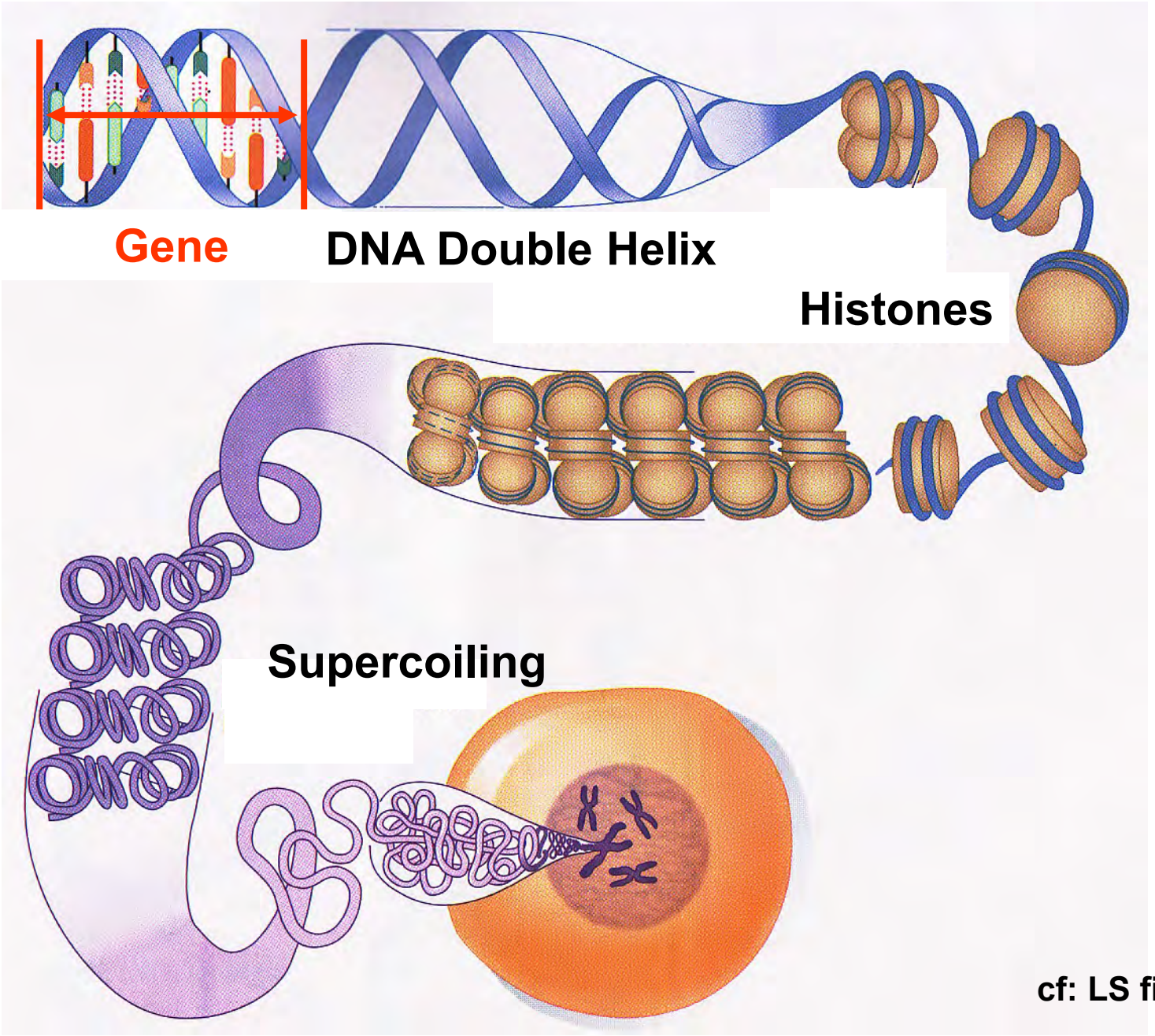
What does DNA look like? Double-helix!!





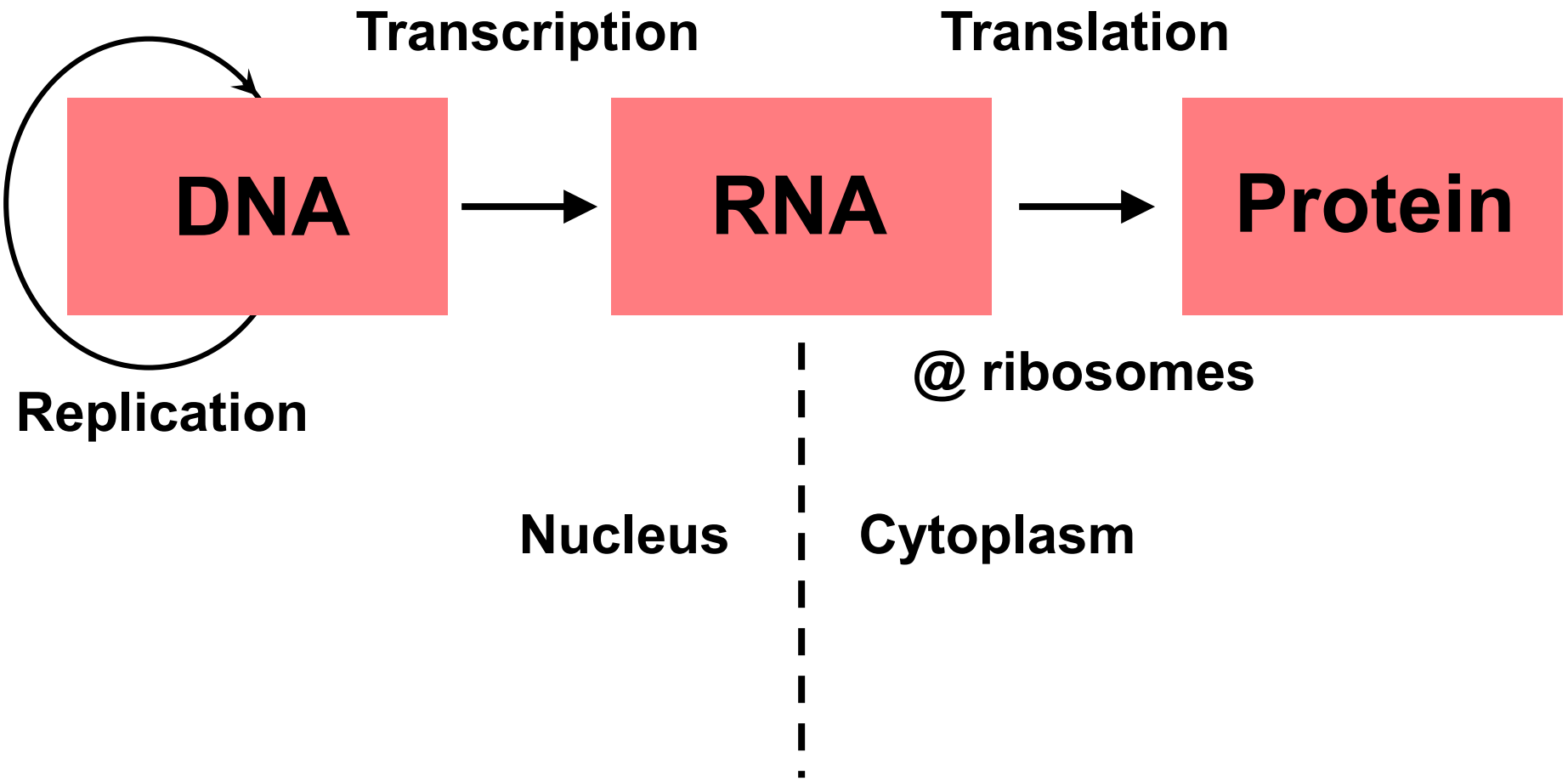
LS fig C-2

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



cf: LS fig C-3

What does DNA do, day-to-day?



cf: LS fig C-6

BI 121 Lecture 5

Nutrition Lab Thursday! More fun...

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

II. ***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!**

III. ***Nutrition Primer*** **Sizer & Whitney (S&W) Sci Lib**

- **A. Essential Nutrients: H_2O, 1^0 Carbohydrates, 2^0 Fats, 3^0 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!**

IV. ***Nutrition in the News*** **Gain weight by drinking calories?**

V. ***Introduction to Digestion*** **Steps + hydrolysis**

DNA vs *RNA*?

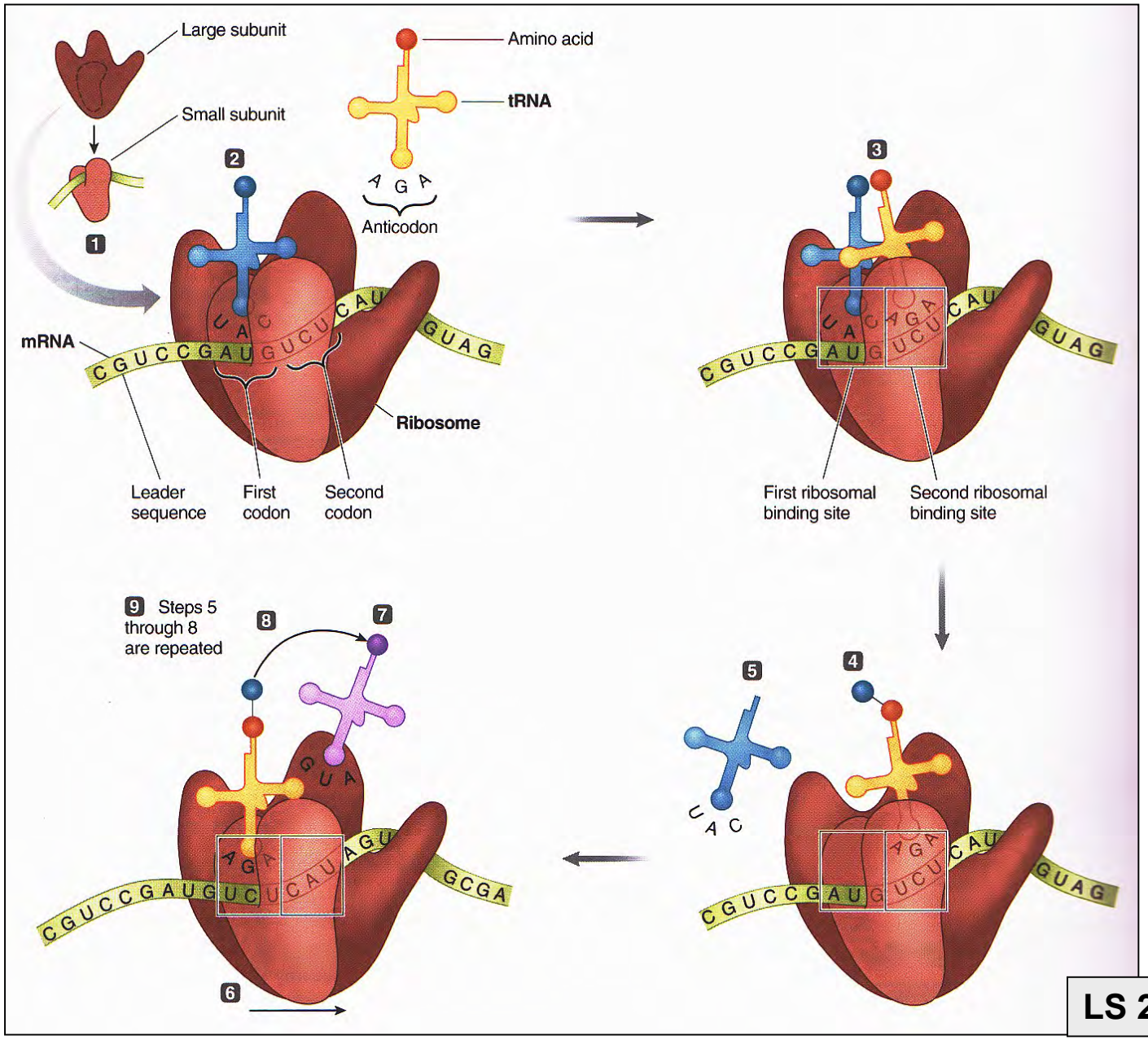
1. Double-stranded
2. Deoxyribose (without oxygen)
3. A, T, C, G
   Thymine
4. Self-replicative (can copy itself)
5. Nucleus (+mitochondria)

1. Single-stranded
2. Ribose (with oxygen)
3. A, U, C, G
   Uracil
4. Needs DNA as template
5. 1^0 Cytoplasm (but Nucleus origin)
6. mRNA, rRNA, tRNA

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

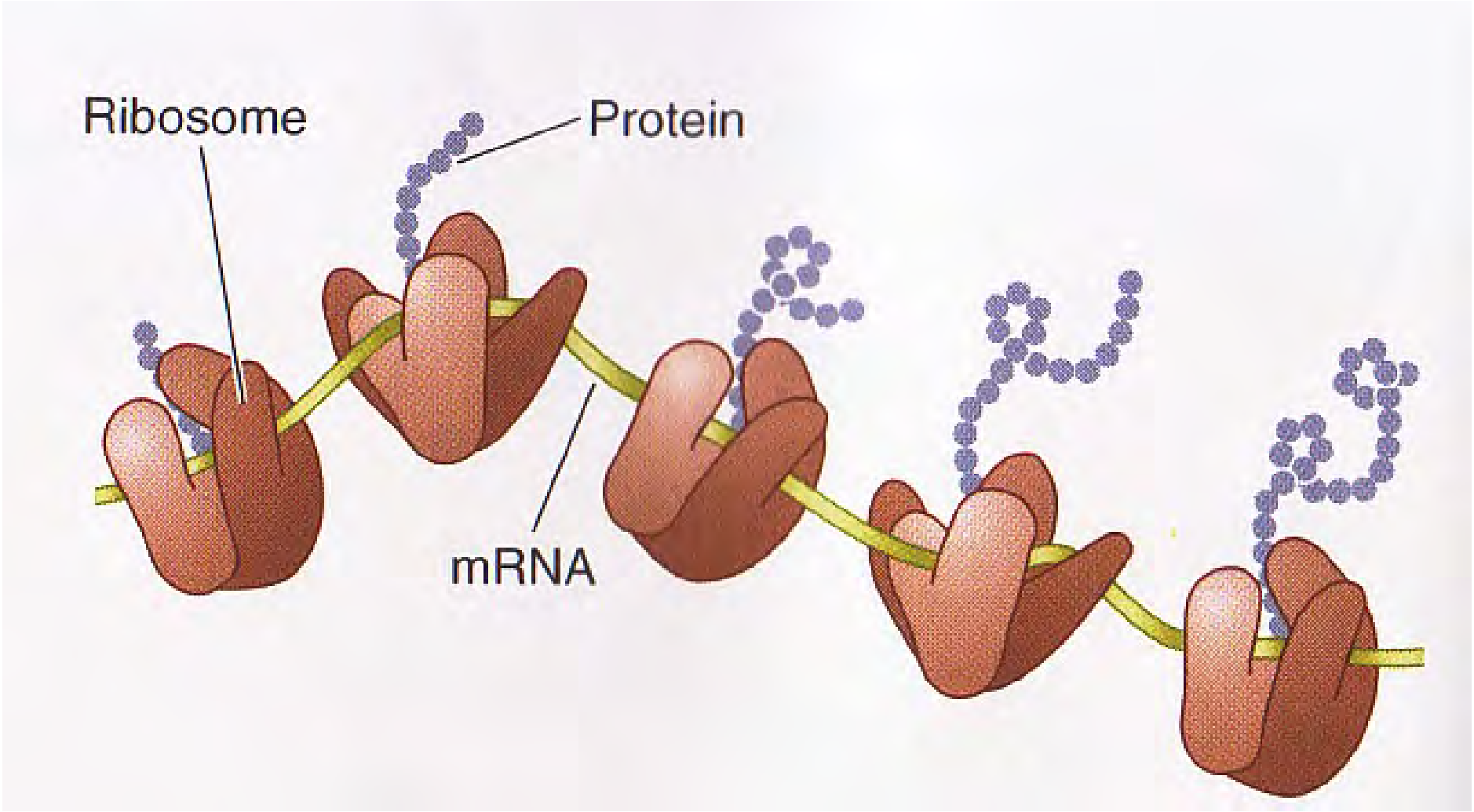
DNA	mRNA	tRNA
code word	codon	anti-codon
TAT	AUA	UAU
ACG	UGC	ACG
TTT	AAA	UUU
TAC	AUG	UAC

Translation? Ribosomes Make Proteins



LS 2012 fig C-7

A Polyribosome. Which Way is Synthesis?



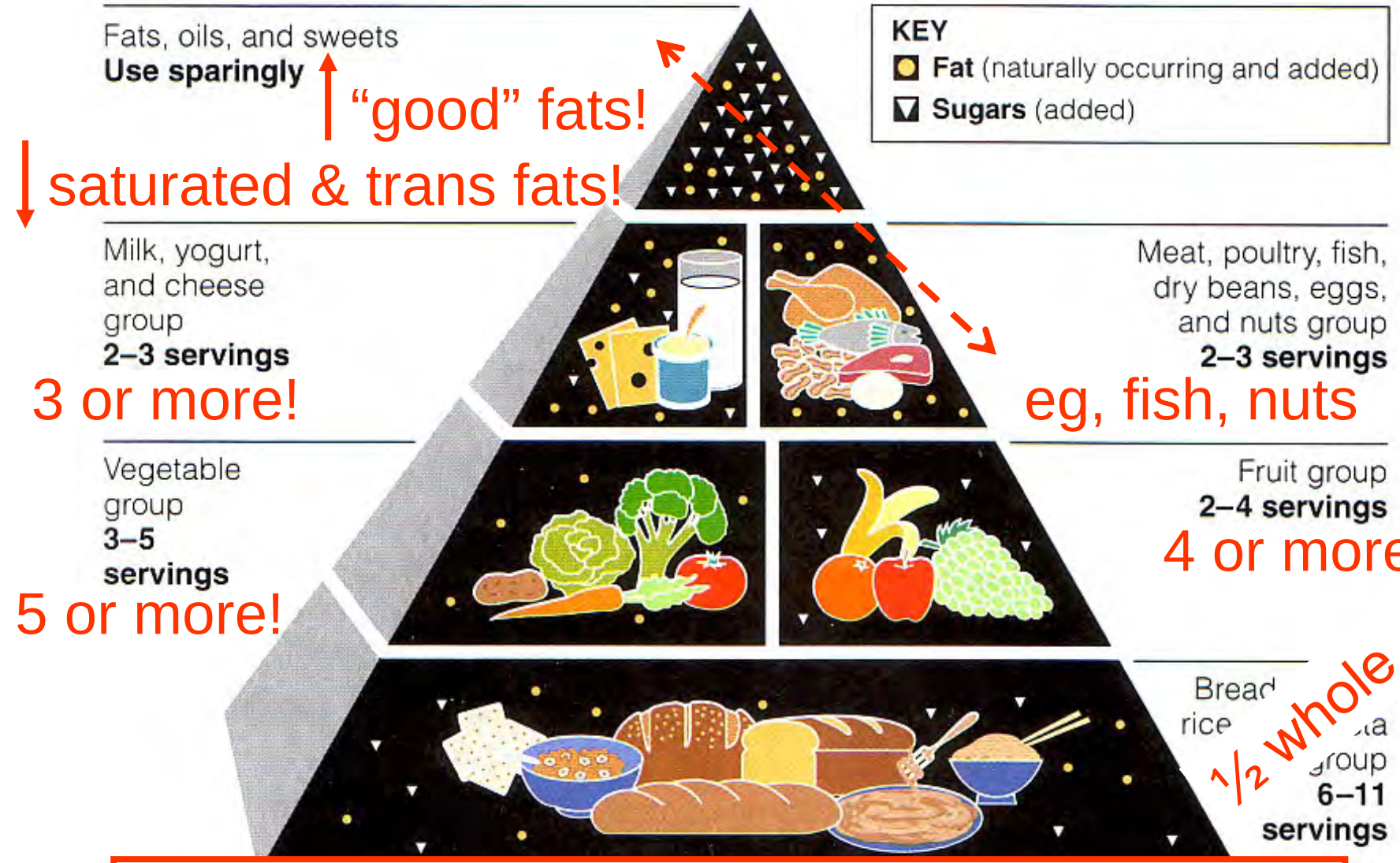
LS fig C-9

Macronutrients & Micronutrients Essential for Life

Macronutrients	Sample Food Sources
H_2O/Water	Water, other drinks, fruits & vegetables
✓ 1^0 Carbohydrates	Grains, vegetables, fruits, dairy products
✓ 2^0 Fats/Triglycerides/Lipids	Meats, full-fat dairy products, oils
✓ 3^0 Proteins	Meats, legumes, dairy vegetables
Micronutrients	***NB*: Need only minute quantities!**
Vitamins (A, D, E, K; C + B)	Vegetables, vegetable oils, fruits, citrus, grains, dairy
Minerals (K^+, Na^+, Ca^{2+}, Mg^{2+} Fe^{2+}, Zn^{2+},…)	Fruits, vegetables, grains, nuts, dairy, meats, processed foods

✓ *Energy nutrients = yield ATP*

US Modifications to 1992 Food Pyramid 2005

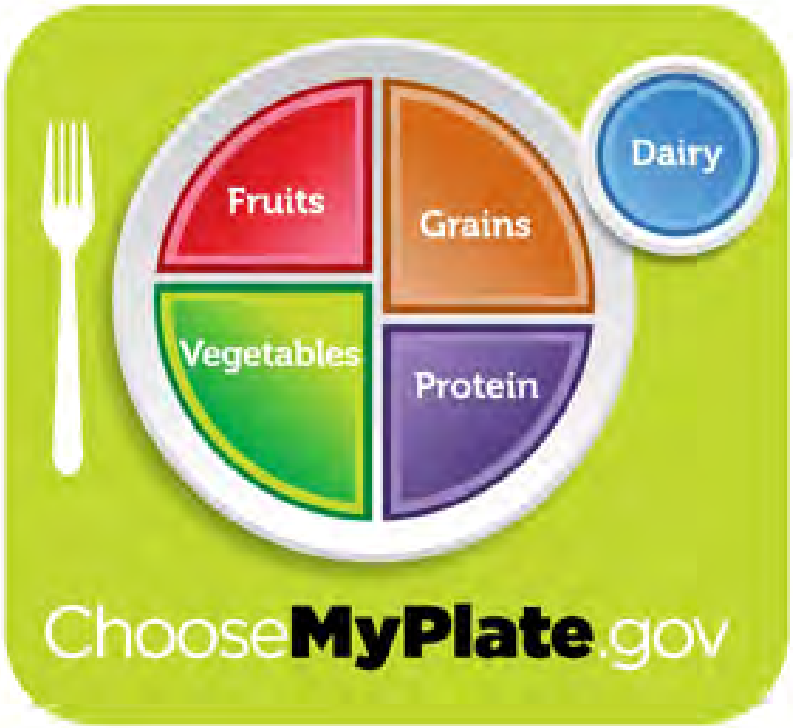


Regular Physical Activity: Exercise! Exercise!!

MyPlate launched June 2, 2011

2. **Focus on fruits.** Whole fruit preferable to juice, but any fruit counts! Fill ½ your plate with fruits & vegetables!

3. **Make at least ½ 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 ½ your plate with fruits & vegetables!

4. **Go lean with protein. Keep protein to < ¼ 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 <u>always</u>, remember...

Do not smoke or use tobacco in any form.

American Institute for Cancer Research

American Institute for Cancer Research (AICR)

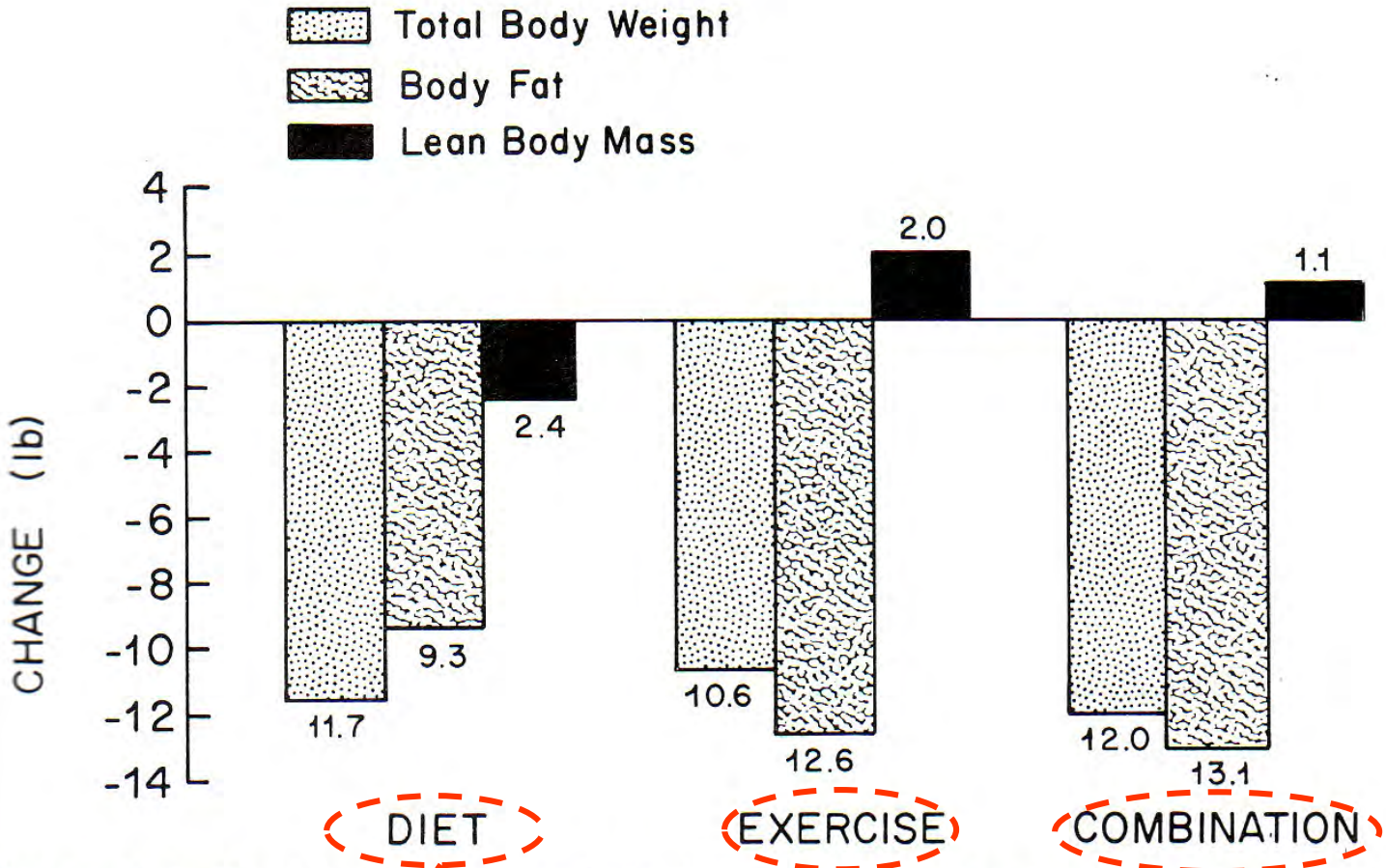


Figure 4–9. Changes in body weight, body fat, and lean body weight for diet, exercise, and combination groups. (From Zuti W. B., and Golding, L. A.: Comparing diet and exercise as weight reduction tools. **Phys. Sportsmed.** 4:49–53, 1976.)

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

Nutrition Lab 3 today! More fun about me...

BI 121 Lecture 6

I. ***Announcements*** ***Got Data?*** Crucial for today's lab! Q? If you want notebook to study for Exam I on Oct 27th, turn in prior lecture next Tuesday, Oct 20st. Sample Exam Q.

II. ***Nutritional Physiology in the News*** Shake the salt habit! Gain weight by drinking your calories? Coconuts are on a roll? *UCB 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

More Reasons to Shake the Salt Habit

① ↓blood vessel vasodilation w/in 30 min by ingesting 1500 mg Na+!

② ↑Ca^{2+} 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!!

UCB Wellness Letter Jun 2011 p 5

5 times per wk? ≡ 106,600 calories/yr ≡ ± 30.5 lb fat/yr

≡

Starbucks Cinnamon Dolce Latte, whipped cream *Venti (20 oz.)*	410 calories
Jogging	50 min.

Better choices!

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.

Coconut Oil Nutritional Wonder?

Claims?

http://coconutoil.com/about-us/

Review articles:calves, hamsters, mice…rare humans

http://www.ncbi.nlm.nih.gov/pubmed/?term=coconut+oil+health+benefits

The bottom line?

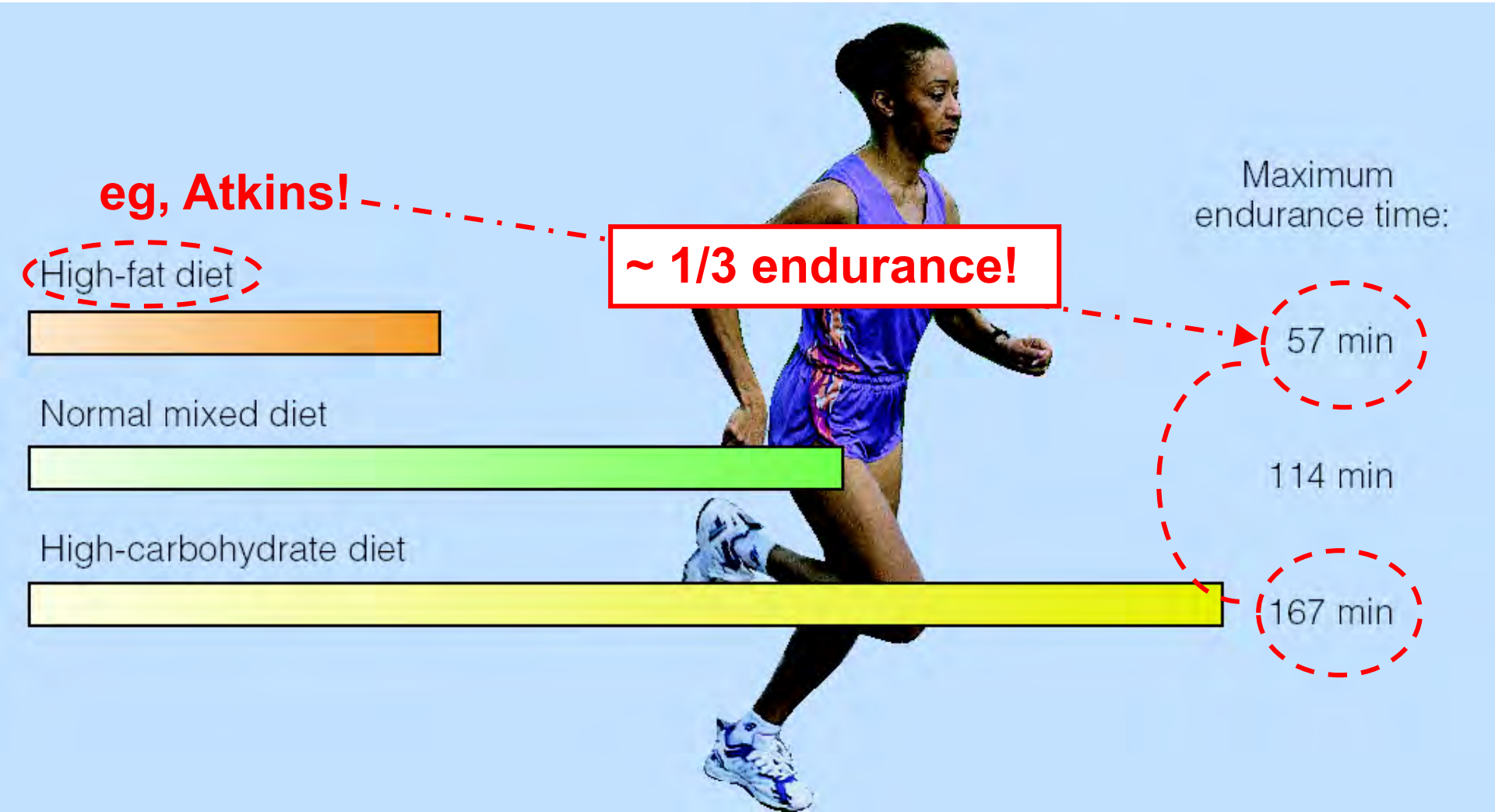
http://www.cspinet.org/nah/articles/coconut-oil.html

http://www.health.harvard.edu/newsletters/Harvard_Health_Letter/2011/May/coconut-oil

http://health.clevelandclinic.org/2012/05/heart-healthy-cooking-oils-101/

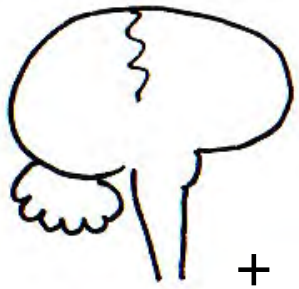
http://en.wikipedia.org/wiki/Smoke_point

Dietary Composition & Physical Endurance



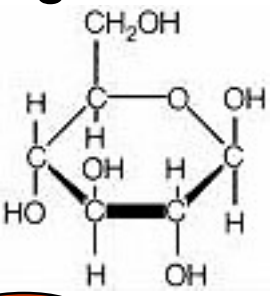
cns

2



+

glucose



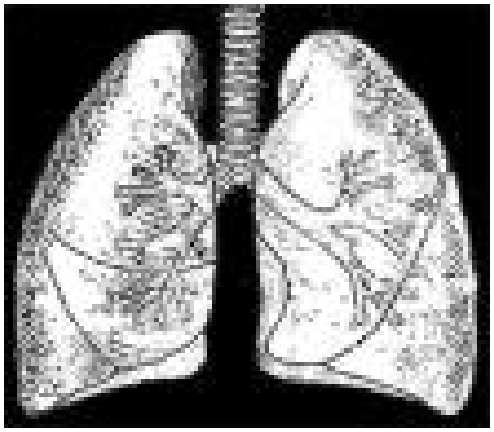
rbcs

3

Negative Effects of Low Carbohydrate

1

4



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.

+ 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

> ¾ **26 lb Water**

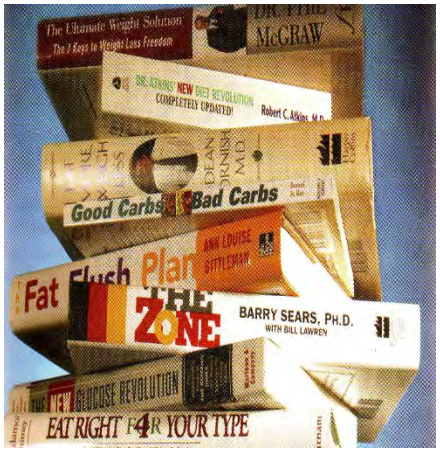
20 lb Lean Body Mass

14 lb Fat

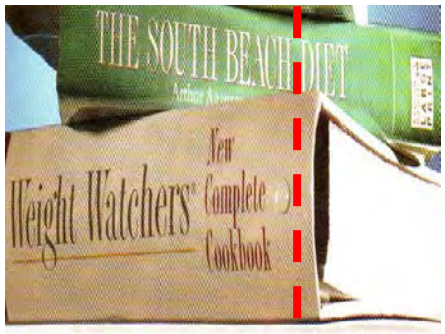
Fat < ¼ total wt loss!

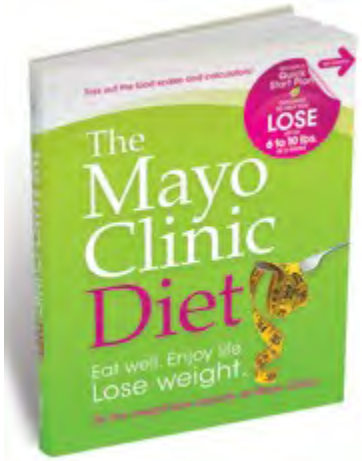
NOT PEER-REVIEWED =

TRADE BOOKS

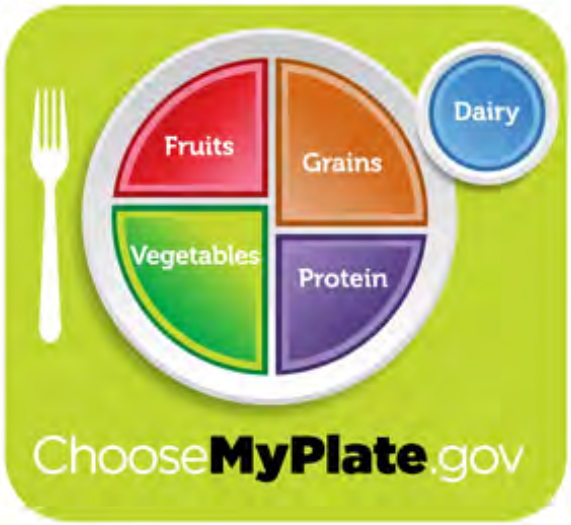


PEER-REVIEWED = TEXTS → RESEARCH





AHA + DASH + MAYO CLINIC



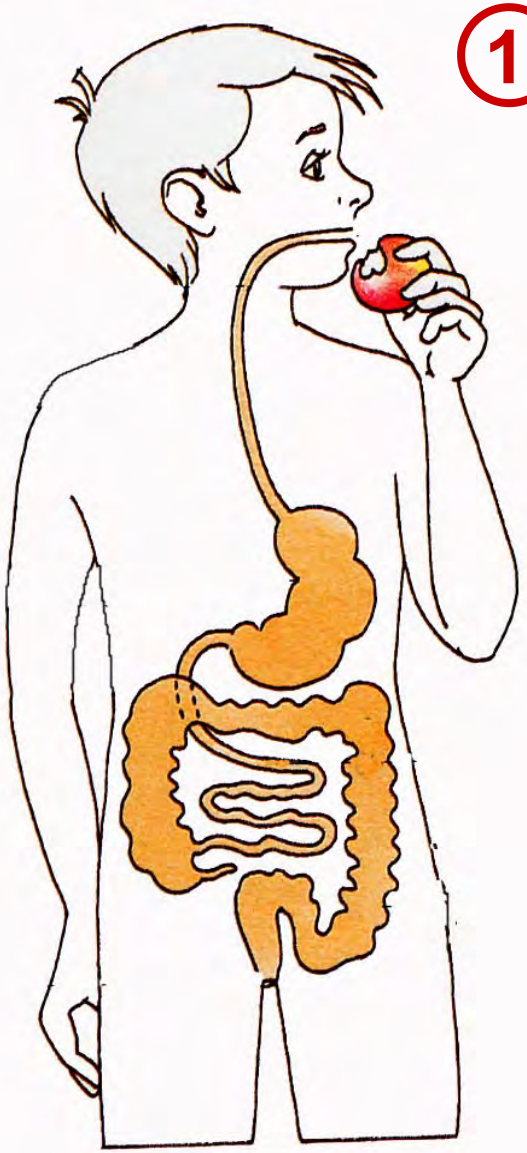
LOWER CARBOHYDRATE

LOWER FAT

ELIMINATE CALORIES or FOOD GROUPS ENCOURAGE FASTING

ADEQUACY BALANCE CONSISTENCY & MODERATION

Digestion Steps

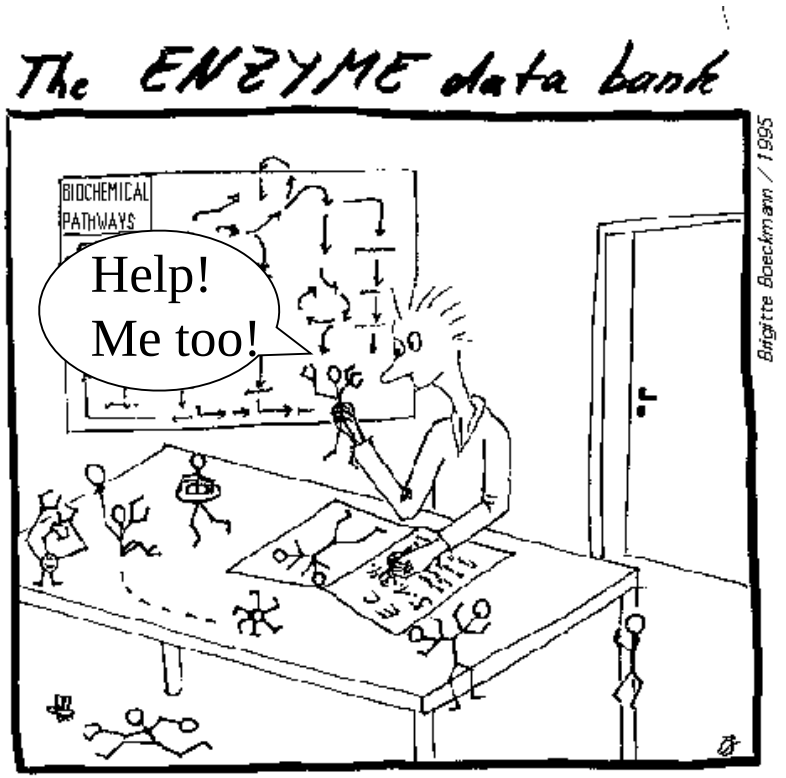


1. Ingestion
2. Mechanical Digestion
3. Chemical Digestion
4. Peristalsis
5. Absorption
6. Storage
7. Defecation

SOURCE: Dr. Eugene Evonuk, 1989. *cf*: L Sherwood, 2012 pp 437-8.

Hydrolysis of Energy Nutrients

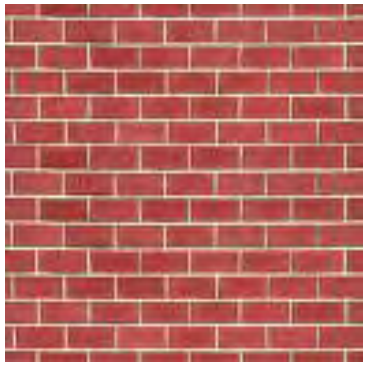
+



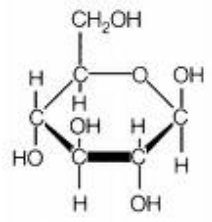
H_2O + Enzyme

Polymer to Monomer (Many to One)

…Central-linking theme!!

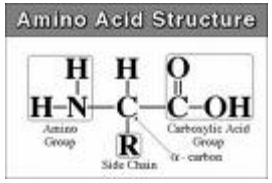


Carbohydrate

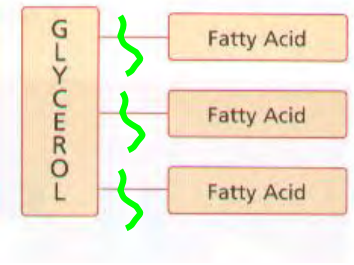


Glucose

Protein
+
Fat

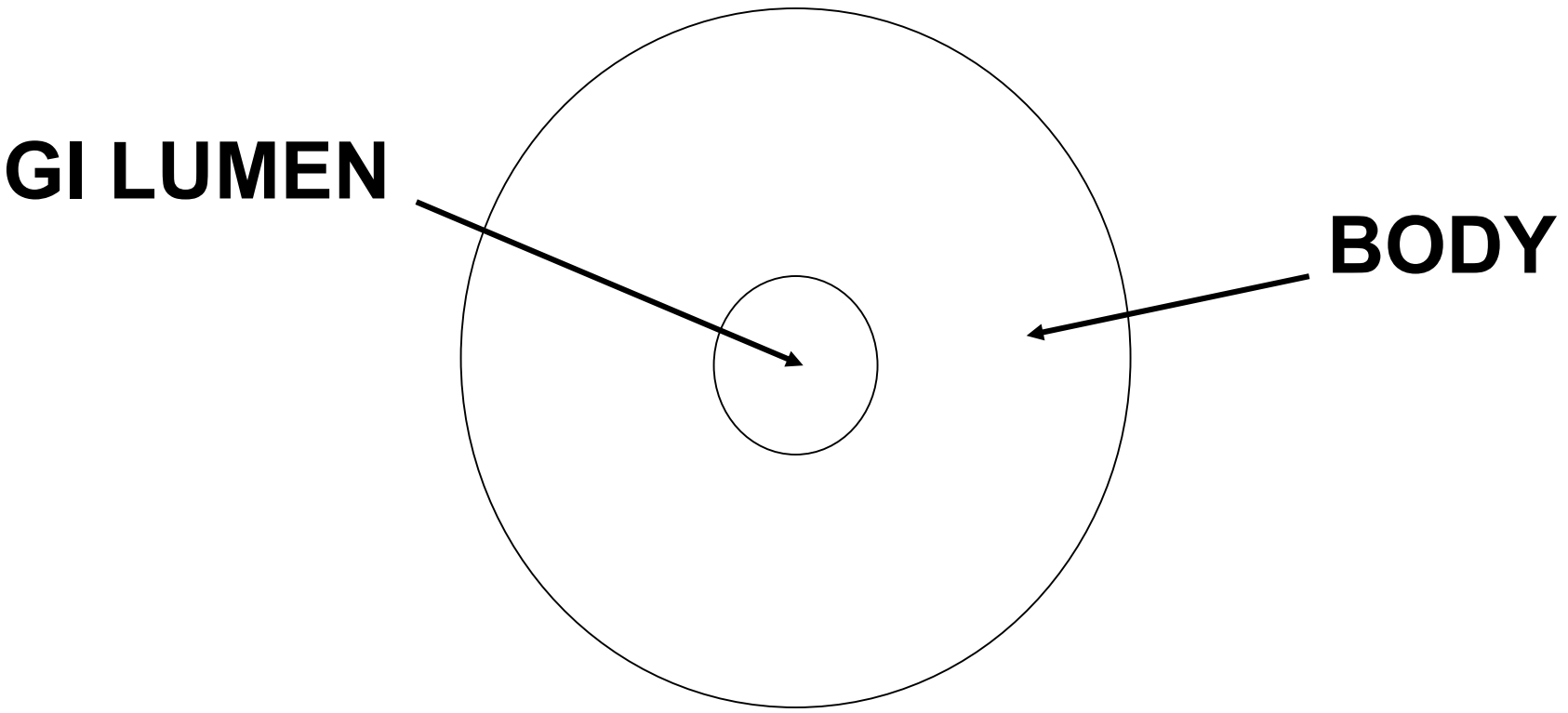


Amino Acids

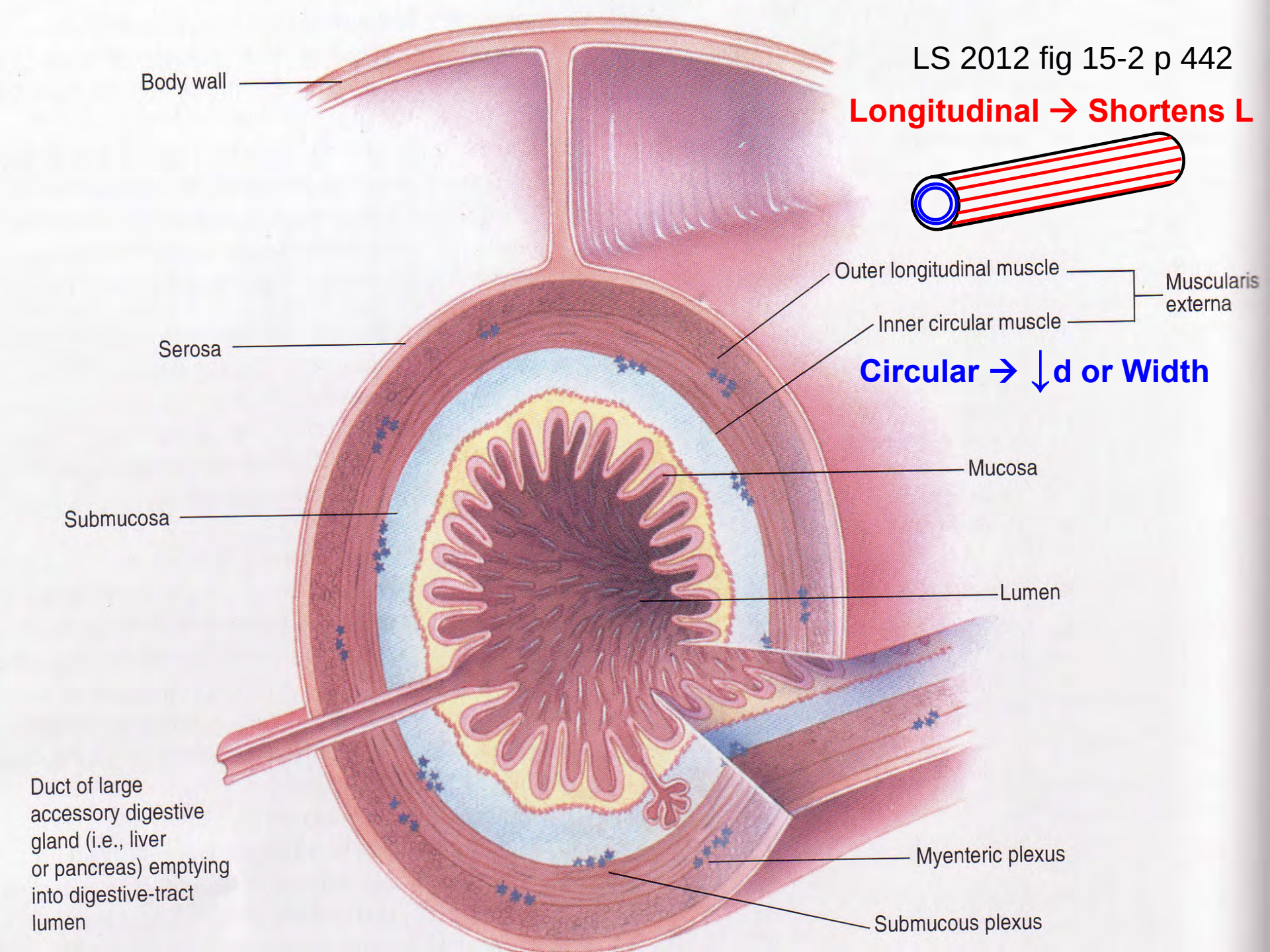


Fatty Acids
+
Glycerol

GI-DONUT ANALOGY



LS 2012 fig 15-2 p 442



Gut Secretions

Secretion	***Release Site***
1. Mucus	**into GI Lumen**
2. Enzymes	**into GI Lumen**
3. H_2O, 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

4. Liver-Gall Bladder

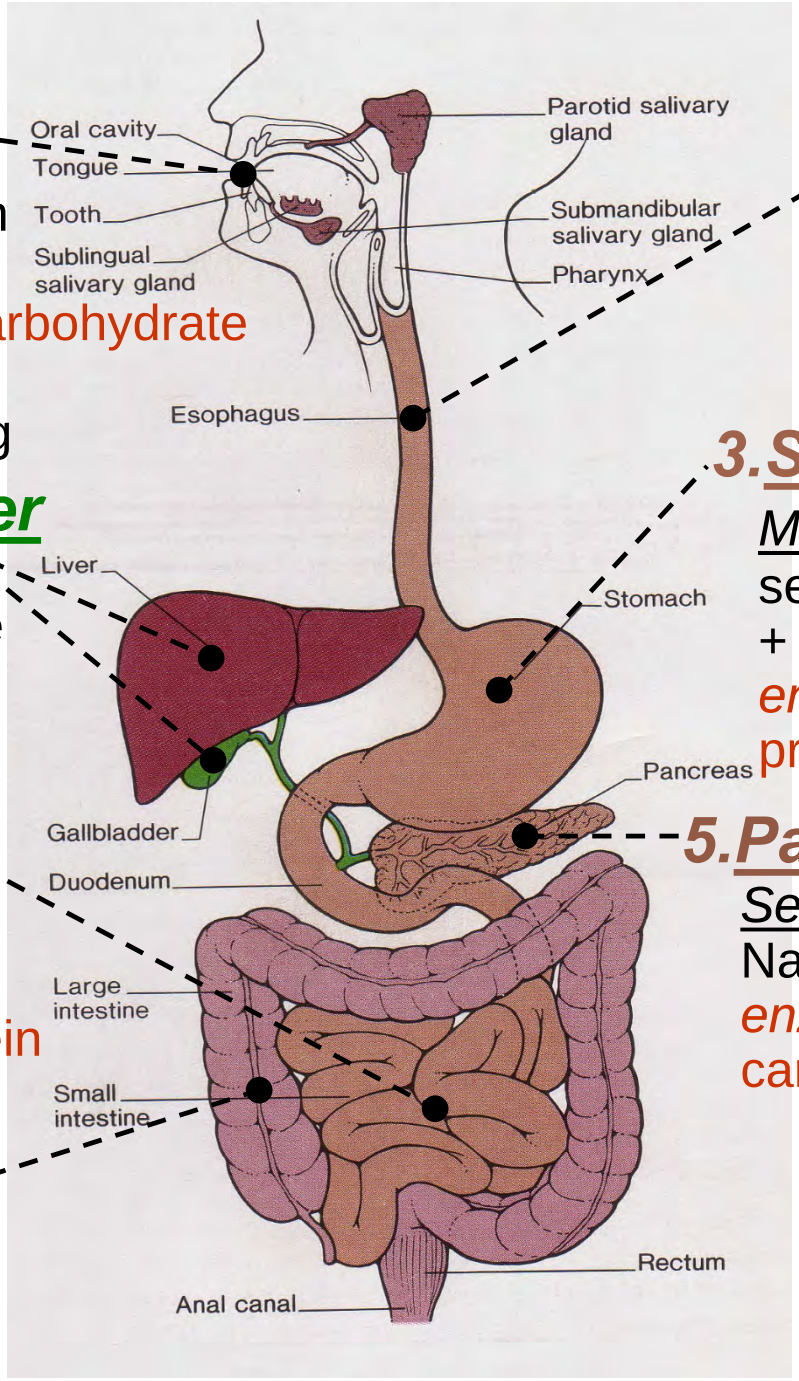
Emulsification =
detergent action of bile
+ secretion

6. Small Intestine

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

7. Large Intestine

Dehydration
secretion + absorption
storage + peristalsis



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

BI 121 Lecture 7 **Exam I one week from today! I'll be ready!...**

I. ***Announcements*** Lab Notebooks? Q? from last time?

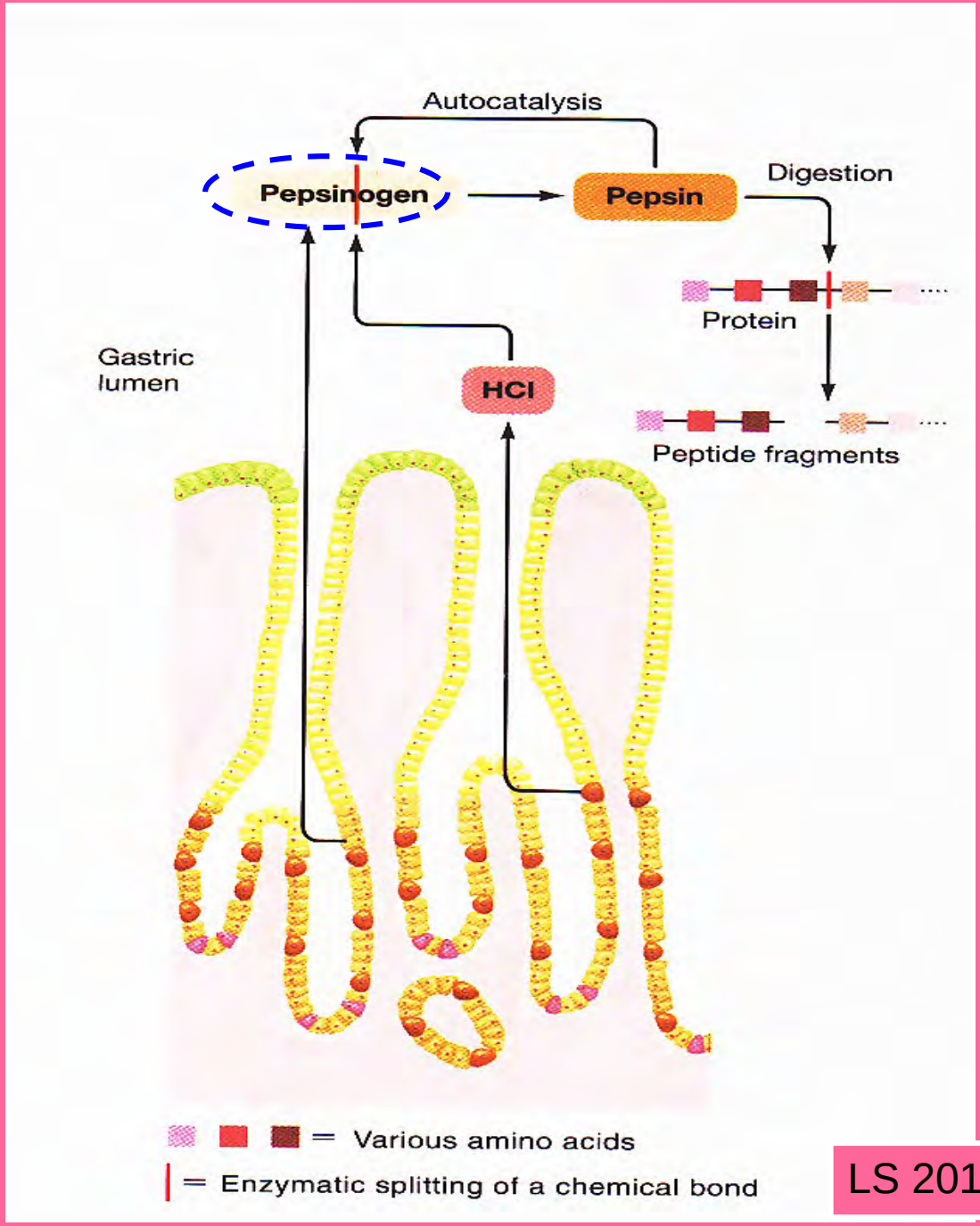
II. ***GI Physiology Connections*** DC Module 3 pp 17-23, LS ch 15+

- A. Organ-by-organ review SI Fox, LS tab 15-1 pp 440-1 +...
- B. Zymogen? = Inactive precursor LS fig 15-9 p 452...
- C. Accessory organs? Pancreas, Liver, Recycling! pp 457-63
- D. Small intestine? Ulcers? LS fig 15-20,15-22 pp 467-8
  http://www.cdc.gov/ulcer ***Beyond the Basics*** LS p 456
- E. Large intestine? LS fig 15-24 pp 472-4

III. ***Cardiovascular System*** DC Mod 4, LS ch 9, Torstar, G&H+…

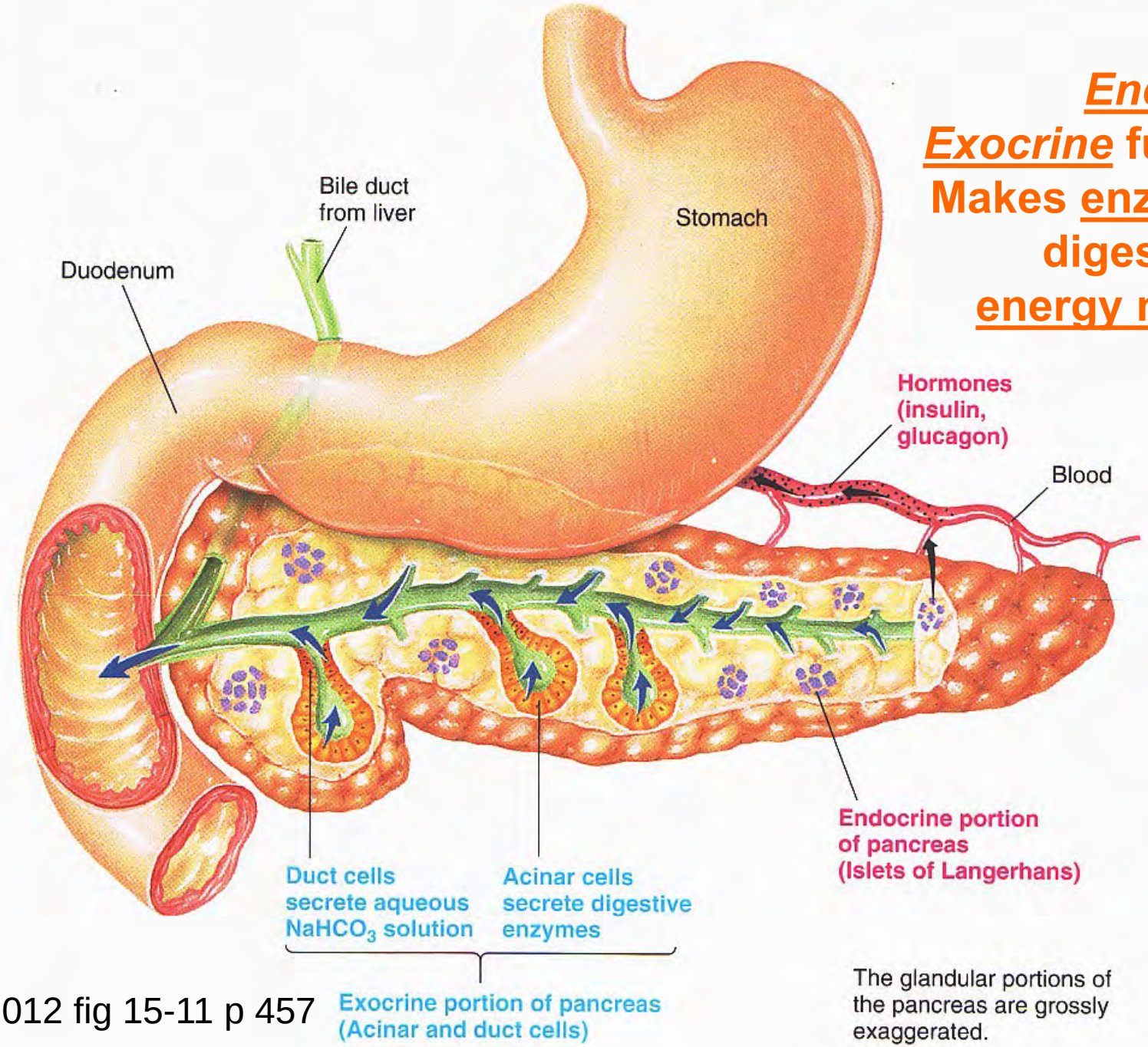
- A. Circulatory *vs.* Cardiovascular (CV)? CV *vs.* Lymphatic
  CV Pulmonary & Systemic circuits DC pp23-31+LS p229+
  DC fig 4-1 p 24, LS fig 9-2b p 231
- B. Arteries, capillaries, veins, varicosities? G&H, Torstar, DC
- C. ♥ layers, box, chambers, valves, inlets, outlets
  LS fig 9-4 p 233, fig 9-2a p 231; DC pp 23-6
- D. Normal *vs.* abnormal blood flow thru ♥ & CVS LS, Fox+…

Zymogen= an inactive precursor

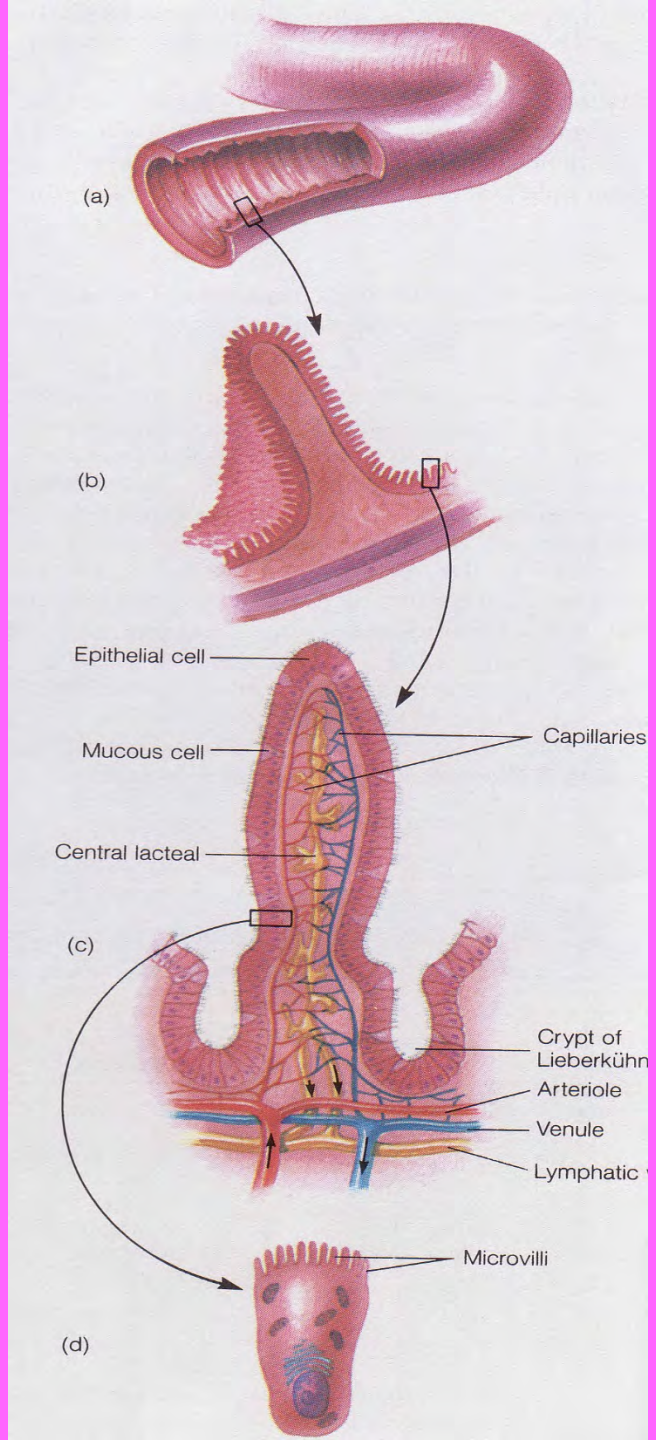


LS 2012 fig 15-9 p 452

Endocrine + Exocrine functions; Makes enzymes for digesting all 3 energy nutrients!



LS 2012 fig 15-11 p 457



LS 2012 fig 15-20 p 467

Ulcer Facts

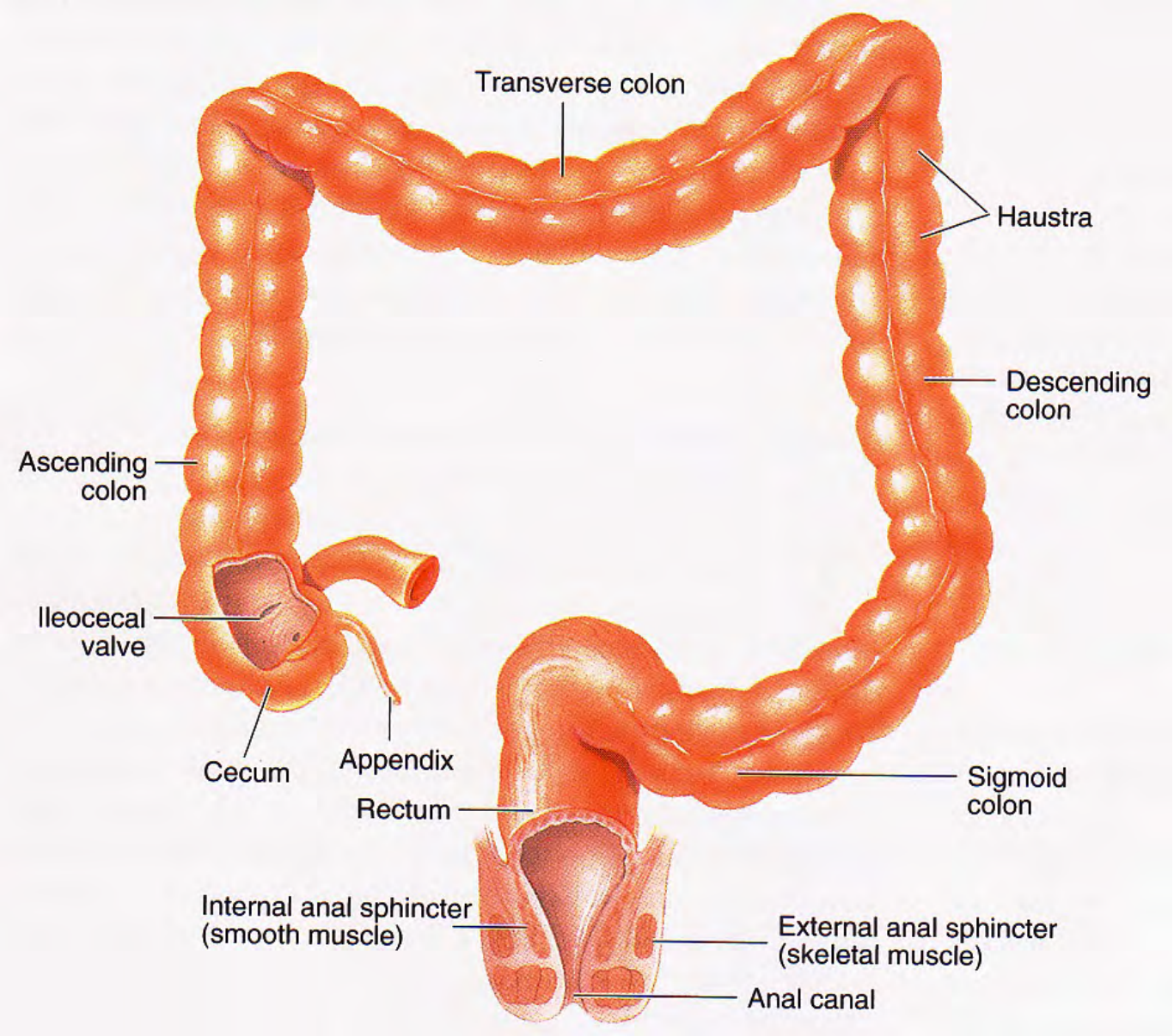
- Most ulcers are caused by an infection, not spicy food, acid or stress.
- The most common ulcer symptom is burning pain in the stomach.
- Your doctor can test you for *H. pylori* infection.
- Antibiotics are the new cure for ulcers.
- Eliminating *H. pylori* infections with antibiotics means that your ulcer can be cured for good.

Table 15-5 Digestive Processes for the Three Major Categories of Nutrients

Nutrients	Enzymes for Digesting the Nutrients	Source of Enzymes	Site of Action of Enzymes	Action of Enzymes	Absorbable Units of the Nutrients
Carbohydrates	Amylase	Salivary glands	Mouth and (mostly) body of stomach	Hydrolyzes polysaccharides to disaccharides (maltose)	
		Exocrine pancreas	Small-intestine lumen		
	Disaccharidases (maltase, sucrase, lactase)	Small-intestine epithelial cells	Small-intestine brush border	Hydrolyze disaccharides to monosaccharides	Monosaccharides, especially glucose
Proteins	Pepsin	Stomach chief cells	Stomach antrum	Hydrolyzes protein to peptide fragments	
	Trypsin, chymotrypsin, carboxypeptidase	Exocrine pancreas	Small-intestine lumen	Attack different peptide fragments	
	Aminopeptidases	Small-intestine epithelial cells	Small-intestine brush border	Hydrolyze peptide fragments to amino acids	Amino acids
Fats	Lipase	Exocrine pancreas	Small-intestine lumen	Hydrolyzes triglycerides to fatty acids and monoglycerides	Fatty acids and monoglycerides
	Bile salts (not an enzyme)	Liver	Small-intestine lumen	Emulsify large fat globules for attack by pancreatic lipase	

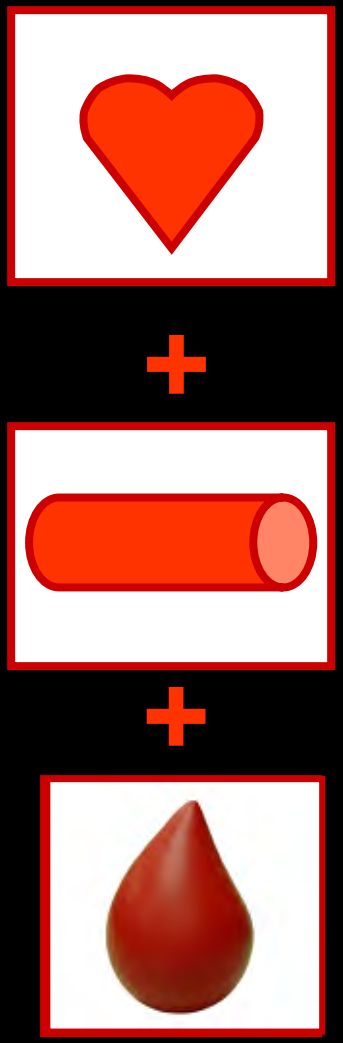
LS 2012 p 446

Large Intestine Structure & Function



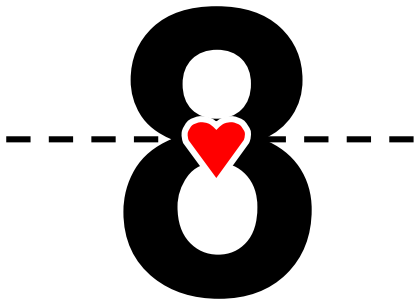
LS 2012 fig 15-24 p 472

Cardiovascular (CV) = Heart + Vessels + Blood!

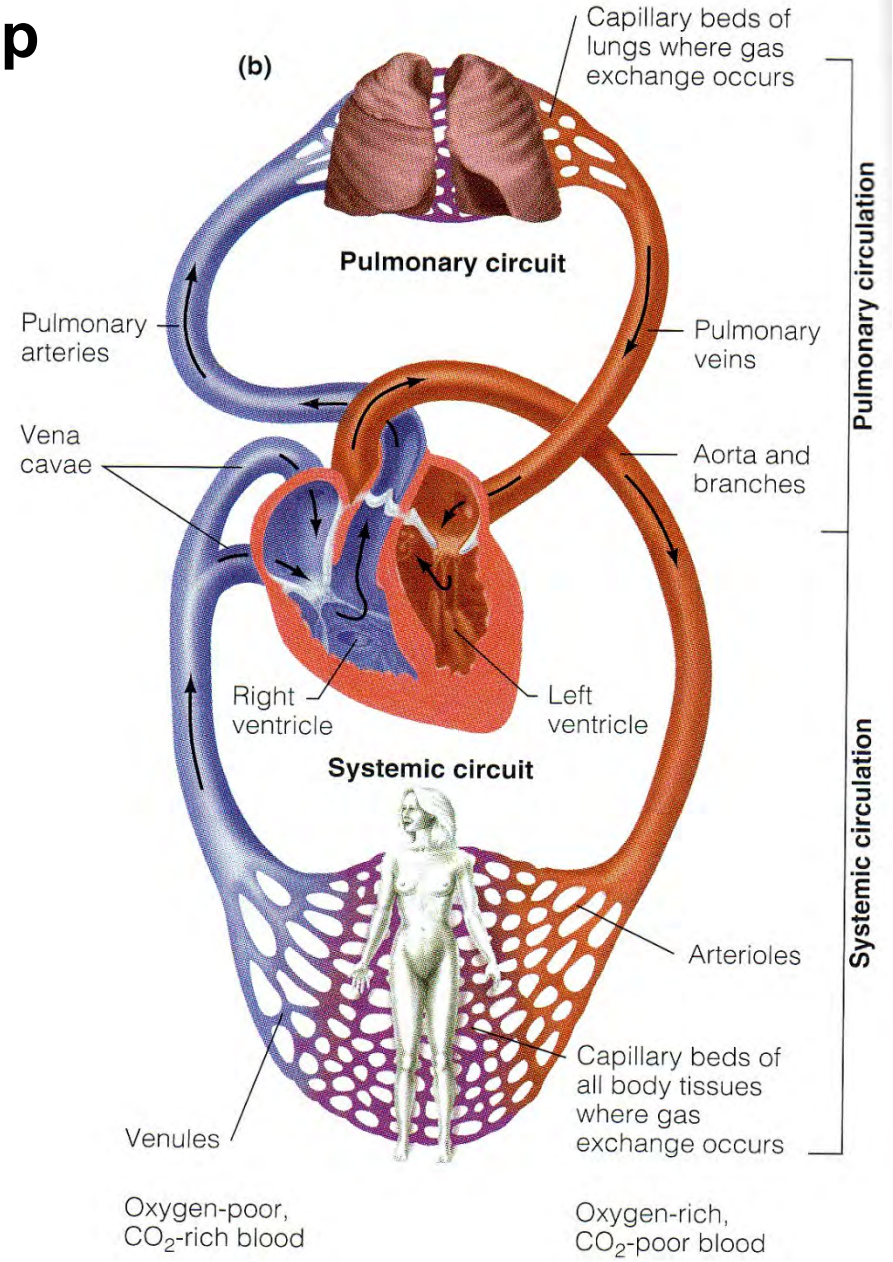


NB: Figure-8 loop

Pulmonary

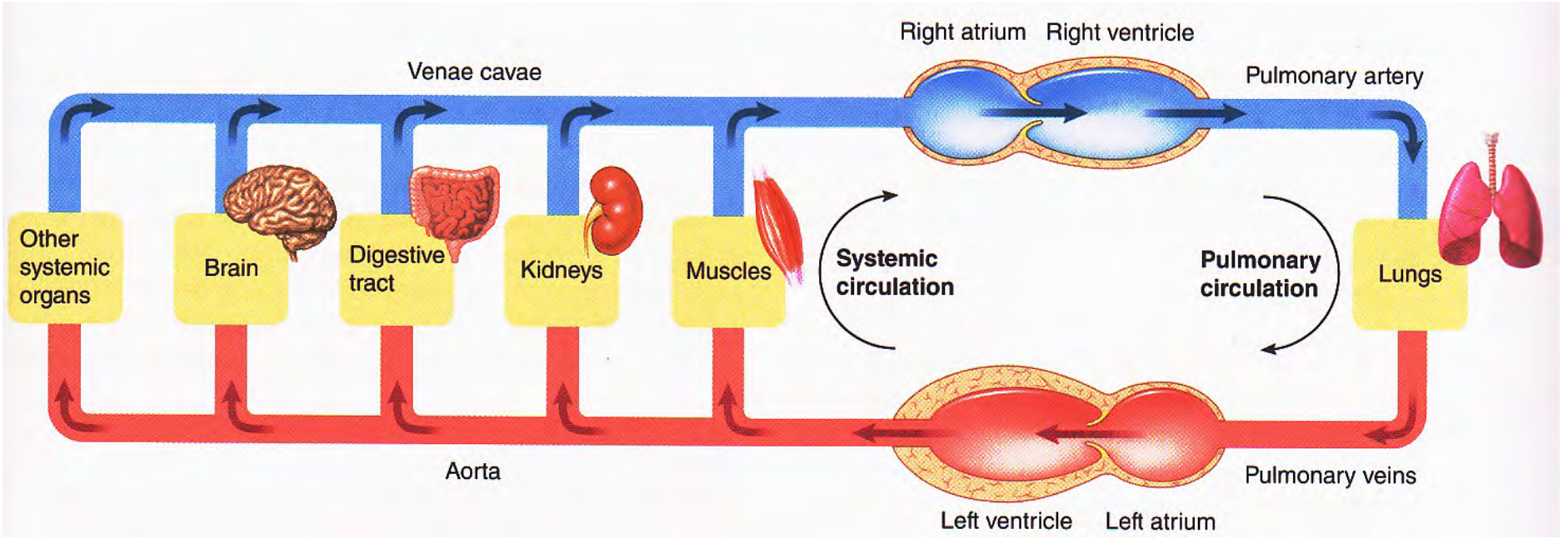


Systemic



D Chiras 2013 fig 4-1b

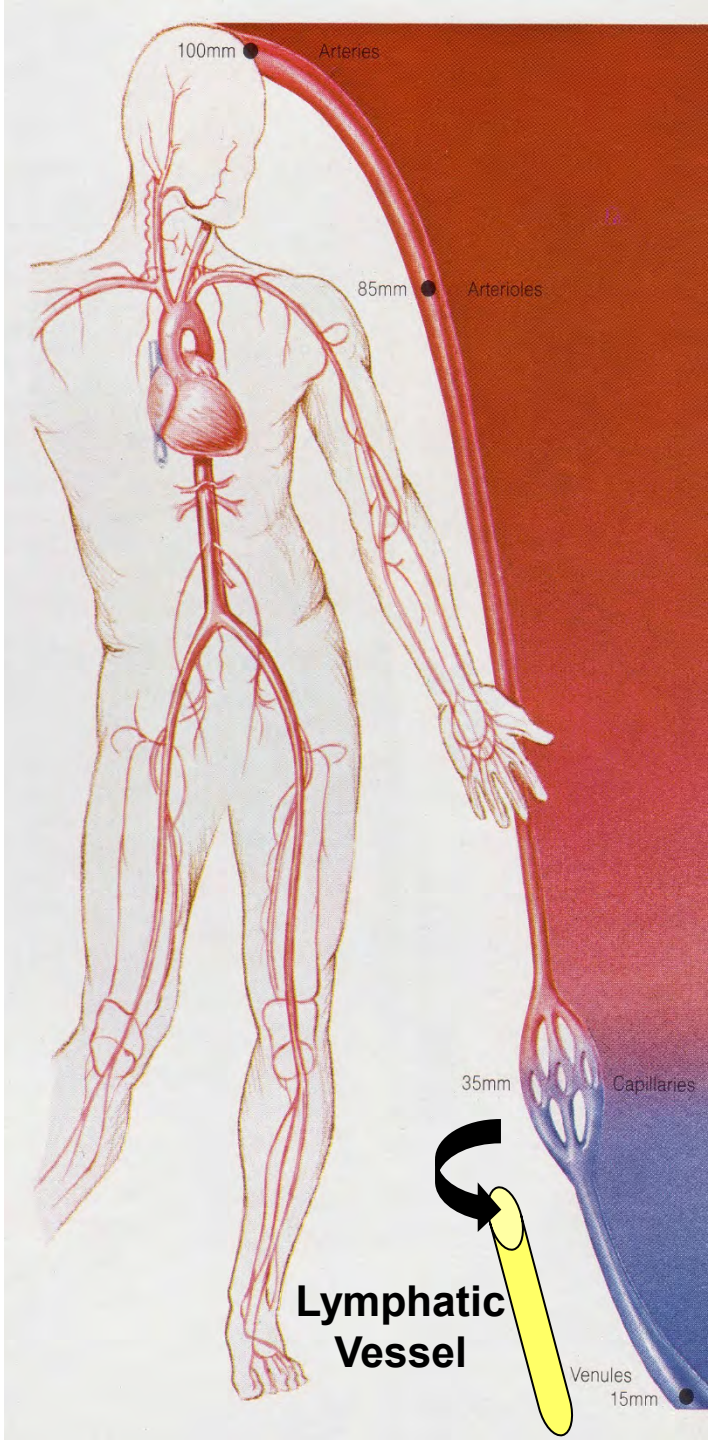
Dual Pump Action & Parallel Circulation



LS 2012 fig 9-2b p 231

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

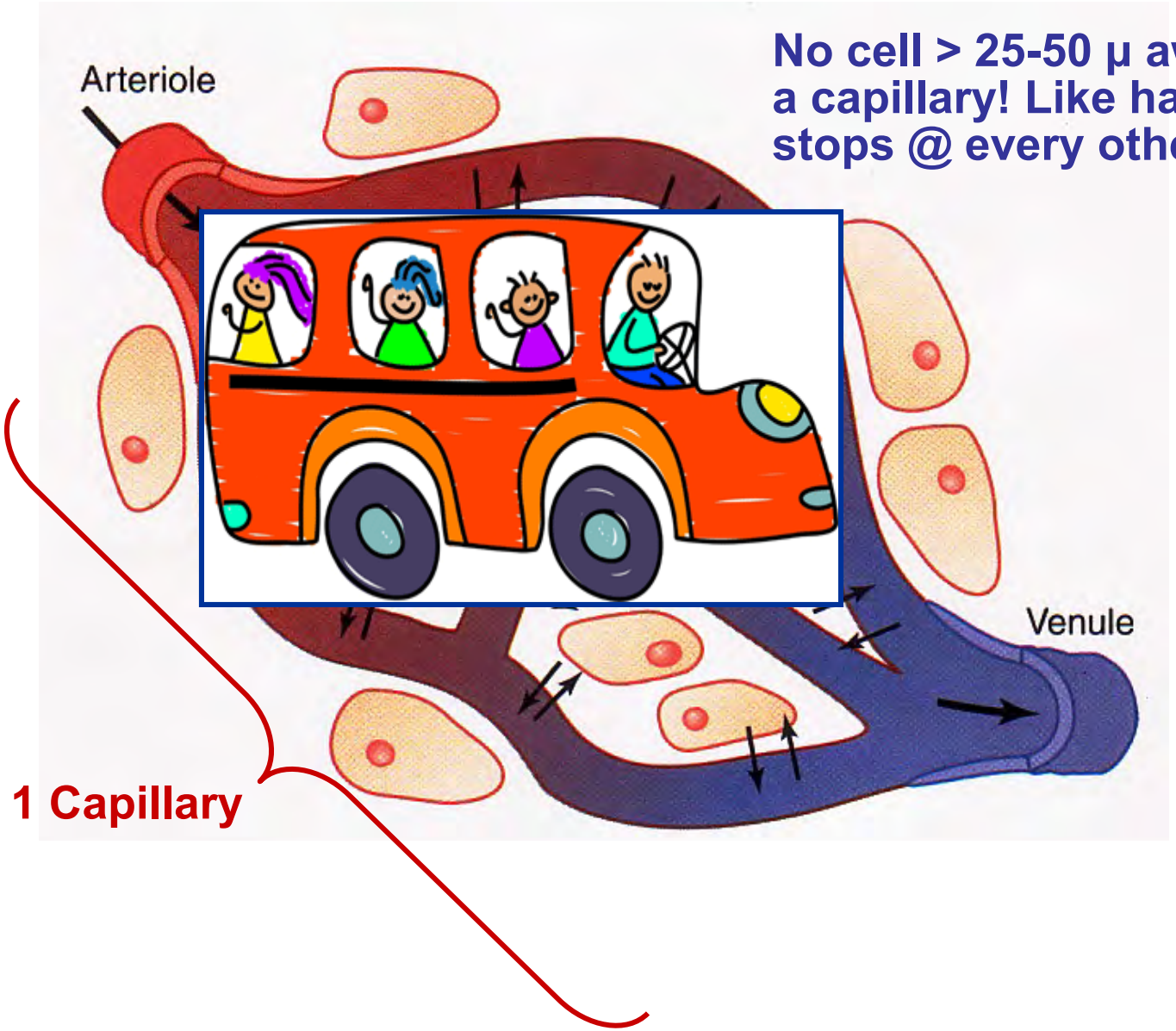
LS 2012 fig 10-21 p 283



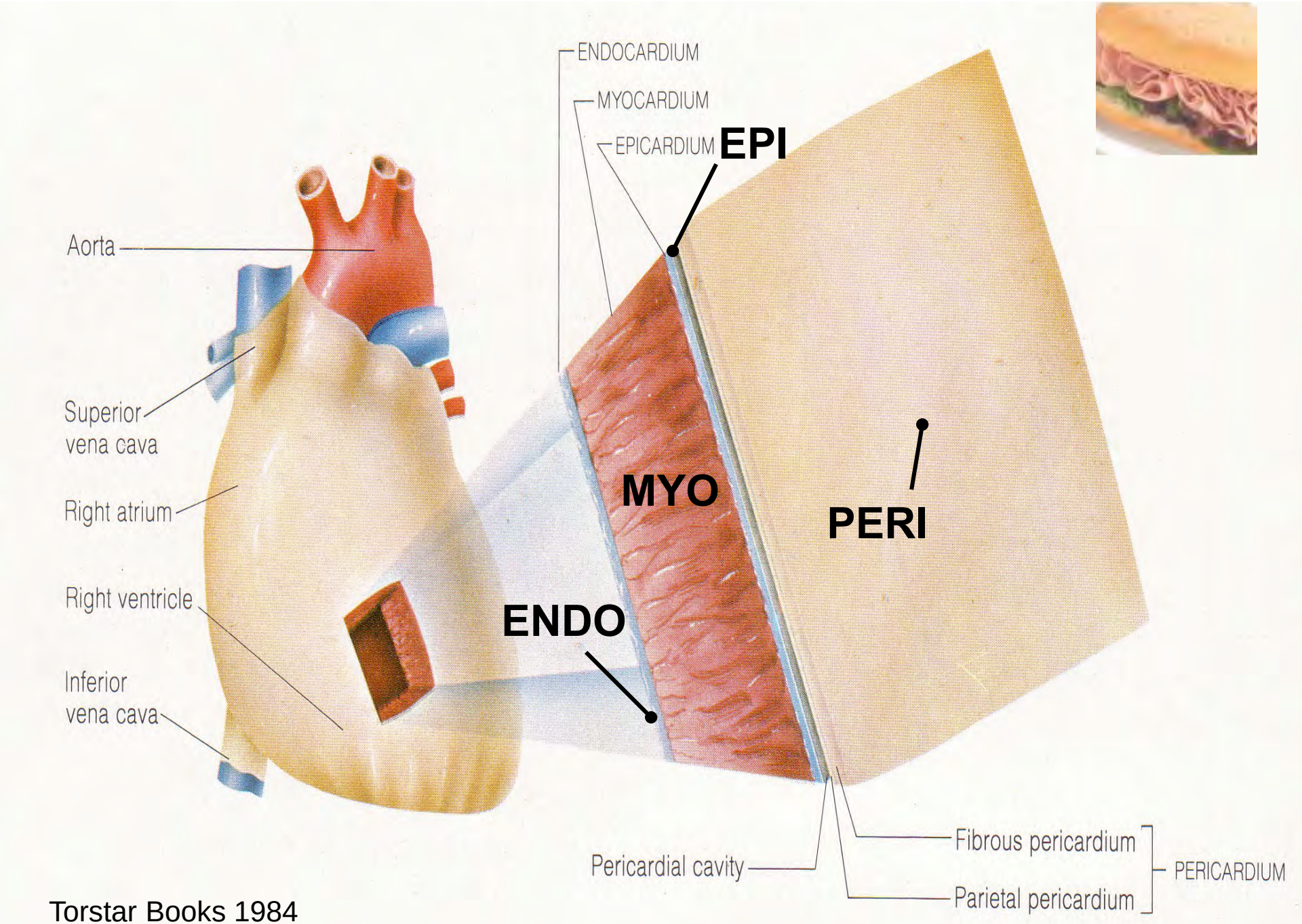
Lymphatics collect run-off & are parallel to venules/small veins!

Torstar Books 1984

Microcirculation Exchange: 10 Billion Capillaries!



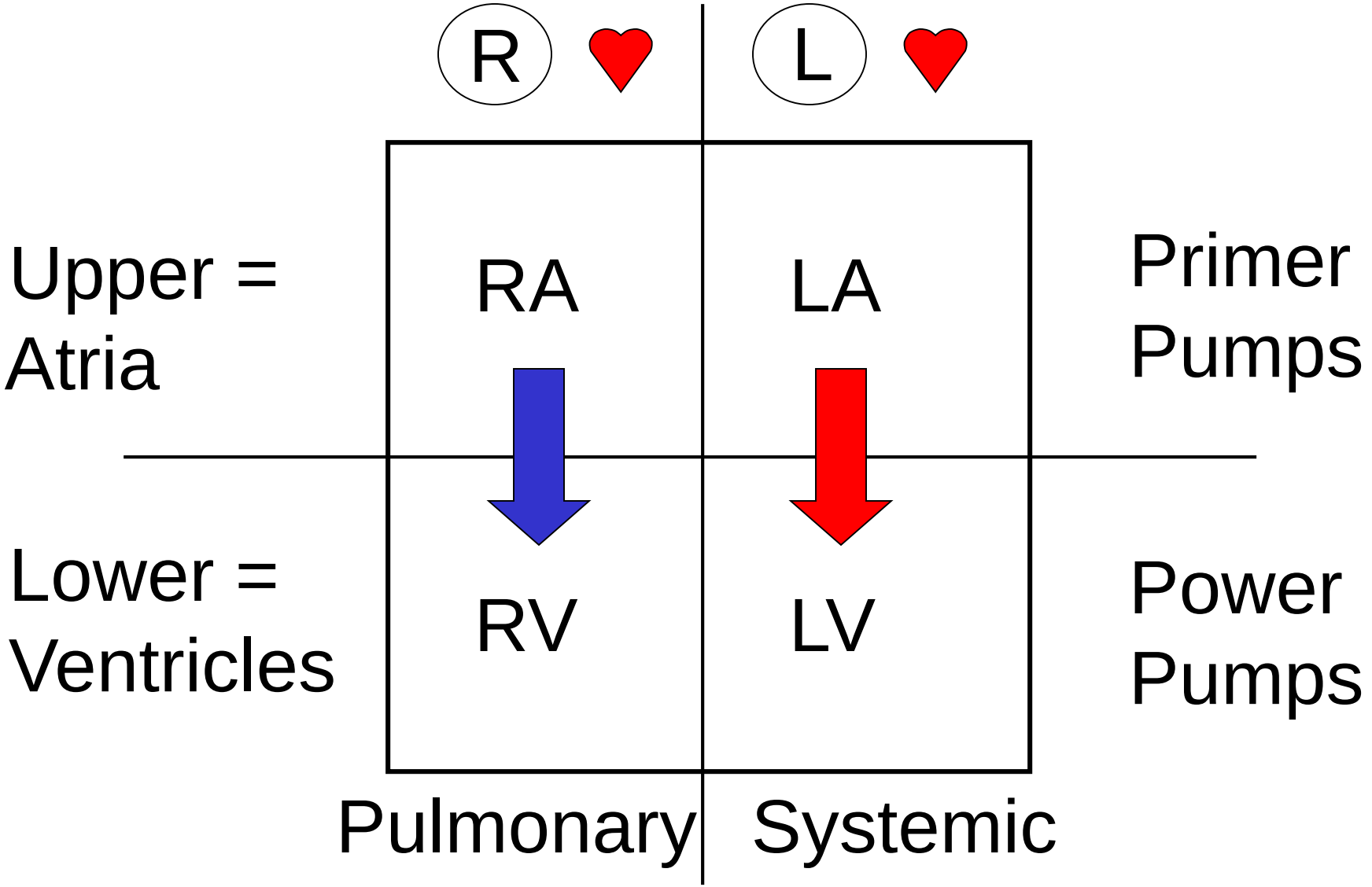
Guyton & Hall 2011 fig 1-2

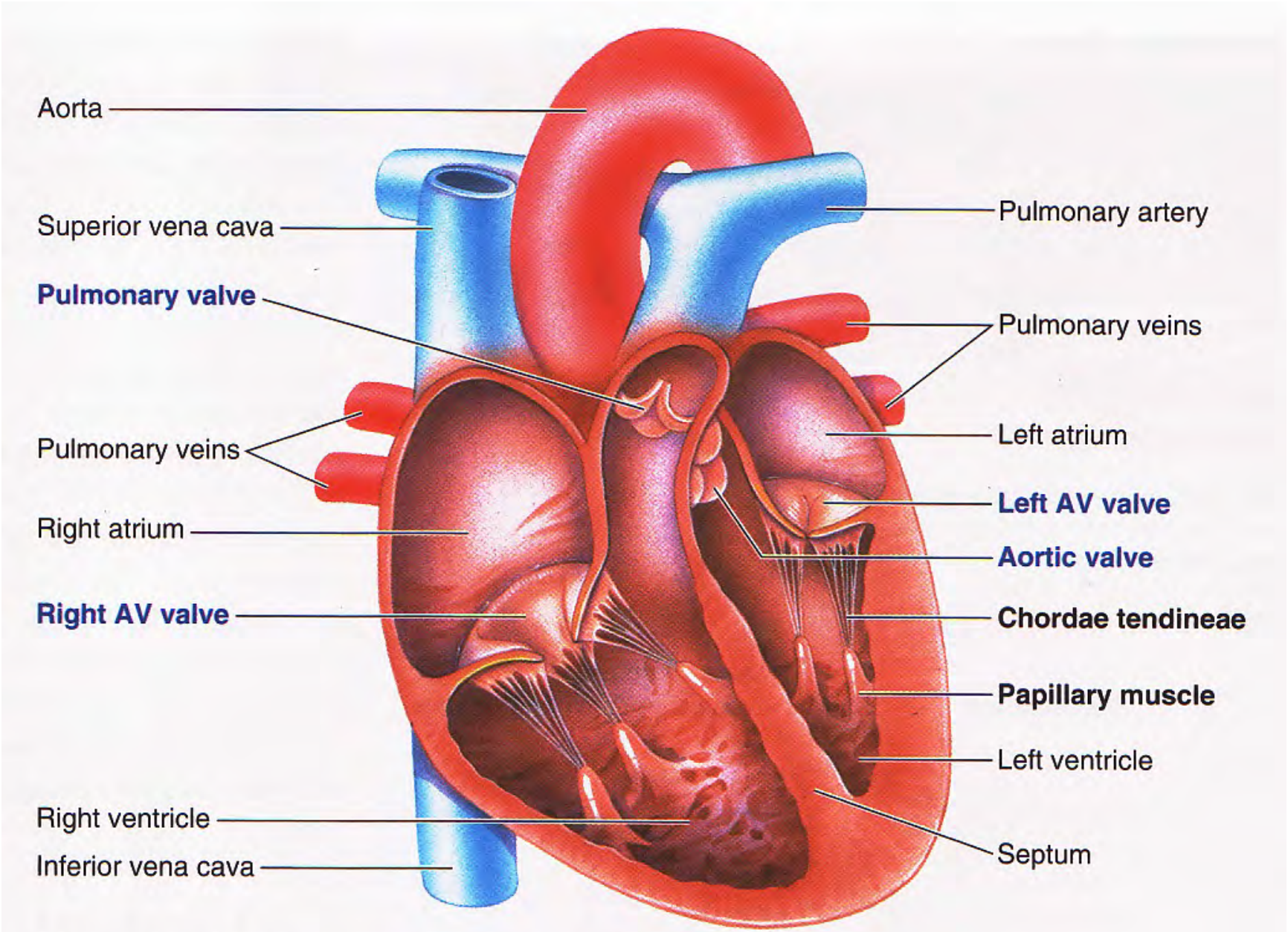


Torstar Books 1984

Human ♥ = 4-chambered box?

2 separate pumps?

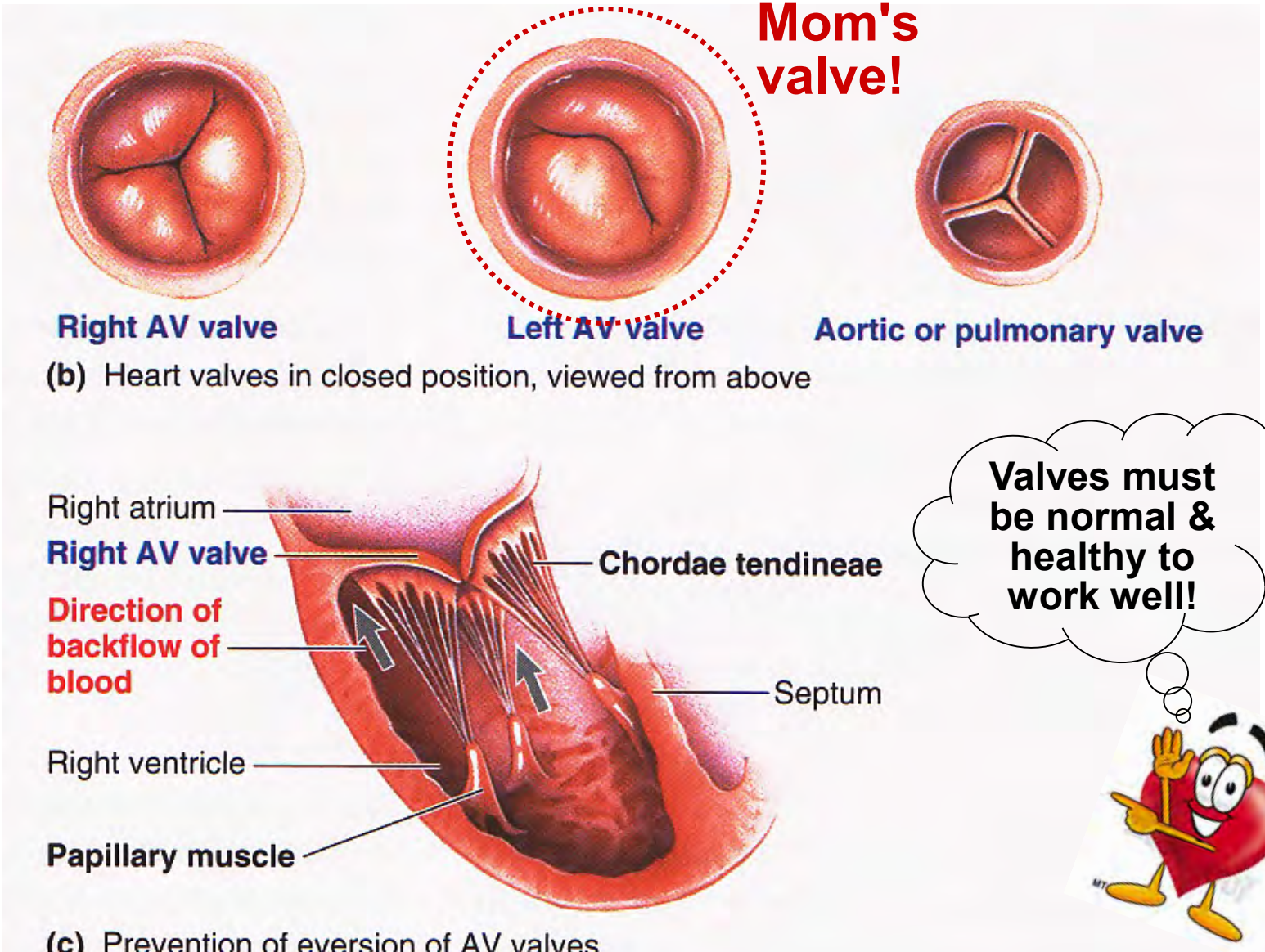




(a) Location of the heart valves in a longitudinal section of the heart

LS 2012 fig 9-4a p 233

Heart Valves Ensure Unidirectional Blood Flow!



● FIGURE 9-4 Heart valves.

LS 2012 p 233

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

BI 121 Lecture 8

Fun heart rate & BP lab today! Hooray!!..

I. ***Announcements*** **Exam I next session; 12 n lab section go directly to 129 Huestis (HUE). All others here (100 WIL)!**
Review: Sunday, 6 pm here (100 WIL)! 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?

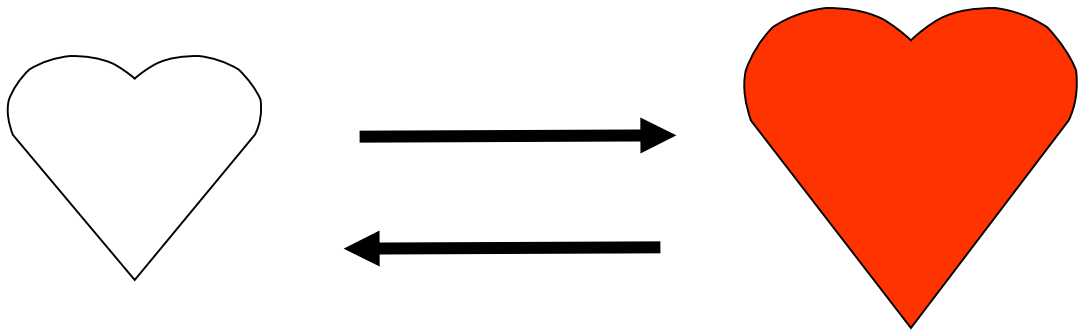
Cardiac Cycle

Systole

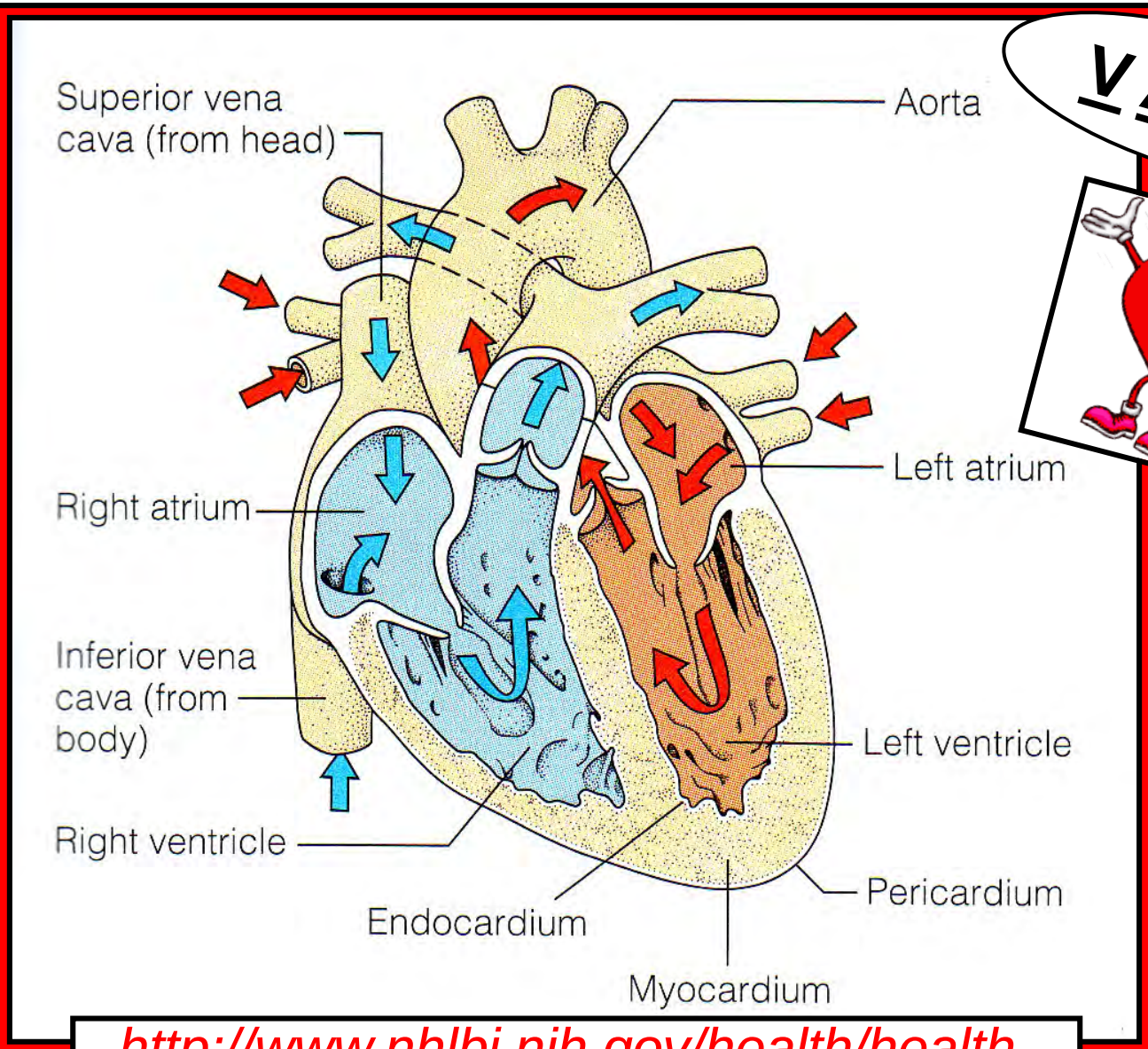
Contract
& Empty

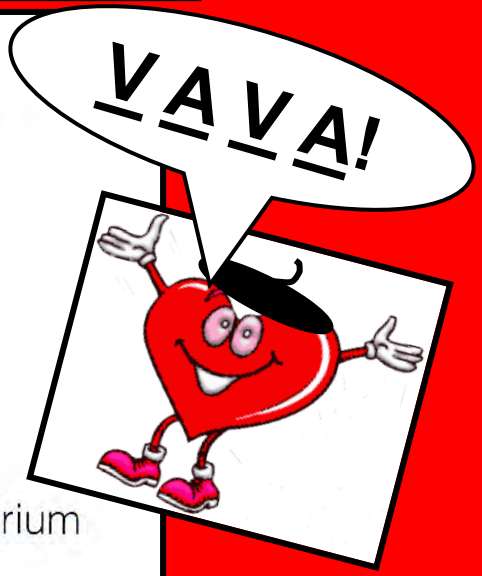
Diastole

Relax
& Fill



Veins → Atria → Ventricles → Arteries





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

LS2007

American Heart Association (AHA) & National Heart, Lung & Blood Institute

http:www.heart.org/

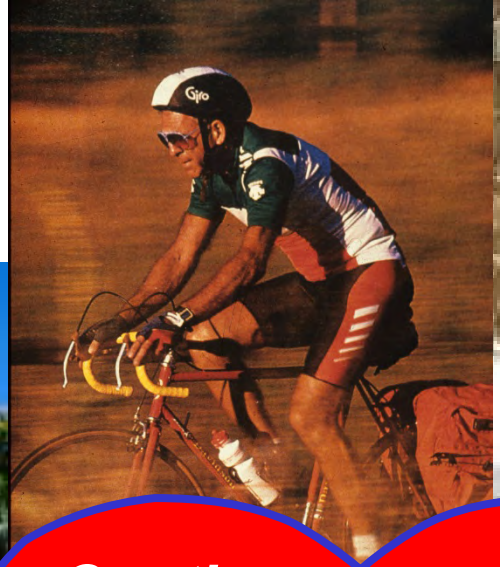
American Heart Association®
Learn and Live℠

http://www.nhlbi.nih.gov/health/

Department of Health and Human Services · National Institutes of Health

National **Heart Lung and Blood** Institute

People Science Health

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

American Heart Association®
Learn and Live℠

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

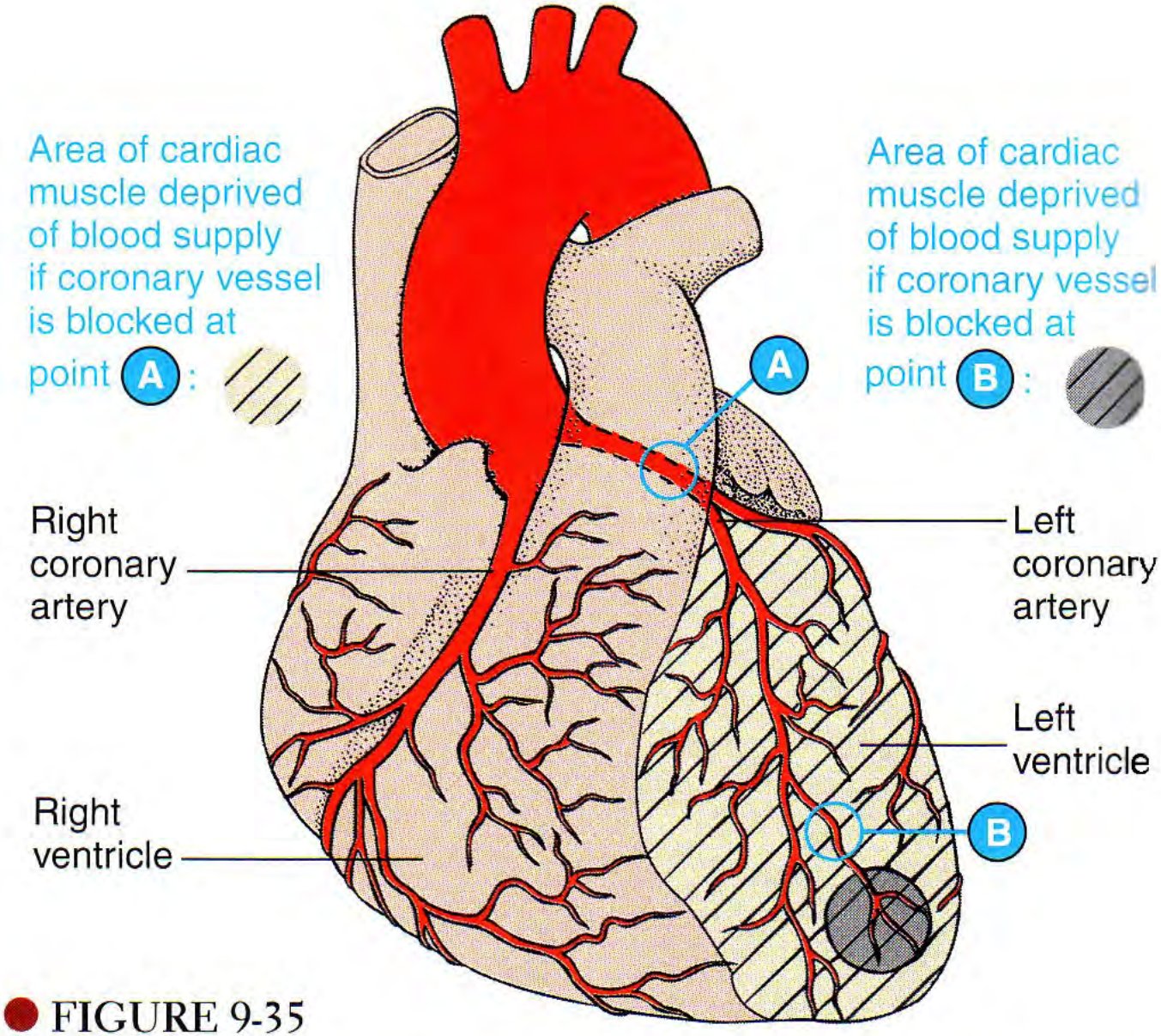
AMI

CVA

TIA

HTN

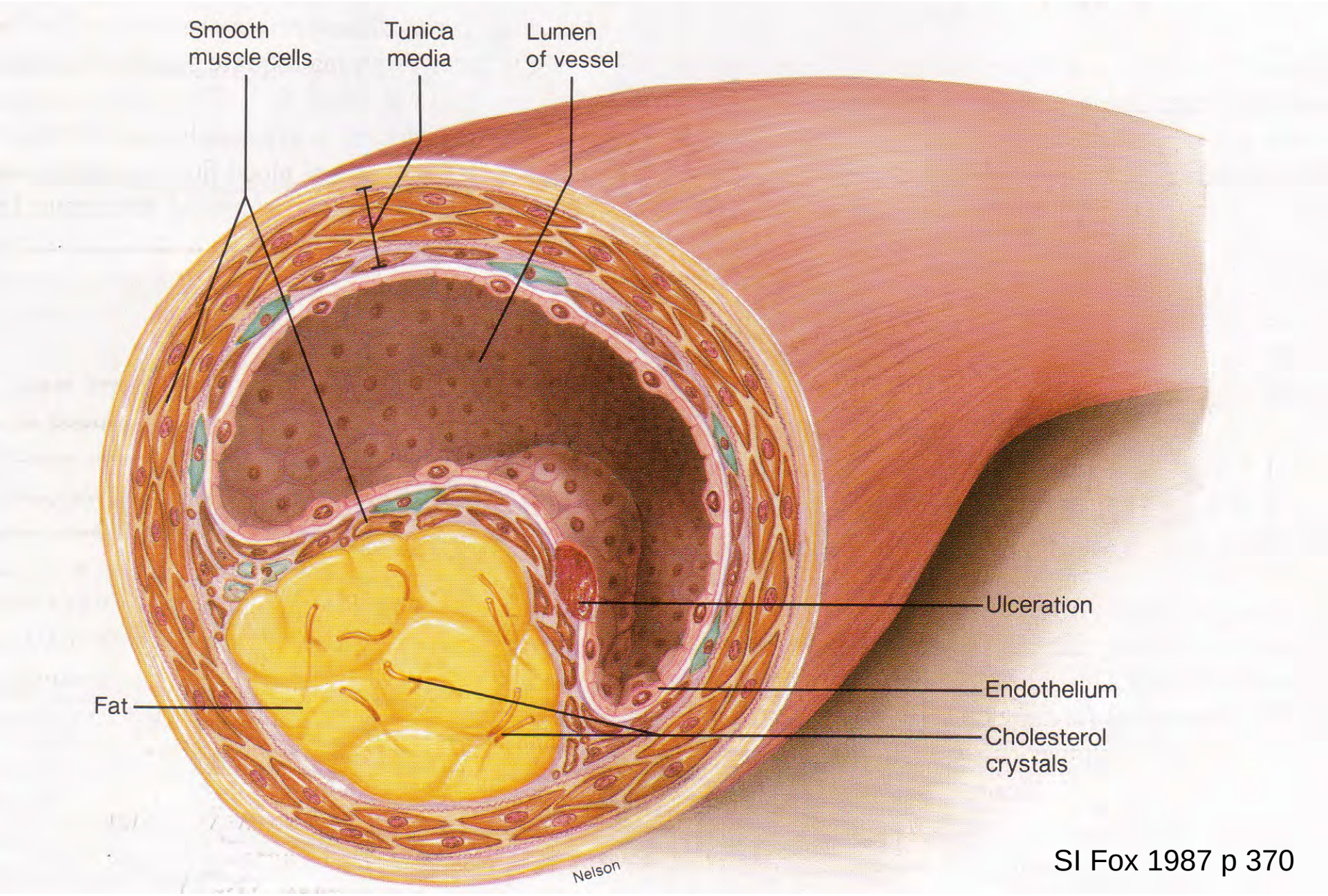
PVD



● FIGURE 9-35

Extent of myocardial damage as a function of the size of the occluded vessel

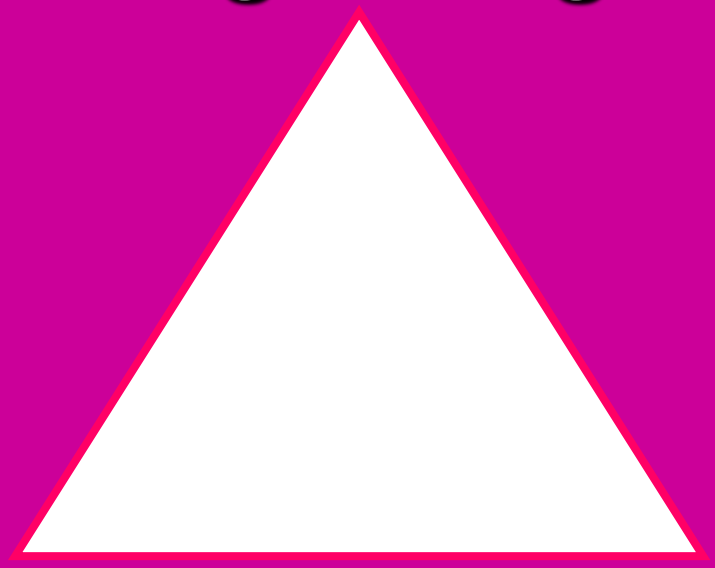
L Sherwood 2004 p 336



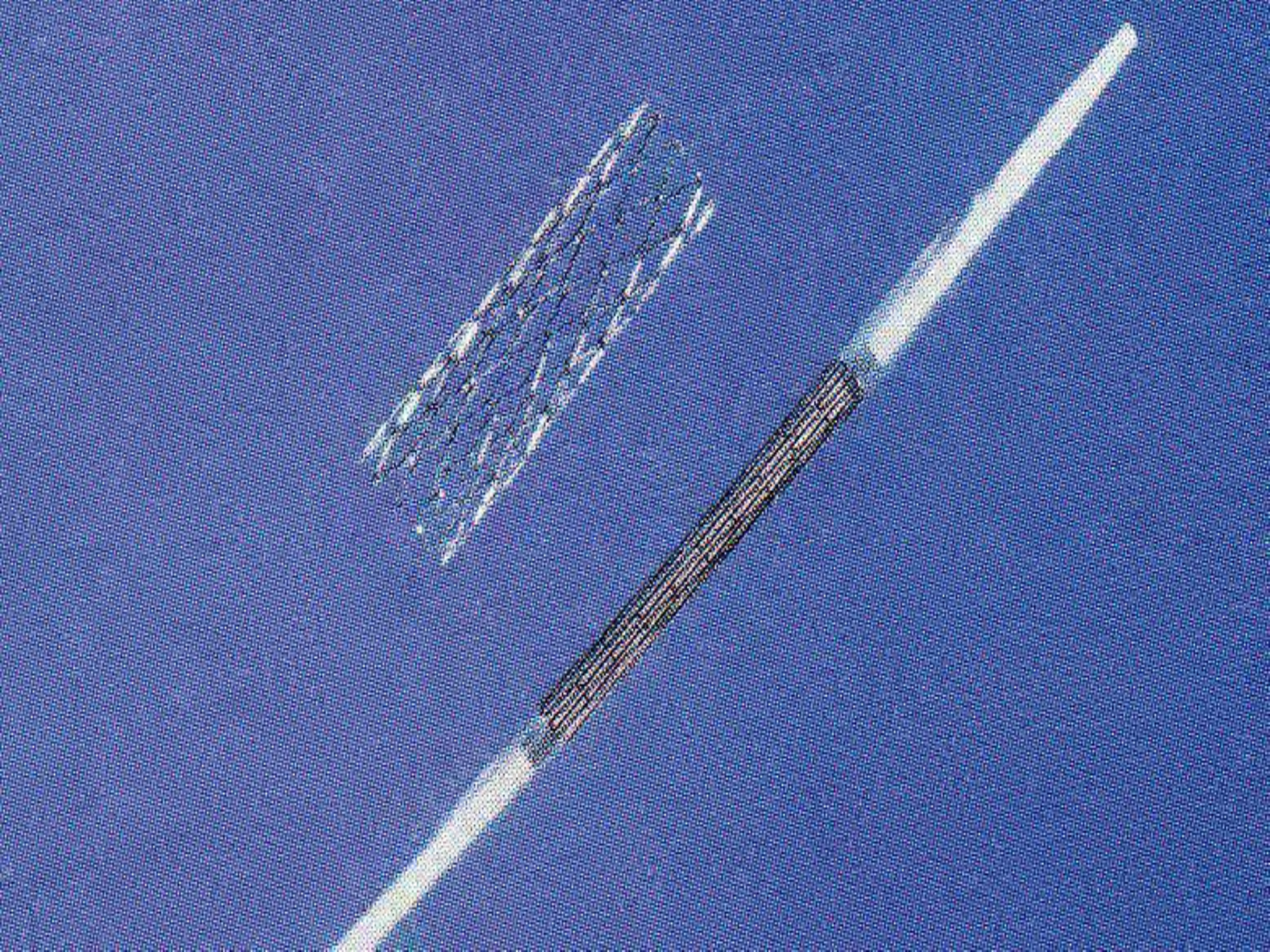
SI Fox 1987 p 370

Treatment Triad

NB: Last blasted resort!!




A



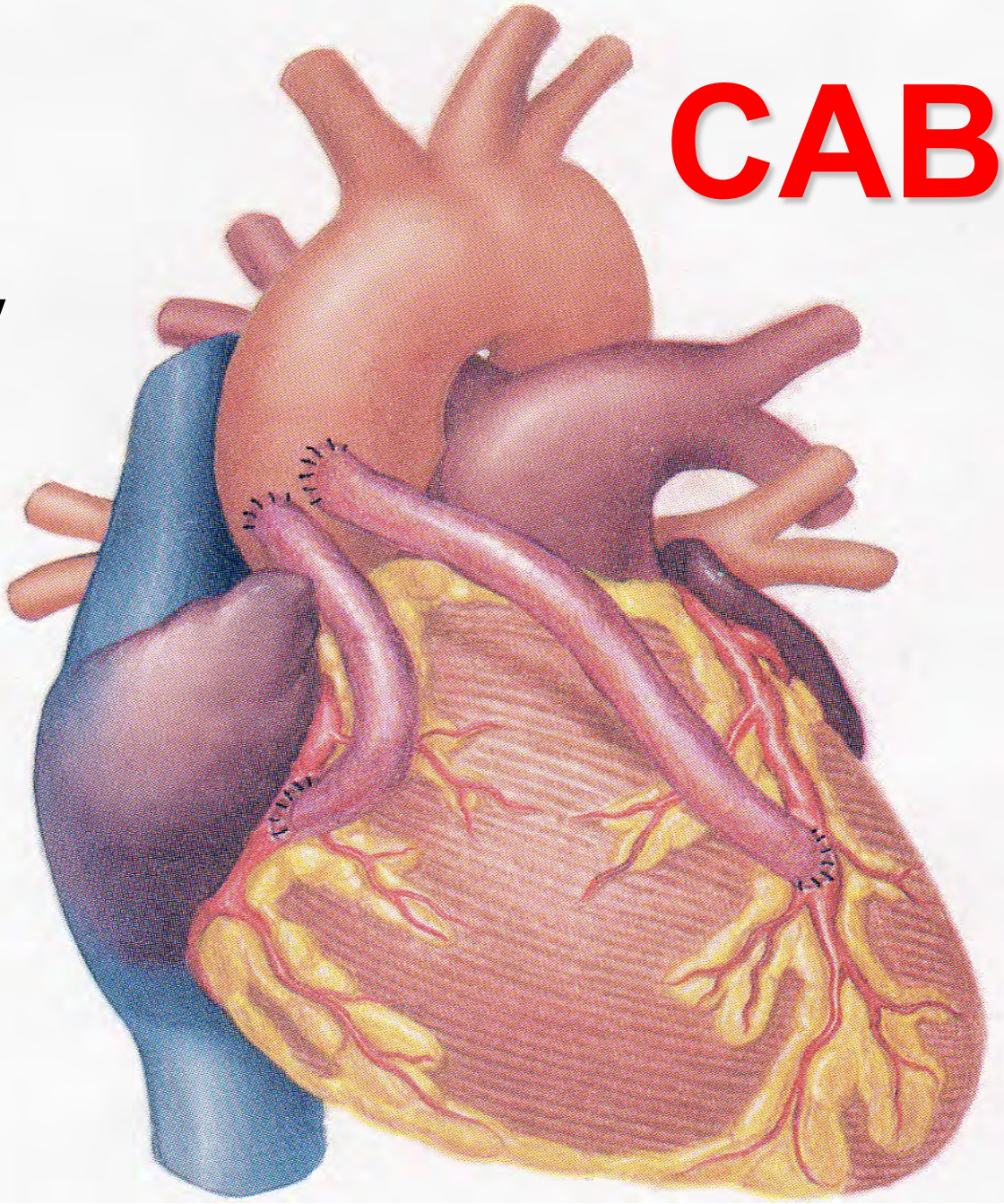
CABG

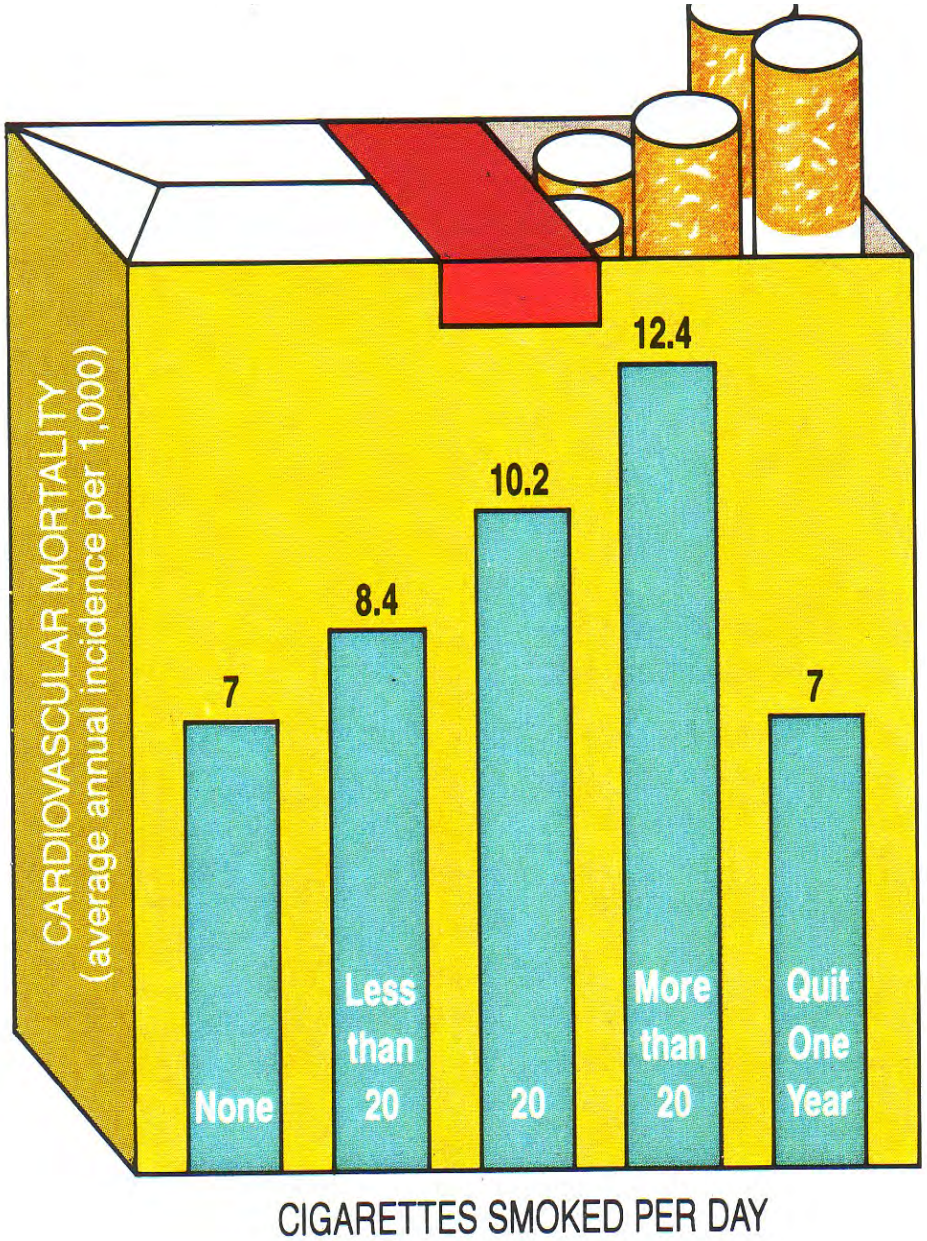
Coronary

Artery

By-pass

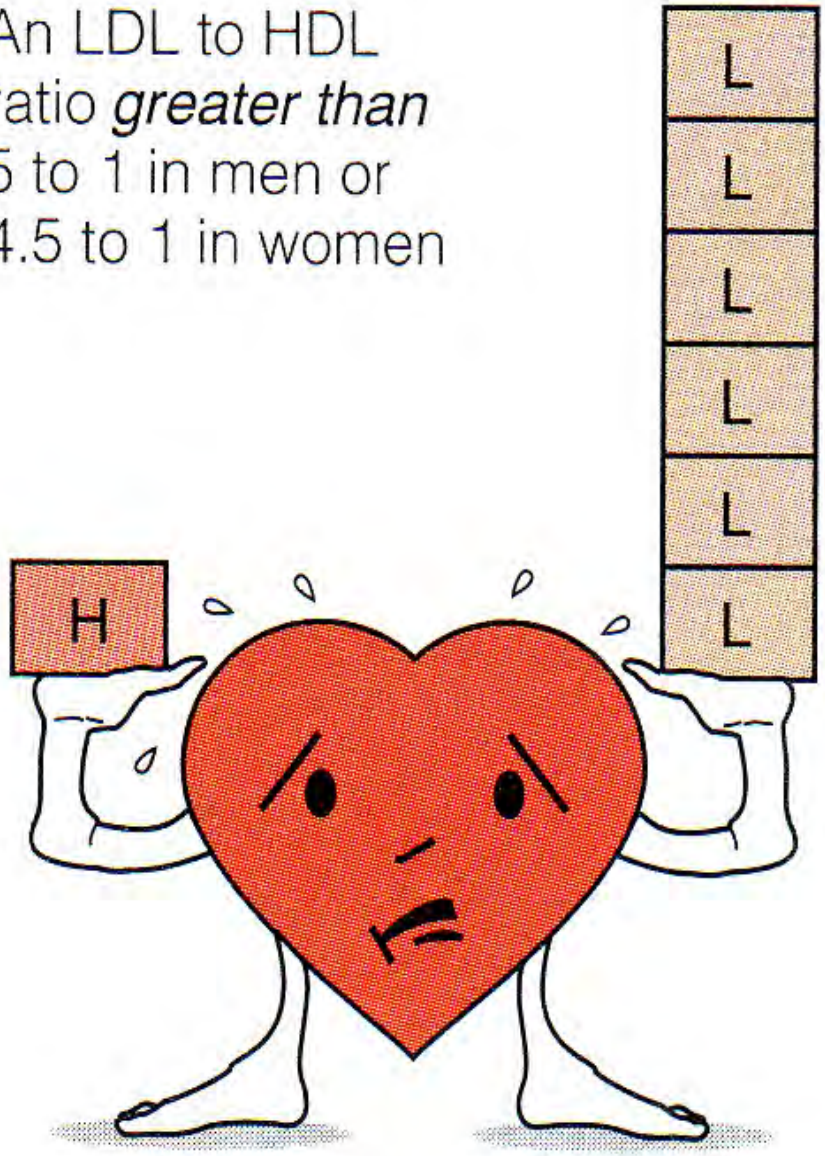
Graft



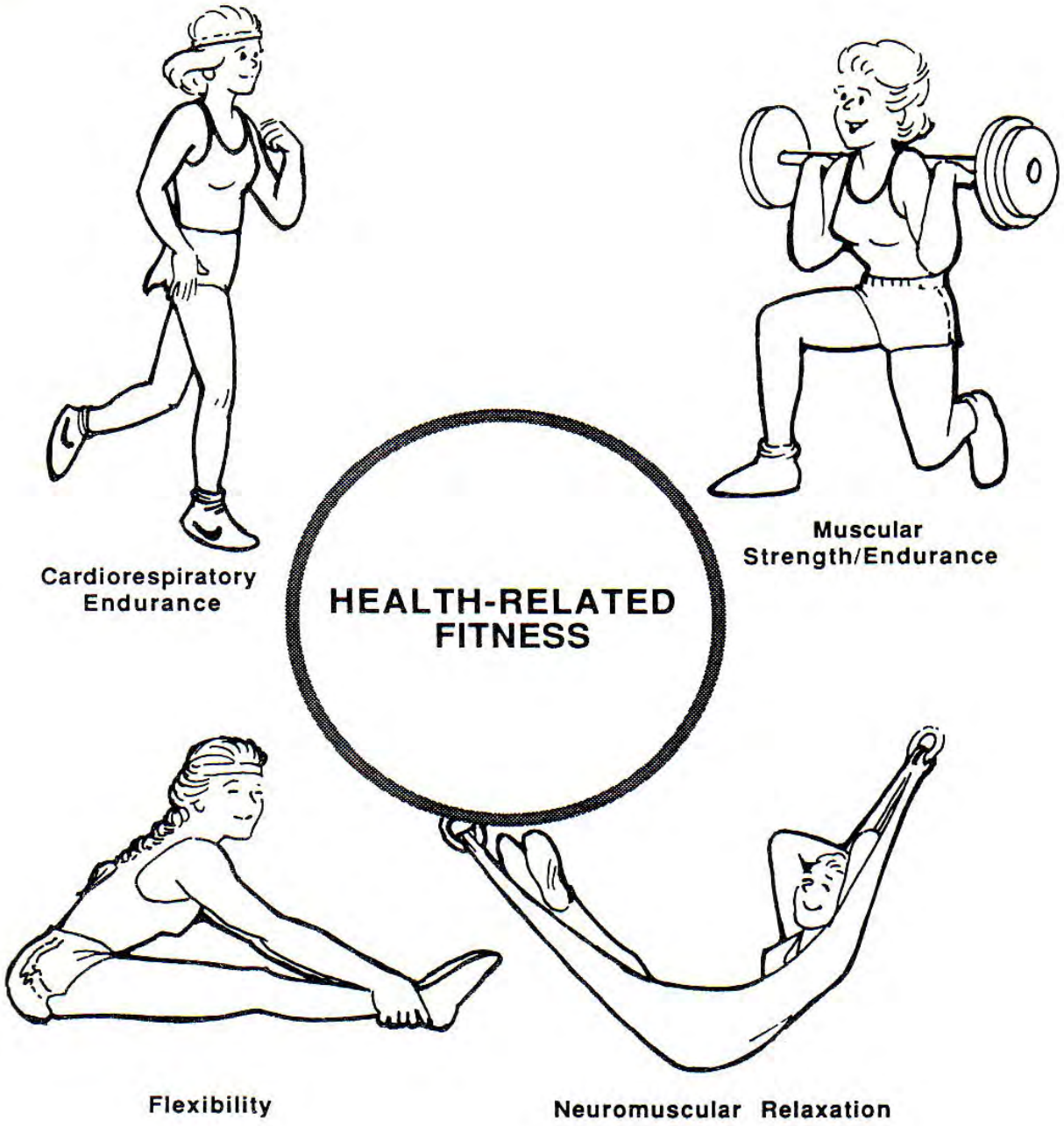

CARDIOVASCULAR MORTALITY
(average annual incidence per 1,000)
7
8.4
10.2
12.4
7
None
Less than 20
20
More than 20
Quit One Year
CIGARETTES SMOKED PER DAY

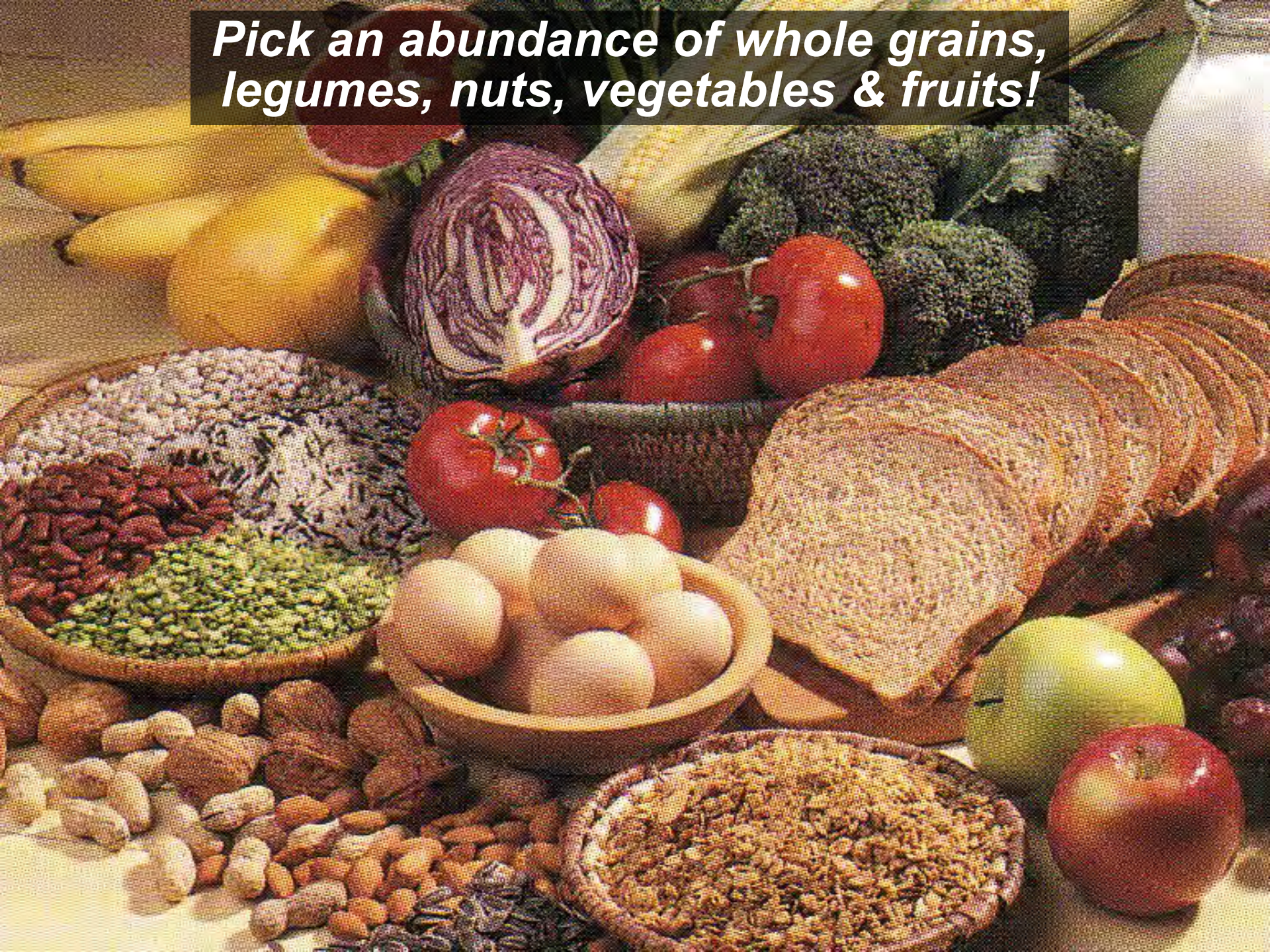

KA-BOOM!
300/200
Hg

An LDL to HDL ratio *greater than* 5 to 1 in men or 4.5 to 1 in women

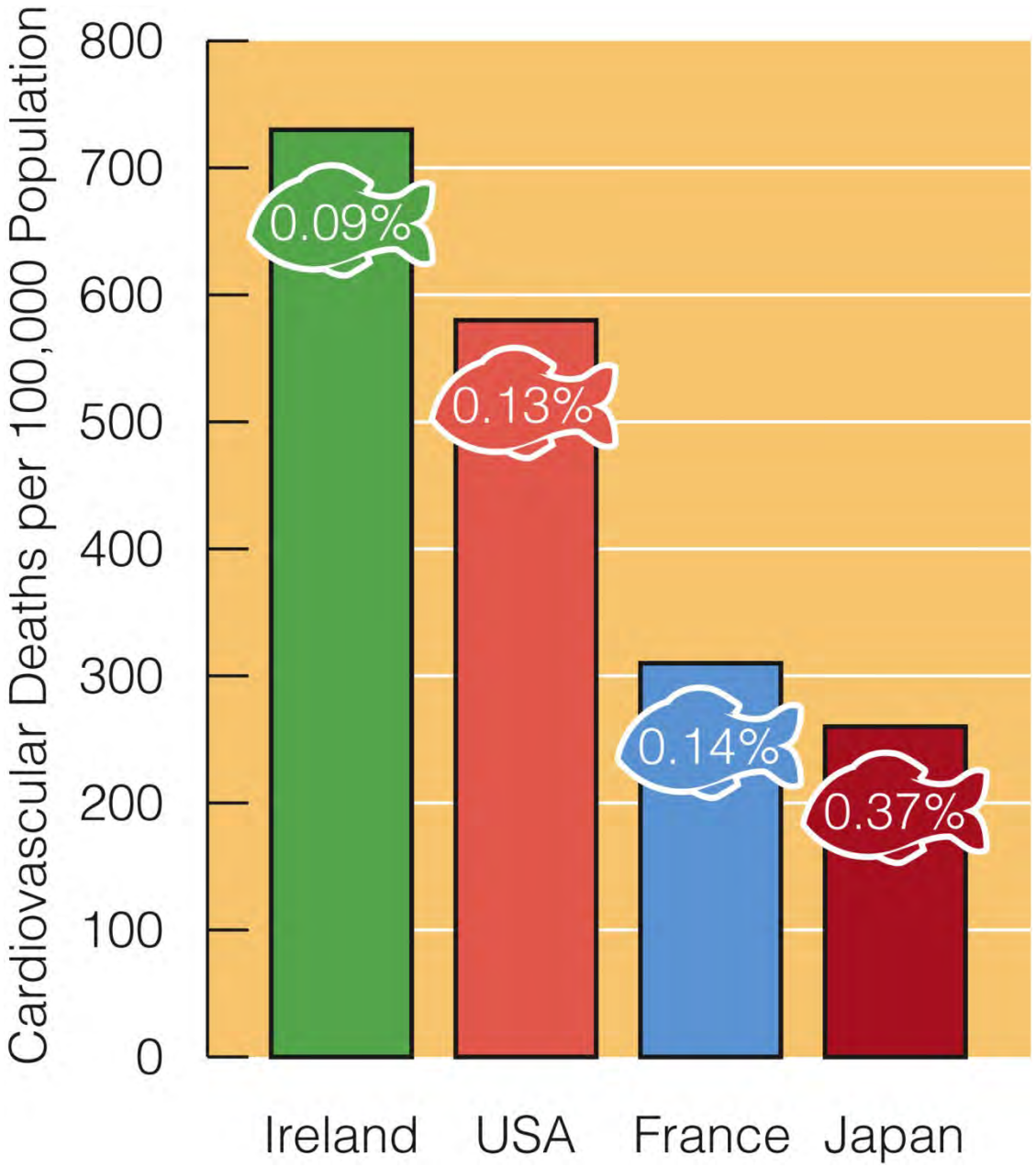


Increased risk of heart disease


HEALTH-RELATED FITNESS
Cardiorespiratory Endurance
Muscular Strength/Endurance
Flexibility
Neuromuscular Relaxation


Pick an abundance of whole grains,
legumes, nuts, vegetables & fruits!

Fish Oil Intakes & Cardiovascular Death Rates



S&W 2011
fig 5-12 p 167

Healthy Oils to Minimize Atherosclerosis

HAPOC?